QST

February 1983 $2.50

devoted entirely to Amateur Radio

ANNEE MONDIALE DES COMMUNICATIONS
WORLD COMMUNICATIONS YEAR
AÑO MUNDIAL DE LAS COMUNICACIONES
1983

Switches from the junkbox

the tempo S-15

...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

The S-15 is the kind of hand held most people want. Simple, rugged, reliable, easy to use...it's the hand held for today and tomorrow. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. The S-15 operates from 140 to 150 mHz (and 150 to 160 on export models). Compare that to the others. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry...just one more indication of the kind of quality that goes into the S-15.

Consider all of these features before you decide on any hand held:

- **5 watt output (1 watt low power switchable)**
- **10 MHz frequency coverage: 140-150 MHz (150-160 for export)**
- **Electrically tuned stages. Receiving sensitivity and output power are constant over entire operating range.**
- **Three channel memory. (1 channel permits non-standard repeater offsets. 200 micro amp memory maintenance (standby)).**
- **A new "easy remove" battery pack**
- **One hour quick charge battery supplied (450 ma/HR)**
- **Plug for direct 13.8 volt operation**
- **Speaker/microphone connector**
- **BNC antenna connector and flex antenna**
- **Extremely small and light weight (only 17 ounces).**
- **Ample space for programmable encoder.**
- **Fully synthesized**
- **Extremely easy to operate**
- **Its low price includes a rubber antenna, standard charger, 450 ma/HR battery (quick charge type) and instruction manual.**

OPTIONAL ACCESSORIES: 1 hour quick charger (ACH 15) • 16 button touch tone pad (S 15T) • DC cord • Solid state power amplifier (S-30 & S-80) • Holster (CC 15) • Speaker/mike (HM 15)

TEMPO S-2
Use 220 MHz repeaters nation wide. Synthesized, field tested and dependable. Add a power amp and build a small station or powerful mobile rig.

TEMPO S-4
The first 440 MHz hand held and still a winner...offers the perfect way to get into an uncrowded band. Reduced price!

TEMPO M-1
Superb quality VHF marine band hand held. Synthesized for world wide use...all marine channels & 4 weather channels. Ch 16 override. All offsets built in.

Boost the power of your hand held or mobile unit with a Tempo solid state power amplifier. Top quality, excellent selection. Please write for literature.

Available at your local Tempo Dealer or from....

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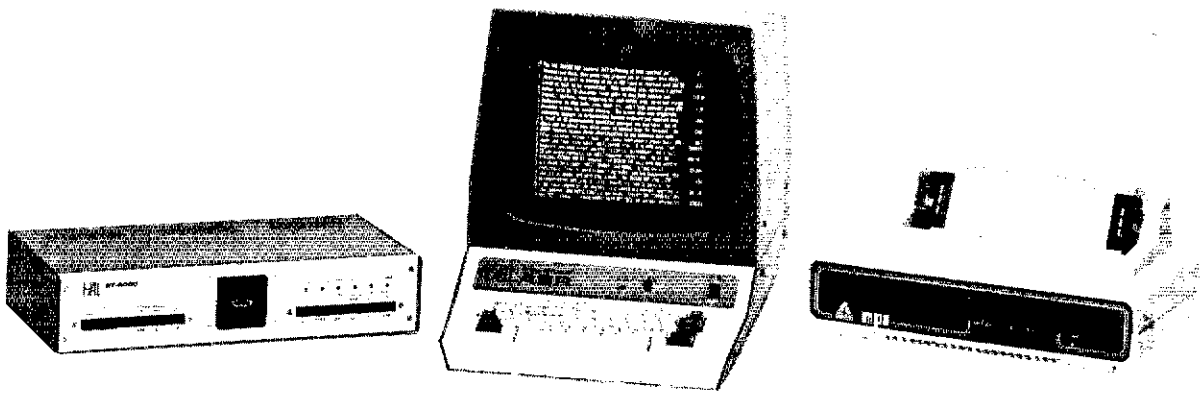
REGAL RTTY



By popular acclaim – the leader and king of radio teleprinter communications – the **HAL DS3100ASR** and **ST6000.** When combined with the **MSO3100 Message Storage Option** and a hard-copy printer, you have the premier RTTY station. Discriminating operators the world-over choose the DS3100 and ST6000 for their stations over any other equipment. The DS3100 and ST6000 have set new standards of comparison for commercial and amateur RTTY data communications; they are representative of the high standards of quality and performance for which HAL is known throughout the world. Put your best RTTY signal forward with the DS3100 and ST6000!

- **Send and receive ASCII, Baudot and Morse code**
- **Full length 72 character lines and 24 line screen**
- **True "ASR" operation – pretype while receiving**
- **50 Line pretype, on-screen transmit buffer**
- **150 Line receive display buffer**
- **MSO3100 adds 450 lines of MAILBOX message storage**
- **P31 green, 12 inch display screen is built-in**
- **Control functions are clearly marked on keytops**
- **On-screen status indicators with real time**
- **Upper-lower case ASCII with ALL control codes**
- **45, 50, 57, 74, 100 baud Baudot**
- **110, 150, 300, 600, 1200, 1800, 2400, 4800, and 9600 baud ASCII – full or half duplex**
- **1 to 175 wpm send and receive Morse code**
- **Current loop or RS232 I/O interface**
- **ST6000 has tuning oscilloscope and loop supply**
- **Three RTTY shifts: 170, 425, or 850 Hz**
- **Multiple active RTTY filters and detector stages**
- **Crystal controlled RTTY transmit tones**
- **Printers available for hard-copy of all 3 codes**

Write or call for more details. See the DS3100, MSO3100, ST6000, and printers at your favorite HAL dealer.

HAL COMMUNICATIONS CORP.

BOX 365
URBANA, ILLINOIS 61801 **217-367-7373**

IC-740

Extensive Versatility for the Serious Operator

The ICOM IC-740 offers features found only on the best amateur equipment and performance second to none.

Dynamic Range. The IC-740 is built to withstand strong adjacent signals and still maintain sensitivity and distortion-free output of the desired signal in its passband. With a dynamic range of over **100 dBm** and an intercept point of **+18dBm,** the IC-740 receiver is a true performer. The IC-740 receiver is also **crunch proof,** and unlike many receivers that have good receiver specifications, it does not collapse under the presence of an RF field.

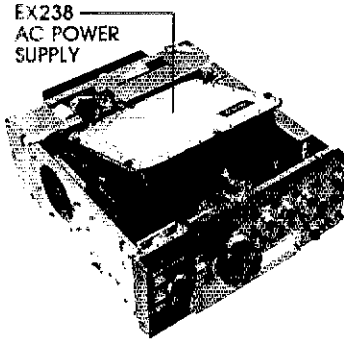
Other outstanding features that are a must for a modern, high-performance amateur receiver are included in the IC-740:

Passband Tuning, adding an additional filtering element to the receiver passband plus giving control of the actual width of the IF stages of the receiver... variable from 2.4 kHz to 700 kHz in SSB, CW or RTTY.

Variable AGC, a two speed AGC with an OFF position allows proper selection of AGC speed **regardless** of mode, VOX or CW breakin. The OFF position makes the IC-740 easily adaptable to frequency converters.

A **Noise Blanker** that really works with both wide and narrow pulse widths and a threshold control to give the optiumum blanking with minimum of signal distortion.

And...the IC-740 has an optional **Internal Power Supply** giving 160-10 meter transceive coverage in **one** package.



These and other fine receiver features plus ICOM's renowned transmitter audio make the IC-740 the **finest amateur transceiver** around today.

$50 Cash Rebate

$50.00 for the purchase of an IC-740.

Begins Dec. 15, 1982
Expires Mar. 31, 1983

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions

February 1983 *Volume LXVII Number 2*

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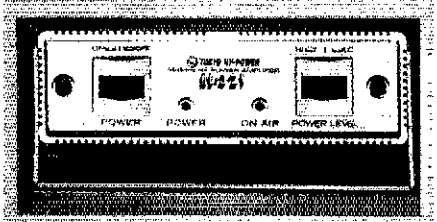
NEWS AND FEATURES

OPERATING

DEPARTMENTS



HL-32V VHF AMPLIFIER — The first of our super compact amplifiers for use with handheld radios. For VHF operations, this unit produces up to 25W output with drive from your 0.5W to 3W handheld. Low insertion loss on receive and selectable power level design provide low VSWR to the transceiver.

Excellent for mobile use in snuggly fitted smaller cars, this little beauty can be stowed under the seat, out of sight and out of mind.

The HL-32V operates linear mode for SSB or FM (switch selected), and the best news of all: the price is only $89.95 Suggested Retail!

Meets or exceeds FCC specifications.

TOKYO HY-POWER LABS, INC.

For catalog, send your QSL card to
Encomm, Inc.
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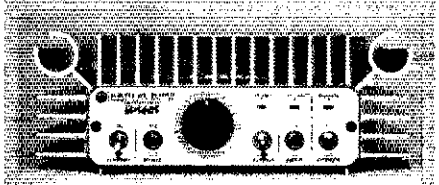

HL-160V VHF AMPLIFIER — This is our big 160W 2 meter linear amplifier which can work with a radio of 10W or even 3W output. This setup is achieved with a pair of rugged VHF R.F. transistors, using highly reliable one-board construction, and with the HL-160V's built-in 12db MOS-FET preamp.

The HL-160V has convenient front panel controls and select switches, LED indicators and a very reliable RF wattmeter. This big amp works SSB, CW, FM and AM modes, and it has a true coaxial relay on the output side.

When you need the power, the HL-160V is the power you need. $349.95 Suggested Retail.

Meets or exceeds FCC specifications.

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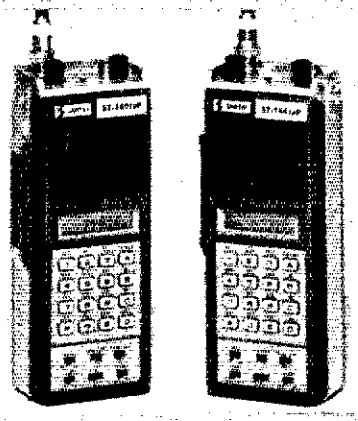

ST-440/μP / ST-144/μP

Only SANTEC packs this much radio into your hands! Get the very most for both bands! ☐ Wide band operation from 142-149.995 VHF (2 meters) and from 440-449.975 UHF (440) ☐ 10 memories with stored offset and/or frequency and with single-button recall ☐ Three output power levels of 3 W high, 1 W medium and 100 mW low (all approx.) ☐ Programmable bandscan with 3 different modes of scan and 2 end limits ☐ Low, low "quiet time" standby of < 10 ma ☐ Display of full 6 digits plus memory channel number and ± offset in use ☐ Full 16 Key Touchtone® pad for repeater control and auto patch ☐ 500 mAHr NiCd battery pack ☐ Priority Scan which always checks Memory no. 1 ☐ 24 hour clock for time checks **anytime**, even if the radio is off, transmitting or monitoring your favorite frequency ☐ Capacity for changing batteries without losing memory data or clock function ☐ Full 2 year extended service plan, which is more than you get from anyone else!

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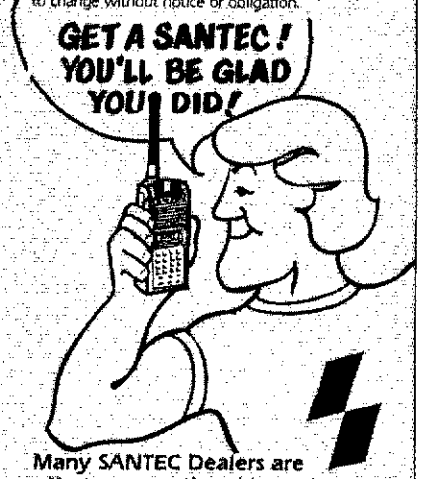

Many SANTEC Dealers are offering exceptional bargains on SANTEC products right now! Get yours today!

ST-440/μP, 440	**Now 337.33**
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Base Charger & Power Supply ST-6BC	29.95
Leather Case ST-LC	29.95
Shoulder Strap ST-SS	5.00
Remote Speaker MS-50S	14.95
Speaker Microphone SM-3	34.95
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Extra NiCd Battery Pack ST-500B3	34.95
Mobile Charger ST-MC	9.95
Extra Wall Charger ST-WC	9.95
6-Pin Ext. Speaker Mic Connector ST-EMC	6.95

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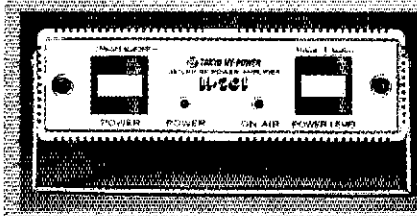

HL-20U UHF AMPLIFIER — This is another super compact from THL, and it's beautiful, with the controls on the brushed metal face panel to make operations as easy as touch and go.

The ultra-compact HL-20U is a basic amplifier for all UHF handheld radios, and it can accept input levels from 200mW to 3W, to provide a big 20W output signal. Fixed antenuator design allows for full output from as low as 200mW drive.

Your UHF handheld operations have never experienced anything like this surprising little amplifier. $119.95 Suggested Retail.

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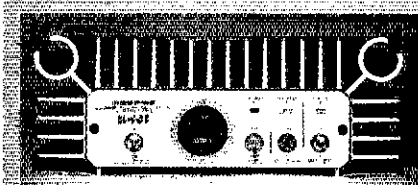

HL-90U UHF AMPLIFIER — Our new 80W output big-power UHF amp, with GAS-FET preamp and drive requirements as low as 10W, is designed for the 70cm amateur band.

It features stable and powerful amplification along with excellent linearity, which is especially effective on SSB. With its built-in receiver preamp, the HL-90U enables you to enjoy more comfortable DX QSO's. Accurate output power can be read with the built-in precision directional coupler, and power can be reduced by one half by the power level switch.

The HL-90U works FM, SSB, and CW. It provides a remote control terminal, and it comes to you for $389.95 Suggested Retail.

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Ringo Ranger II

Simply the best

The best combination of gain, bandwidth and low angle radiation for simplex or repeater operation.

Quick easy assembly and installation

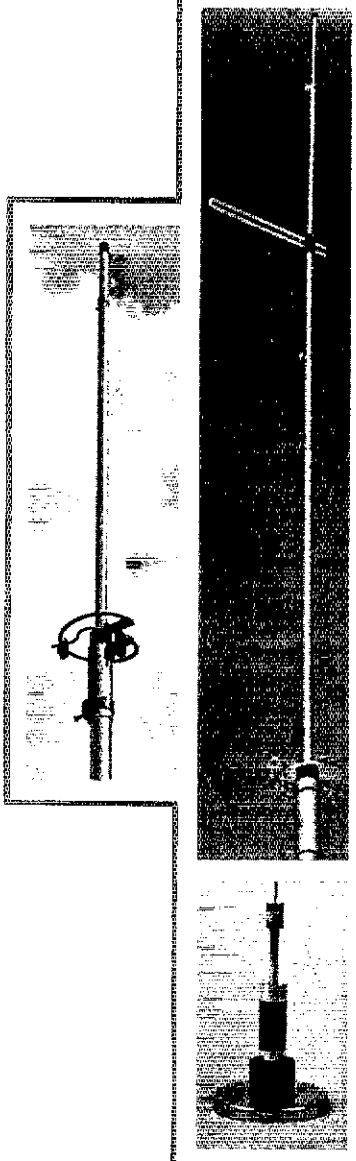
Mount anywhere with compact dimensions and neat appearance

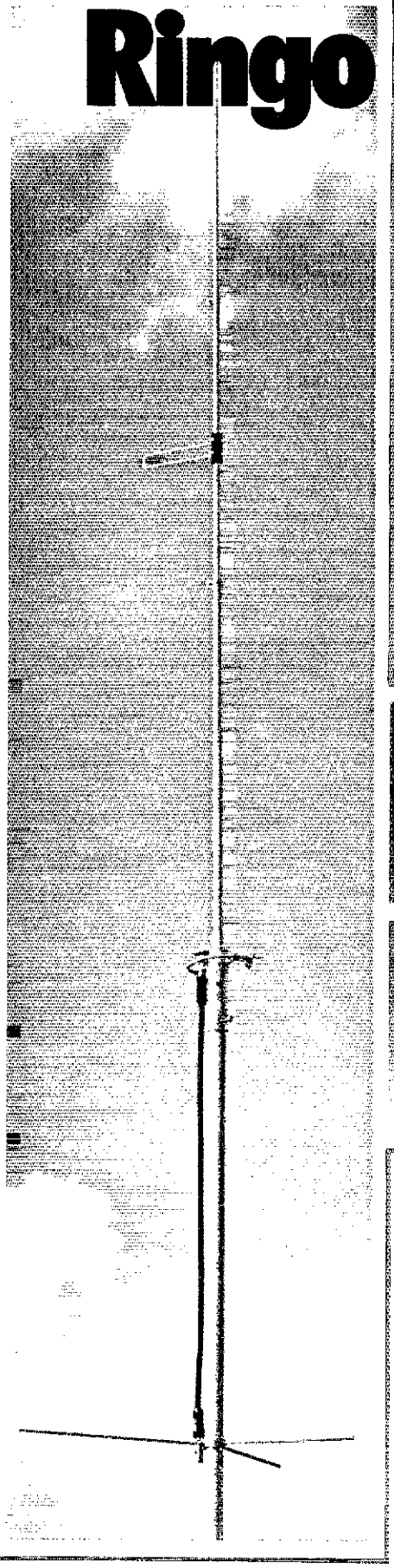
Proven performance and durability in all environments

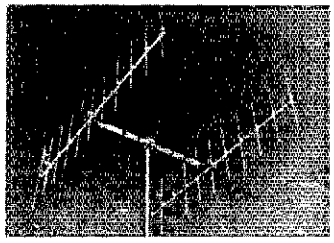
Complete FM band coverage

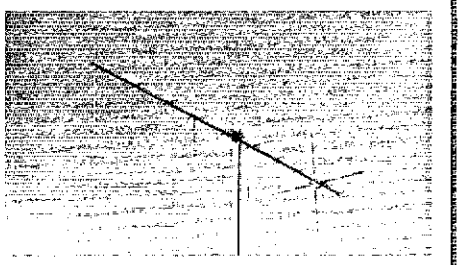
One year warranty

Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft antennas. The reason is very simply that they are the best. Now is the time for you to enjoy the value of a Cushcraft antenna. See your nearby dealer today.









RINGO RANGER II

ARX-2B	134-164 MHz
ARX-220B	220-225 MHz
ARX-450B	435-450 MHz

RINGO RANGER

ARX-2	134-164 MHz

RINGO

AR-6	50-54 MHz
AR-2	135-175 MHz
AR-10	28-29.7 MHz
AR-220	220-225 MHz
AR-450	440-460 MHz

MOBILE ANTENNAS

MS-147	144-148 MHz	Magnetic Mount
TS-147	144-148 MHz	Trunk Lip Mount
MS-220	220-225 MHz	Magnetic Mount
TS-220	220-225 MHz	Trunk Lip Mount

YAGIS

A147-4	145.5-148 MHz	4 Element
A147-11	145.5-148 MHz	11 Element
A147-22	145.5-148 MHz	22 Element
214-FB	145.5-148 MHz	14 Element
A220-7	220-225 MHz	7 Element
A449-6	440-450 MHz	6 Element
A449-11	440-450 MHz	11 Element

CROSS YAGI

FOR CW/SSB and FM

A147-20T 144-146 MHz Horizontal
145.5-148 MHz Vertical

cushcraft CORPORATION

THE ANTENNA COMPANY
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

NEW

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk power," improved intelligibilit
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

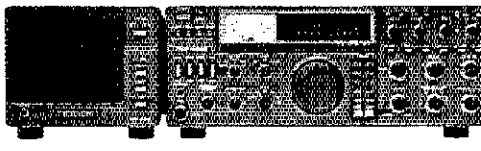
Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 H plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug
- TL-922A linear amplifier (not for CW QSK
- SM-220 station monitor (not for pan-adapt
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

pacesetter in amateur radio



Specifications and prices are subject to change without notice or obligation

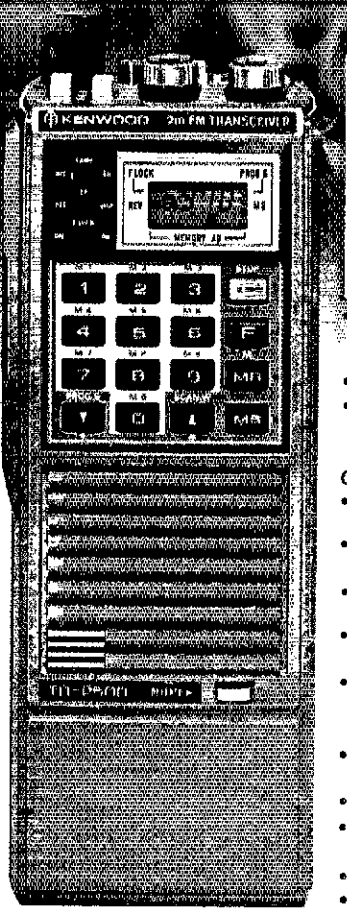
TR-2500

BIG performance, small size, smaller price!

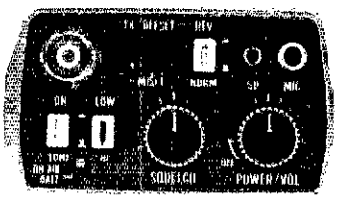
The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs). 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.



CONVENIENT TOP CONTROLS

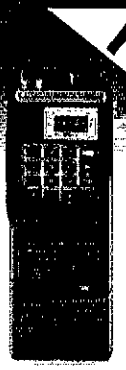


- Optional MS-1 mobile or ST-2 AC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply.
- VB-2530 2-M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

NEW



TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- Hi-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR 2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or +600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encoder, with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.

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Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 15 divisions of the League are further arranged into 73 administrative "sections," each headed by an elected Section Communications Manager or Section Manager. Your SCM/SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SCM/SM has an appointment available. Check with your SCM/SM (below) for further information. Section boundaries are defined in the booklet *Operating an Amateur Radio Station*, free to members.

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THE AMERICAN
RADIO RELAY
LEAGUE, INC.

"It Seems to Us..."

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 the vast majority of active amateurs in the nation and has a proud history of 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., USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI.

Survival

Will we always have Amateur Radio?

What a question! That Amateur Radio should disappear as an avocational pursuit is unthinkable. Hasn't it survived the hazards of half a dozen World Frequency Conferences, broadcast interference, television interference, attempted military and commerical inroads on our frequencies, and competition from Citizens Radio?

We radio amateurs have, indeed, successfully navigated some choppy seas in our 75-year history . . . but heavier weather may lie ahead.

Increasingly, radio amateurs find themselves embroiled in legal action arising from zoning and radio interference conflicts. Within the past decade the number of local statutes seeking to restrict our right to erect antennas — and in some cases, to operate at all — has increased manifold.

At the national level, we have witnessed a growing number of actions by the Congress affecting the future and well-being of the Amateur Radio Service, as for example WARC ratification, and legislation concerning RFI-vulnerable equipment design and provision of volunteer services to FCC.

Who is looking out for our interests in these matters? The politicians? ARRL? FCC? The good Lord? (Certainly, we *hope*, the last . . . while recalling the old bromide "the good Lord helps those who help themselves.")

ARRL has been consistently active on a variety of fronts in the defense of Amateur Radio. Not just the Board of Directors or the staff in Newington, but everyone who supports the organization through his or her membership plays an important role in this effort to keep Amateur Radio alive and thriving.

Thousands of League members go farther, and lend effective support in the continuing campaign to publicize the virtues of Amateur Radio and to recruit desirable newcomers to the game.

But the shape of the future now tells us that we must become increasingly active on the political front in order to safeguard Amateur Radio from oppressive legislation, as well as to encourage that which will benefit the service.

The multitude of social and societal benefits provided by a healthy Amateur Radio Service are by no means fully understood nor appreciated by many office holders who may be instrumental in determining its destiny.

The ongoing revision of the ARRL Field Organization provides, among other things, a volunteer role designed to bolster our collective ability to communicate with our political entities. The effectiveness with which this function is performed may significantly affect our future.

To those who shudder and turn away from anything "political," I would suggest that we do so at our own peril. The essence of our democratic government is that our elected representatives in government exist to serve us, not to dominate nor manipulate us. We who enjoy and perceive the many attributes of Amateur Radio must shoulder the responsibility of ensuring that this unique public service is *understood* and *supported* by our political leaders at all levels.

As in the recent past, there will be occasions requiring that we act in concert, presenting a unified front in political matters potentially affecting the welfare of Amateur Radio. If we are to be effective, we must first establish a consensus so that we speak with a common voice. Lone cries in the wilderness accomplish little.

A growing need exists for us not only to educate those occupying political office, but to establish lines of friendship and confidence to each of them. No one who really understands the nature and value of the Amateur Radio Service is likely to undermine it by sponsoring injurious legislation.

We have a marvelous and highly saleable product to demonstrate. But we must acknowledge this growing need and respond to it . . . together. — *Vic Clark, W4KFC*

10 MHz — Our Role

We are on 10 MHz at long last . . . an exciting new band with unique propagation characteristics!

It is a new experience in another way, too. For the first time on any hf allocation, radio amateurs are the *secondary* occupants. That is to say, our presence there is on a *not-to-interfere basis* with the primary user, the Fixed Services.

For this reason, the member societies of the International Amateur Radio Union agreed that it would be advisable to avoid encouraging any form of competitive activity on the band . . . no contests or activity-generating award credits. The ARRL Board of Directors has endorsed that position.

Those who served as members of the IARU team at the 1979 World Administrative Radio Conference became well aware of the intense competition for frequencies in that part of the spectrum. Indeed, that radio amateurs now have a band there at all is a bit of a miracle.

We now are called upon to perform as responsible occupants of the band, and to demonstrate, once again, our capacity for disciplined operation and effective self-regulation. In the U.S. the ground rules call for us to stay clear of 10,109-10,115 kHz, and to cause no interference to commercial and government circuits operating elsewhere in the 10,100-10,150 kHz band.

An acceptable performance on 10 MHz might provide the key to earlier access to the 18- and 24-MHz bands, now occupied by other services, but eventually destined to become amateur exclusive allocations.

The catchword on 10 MHz is "misuse it and lose it." — *Vic Clark, W4KFC*

League Lines...

The United States Senate has approved Treaty Document 97-21, thus consenting to ratification of the Final Acts of the 1979 World Administrative Radio Conference. This represented the last major hurdle for implementation in the United States of the WARC-79 agreements. President Reagan is expected to sign the document without delay.

FCC proposals for a post-WARC frequency allocations table (Docket 80-739) were released December 30; the public has until March 10 to comment. March QST will carry details as regards the Amateur and Amateur-Satellite Services. The proposals generally follow the international table agreed to at Geneva in 1979, but several issues remain to be resolved.

- 160 meters: Radiolocation transmitters now operating at 1625-1705 kHz will have to be relocated when the A-M Broadcasting Band is expanded later in the decade; FCC is looking at 1900-2000 kHz for them, and proposes that the Amateur Service be secondary in this segment in the meantime. Remaining LORAN-A operations in Region 2 soon should be phased out.
- 220 MHz: Non-amateur fixed and mobile services will not be implemented in the band pending completion of a joint FCC/NTIA study of spectrum requirements for the band; however, in the table FCC proposes Amateur, Fixed and Mobile as co-equal, primary sharing partners.
- 420 MHz: Amateurs along the Canadian border would lose access to 420-430 MHz under the FCC proposal, but "Waivers as appropriate could be considered based on technical consideration." See August 1981 QST, p. 57, and September 1981 QST, p. 56, for more background.
- 2300 MHz: Aeronautical flight-test telemetry requirements at 2310-2390 MHz are such that interference "cannot be tolerated"; therefore, FCC proposes deleting the amateur allocation in this segment, but elevating our status at 2300-2310 MHz and maintaining the allocation at 2390-2450 MHz. See October 1981 QST, p. 58, and November 1981 QST, p. 68.

At this stage these are proposals only; resulting rules changes affecting amateurs are some months away.

The FCC has dismissed a petition for rulemaking by W4MB that sought to have the two new WARC bands at 18 and 24 MHz immediately allocated to the Amateur Radio Service. According to the Commission, while the frequencies 18.068-18.168 MHz and 24.890-24.990 MHz were reallocated at the 1979 WARC for the exclusive use of the Amateur Radio Service, the use of these frequencies by amateurs is subject to the transfer of all current assignments from these frequency bands. There are currently 33 government and four non-government assignments in the 18-MHz band and 10 government and two non-government assignments in the 24-MHz band. Accordingly, the petition was dismissed as premature.

League petition for Novice phone privileges dismissed by FCC. Back in January 1979, the ARRL filed a petition for rule making to allow Novice class operators phone privileges on the 220-225 MHz band. The FCC has dismissed the petition, RM-3314, on the basis that it had already thoroughly considered the structure of the amateur license classes and that it is still considering a no-code amateur operator license. Therefore, according to the FCC, no useful purpose would be served in granting the petition at this time. For a perspective on the League's petition, see November 1978 QST, page 9, and March 1979 QST, page 58.

Comments filed by the Utilities Telecommunications Council (UTC) regarding the new Amateur Radio WARC bands brought a quick rebuttal from ARRL. UTC had filed comments in General Docket 82-625 which sought allocation of the new 10-MHz, 18-MHz and 24-MHz amateur bands for the Special Industrial, Petroleum, Telephone Maintenance and Power Radio Services. ARRL has opposed such allocation, stating "that on the eve of ratification of the Geneva treaty by the United States, it is inappropriate to make an 11th-hour new allocation of the frequencies . . . to the fixed services, only to have fixed stations which would occupy those frequencies be relocated beginning immediately following ratification." Details will appear in next month's QST.

Vernon P. Wilson, KT4K, is retiring as Chief, Regional Services Division, Field Operations Bureau, FCC. Vern plans to divide his time between Maine and Florida in retirement, where he will probably continue to keep in touch with his many on-the-air friends.

Amateur Capsule 1982

This was the year the League, under new leadership, gave new vitality to ARRL field volunteers, a landmark Amateur Radio bill became law, and U.S. and Canadian amateurs finally got on a new WARC band.

By Andrew Tripp,* KA1JGG

The year 1982 will be remembered for many things, but perhaps first and foremost will be the changes that occurred — events that undoubtedly will have a tremendous impact on Amateur Radio for years to come. In March, the Board of Directors selected a new president and a new general manager. At the same time, ARRL began laying the groundwork for the reorganization of its volunteer field organization. From section-level appointments to club affiliation, roles and responsibilities would be redefined and expanded, making the field organization more effective and developing closer ties between local amateurs and Hq. Coupled with this, ARRL Advisory Committees took on a new look, with increased membership and better representation, giving them a greater voice in League planning.

With the signing into law of a long-awaited "Amateur Radio bill," amateurs gained a valuable foothold in their efforts to solve some nagging problems, such as RFI, and a more active role in shaping the future of ham radio. Amateur Radio gains from WARC-79 began to bear fruit with FCC approval for limited use of the 10-MHz band, followed by Senate ratification of the treaty in the waning weeks of 1982. On the state and local levels, amateurs continued to tackle restrictive antenna ordinances, interference problems and leaky cable-television systems.

Internationally, a new president took the helm of the IARU, amid plans to restructure the 57-year-old organization. ARRL added a staff member to help the IARU Secretary expand and improve activities on behalf of amateurs worldwide. And China, absent for many years, was back on the air — testimony that Amateur Radio is alive and well in that country, but developing ever so slowly.

1982 was not without controversy. But despite these issues — or perhaps because of them — optimism prevailed, and there was widespread confidence that the winds of change would bring with them a breath of fresh air. Evidence of this was the marked increase in on-the-air activity, with public service and contesting leading the way, and the renewed interest of local amateurs to take part in — not just be a passive part of — Amateur Radio history. It promised to be a banner year; amateurs were not disappointed.

Setting Up Housekeeping

At its semiannual meeting in March 1982, the ARRL Board of Directors chose a new president and a general manager, setting the stage for the year's events. Vic Clark, W4KFC, was elected president, succeeding Harry Dannals, W2HD, who stepped down from that volunteer position after serving for the past 10 years. Harry retired to private life, but is certain to remain active in Amateur Radio affairs. Vic, an ARRL vice president for six years and an active participant at the 1979 ITU World Administrative Radio Conference (WARC-79), brought a wide breadth of experience to his new role.

ARRL past President W2HD (left), incoming General Manager K1ZZ (center) and newly elected President W4KFC at the March Board meeting.

For ARRL general manager and secretary, the Board selected David Sumner, K1ZZ, to fill vacancies created by the retirement of Richard L. Baldwin, W1RU, from paid employment at ARRL Hq. General manager since 1975, Dick began his employment at Hq. in 1948. He had the key staff role and was the "executive officer" for the ARRL at WARC-79.

Dave, assistant general manager since 1976, has worked at ARRL Hq. since 1972 and was an active volunteer from the time of his first license at age 13, in 1962. Also a member of the Amateur Radio team in Geneva, Dave has traveled extensively on behalf of the Amateur Radio Service.

In other Board action, W1RU was elected vice president for International Affairs, replacing Noel Eaton, VE3CJ, who retired. IARU member-societies later approved Dick's candidacy for IARU President.

With personnel matters decided, the League began setting in motion its two-year plan to breathe new life into ARRL sections. With recommendations from the Long-Range Planning Committee, ARRL initiated a major overhaul of the section-level organization. This reorganization (which began on January 1, 1983) is the most significant change in the section-level structure in more than 50 years.

*QST Features Editor

Traditionally, section-level responsibilities have covered on-the-air activities, particularly traffic handling and emergency communications. This role has now been expanded into other areas, such as public relations and government liaison. In addition, the elected post of Section Communications Manager (now called Section Manager) has been redefined and given greater authority to delegate responsibility to other volunteers.

To augment this restructuring, the Board adopted new rules and regulations for ARRL Advisory Committees. The committees now are organized on the basis of one member per division per committee, a departure from the one-member-per-call-area representation of the past. Also, the Special Services Club program, approved by the Board in 1982 and scheduled for implementation in 1983, will improve amateurs' effectiveness on the local level.

Several specialty newsletters saw their debut in 1982. Among them was *New Ham News,* an updated version of a publication that first appeared in the mid 1970s. Sporting a lively new format, *NHN* is mailed automatically to newly licensed amateurs. In late October, the first issue of the *ARRL Letter,* a biweekly newsletter designed to disseminate late-breaking Amateur Radio news in a timely manner, appeared. True to its purpose, the first issue announced our newly acquired access to the 10-MHz band.

Capitol Hill: A Landmark Law

On September 13, 1982, radio amateurs nationwide had good reason to rejoice: President Reagan had signed the Goldwater-Wirth Amateur Radio bill into law, capping a 10-year struggle by ARRL to get federal action on solving radio-frequency interference. Perhaps the most significant federal legislation for radio amateurs since the Communications Act of 1934, P.L. 97-259 amends the Act to give FCC the authority to (1) establish RFI-rejection standards for home electronics equipment; (2) enlist the aid of volunteers in monitoring the amateur airwaves for rules violations, and in preparing and administering amateur examinations; and (3) extend the license term to 10 years. The law also exempts amateur communications from the secrecy provisions of the Communications Act. Ratification of the Radio Regulations and Final Protocols, Geneva, 1979 (the formal name for the WARC results), remained stalled in the Senate for most of 1982. But things took a turn for the better when, on October 28, FCC approved limited use of the 10-MHz band — one of three new hf bands allocated for amateur use at WARC-79. Then, On December 21, the Senate ratified the Final Acts, thus removing the last major hurdle for implementation in the U.S. of the WARC-79 agreements.

ARRL Washington Area Coordinator Perry Williams, W1UED (right), meets with Senator Barry Goldwater, K7UGA, coauthor of the Amateur Radio bill signed into law.

Regulatory Matters

Cable-television interference dominated the regulatory scene in 1982. In January, ARRL filed a formal rule-making request (RM-4040) calling for the prohibition of cable-television operation on frequencies allocated to the Amateur Radio Service, particularly on the 144- and 220-MHz bands, where much amateur public service is performed. ARRL pointed out that cable interference is the direct result of inadequate shielding, poor-quality components and inferior installation procedures of cable companies. In calling for the action proposed in RM-4040, ARRL said the problem of CATVI cannot be resolved in the context of the present rules.

ARRL's action stirred the National Cable Television Association, which requested a meeting with ARRL officials. ARRL agreed to an extension of the deadline for comments on RM-4040, provided that NCTA would exhort its members to clean up their cable system operations. NCTA had until September 1, the new comment deadline, to show some improvement, but was unable to do so. ARRL followed with Comments on its own petition, reiterating the League's position that there be "adequate safeguards in the form of Federal regulation and enforcement so that legitimate users of the radio spectrum are protected from the insidious and detrimental effects of radio frequency interference both from and to these (CATV) ostensibly closed systems."

NCTA countered with its claim that the interference problem is "not as great as ARRL would have the Commission believe," and called for the dismissal of the ARRL request to ban cable operations from frequencies allocated for amateur use. ARRL, in its reply, urged the FCC to act favorably on its petition and to provide the relief sought on either a blanket basis or "on a case-by-case basis automatically upon receipt of a verified complaint of interference to or from an amateur station." In the meantime, the ARRL RFI Task Group continued in its role as legislative and regulatory watchdog, monitoring actions on Capitol Hill and advising the Board on RFI matters, particularly CATVI.

In what was to turn out to be one of the controversial issues of 1982, FCC instructed its staff to prepare and release to the public proposals for the creation of a new, no-code amateur license. This action prompted immediate protest from the amateur community. After much discussion on a number of alternatives, the Commission directed the Private Radio Bureau to prepare a Notice of Proposed Rule Making (NPRM) on two choices: a codeless Technician class license, and a Canadian-style digital license.

Meanwhile, ARRL was on record as opposing a no-code license. At its meeting on November 20, the ARRL Executive Committee decided that, ". . . in light of the impending transfer of amateur license examination responsibilities to the amateur community and its attendant workload, the possibility of deferring for at least 18 months the issuance by FCC of a Notice of Proposed Rule Making seeking to establish a new codeless license be explored with the Commission." Unless the FCC heeds ARRL's request, the NRPM should be released early in 1983.

On October 28, FCC delighted the amateur community by releasing temporarily the 10.100-10.109 and 10.115-10.150 MHz portions of the 10-MHz band for General, Advanced and Extra Class licensees. The band is available on a secondary, noninterference basis. The 10.109-10.115 MHz segment was not made available to amateurs because of its daily use by a priority government radio service.

ARRL had urged the FCC to make the frequencies available to U.S. amateurs as quickly as possible, arguing that amateurs would better be able to fulfill their public service obligations to foster international goodwill and to enhance their ability to provide reliable communications. FCC agreed with ARRL's objectives, saying, "Although the ratification process for the Final Acts of WARC-79 is not yet complete, we believe that the public interest supports amendment of our rules to allow amateur operators in the United States temporary use of the frequencies."

In other action, the FCC issued an NPRM in response to an ARRL proposal to expand the 20-meter telephony subband, in an attempt to ease serious overcrowding. In general, the idea of expanding the subband from 14.200-14.350 to 14.150-14.350 MHz received a favorable response from the amateur community, although the FCC version varied slightly from the ARRL plan. For General class operators, the ARRL argued, the FCC proposal would split the

frequencies available, thereby creating two sets of band edges and increasing the possibility of rules violations. Instead, the ARRL contended, its original plan (reported in April 1981 *QST*) would be the best course of action: the lower 25 kHz for Extra, the next 50 kHz for Advanced and Extra, and the upper 125 kHz for General, Advanced and Extra, keeping the bands contiguous.

In a related item, ARRL also commented on an FCC Notice of Inquiry (NOI) regarding the future expansion of hf telephony subbands on 80, 40, 15 and 10 meters. League comments, based on member input solicited in *QST* last April and May, said that the additional expansion (1) for the most part, would *not* have a detrimental effect on domestic telegraphy operations and (2) should be contiguous with existing subbands. The League urged early FCC issuance of an NPRM on these proposals.

Effective October 28, FCC permitted the use of any digital code on amateur frequencies above 50 MHz, except those frequencies on which only A1 emission is permitted (50.0-50.1 and 144.0-144.1 MHz). As early as October 1980, ARRL had petitioned FCC for a rules change to permit greater experimentation with digital techniques, citing a "compelling need" if radio amateurs are to continue as the primary contributors to the advancement of the radio art. FCC's major concern in allowing the experimental frequencies was its enforcement capability. However, the inclusion of special provisions and amateurs' desire to protect their frequencies against unauthorized use, FCC agreed, would provide adequate protection against misuse of the frequencies.

By year end, proposals to cut some logging requirements and to change the rules for maximum authorized power were introduced. In addition, FCC approved new beacon rules. Most important was authorization of automatic control on specific frequencies for amateur stations making one-way beacon transmissions to detect unusual propagation conditions and to check out and adjust receiving equipment.

Legal Actions

State and local governments continued to introduce restrictive antenna ordinances, in some cases severely hindering amateur activities. With ARRL support, local amateurs challenged these restrictions.

In Burbank, Illinois, amateurs filed a class-action suit against the city. Backed by ARRL-pledged financial support, James C. O'Connell, W9WU, the plaintiffs' attorney, sought a declaration by the Court that the city's ordinance restricting antenna height is an unconstitutional abridgement of their rights. The complaint also asked for an order temporarily restraining the City of Burbank from bringing any legal action against anyone erecting or maintaining an amateur or CB antenna.

An important case is shaping up in Oklahoma City, where a ruling by a federal district judge in 1982 opened the door for a legal precedent favorable to Amateur Radio. Charles M. Guschke, N5SW, sued the city in June 1981, charging its zoning ordinances were too restrictive in not allowing him to maintain his 78-foot-high antenna tower. ARRL filed a friend-of-the-court brief in support of Guschke's case, emphasizing that federal interests in Amateur Radio were being thwarted by overly restrictive Oklahoma City ordinances. In denying the city's motion to dismiss the case for lack of federal jurisdiction, the judge ruled that the suit filed by Guschke "states a substantial federal question of the application of the Communications Act of 1934. . ." The judge's ruling means that Guschke will have a trial on the merits of his claim that Oklahoma City has deprived him of his constitutional rights of free speech and privacy, and of his liberty and property without due process of law.

Communications Highlights

Public service communications took the lead in 1982 when, in January, radio amateurs in Washington, DC were suddenly called into action. A commercial airliner, just departed from National Airport, had crashed into the rush-hour traffic on the 14th Street Bridge and then into the frozen Potomac River. Amateurs' response was swift, as they provided communications for rescue and salvage operations for four bone-chilling days.

In the same month, ARES groups in Alabama and Mississippi were called out when those states were besieged by more than a week of severe weather, beginning with heavy rains, continuing with a tornado and ending with heavy snowfall. Similar weather ripped through northern California in March, again generating exemplary public service from amateurs in the face of extreme conditions. The year closed out with outstanding amateur action during Hawaii's hurricane Iwa.

Field Day 1982 continued its tradition of being the most popular operation of the year. The technology may have changed over the years, but the purpose has remained the same: to test radio amateurs' preparedness to deal with any situation during an emergency. Amateurs came out in droves again this year, with nearly 30,000 participating in the 46-year-old event.

Carl Henson, WB4ZNH, sparked quite a controversy among DXers when he charged that operating from a "list" or "DX net" is poor operating ethics, and attempted to get DXCC Rule 12 amended to say so. His correspondence campaign to hundreds of DX enthusiasts prompted an avalanche of letters from a polarized DX community, thus catching the attention of the ARRL DX Advisory Committee.

In 1981, the VHF/UHF Ad Hoc Contest Committee was established to investigate and make recommendations on how to better meet the objectives of v/uhf contesting. In February, and in an update in November, the Committee reported on its latest actions. The availability of a single-band award, first seen in the June ARRL VHF QSO Party, proved to be an overwhelming success. This was followed by the moving of the EME contest to more favorable dates and the institution of scoring to reward more-distant contacts in the August UHF Contest. The Committee closed out the year considering a host of other matters, among them the ultimate best time frame for each contest and the use of grid squares for both contest and award purposes.

At ARRL Hq., W1AW invested further in the computer age with the installation of a second Heath H89 computer; the results can be heard on any of the scheduled W1AW transmissions. All W1AW code practice and cw, Baudot and ASCII bulletins are now computer generated.

Rounding out communications activity in 1982 was an operating record. A new 10-GHz DX record was set by Nicola Sanna, IØSNY, who worked IØYLI and IWØBFZ at distances of 1101 and 1166 km, respectively. These are the first-ever contacts over 1000 km on 10 GHz.

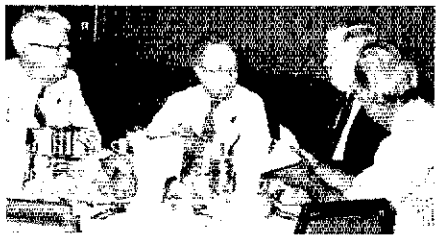
Technical Developments

While other amateur concerns were grabbing the headlines, amateur technology also moved along at an industrious pace, improving on old techniques and breaking new ground. Throughout the year, *QST* reported on several such developments, publishing an article on a power MOSFET kW amplifier, believed to be the first on the subject to appear in an amateur publication; articles on converting existing equipment to cover the new WARC bands; a construction project for a high-powered amplifier for the 900-MHz band, in anticipation of the future use of that band; and new articles by Beverage and Kraus, two authors prominent for decades in antenna research and development.

Meanwhile, others, such as the Amateur Radio Research and Development Corporation (AMRAD) in Washington, DC, were exploring other frontiers. With temporary authorizations from FCC in hand, these experimenters were busy making household words of such new amateur communications techniques as AMTOR and spread spectrum, exemplifying the amateur pioneer spirit.

International Affairs

In August, the International Amateur



One last time together (l-r): IARU President VE3CJ, General Manager W1RU, ARRL President W2HD and Vice President WØBWJ at the March Board meeting.

Radio Union took on a new president and the beginnings of a new structure. Noel Eaton, VE3CJ, the sixth IARU president and the first from outside the U.S., retired and was succeeded by Richard L. Baldwin, W1RU, retired ARRL general manager and the new Vice President for International Affairs. Noel's distinguished career as IARU president, which began in 1974, includes heading the IARU team in Geneva, Switzerland, for WARC-79.

During his term as president, he formed a Restructuring Committee to examine the IARU Constitution and make recommendations on how it could better serve the membership. This year, after three years of study and membership contact, the Restructuring Committee found a common view that IARU policies ought to be decided by an Administrative Council, comprised of officers of IARU and two representatives from each of the three Regions. The concept was put to the Union membership in June and was adopted in November.

Throughout the year, representatives of IARU Regions 1, 2 and 3 attended meetings at various locations around the world. Among the subjects participants discussed or acted on were the election of new directors for the Region 3 Association, implementation of the three new WARC bands, and IARU constitutional reform.

The big international operating news of 1982 has to be the reappearance of China on the amateur airwaves. Long dormant, China took a giant step toward active participation in international Amateur Radio when, on March 29, on-the-air operations began from BY1PK. Although Amateur Radio is now a club-station activity and no individual licenses were issued during the year, amateurs are confident that, in time, Amateur Radio in China will expand.

The Canadian contingent to the March Board meeting (l-r): IARU past President VE3CJ, Director VE3OT and Counsel VE2VW.

CRRL Matters

Citing an unexpectedly heavy schedule and a feeling that he would be unable to do justice to both his job and his League responsibilities, Mitch Powell, VE3OT, resigned as Canadian Division Director after three years in that position. Succeeding him was Thomas B. J. Atkins, VE3CDM, who became Canadian Division Director, effective September 20. Tom had served as vice director since 1978 and was the Canadian representative at the IARU Region 2 Conference in Lima, Peru, in 1980. Harry MacLean, VE3GRO, was appointed by ARRL President Clark as the new Canadian Division vice director. Harry is the conductor of Canadian NewsFronts in *QST*, and has been active in CRRL and ARRL affairs.

In October, several changes to the CRRL By-Laws were approved in a General Meeting in Waterloo, Ontario. Among them were (1) the addition of two new directors to the CRRL Board, (2) the CRRL president and the ARRL Canadian Division director becoming one and the same, and (3) the CRRL vice president and the ARRL Canadian vice director becoming one and the same.

On May 21, DOC released the 10.1- to 10.15-MHz band to Canadian amateurs. Amateurs are the primary users of the band in Canada, but DOC is treating amateurs as secondary users from an international standpoint. A1 emissions for Amateur class licensees and A1 and F1 for Advanced amateurs are permitted. DOC did not indicate any power restrictions or whether Amateur class licensees with "10-meter endorsements" would be permitted to use F1 emissions; CRRL requested clarification of these points.

Satellite News

Amateurs' high expectations for UoSAT-OSCAR 9 were temporarily allayed when, in April, a command-system glitch left both of the satellite's telemetry beacons gated on, causing UO-9, in effect, to QRM itself to "deaf." The UoSAT team at Surrey, England, tried to solve the problem, but to no avail. If nothing could be done, UO-9 would be useless.

In September, after repeated attempts to get UO-9 to respond to commands, a team of amateurs at SRI International, Menlo Park, California, took a shot at the bird. With 42-dBd gain of a 150-foot dish antenna pointed skyward, the SRI team blasted about 10 MW of 70-cm erp toward UO-9. The beacons fell silent; UoSAT-OSCAR 9 had been saved!

During the year, radio amateurs at AMSAT were busy putting the finishing touches on another spacecraft — AMSAT Phase IIIB, the latest in amateur satellites. Having passed its final testing, Phase IIIB now awaits a launch, scheduled for April 1983, aboard an ESA Ariane rocket.

Beginning with the December issue of *QST*, experienced amateur satellite enthusiasts and newcomers had a new source of information in a new monthly column, Amateur Satellite Program News. Using news gleaned from a variety of sources, ASPN will give readers a monthly update on amateur satellite activities.

Silent Keys

Reported along with the year's events was the passing of many memorable radio amateurs, enthusiasts who have contributed so much to the Amateur Radio Service. Among them was Francis Edward Handy, W1BDI, affectionately known by his ham community as "Mr. Amateur Radio." His 42-year service to ARRL and Amateur Radio is peppered with achievements, which include the writing of countless *QST* articles and the first two editions of *The Radio Amateur's Handbook* ("Handy's Handy Handbook"), and the founding of Field Day, the ARRL section-level field organization and other on-the-air activities and traditions.

Robert M. Booth, Jr., W3PS was another silent key during 1982. Bob's most illustrious contributions to ARRL and Amateur Radio were accomplished through his role as general counsel, a position in which his optimistic outlook, eye for detail and stick-to-itiveness were often called upon to turn the tide of a regulatory battle in favor of Amateur Radio.

The list goes on with such names as Jesse Bieberman, W3KT, an active amateur for more than 60 years, many of which were as a director or vice director of the ARRL; Morton B. Kahn, K4KR/W2KR, Hudson Division director (1958-64) and an SCM in the 1920s; Clark C. Rodimon, W1SZ, managing editor of *QST* prior to WW II; Dr. James L. Lawson, W2PV, noted *QST* author and DXer; Philip E. Haller, W9HPG, Central Division director for 13 years and longtime EC for Cook County; and Richard C. Spenceley, KV4AA, famous DXer.

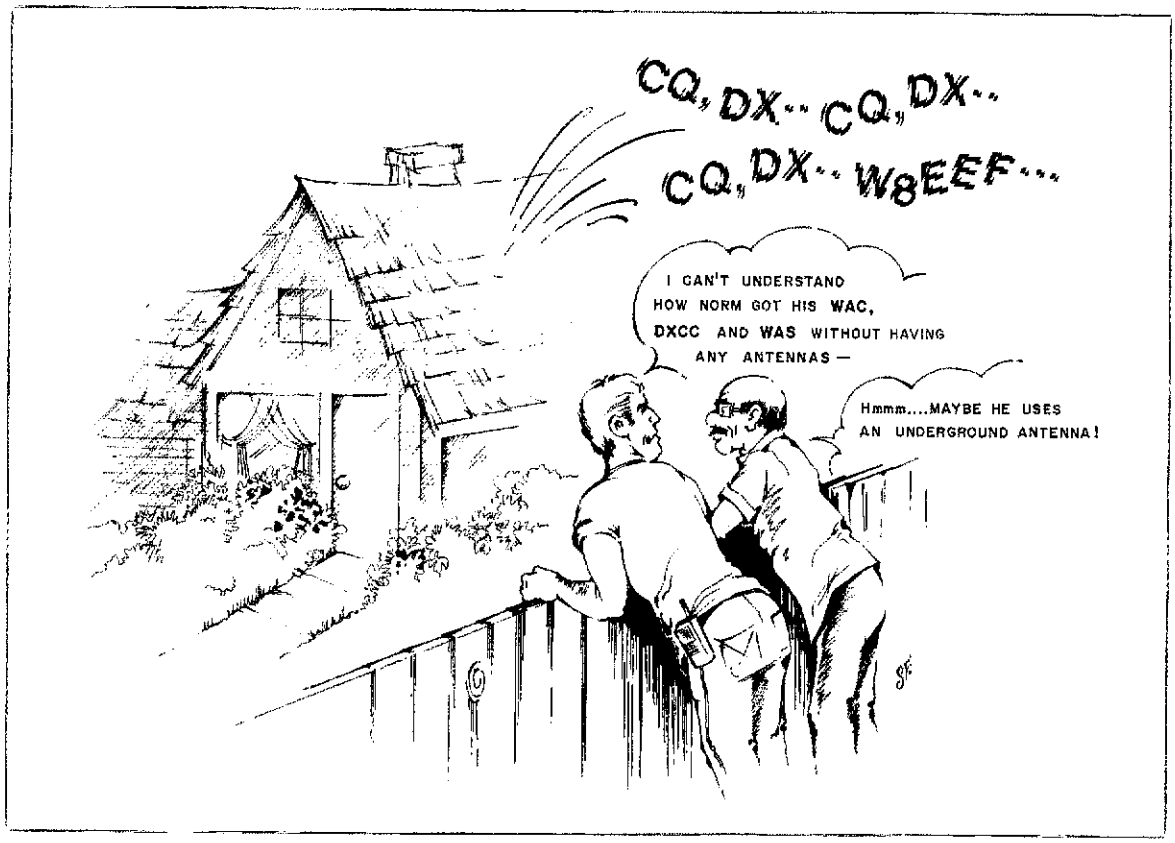
Looking Ahead

Much happened in 1982, and amateurs can take pride in the gains they have made. But the surface has only been scratched. The new Amateur Radio law is only a beginning; now comes the task of putting its provisions to work. In the coming months, section-level reorganization will get into full swing; amateurs' vigorous support and participation is needed if it is to succeed. Many pressing regulatory and legal issues need to be examined and resolved, and new technological advances must be developed and explored. If the past year's events are any indication of what is to come, Amateur Radio, with ARRL in the lead, is indeed embarking on a new era.

Antennas for Those Who Can't Have Antennas!

Radio amateurs don't engage in covert activities, but there are times in all of our lives when hidden or "invisible" antennas are necessary if we are to get on the air.

By Doug DeMaw,* W1FB



The unfortunate fact of the matter is that some radio amateurs dwell where antennas are prohibited. In other situations the operator may not want to erect outdoor antennas for fear of neighborhood opinions that he or she is destroying the beauty of the residential area. We amateurs don't regard our antennas as eyesores; in fact, we almost always regard them as works of art! But there are occasions when having an outdoor or visible antenna can present problems, especially for those who live in apartments.

When we are confronted with restrictions, self-imposed or otherwise, we can take advantage of a number of options toward getting on the air and radiating at least a moderately effective signal. In this context, a poor antenna is certainly better than no antenna at all! A number of techniques enable us to use indoor antennas or "invisible" antennas out of doors. Many of these systems will yield good to excellent results for local and DX contacts, depending on band conditions at any given time. *Don't erect any antenna that can present a hazard (physical or electrical) to humans, animals or buildings. Safety first!*

*Senior Technical Editor, ARRL

Invisible Antennas

In some areas, clotheslines are attached to pulleys (Fig. 1) so that the user can load the line and retrieve the laundry from a back porch. Laundry lines of this variety are accepted parts of the neighborhood "scenery," and can be used handily as amateur antennas by simply insulating the pulleys from their support points. This calls for the use of a conducting type of clothesline, such as heavy-gauge stranded electrical wire with Teflon or vinyl insulation. A high-quality, flexible steel cable (stranded) is suitable as a substitute if one doesn't mind cleaning it each time clothing is hung on it.

A jumper wire can be brought from one end of the line to the ham shack when the station is being operated. If a good electrical connection exists between the wire clothesline and the pulley, a permanent

connection can be made by connecting the lead-in wire between the pulley and its insulator. A Transmatch can be used to match the "invisible" random-length wire to the transmitter and receiver.

Invisible "Long Wire"

In reality, an antenna is not a classic "long wire" unless it is one wavelength (or greater) long. Yet, many amateurs refer to all relatively long spans of conductor as "long wires." For the purpose of this article we will assume we have a fairly long span of wire, and refer to it as an "end-fed wire."

If we use small-diameter enameled wire for our end-fed antenna, chances are that it will be very difficult to see against the sky and neighborhood scenery. The higher the wire gauge, the more "invisible" the antenna will be. The limiting factor with very fine wire is fragility. A good compromise can be realized by using no. 24 or no. 26 magnet wire for spans up to 130 feet (m = ft × 0.3048). Lighter-gauge wire can be used for shorter spans, such as 30 or 60 feet. The major threat to the longevity of fine wire is icing; also, birds may fly into the wire and break it. Therefore, this style of antenna may require frequent service or replacement.

Fig. 2 illustrates how we might install an invisible end-fed wire. It is important that the insulators also be lacking in prominence. Tiny Plexiglas blocks work well, as do small-diameter, clear plastic medical vials. Some amateurs simply use rubber bands for end insulators, but they will deteriorate rapidly from sun and air pollutants. They are entirely adequate for short-term operation with an invisible antenna, however.

The invisibility of the antenna can be carried even further if one is willing to use camouflaging techniques. This can be achieved by spraying the antenna wire with green, tan, brown, black and light blue paint at 1-foot intervals. In some instances, a single layer of gray or medium-blue paint will help to disguise the antenna. The wire must be free of grease and dirt if paint is applied, and the paint should be of "exterior" grade. This camouflaging effect can also be realized by dipping sections of the wire into cans of paint of the appropriate colors, assuming that spray paint is not available or desired.

Rain-Gutter or TV Antennas

A great number of amateurs have taken advantage of standard house fixtures when contriving inconspicuous antennas. A very old technique is the use of the gutter and downspout system on the building. This can be seen in Fig. 3: A lead wire is routed to the shack from one end of the gutter trough. We must assume that the wood on which the gutter is affixed is dry and of good quality in order to provide a reasonable insulation factor. The rain-gutter antenna may perform quite poorly during wet weather or when there is ice and snow on it and the house roof.

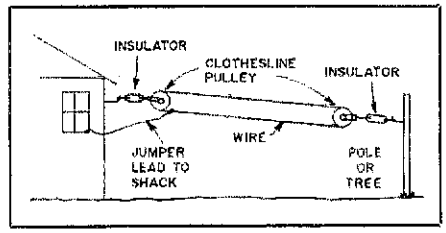


Fig. 1 — One form of hidden antenna is shown in this drawing: The antenna performs double duty as a radiator and a wash line. Large-diameter insulated wire (flexible) can be used as the line, or a clothesline with a wire center may be employed. The pulleys are insulated from the house and the pole.

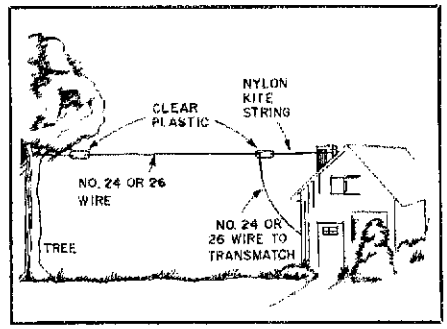


Fig. 2 — Light-gauge enamel-covered wire works nicely as a hard-to-see antenna. Although a bird may knock it down from time to time, re-erecting it beats having no antenna at all!

We need to ensure that all joints between gutter and downspout sections are bonded with straps of braid or flashing copper to provide good continuity in the system. Poor joints can cause rectification and subsequent TVI and other harmonic interference. Also, it is prudent to insert a section of plastic downspout about 8 ft above ground. This will prevent humans from receiving rf shocks or burns while the antenna is being used. Improved performance may result if the front and back gutters of the house are joined by a jumper wire to increase the area of the antenna.

Fig. 3 also shows a TV or fm antenna that can be employed as an invisible amateur antenna. Many of these antennas can be modified easily to accommodate the 144- or 220-MHz bands, thereby permitting the use of the 300-Ω line as a feeder system. Some fm antennas can be used on 6 meters by adding no. 10 buswire extensions to the ends of the elements and adjusting them for a VSWR of 1:1. If 300-Ω line is used it will require a balun or Transmatch to interface the line with the station equipment.

For operation in the hf bands we can tie the TV- or fm-antenna feeders together at the transmitter end of the span and treat the overall system as a random-length wire. If this is done, the 300-Ω line will have to be on TV standoff insulators and spaced well away from phone and power company service-entrance lines. The TV or fm radio must of course be disconnected from the system when it is used for amateur work! Similarly, masthead amplifiers and splitters must be removed from the line if the system is to be used for amateur operation.

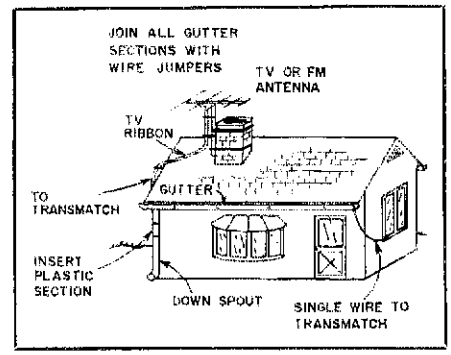


Fig. 3 — Some amateurs have had success when using the rain gutter as a random-length, end-fed radiator. The lower portion should be insulated from the remainder of the gutter and downspout to prevent rf hazards to animals and people. The TV or fm antenna-lead wire also can be used as a random-length antenna, as shown here.

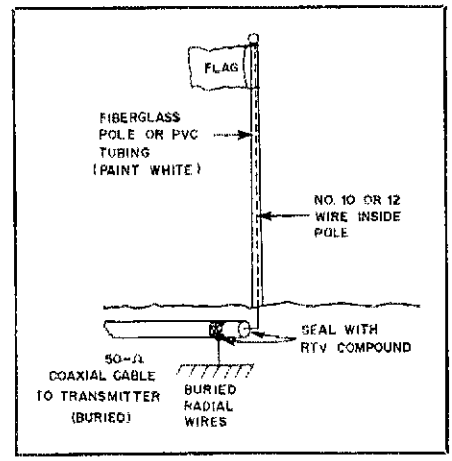


Fig. 4 — One can be patriotic while using a disguised antenna. The flagpole also serves as a vertical antenna in this illustration. Insulation should be used over the lower part of the antenna to prevent shock hazard to people and animals.

Flagpole Antenna

We can exhibit our patriotism and have an invisible amateur antenna at the same time by disguising our radiator as shown in Fig. 4. The vertical antenna is a wire that has been placed inside a plastic or fiberglass pole.

As shown, the flagpole antenna is structured for a single amateur band, and it is assumed that the height of the pole corresponds to a quarter wavelength for the chosen band. The radials and feed line can be buried in the ground as shown. In a practical installation, the sealed end of the

coax cable would protrude slightly into the lower end of the plastic pole.

If a large-diameter, fiberglass pole were available, we might be able to conceal a four-band trap vertical inside it. Alternatively, we might use a metal pole and bury at its base a water-tight box that contained fixed-tuned matching networks for the bands of interest. The networks could be selected remotely by means of a stepping relay inside the box. A 30-ft flagpole would provide good results in this kind of system, provided it was used with a buried radial system. At least one commercial antenna (from Delta Corp.) is used in this manner, but with an elaborate, continuously adjustable matching network (and VSWR indicator) that is operated remotely.

Still another technique uses a wooden flagpole. A small-diameter wire can be stapled to the pole and routed underground to the coax feeder or the matching box. The halyard could by itself constitute the antenna wire if it were made from heavy-duty insulated hookup wire. There are countless variations for this type of antenna, and they are limited only by the imagination of the amateur.

Other Invisible Antennas

Some amateurs have used the metal fence on apartment verandas as antennas, and have had good results on the higher hf bands (20, 15 and 10 meters). We must presume that the fences were not connected to the steel framework of the building, but rather were insulated by the concrete floor to which they were affixed. These veranda fences have also been used effectively as ground systems (counterpoises) for hf-band vertical antennas that were put in place temporarily after darkness fell.

One New York City amateur used the fire escape on his apartment building as a 40-meter antenna, and reported high success in working DX stations with it. Another apartment dweller made use of the aluminum frame on his living-room picture window as an antenna for 10 and 15 meters. He worked it against the metal conductors of the baseboard heater in the same room.

There have been many jokes told over the past decades about "bed-spring antennas." The idea is by no means absurd. Bed springs and metal end boards have been used to advantage by many apartment dwellers as 20-, 15- and 10-meter radiators. A counterpoise ground can be routed along the baseboard of the bedroom and used in combination with the bed spring. It is important to remember that any independent (insulated) metal object of reasonable size can serve as an antenna if the transmitter can be matched to it. An amateur in Detroit, Michigan, once used his Shopsmith craft machine (about 5 feet tall) as a 10-meter antenna. He worked a number of DX stations with it when band conditions were good.

A number of operators have used metal curtain rods and window screens for vhf work, and found them to be quite acceptable for local communications. You'll have best results with any of these makeshift antennas when the "antennas" are kept well away from house wiring and other conductive objects.

Strays

FINISH

N9CGC (left), WB9MVC (center) and KB9MU of the McHenry Co. (Illinois) Wireless Association helped members of the Schaumburg RC monitor a 10-km race sponsored by the Lake Zurich Jaycees. During the race, the hams radioed runners' times and medical information to race officials from checkpoints along the course. *(KA9HAO photo)*

W4KFC TO SPEAK NATIONWIDE ON REPEATER NET

☐ Radio amateurs are invited to listen and speak to ARRL President Vic Clark, W4KFC, when he discusses "The Future of Amateur Radio" on the Teleconference Radio Net, March 3, at 7:15 P.M. CST. Amateurs can participate on the following repeater frequencies:

Phoenix, AZ — 147.36
Avon, CT — 224.78
Roswell, GA — 145.47
Wichita, KS — 146.82
Minneapolis, MN — 146.64
Long Island, NY — 147.375
Beaverton, OR — 147.32
San Antonio, TX — 146.70
Los Angeles, CA — 224.04
Washington, DC — 147.21
Chicago, IL — 147.15
Billerica, MA — 147.12
Cherry Hill, NJ — 147.375
Rochester, NY — 145.11
Dallas, TX — 146.97
Madison, WI — 146.76

If you're not within range of one of these repeaters, it is still possible that a repeater in your area will be tied into the net. Watch for local publicity or check the local repeaters at net time.

Also, mark June 2, 1983, 7:15 P.M., on the calendar. Joe Reisert, W1JR, a nationally recognized expert on EME communications, antennas and TVI, will be the featured speaker on TRN.

The Teleconference Radio Net uses the latest multipoint teleconferencing technology to tie together repeaters across the U.S. The objective is to allow hams to listen and talk to leaders and experts from the Amateur Radio, scientific and electronics communities. The net is organized by the Honeywell ARCs of Minneapolis, Billerica and Phoenix as a service to all amateurs. For further information, contact Rick Whiting, WØTN, national net manager, 4749 Diane Dr., Minnetonka, MN 55343, tel. 612-870-2071.

ANOTHER CLAY HEARD FROM

☐ In November 1982 *QST*, there is a Stray about the Clay family of Connecticut with five hams. Well, we are the Clay family of Louisiana with *seven* hams: Roy, Jr., KB5IG; Annie, N5AYU; Sacha, N5DUX; Roy, III, WB5HVS; Eugene, WD5HGD; Timothy, KA5DBK; and Robert, KA5DFJ.

Next Month in QST

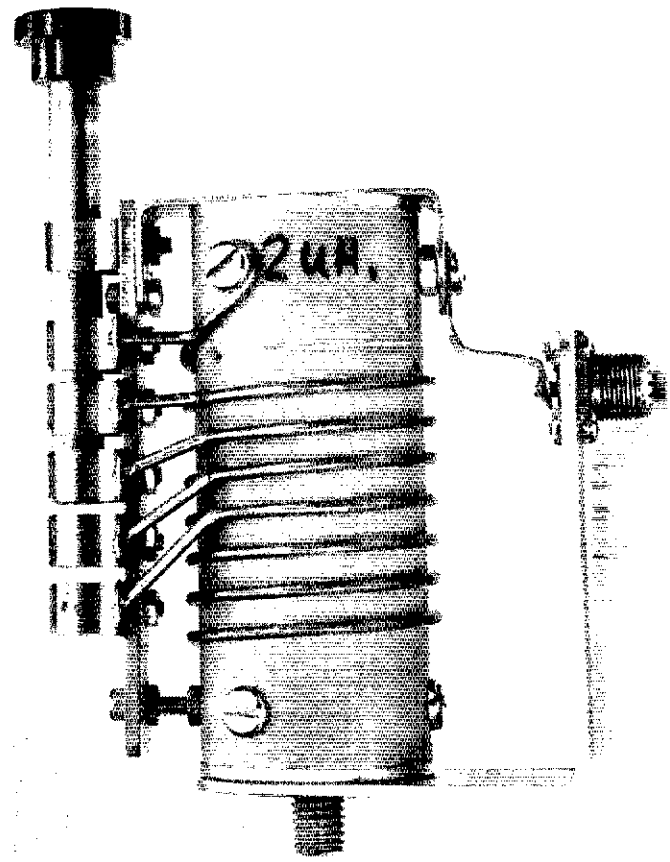
Ah, spring, when hams from Las Vegas to Labrador begin to think antennas. March *QST* will bring you details of X Beams and Delta Loops, along with a beginner's look at impedances and an in-depth discussion of baluns. In addition, you'll read about

- an easy-to-build receiving converter for 435, just in time for the Phase IIIB launch, and
- AMSAT-OSCAR 8, perhaps the most successful OSCAR of all, as it celebrates its fifth anniversary.

"Be Switched," Easily

No, not a hickory switch, an rf switch! Don't punish your home-built equipment with a store-bought switch. Next time, build your own!

By Paul Johnson,* W7KBE



Switches for high-powered rf linear amplifiers, tuners and other equipment may be hard to find. The surplus market is drying up, and new switches are expensive. Unless your junk box yields a switch for your next project, the only choice may be to fabricate what you need.

Two requirements must be met. Rf switches have to handle high currents. This dictates large contact surfaces with very low resistance. Second, the use of good insulating materials is essential to prevent arcing and to reduce losses.

Several switches are described here, but they employ two basic designs. These switches can be fabricated with a vise, electric drill, hacksaw and other small hand tools. The materials used are easily obtainable. One type uses fuse clips containing beryllium-copper (silver-plated ones are best). Many sizes can be found in surplus houses. Round brass rod is available at metal supply houses. Glass-epoxy board, 1/8-inch thick, is excellent insulation and is easy to work with.[1] The second design uses hardware from a dpdt knife switch. One with a 2- × 4-inch porcelain base is a good choice. Electrical supply houses carry them as a stock item, but electronic flea markets are another source.

Slide Switches

The title-page photo shows a five-position, single-pole, shorting-type switch used to tap a matching coil at the base of a mobile whip. This switch has a push-pull action, shorting out coil turns to obtain the correct inductance to match 50-ohm coaxial cable on different bands. Large clips are used to carry the heavy current present at the base of a mobile antenna. The clips are mounted on a 1-inch-wide strip of glass-epoxy board. A 1/2-inch-diameter brass rod acts as a shorting bar and it slides up and down in the clips to change the inductance. Solder lugs, in the form of thin copper strips, are placed under the clips. The top clip acts as a guide when the sliding rod is in the upper position.

A single-pole, five-position shorting type of switch is shown in Fig. 1. Fuse clips and a piece of brass rod are used to short sections of a tapped coil. Small clips and a 3/8-inch rod are used. The fuse clips are mounted on a 1-inch-wide glass-epoxy strip. Careful alignment of the clips is necessary so the contacting surface areas are maximized and the sliding action is easy. Thin copper strips under the fuse clips serve as solder lugs.

I built an antenna-matching network that uses a two-pole, three-position, shorting type of switch.[2] Fig. 2 shows the construction details. Here again, fuse clips and brass rod for shorting the tapped coil are used. To obtain two poles on one sliding rod, two pieces of brass and two pieces of Bakelite® are used. This assembly is made by drilling and tapping the ends of the rods for no. 8-32 screws, and the rod is then fastened with studs. The fuse clips are mounted on a 1-inch-wide glass-epoxy strip, and are aligned carefully.

Another switch, using fuse clips, was designed for a linear amplifier. In this case the output circuit was a Pi-L network. Therefore, a five-position, two-pole, shorting type of switch was necessary. The amplifier operates on five bands. Fig. 3 is a picture of the switch. Two sliding brass rods are used in parallel to make two poles. A third pole, in the center, places another capacitor across the main tuning capacitor when the switch is all of the way out. This pads the main tuning capacitor for 80-meter operation. The fuse clips are mounted on a 2-1/4-inch-wide glass-epoxy strip. Again, careful alignment is important to obtain easy push-pull action.

A piece of phenolic rod protrudes through the front panel. Grooves are cut in this rod, and different colors of paint can be applied in each one. The grooves line up with the front panel to indicate the position of the switch. With the knob against the front panel, all sections are shorted, putting the amplifier on 10 meters. A shaft coupler on the inside prevents the rod from being pulled out of the guide clips. When the rod is at the stop, all the way out, the amplifier is on 80 meters.

Rotary Switch

A rotary type of switch is shown in Fig. 4. Here the knife-switch parts are used. The copper parts are removed from the

[1]Notes appear on page 19.

*10817 Brookside Drive, Sun City, AZ 85351

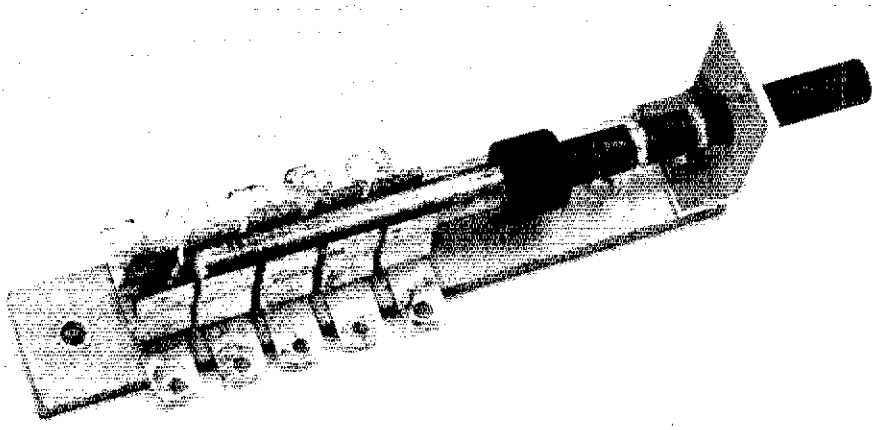


Fig. 1 — Construction details of a single-pole, five-position shorting type of switch are shown. Note the grooves in the Bakelite® rod. They are painted various colors and used to indicate the switch position on the front panel.

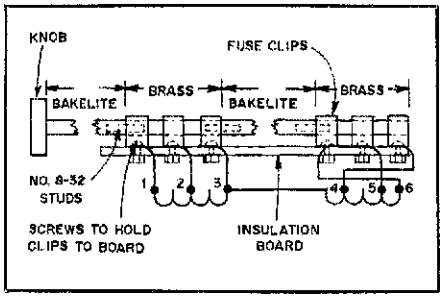


Fig. 2 — Construction and wiring of a two-pole, three-position switch for use in an antenna-matching network.

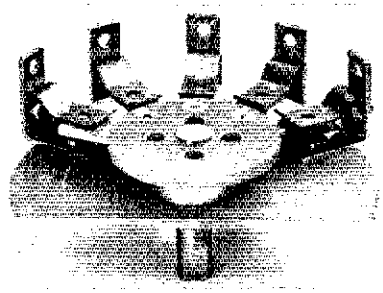


Fig. 4 — Photo of a rotary type of shorting switch. Knife-switch parts are used to make the contacts.

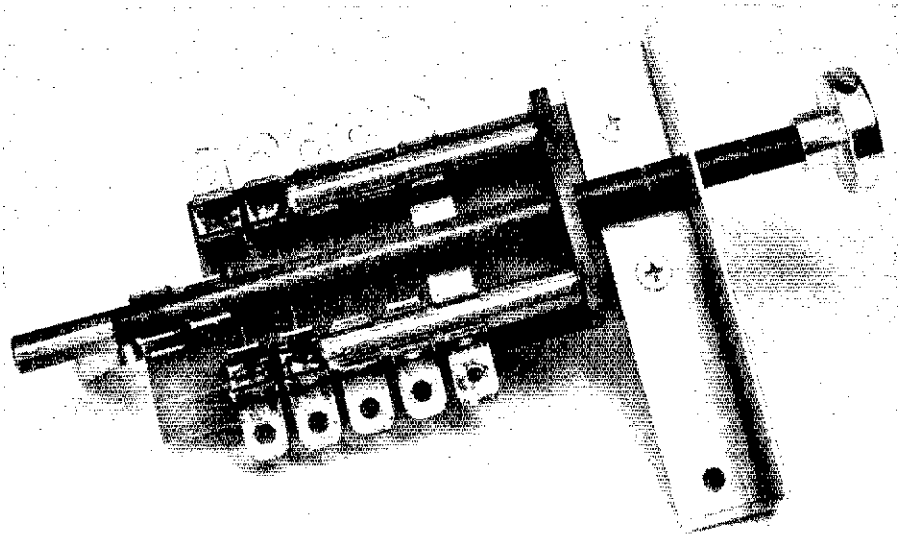


Fig. 3 — Photo of a switch built for use in the Pi-L network of a linear amplifier. Note the third set of contacts in the center. They are used to add an extra capacitor in the 80-meter position.

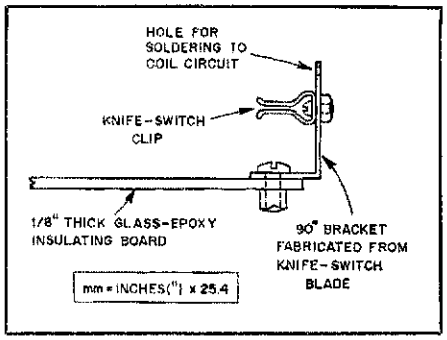


Fig. 5 — Construction details of the rotary-switch contacts.

porcelain base. Bend the knife blades to form 90° brackets (Fig. 5). These angle brackets support the knife clips and also act as soldering lugs. This switch is a single-pole, five-position shorting type, useful in a linear amplifier Pi network. The 90° brackets, when bolted to the knife clips, are mounted on a circular piece of glass-epoxy board about 3-1/2 inches in diameter. The clips are mounted in a semicircle, 30° apart. A portion of the circular insulating board is cut off to save space.

A rotary segment, which engages the clips to short sections of the tapped coil, is fabricated from 0.062-inch thick brass sheet. It was first cut into a circle, the holes laid out, then recut to make the proper size segment. To insulate the rotor from the rest of the switch, it was mounted on a circular piece of glass-epoxy board with three screws. This assembly has a flanged 1/4-inch brass shaft fastened to the circular board by means of four screws. The 1/4-inch shaft and rotor assembly run in a 1/4-inch panel bearing. It is possible to gang two (or more) such switches. A large indicator knob is used to turn this switch, and the switch positions are marked on the front panel for reference.

Conclusion

You should consider silver plating all switch parts before assembling, if it can be done reasonably. The plating should be fairly heavy, but does not require polishing. Plating will help keep the contact resistance low, and soldering will be easy. The general appearance of a plated switch adds a professional touch to a home-built project.

Dimensions are given only as guides to switch construction. The switch sizes depend on available materials and the intended application. Alignment of the clips is important. This is accomplished by making the mounting holes a little oversized. The rod or swinger is engaged into the clips and the screws tightened, giving correct alignment and providing maximum surface contact.

The number of physical variations for switches using these designs is limited only by your imagination. Many new applications will be found. Will you be one of the innovators?

Paul A. Johnson, 67 years of age, retired in 1974 from the Carnegie Institution of Washington, DC (a non-profit research organization) as the model-shop manager. He has done considerable field work in radio astronomy and seismology throughout the U.S. and South America. In addition to his present call sign, W7KBE, Paul has held W8EET, W8MPF, W3KTK and W3EET.

Notes

[1]mm = inches × 25.4.

[2]L. Aurick, "The 'Lowbander's' One-Antenna Farm," *QST*, Feb. 1982, pp. 23-24.

Efficient Ground Systems for Vertical Antennas

Elevated ground systems for vertical antennas have been a bit of a mystery for the past 60 years. This report of an extensive study reveals some startling results.

By Archibald C. Doty, Jr.,* K8CFU, John A. Frey,** W3ESU, and Harry J. Mills,*** K4HU

On the evening of November 27, 1923, the first two-way transatlantic radio communications took place between two Amateur Radio stations in the United States and a fellow amateur in France. One of the American stations was operated by John L. Reinartz, "the father of short-wave radio."

The antenna installation of that station was novel. The success of the Reinartz station was attributed to a new principle of antenna construction: A counterpoise was used as the second part of the balanced antenna system, rather than the capacitive ground used previously. After that night, the counterpoise (an elevated array of one or more insulated wires placed under the antenna) was used commonly in amateur and commerical antenna systems for more than 10 years. As the counterpoise was developed, its usual configuration became a symmetrical pattern of radial wires used as the "artificial ground" under electrically short (one quarter wavelength or less) vertical antennas, as shown in Fig. 1.

Development of the counterpoise was, by necessity, empirical in nature, as sophisticated instrumentation and standardized antenna testing procedures were not available in those early days of radio. But after 1937 the counterpoise was almost forgotten because of a landmark research program on another type of ground system — the buried radial.[1] This research, conducted by the legendary George H. Brown, was so detailed and authoritative that its results were used to develop the Federal Communications Commission's requirements for a-m broadcast stations. These requirements, which still apply today, specify that each station shall be equipped with a ground system consisting of at least 120 radials, each being at least 1/4 wavelength long.[2]

As is often the result of rigid regulation, interest and development of possibly superior ground systems, including the counterpoise, has languished for the past 40 years. The same situation holds true for the "first cousin" of the counterpoise — the elevated ground screen. This is an elevated ground system that may be physically identical to the counterpoise, except that the radial wires are connected to the earth. The ground screen is little used these days, and the literature provides a very limited amount of information on its operating characteristics.

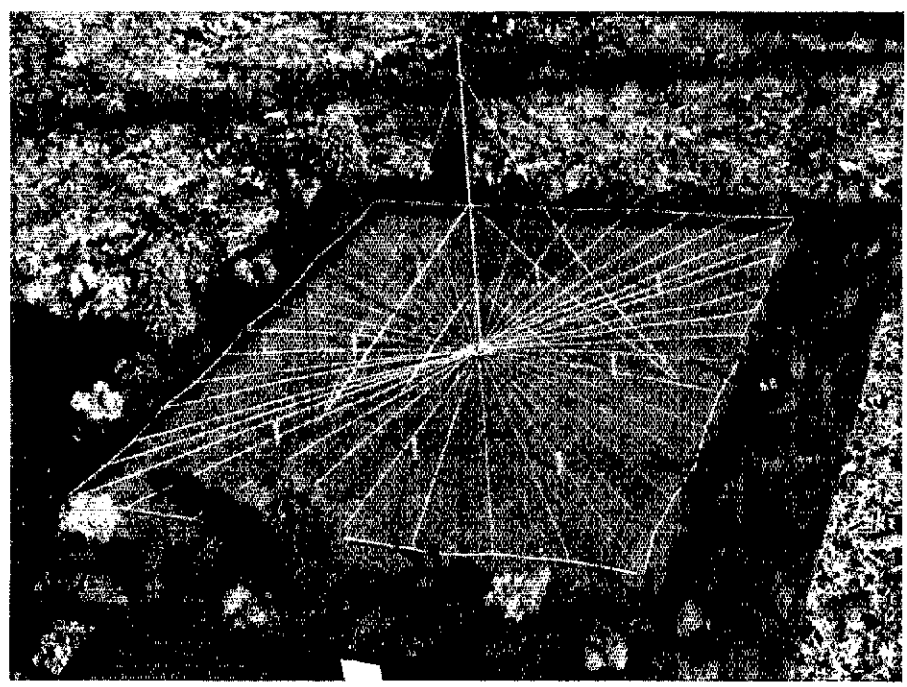


Fig. 2 — This scale model of the test antenna system was built before construction of the full-size version was undertaken. The model measures 3 by 5 feet, while the actual antenna system is 200 by 300 feet.

*Jackson Rd., Rte. 3, Fletcher, NC 28732
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***319 Valley St., Hendersonville, NC 28739

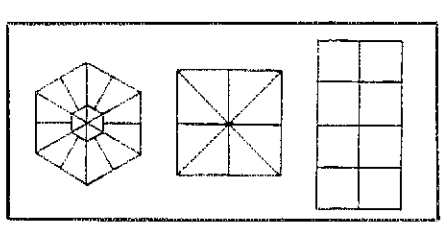

Fig. 1 — Typical arrangements of wires for counterpoise or ground-screen systems.

The Test Program

In 1979 a rather elaborate program was begun in Fletcher, North Carolina, to determine the effectiveness of the counterpoise and elevated ground systems. These tests were conducted at 1.8 MHz. The ver-

[1]Notes appear on page 25.

tical antenna used for the portion of the test program reported here was a 45-degree (about 65-foot) top-loaded section of tower.[3] The base of this antenna was 4 feet above the ground and was insulated from the earth. The antenna was deliberately offset slightly from the center of the radial system so that no two radials would be of exactly the same length. The radial wire system used in the tests covers an area of 200 × 300 feet (slightly less than 1.4 acres). This system was used first as a counterpoise and then, after it had been grounded at several locations, as a ground screen. The longer dimension was selected on the assumption that the optimum radial lengths determined by Brown for buried radials would also be correct for a counterpoise and an elevated ground screen (a correct assumption, as it turned out!).[4] The smaller dimension was selected to be less than the optimum length found by Brown.

Tests were conducted with 6, 12, 18, 24, 36, 40 and 48 radials in place. Total lengths of wire in the various systems tested were from 1821 feet to 7386 feet. The radial wires are from 6 to 8 feet above ground. Before construction of the antenna system was undertaken, the 3- × 5-foot scale model shown in Fig. 2 was made and evaluated for mechanical considerations.

Ground Conductivity

Antenna literature is full of references to the importance of ground conductivity to the efficient operation of vertical antennas. Our first chore, therefore, was to determine the ground conductivity of the test site. There have been few mentions in the literature of actual measurements of conductivity, and no convenient system for such measurements was offered until recently. In the Fletcher test program, ground conductivity was measured directly by the relatively simple method described by Sevick.[5] At first we experienced trouble from ground currents. Thus, we modified Sevick's circuit by adding an isolation transformer, and that cleared up the problem. Fig. 3 shows the results of four months of daily tests of the ground conductivity at a "standard" fixed location adjacent to the base of the antenna. As is shown by this data, the conductivity varied by a factor of approximately 2:1 over the period covered.

Data has now been accumulated for a total of 16 months, and conductivity has remained within the limits shown. The long-term variations in conductivity correlated, as expected, with the variations in temperature and rainfall. In addition, however, severe variations in conductivity were found at different locations in the test site. As illustrated in Fig. 4, ground conductivity varied by a factor of 7.5:1 within less than 10 feet.

In theoretical analyses of vertical antenna radiation patterns, previous literature indicates that the ground conductivity was assumed to be homogeneous throughout the area covered by the antenna ground system (usually buried radial wires). Our tests indicate that it should *not* be assumed that the ground conductivity will be homogeneous. Past usage of an area (such as agricultural, where fertilizers or chemicals have been applied), past conditions (as on cleared land previously covered with brush or trees, which could accumulate salts or other chemicals in their root systems), and microtopography (smaller ruts or lower areas that may contain electrolytes washed from higher areas) can be expected to produce considerable local variations in ground conductivity. If you have built a vertical antenna and have found that its radiation pattern is unusual in any respect, perhaps the ground conductivity under it was the reason!

RF Current Measurements

The tests reported here (and those conducted subsequently) required the taking of literally thousands of rf current measurements. Currents were repeatedly measured in each radial wire at various distances from the antenna, for the various test conditions. As soon as the earliest measurements were made in the

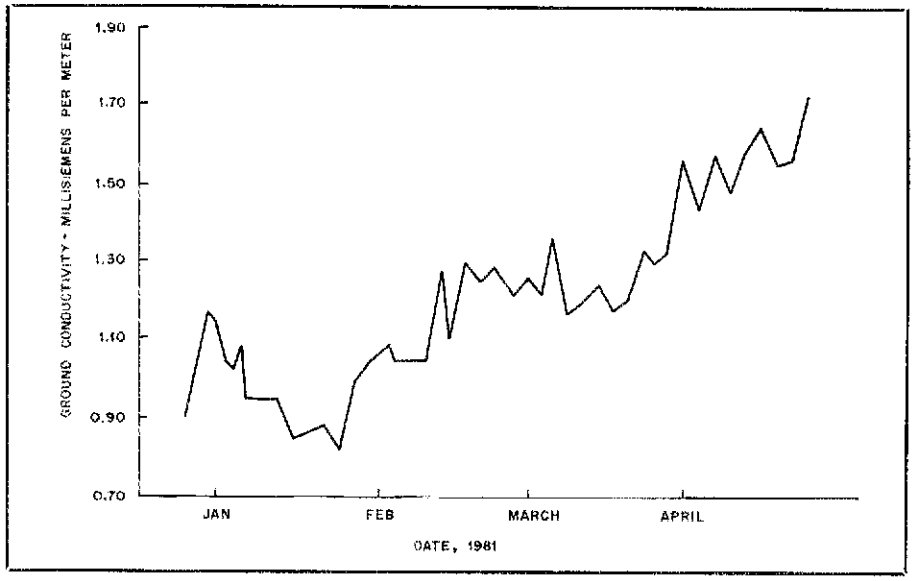

Fig. 3 — Ground conductivity at one fixed location in the test site at Fletcher, North Carolina. Measurements, taken daily, are shown here for the first four months of 1981.

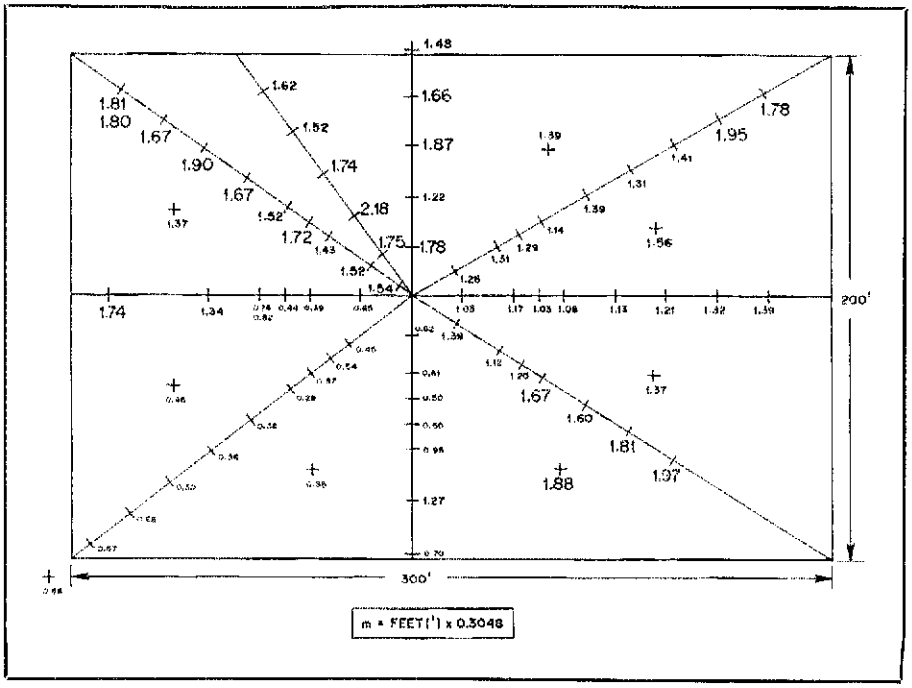

Fig. 4 — Ground conductivity along different radials at the test site. Note that there is a difference ratio of as much as 7.5:1 within a distance of 10 feet.

test program, it was evident that the most sensitive rf ammeter commonly available (0-100 mA) would not be satisfactory. Readings of less than 1 mA were commonplace at the power level that we wished to feed to the antenna. Accordingly, a magnetometer of the design published by Carr was constructed and used throughout the test program, Fig. 5.[6]

Although it is not evident in Fig. 5, two pieces of sheet plastic, spaced 1/8 in. apart, are mounted on the top of the magnetometer. The radial to be measured was placed in the slot between the pieces of plastic, thus locating the wire precisely. It was found that the meter was capable of reproducible measurements of rf currents of less than 10 microamperes, and of indicating the presence of levels in the area of 1 to 3 microamperes. The magnetometer was calibrated by averaging readings from a number of sensitive thermocouple-type instruments. The extreme sensitivity of the meter allowed it to indicate clearly the presence of a small aluminum ladder 5 feet from a radial!

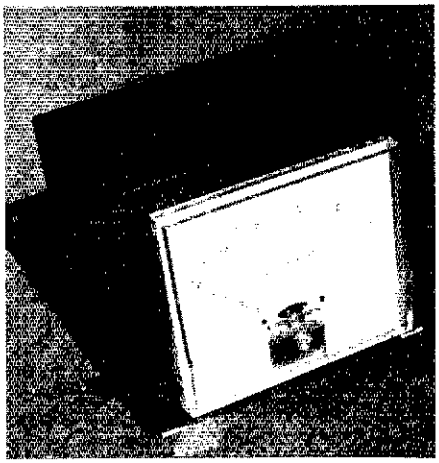

Fig. 5 — The magnetometer used for rf current measurements, after Carr.[6] The basic meter movement is a 5-inch, 50-μA instrument, selected for its sensitivity and readability.

In use, the instrument was placed against the radial wire and positioned so the wire would "snap" into place in the slot between the plastic sheets. This enabled repeatable measurements to be taken rapidly. In other tests, rf currents were measured in buried radials by cutting small rectangular holes in the earth beyond the depth of the radials. This permitted inserting the magnetometer into the holes with the buried wires positioned in the slot.

Current Distribution in Counterpoise Radials

No record has been found in past literature of specific data on the the distribution of current in the wires comprising any type of artificial ground system — buried radials, counterpoise or ground screen. What data is available indicates that there is uniform distribution of current in the radial wires of such systems. The thousands of measurements made in the Fletcher tests clearly indicate lack of uniformity of current distribution in the radial wires of a counterpoise. Fig. 6, showing the result of 800 data points, illustrates the wide variation of current flow found in the radial wires of a 48-radial counterpoise.

The distribution shown was a considerable surprise. Every indication found in the literature of the past 60 years[7-11], and in modern commentary by experts in the field, indicates that the counterpoise was thought to act as one plate of a large capacitor. The earth was thought to act as the second plate. It was believed that the return currents flowing back to the base of the antenna through the radials should be better distributed than with buried radials. It was also believed that the currents should show some concentration (as the result of the "edge effect" of a capacitor) along the periphery of the counterpoise system, rather than being concentrated near the base of the antenna, as is found with buried radial systems. The Fletcher tests showed an entirely different distribution of current flow in the radials of a counterpoise from that predicted in the literature.

A number of tests at the inception of the program indicated that there was a direct relationship between the level of current in the counterpoise radials and the conductivity of the ground under them. The most striking illustration of this correlation comes from comparing Fig. 4, which shows the conductivity of the ground at the test site, and Fig. 6, showing the currents in the radials. The comparison of these two illustrations offers an intriguing possibility. Shouldn't it be possible to modify the current pattern in the radials, and thus the radiation pattern of the antenna, by artificially modifying the conductivity of the ground under the radials? Preliminary tests by the authors indicates that this is definitely possible!

As radials were added to the counterpoise, a record was kept of the current supplied to the antenna, and the return current collected by the radials. The results are given in Table 1. This data indicates that an elevated counterpoise of less than 50 radial wires provides a very efficient ground system. Previous tests have indicated that more than 100 radials are required to provide the same level of performance if buried radials are used.

As previously mentioned, it has been thought that an elevated counterpoise acts in conjunction with the earth as a giant capacitor, with the counterpoise radials being one "plate" and the earth the other. The Fletcher tests clearly indicate that a counterpoise operates in a more complex

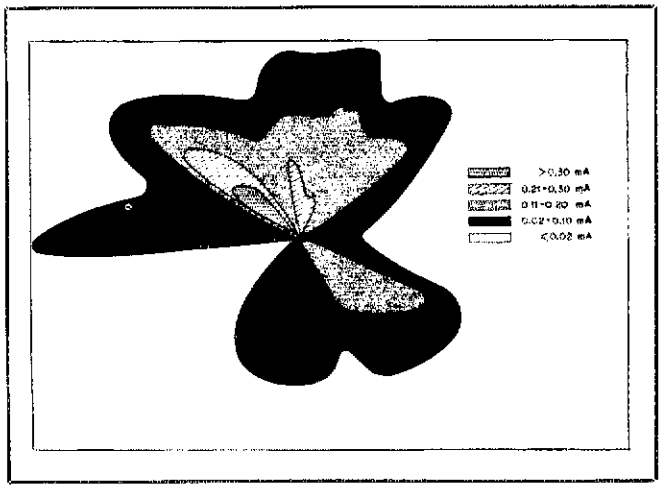

Fig. 6 — The range of current distribution in the wires of a 48-radial counterpoise is shown over the area of the test site. This drawing is based on approximately 800 data points. As one would assume, the current tends to be greatest at the base of the vertical radiator. But the surprising fact emerged that the current was nowhere near being equal from one radial wire to another.

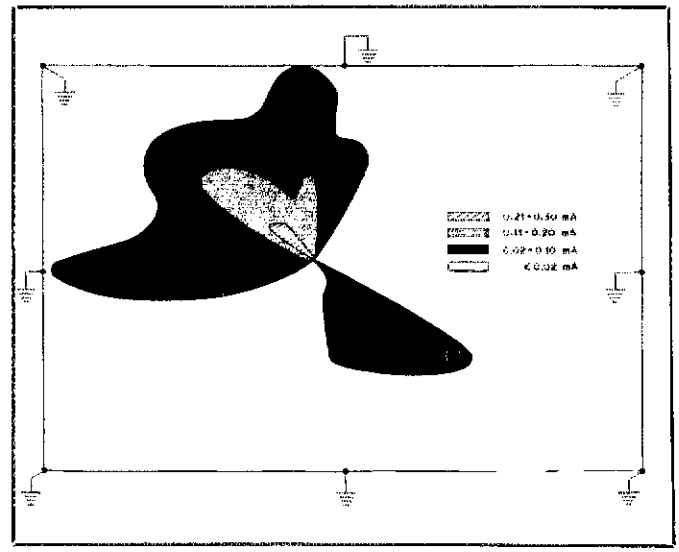

Fig. 7 — The range of current distribution in the wires of a 48-radial elevated ground screen. The wires were grounded at the center, and at eight points on the periphery of the system.

Table 1

Current Flowing in the Antenna and in the Radials of a Counterpoise

No. of Radials	Antenna Current, mA	Return Current, mA	Return as % of Ant. Curr.
6	350	220	63
12	390	260	66
20	495	445	90
28	495	450	91
36	495	455	92
40	495	490	99
48	495	495	100

manner than has been thought for the past 60 or so years, and that the wires in a counterpoise system definitely do not operate in concert as the plate of a large capacitor of the type usually considered. Rather, the counterpoise appears to operate efficiently as the result of a number of factors, including those itemized below.

1) Each radial of a counterpoise is individually capacitively coupled to the earth under that radial.

2) The magnitude of the currents carried by the radials of a counterpoise vary as the conductivity of the ground under the radials — the higher the conductivity, the higher the current. Current distribution in counterpoise radials is *not* similar to that found in buried radial systems.[12]

3) The counterpoise provides an efficient, low-loss path for antenna return currents, as do buried radial systems. The small amount of current in the counterpoise radials which is not directly induced from the antenna is in the form of displacement currents flowing from the earth as "charge-discharge" currents. However, the return currents in a buried radial must flow through high-resistance, high-loss earth to get to those radials. What this means in practice is that a counterpoise operates more efficiently — with less loss — in collecting return currents and guiding them to the base of the antenna than does a buried radial ground system.

The Elevated Ground Screen

The elevated ground screen used in the tests was the same physical array of radial wires as that for the counterpoise tests. For the ground screen tests, however, the radials were grounded at the center of the "spiderweb," and at eight locations around the peripheral wire that connected the far ends of the radials. Previous literature provides no specific data as to what distribution of current might be expected in the radial wires of an elevated ground screen. The only information we could uncover indicates the belief that the currents in the radials of a buried ground system should be equal from radial to radial. The measurements made at Fletcher leave no doubt that there was a pronounced lack of uniformity of current distribution in the radials of the ground screen tested. Fig. 7, which portrays several hundred data points, illustrates the wide variation of current flow found.

The radial wires in the ground screen vary in length from 96 feet to 173 feet. Each radial is grounded at its end near the antenna, and through the grounded peripheral wire at its far end. The various current levels in the radials are not related to the radial lengths. No rational explanation could be found for the unexpected, uneven, current pattern until the ground conductivity factor, discussed above in relation to the counterpoise, was discovered.

From the test data, a direct correlation was found between the level of current flow in the radials and the conductivity of the ground under those radials. Fig. 4 shows the ground conductivity at numerous locations of the test site, and Fig. 7 shows the level of the return currents in the radials of a 48-wire elevated ground screen over that ground. A comparison illustrates this correlation.

Additional testing showed that the correlation holds true even if a radial is placed on the surface of the ground, and connected to ground stakes every 20 feet. This was verified by testing a radial laid on the ground at two different locations, one having higher ground conductivity, and the other lower conductivity. Fig. 8 shows the considerable difference in radial current found. As shown, the current was substantially higher when the radial was on the ground with higher conductivity.

As each set of radials was added to the ground screen, a record was made of the current being supplied to the antenna, and the return current collected by the radials. The results are given in Table 2. As was also found in the case of the counterpoise, it appears that a ground system of fewer than 50 elevated radials may be as efficient as more than 100 buried radials.

Table 2

Current Flowing in the Antenna and Radials of Elevated Ground Screen

No. of Radials	Antenna Current, mA	Return Current, mA	Return as % of Ant. Curr.
0*	440	380	86
6	415	370	89
12	380	330	87
20	410	370	90
28	490	450	92
36	495	470	95
40	495	490	98
48	495	493	99

*Two 8-foot ground rods at base of antenna used to collect this data.

The lack of research data in the past literature on the operational characteristics of the counterpoise extends to the ground screen. The ground screen is described in some detail by Laport[13] and others, and its use is recommended in conjunction with buried-radial-wire ground systems to reduce ohmic losses near the base of a vertical antenna — losses caused by the concentration of return currents in that area (i.e., I^2R losses). There is, however, no specific data on elevated ground screens operating alone, without additional buried radials. It can only be deduced that the ground screen has been considered to be identical in its operating characteristics, regardless of whether the radial wires were buried or elevated.

The Fletcher tests indicate that an elevated ground screen operates with excellent efficiency as the result of a number of factors.

1) The ground screen operates as a low-resistance, low-loss path for return currents.

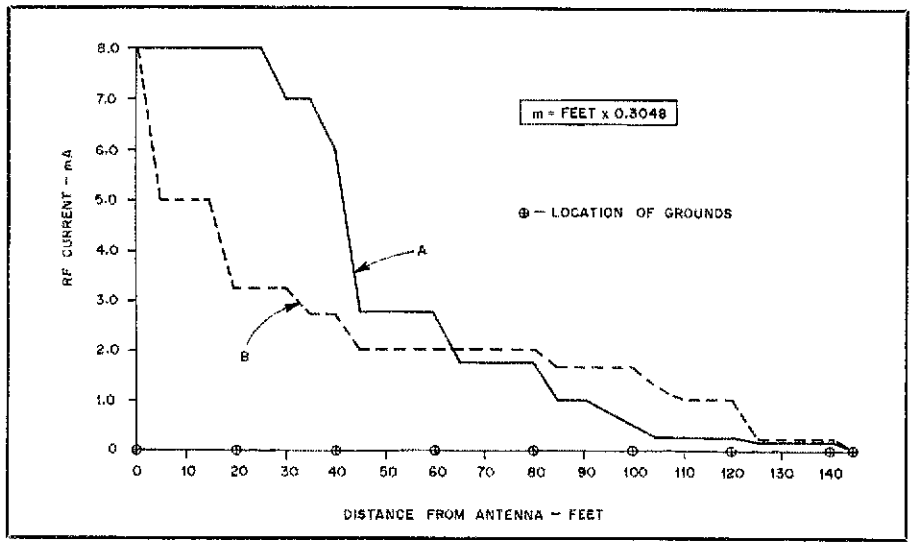

Fig. 8 — This drawing shows how ground conductivity affects the current flowing in a radial wire placed on the surface of the earth. Both wires were grounded every 20 feet. The wire of curve A was placed over soil with conductivity averaging 1.66 mS/m, while that under curve B averaged 1.17 mS/m.

2) Even though it is grounded at each end, each radial of the ground screen tested was capacitively coupled to the ground beneath it.

3) Return currents carried by the radials of an elevated ground screen vary with the conductivity of the ground under the individual radials — the higher the conductivity, the higher the current.

Summary of Findings

Our findings may be summarized briefly as follows: (a) There can be large variations in surface ground conductivity within the area covered by the ground system of a vertical antenna. (b) If there are variations in ground conductivity in the area occupied by a radial system, there will be corresponding variations in the magnitude of the currents in the various radials. These variations will persist regardless of whether the radials are elevated and insulated, as in a counterpoise, or grounded, as in a ground screen. (c) Elevated ground systems — counterpoise or ground screen — will collect return currents primarily as displacement currents induced directly by the field of the antenna. Currents will also be collected as charge-discharge currents induced from the ground below.

The majority of the return currents carried by elevated ground-system radials are collected directly from the antenna, or from the ground through an air dielectric. There is no necessity for these currents to pass for any considerable distance through high-resistance earth (as is the case when buried radials are used). As a result, these systems are highly efficient. Initial indications (i.e., a comparison of the data presented here with Brown's very thorough research on buried radials[14]) are that elevated "ground" systems used with electrically short vertical antennas may require substantially fewer radials than needed by a buried wire system of equal efficiency. (These indications have not yet been confirmed by direct comparison.)

Future Research

The research project described in this article was designed to help fill the gap of technical knowledge about the counterpoise and the elevated ground screen. Our findings, to a considerable degree, do not agree with the technical writings of the past 60 years, and they may therefore be controversial. In this regard we would like to point out that in the 45 years since the last comprehensive work was done on radial-current measurements, there have been great advances in instrumentation and techniques for measuring both ground conductivity and rf currents in wires. Thus, today's researcher, using relatively simple equipment, can make infinitely more accurate measurements than could be done in the past with a whole laboratory full of instrumentation.

We hope this research will encourage others to continue the investigations we have started, and that Amateur Radio operators, who have always led the way in the area of practical experimentation, will obtain operational evaluation of counterpoises and ground screens from on-the-air tests. To assist efforts in this direction, we have examined the results of our research and have designed a "Minipoise" ground system that can be constructed in almost any backyard. As shown in Figs. 9 and 10, this antenna system comprises a 30-foot-high vertical antenna and a 100- × 100-foot counterpoise.

You might think the 30-foot vertical is short for use on 160 meters. However, a check of the literature shows us that ". . . an antenna of infinitesimal length, subject to no losses, yields a field strength which is only 4.25 percent less than the field from a quarter-wave antenna."[15] This makes a 30-foot-high antenna, if used with a really efficient ground system, begin to look more attractive!

The 100- × 100-foot radial system, again based on past practice with buried radials, might seem too small to fill the requirement of a "really efficient ground system" for a 1.8-MHz antenna. But a look at Fig. 6 shows that by far the majority of the return currents in the radial wires of a counterpoise are collected within 100 feet of the base of the antenna. And if this is so, why should the radials be longer?

At present, we are testing an extensively instrumented version of the system shown in Fig. 9, and have designed a rigorous test program to check its characteristics. We are making our design widely available, in the hope that others will join us in operational testing of this antenna. If impetus is required to get others interested, we might mention that our original antenna has been providing some rather remarkable results. From our location in the mountains of North Carolina — 400 miles inland — we have, with no difficulty at all, worked all continents on 160 meters. Our contacts included ZL, 4X4, OA, LZ, ZS, many European countries and all 50 states. And 99% of these contacts have been on ssb! We hope that many amateurs will join us in further testing of the counterpoise or ground screen systems.

Acknowledgments

From the inception of our test program

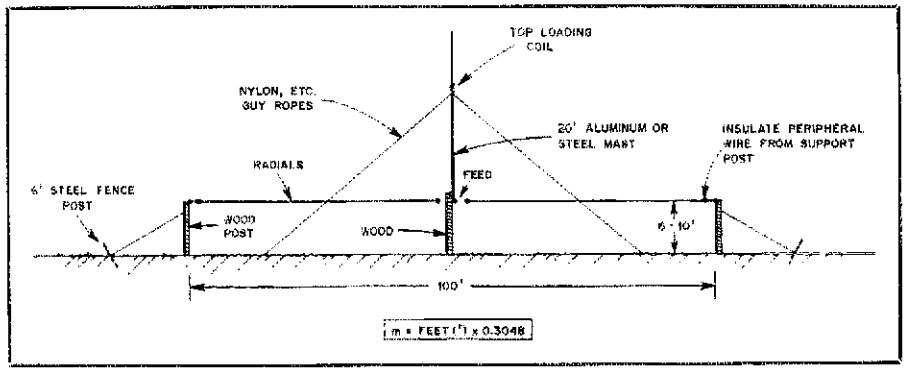

Fig. 9 — The Minipoise antenna system with a short, top-loaded vertical radiator, for 160-meter operation. See text.

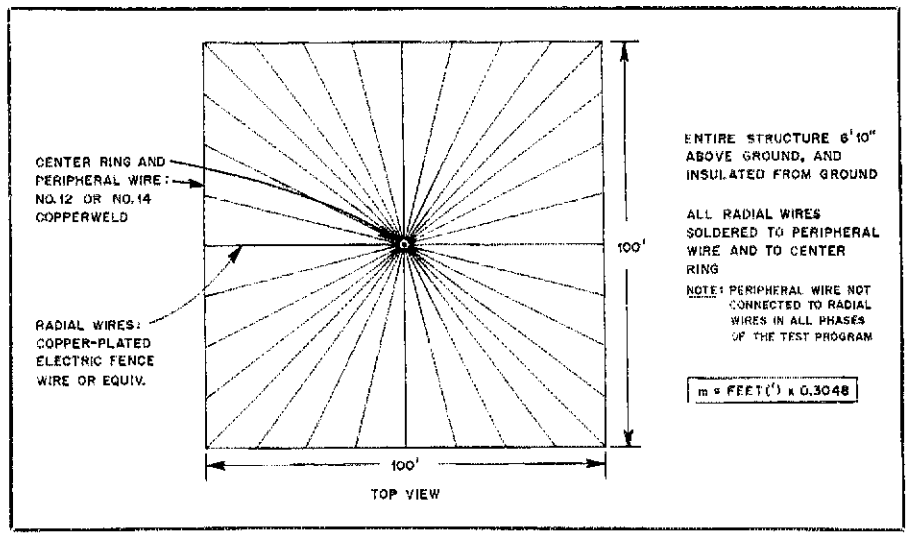

Fig. 10 — The Minipoise (miniature counterpoise) radial system is 100 feet square. This antenna was developed to promote interest in furthering the tests begun by the authors.

we have had a great amount of help, suggestions and encouragement from a number of our friends. Thus, we would like to express our very sincere thanks to those who gave their personal time to help this project: to Edmund A. Laport, without whose encouragement this project would never have been finished; to Barry A. Boothe, W9UCW, Earl W. Cunningham, K6SE, Paul R. Engle, K9QLL, and Richard B. Frey, K4XU, for their incisive and expert editing of the full technical report, from which this article was excerpted.

The complete (75-page) report of the full (15,000-measurement) test program includes the results of extensive additional tests not reported here. These included investigation of (a) capacitance of elevated radial wires to ground, (b) dielectric anomolies in the test area, (c) radial current vs. number of radials, and (d) effect of artificial modification of ground conductivity on radial current. Also, 27 references, in addition to those appended, were used in the design of the test program. The authors will be glad to share this material with anyone planning to undertake a definitive test program on the counterpoise or the ground screen. QST

Notes

[1]G. H. Brown, R. F. Lewis, and J. Epstein, "Ground Systems As A Factor in Antenna Efficiency," *Proceedings of the IRE*, June 1937, pp. 753-787.
[2]FCC Rules and Regulations, Part 73, Subpart A, 1972.
[3]Meters = ft × 0.3048.
[4]See note 1.
[5] J. Sevick, "Measuring Soil Conductivity," *QST*, March 1981, pp. 38-39.
[6]K. F. Carr, "Ground Currents Measuring," *Ham Radio*, June 1979, pp. 46-47.
[7]K. Henny, *Principles of Radio*, 3rd ed. (New York: John Wiley and Son, 1938), p. 461.
[8]S. A. Schelkunoff and H. T. Friis, *Antennas, Theory and Practice* (New York: John Wiley and Son, 1952).
[9]A. R. Nilson and J. L. Hornung, *Practical Radio Communication* (New York: McGraw-Hill, 1935).
[10]*Antennas and Radio Propagation*, Dept. of the Army, 1935.
[11]Schure, *Antennas* (New York: John R. Rider, 1957), pp. 23, 73.
[12]E. A. Laport, *Radio Antenna Engineering* (New York: McGraw Hill, 1952), pp. 48-54, 115-117, 187.
[13]See note 12.
[14]See note 1.
[15]See note 1.

References

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Electrical Communications System Engineering Radio, Dept. of the Army, TM 11-486-6, 1956.

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"Some Thoughts on Spark Operation," January 1921 *QST*. See the secton on "Grounds," pp. 6, 7.

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The ARRL Antenna Book, ARRL, 1968, pp. 200, 201.

New Books

☐ *Amateur Radio Operating Manual*, R. J. Eckersley, G4FTJ, editor, published by the Radio Society of Great Britain, London; second edition, 1982. 204 pages, soft-cover, 7-1/4 × 9-3/4 in., $10. Available from ARRL Hq. or your radio book counter.

There are lots of new books on Amateur Radio subjects floating around these days, many of them with inflated price tags and few of them worth the asking price. Shelling out upwards of $10 for a poorly researched and sloppily edited publication appears to be what some publishers expect radio amateurs to do these days.

One book that definitely *is* worth the money, if you're at all interested in viewing on-the-air operating from a fresh perspective, is the *Amateur Radio Operating Manual*, published by the Radio Society of Great Britain. In the brand-new second edition of this popular publication, editor R. J. Eckersley, G4FTJ, combines the efforts of some 50 contributors into a highly informative volume of more than 200 pages. Much of this material is original and unique to this publication; you probably won't find it anywhere else on this side of the Atlantic.

While written primarily for the British amateur and shortwave listener, most of its contents are of universal interest. Just about all aspects of Amateur Radio operating are covered in sufficient depth to be instructive to the old-timer but the text is written at a level that should appeal to the newcomer. In fact, a non-radio enthusiast could pick it up, read the opening chapter defining the Amateur Radio Service, and continue from there, developing a pretty good (although vicarious) working knowledge of what Amateur Radio is all about. This is in contrast to most other Amateur Radio literature, which seems to presuppose a large amount of "inbreeding."

The 10 chapters and 7 appendices include 11 pages on how to set up a station, 17 pages on operating practices, *52* pages of information on DXing (at hf *and* vhf/uhf), 10 pages on amateur satellites and 19 pages on contesting (did you know that most contesters drink Coke, Pepsi, black coffee or tea?), and so forth. The book is lavishly illustrated throughout, with high-quality charts and graphs, diagrams and very detailed maps. Of particular interest, for both the armchair traveler and the DXpeditioner, are the individual call area maps for each country that has been assigned an ITU call sign block, along with the addresses of the licensing administration and the national Amateur Radio society in each country.

I have the utmost admiration for Editor Eckersley and his associates for the painstaking work involved in compiling all the information that appears in the RSGB *Amateur Radio Operating Manual*. However, I would comment that the *ARRL Operating Manual*, although not nearly as comprehensive, may be more readable to amateurs on this side of the pond, owing to its somewhat more informal prose style. Between the two of them, no questions about Amateur Radio operating — one of life's spirited adventures — will be left unanswered. — *Robert Halprin, K1XA*

☐ *EMP Engineering And Design Principles*, by Bell Laboratories, copyright 1975, second printing. Soft-bound, 8-1/2 × 11 in., 151 pp., $14.95 plus $2 shipping. Available from Clayton Survival Services, P.O. Box 1411 Mariposa, CA 95338.

In the August 1981 issue of *QST*, a major article featured the subject of EMP — electromagnetic pulses generated by a high-altitude detonation of a nuclear device. A 250-mile-high nuclear detonation over the central USA would create an intense pulse of tens of kilovolts within nanoseconds over a frequency range from a few cycles into vhf. The radius of this pulse would cover the entire continental USA. Consequently, EMP represents a potential threat to the integrity of all solid-state devices in general, and to Amateur Radio equipment in particular.

This book, although written at the engineering level, is an excellent source that enables amateurs to better understand EMP and take precautionary measures against it. The book is directed toward telephone company buildings, installations and equipment. However, most of the information is applicable to radio communications.

An opening chapter covers EMP generation and characteristics in detail, and is excellent in providing for an understanding of the EMP phenomenon.

A chapter on coupling to exterior structures deals with EMP conduction by power lines, cables, towers, waveguides and other metallic objects into the interior of a building.

The chapter on shielding is of limited interest to amateurs, since it mostly involves shielding an entire building from EMP by means of reinforcing steel rod loops installed during the construction of concrete buildings.

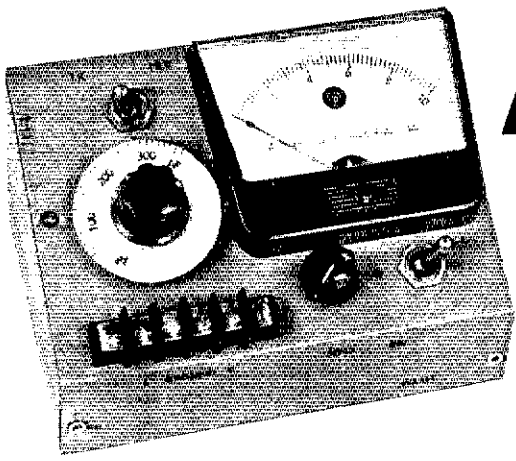
Coupling inside the building is the subject of a chapter that deals with methods of preventing EMP from reaching sensitive devices, principally by multiple bonding and grounding outer shields of conductors, but also through the use of EMP-effective lightning arrestors.

Component susceptibility and electrical devices for EMP mitigation are two chapters of real interest and practical value to radio amateurs — particularly to designers and builders of solid-state equipment. Detailed factual data is given on various types of component vulnerability to EMP, and various methods are outlined on how to protect these components.

The final two chapters concern EMP testing and personal safety. This information is interesting, but few (if any) hams have this kind of high-voltage testing capability.

EMP Engineering And Design Principles is one of the few available sources of detailed information on EMP. I highly recommend it for reading and application by all radio amateurs, and designers of Amateur Radio equipment.

With new Amateur Radio equipment now virtually 100% solid-state, our hobby, which serves in the public interest, can ill afford to fall behind the state of the art with regard to EMP. We must be able to provide radio communications in the event of a nuclear emergency situation. — *Fred Huntley, W6RNC* QST



A Simple L-C Meter

Build this circuit and unlock the secrets of unmarked components

By Frank Noble,* W3MT

The instrument described in this article minimizes pitfalls that tend to discourage the prospective builder: It is relatively cheap to build, the set-up is fast, the L/C calculations are easy and the accuracy is good. A miniature crystal-controlled oscillator, in conjunction with the unknown coil, forms the "heart" of the device. Voltage across the coil is indicated on a meter; it will be maximum when the coil is resonant. The coil is resonated with a calibrated variable capacitor. Operating frequencies for the crystal oscillator are chosen so that the unknown inductance is an integer power of 10 times the reciprocal of the resonant-tank capacitance. This simplifies the math involved. It is easily shown that the frequencies required will have the number sequence either $1/2\pi$ or $\sqrt{10}/2\pi$.[1] I used 5033- and 15,915-kHz crystals with a 365-pF broadcast variable capacitor in the tank circuit. This results in an inductance range of 0.286 to 28.6 μH and a capacitance range of 10 to 330 pF — values commonly used in the range of 2 to 30 MHz.

The Circuit

Fig. 1 is the schematic diagram of the meter. The positive battery terminal and one end of the coil are directly grounded, which simplifies the metering circuit. A Pierce crystal oscillator is used because it does not require a tuned circuit. Other oscillators require tuned tank circuits that must be switched, increasing complexity and cost. The oscillator FET source resistor value was found experimentally. This value produces the cleanest waveform; it is free from harmonics that can produce false meter indications. A capacitive voltage divider is used as an interstage coupling network, employing a small input capacitor to minimize oscillator loading and a large output capacitor to reduce amplifier drive. With the amplifier operating in the linear mode, the chance for spurious meter indications is further reduced. An unbypassed source resistor in the amplifier stage reduces distortion and increases the effective drain resistance, reducing the load on the output circuit. This increases the tuning sharpness. A 1N34A germanium diode rectifies the rf energy, which is then displayed on a sensitive μA meter.

Measuring Inductance

To measure inductance, the unknown coil is connected, the instrument is energized, and the variable capacitor is tuned until the coil resonates; this is indicated by a peak in the meter reading. If it does not peak, the crystal is switched and the unit is tuned again. At resonance, the inductance in microhenrys is $1000/C_{pF}$ when using the 5033-kHz crystal; and $100/C_{pF}$ for the 15,915-kHz crystal.

Instrument accuracy is limited by crystal tolerance and the variable capacitor calibration. Crystal frequency accuracy far exceeds the dial calibration accuracy, so low-tolerance crystals make economic sense.[2] The specified capacitor has semi-circular plates and a capacitance range from 10- to 365-pF, which is close to 2 pF-per-degree of shaft rotation. Accuracy adequate for amateur purposes may be obtained by dividing the dial in increments of 10 pF, or 5 mechanical degrees, by means of a protractor. Accent the 50-pF points and label the 100-pF points to make the dial easily readable.

A correction for amplifier output capacitance, including the rectifier diode and strays, may be made by resonating a standard 5-μH coil, using the 1000 switch position and setting the variable capacitor to read 200 pF.[3] Since the capacitance variation is linear with shaft rotation, calibration will be correct throughout its range.

Measuring Capacitance

To measure capacitance over the range of 10 to 333 pF, set the crystal switch to 1000 and resonate a 3-μH coil with the variable capacitor; note the dial reading.[4] The unknown capacitor is then connected across the coil, and resonance is established by tuning the variable capacitor. The difference between the two capacitor-dial readings is equal to the unknown capacitance, within the dial calibration accuracy. Frequency has no effect as long as it is constant; with crystal control this is no problem.

Construction

The mechanical layout of the circuit is not critical. As with all rf gear, use short, direct leads, with the output circuits separated from the input to prevent spurious oscillations. I used Vectorbord®, supported by the capacitor frame, to mount the rf circuits. The crystals were "epoxied" to the board with the pins protruding through, and wires were soldered directly to the pins. Amplifier output capacitance should be minimized by keeping leads short and away from grounded objects. I installed the circuit, including a surplus 3-1/2-inch meter and battery, in a steel sloping-front cabinet, as shown in Fig. 2.

Conclusions

There are a number of practical uses for

[1]Notes appear on page 27.

*10004 Belhaven Rd., Bethesda, MD 20817

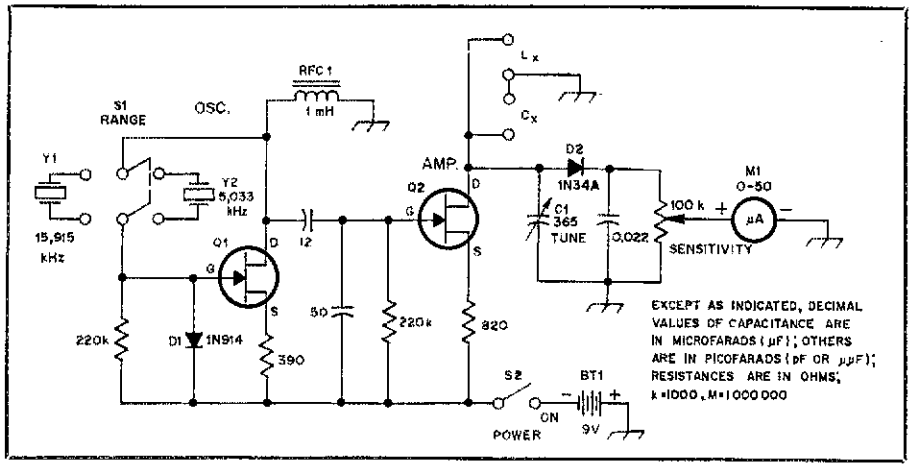


Fig. 1 — Schematic diagram of the L-C Meter. Resistors are carbon composition, 1/4- or 1/2-W; capacitors are disc ceramic, 100-V units.

C1 — 10- to 365-pF variable capacitor. See text for details.
D1 — 1N914 silicon switching diode.
D2 — 1N34A germanium point-contact diode.
M1 — Small dc meter, 50 μA.
Q1, Q2 — Silicon JFET, Radio Shack 276-2035 or equiv.
Y1* — 15,915-kHz quartz crystal, 32-pF loading, HC6/U holder, ICM type 434115 or equiv.
Y2* — 5033-kHz quartz crystal, 32-pF loading, HC6/U holder, ICM type 433115 or equiv.

*The exact crystal frequencies may be found by using the following equations:

$$Y1 = \frac{10^5}{2\pi} \text{ kHz}$$

$$Y2 = \frac{10^4\sqrt{10}}{2\pi}$$

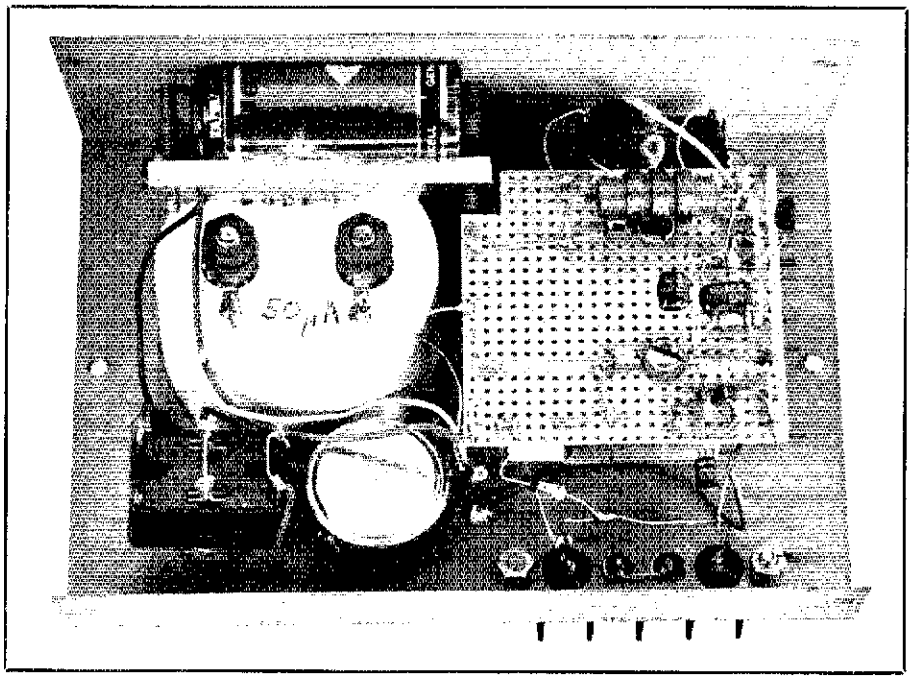


Fig. 2 — Interior view of the L-C meter.

a fast and simple inductance meter. Rather than fiddle with inductance formulas or calculators, it is much easier to wind too many turns on a form and measure the inductance, then remove turns until the desired value is reached. This is especially true for slug-tuned and toroidal coils when the permeability is not known.

Capacitors are usually labeled with their value, which negates the need for a capacitance meter. With time, however, labels deteriorate and capacitors open, leak or short. If the builder uses old or surplus stock, measurement may be the only way to go. QST

Notes

[1]From the resonance formula

$$L = \frac{1}{\omega^2 C} \quad \text{(Eq. 1)}$$

we require that

$$L = \frac{10^{-N}}{C} \quad \text{(Eq. 2)}$$

where N is any integer.

From the above

$$\omega^2 = 10^N \quad \text{(Eq. 3)}$$

so that

$$\omega = 10^{N/2} \quad \text{(Eq. 4)}$$

If N is an even number, N/2 is an integer, which we will call M. Then

$$f = \frac{10^M}{2\pi} \quad \text{(Eq. 5)}$$

f will have the number sequence of $1/2\pi$; the decimal position will be determined by M.

If N is an odd number, N − 1 is an even number that we will call P. Then

$$\omega^2 = 10^P \times 10^1 \quad \text{(Eq. 6)}$$

and $$\omega = 10^{P/2} \times 10^{1/2} \quad \text{(Eq. 7)}$$

But P/2 is an integer, which we will call K. Then

$$\omega = 10^K \sqrt{10} \quad \text{(Eq. 8)}$$

and

$$f = \frac{10^K \sqrt{10}}{2\pi} \quad \text{(Eq. 9)}$$

f will have the number sequence of $\sqrt{10}/2\pi$; the decimal position will be determined by K.

[2]The crystals are general-purpose (GP) types available from International Crystal Mfg., 10 North Lee, Oklahoma City, OK 73102.

[3]For details describing the 5-μH coil, see recent editions of the *ARRL Handbook* under Dip Meter, Measuring inductance and capacitance.

[4]I used a home made, 3-μH coil, consisting of 11 turns of number 20 tinned wire, with a total length of 5/8-inch. The exact value of this inductor is not critical, but the tank should resonate within a dial reading of 300 to 350 pF.

Strays

I would like to get in touch with . . .

☐ anyone having an instruction manual and circuit diagram for an OS-8C/U Navy Department oscilloscope, manufactured by Jetronic Industries, Inc., Philadelphia. Leo H. Hansen, WBØTDU, Star Rte., Box 2032, Virginia, MN 55792.

☐ other amateurs who are involved in the emergency services field, particularly EMTs and paramedics. Jeff Howell, WB9PFZ, P.O. Box 463, Madison, IN 47250.

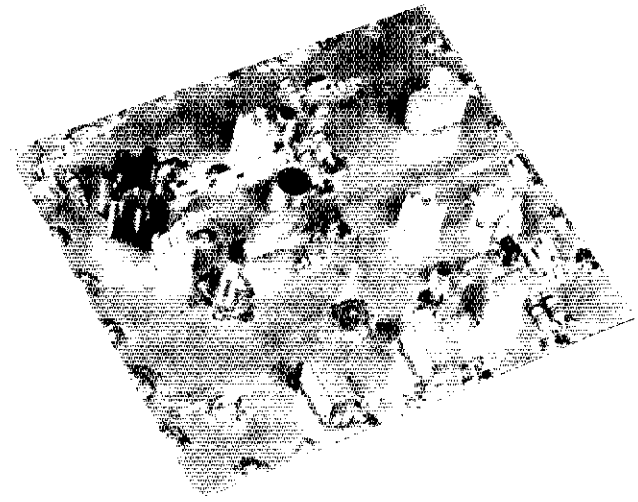
☐ University of Texas alumni who are hams, to join the UTARC as associate members. Lee Murrah, WD5CID, 5303 Scenic View Dr., Austin, TX 78746.

☐ any hams who were cadets at the Florida Military Academy in St. Petersburg. H. Vandergrift, WA4WME, 2308 Zinnia Ct., Killeen, TX 76541.

***QST* congratulates . . .**

☐ Frank Thornburgh, WA6GYR, of Pleasant Hill, California, on being appointed as a communications specialist at the Federal Emergency Management Agency (FEMA) Region IX Headquarters.

A High-Quality UHF Source for Microwave Applications†



Need a state-of-the-art signal source for the high bands? Build this one! It has what you may be looking for.

By The RSGB Microwave Committee*

This article describes a unit that delivers a minimum of 100 mW from a 12-V supply, at an output frequency of 360 to 440 MHz, using a fifth-overtone crystal in a range of 90 to 110 MHz. The output is intended for multiplication up to microwave frequencies for use as a local oscillator or transmitter. This signal still has a good quality note at 10 GHz. Members of the RSGB Microwave Committee developed it from the Plessey AMETS transmitter board.

Overview

The design uses a Butler crystal oscillator, eliminating frequency-multiplier stages. This circuit has a very low noise output compared with the commonly used single-transistor variety. Crystal loading is less, allowing a higher working Q to be realized. Leadless disc capacitors are used on double-sided circuit-board material for efficient decoupling.

The two amplifier stages are operated in Class A, contributing to the low-noise performance and making instability problems very unlikely. All inductors and lines are printed on the board; only four adjustments are needed to align the unit. We made provision for on/off keying of the output stage, or for applying fm or fsk to the oscillator. Several dozen of these boards have been built and used in a variety of microwave applications, giving excellent results.

Construction

The unit is constructed on 0.063-in.-thick, double-sided, copper-clad fiberglass epoxy board (dielectric constant is approximately 5) with ground plane on the component side of the board.[1] Using materials with different dielectric constants may result in incorrect resonant frequencies for the tuned circuits; you should avoid this. The circuit diagram is given in Fig. 1.

Construction is generally straightforward; the layout of components on the board is shown in Fig. 2. It is important that the component values be adhered to and in particular that only new, branded semiconductors be used for Q1-Q4, inclusive; surplus types usually do not perform satisfactorily. The grounded ends of the components are soldered to both top and bottom ground planes. All components should be mounted with absolute minimum lead lengths. Q2, Q3 and Q4 should be pushed down flush with the top side of the board. Solder the cans of Q2 and Q3 to the ground plane. Q4 is fitted with a TO-5 heat sink.

Take care mounting the 1000-pF leadless disc-ceramic capacitors. They are located in slots in the circuit board, made by drilling several holes close together and then joining them to form a slot. You can do this quite easily using the tool shown in Fig. 3. Break off the end of a hacksaw blade and cut or file the end to a taper. The teeth should be oriented as shown. The point is thin enough to fit into one hole at the end of the row. Hold the hacksaw blade quite close to the board, and use it gently to prevent it from snapping off. If it breaks, the blade can easily be repaired by filing it to a point again.

Another method uses a no. 60 (1 mm) drill bit in a vertical drill as a mill. Hold the drill bit in the chuck so only 1/8 to 1/6 inch protrudes. Move the board sideways so that the edge of the drill bit cuts the slot, joining the holes. Hold the board against a straight edge to ensure a straight slot. If the drill breaks, it can still be reused. Clean the edges of the slot with a flat needle file or nail file. Do not make the slot too wide; otherwise, it will be difficult to solder the discs, which should be positioned and soldered exactly as shown in Fig. 4. Ensure that the solder flows properly on the metal of the capacitors. Various "surplus" leadless discs gave trouble in this respect on some of the prototypes. We found the most reliable types to be those made by Steatite[2], which are actually trapezoidal (coffin-shaped) rather than round. They proved extremely easy to solder in place, and are recommended.

For other types, a useful technique is to heat the edge of the slot first, insert the disc, touch the soldering iron to the disc (not the board), and then apply solder to form a neat fillet. If silver-loaded solder can be obtained, then this is also worth using.

The ground planes on both sides of the board are joined at many points by short lengths of no. 20-24 wire (e.g., scrap component leads) soldered in all the remaining

†Adapted from an article of the same title in *Radio Communication* (RSGB), Oct. 1981.

*Radio Society of Great Britain, Alma House, Cranborne Road, Potters Bar, Herts. EN6 3JW, England

[1]Notes appear on page 32.

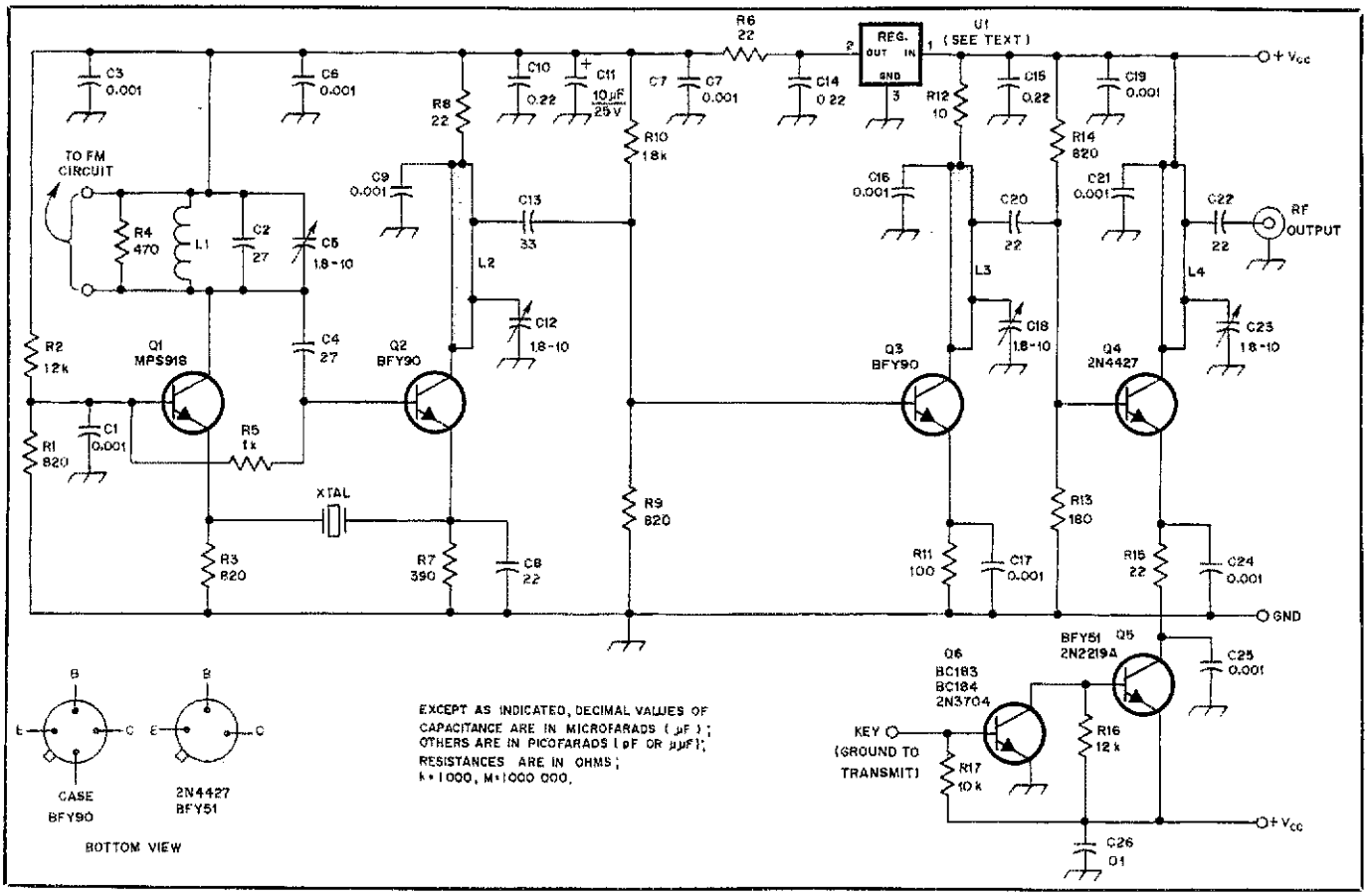


Fig. 1 — Circuit diagram of the signal source. For best results, construct using the board layout found in the Hints and Kinks section of this issue. All fixed-value resistors are 1/4-W, carbon composition type. Variable resistors are 1/4-W pc-board mounting type. Capacitors are subminiature disc ceramic, unless otherwise specified.

C1, C3, C6, C7, C9, C16, C17, C19, C21, C24, C25 — 0.001-µF leadless disc, Steatite 0.001 µF/80/20 TEFK7 400 V or equiv.
C5, C12, C18, C23 — 1.8-10-pF film trimmer, Mullard 809-05002 or equiv.
C10, C14, C15 — 0.22-µF polyester.
C11 — 10-µF, 25-V electrolytic.
Q1 — Npn, silicon rf/i-f amplifier, 250 mW, MPS918.
Q2, Q3 — Npn, silicon, rf amplifier, 1 W, BFY90.
Q4 — Npn, silicon, power amplifier, 1 W, 2N4427.
Q5 — Npn, silicon, power amplifier/switcher, 1 W, 2N2219A or equiv.
Q6 — Npn, silicon, general purpose, 500 mW, BC183 or equiv.
U1 — Voltage regulator IC, see text.
Xtal — HC18/U or HC25/U fifth overtone.

EEG-311

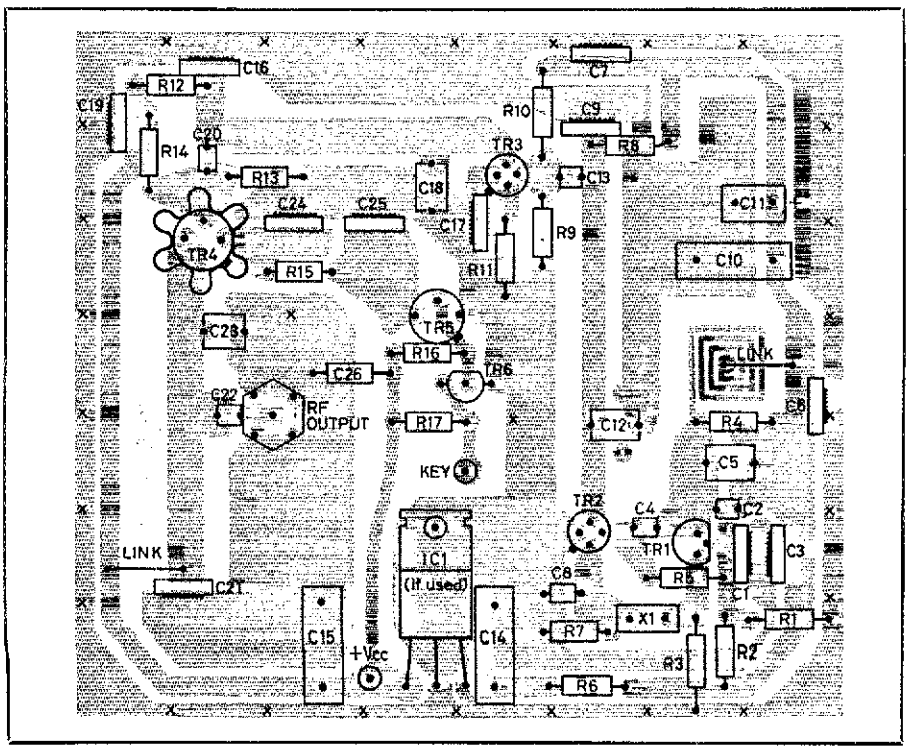


Fig. 2 — Parts-placement guide for the signal source. Parts are placed on the ground plane side of the board. (The etching patterns for both sides of the board appear in the Hints and Kinks section of this issue.) X indicates jumpers joining top and bottom ground planes. [Several parts labeled on the diagram are not in *QST* style — Ed.]

holes that are not cleared on the upper side of the board. These are located all around the edge of the board, as well as in a number of other places. It would be possible to replace the wires around the edges of the board with thin copper foil, folded and soldered along the edges of the board, connecting the two ground planes.

Do not forget the two wire links on the board connecting L1 and L4 to the positive supply. Holes are provided for either the 2- or 3-pin types of trimmer capacitor, which should be mounted so that their movable plates are connected to minimize stray capacitance coupling and loading effects when trimming tools are used.

The output can be taken by small-diameter coaxial cable directly from the

board, with the cable braid soldered carefully to the top ground plane (Fig. 5). Or, you can use an SMB, SMC (Conhex), or SMA socket on the board.

We made provision on the board for a TO-220-style voltage regulator for the oscillator supply. This reduces the chirp on the note considerably during keying. These regulators generally require an input voltage at least 2.5 V greater than the regulated output voltage. If a 12-V one is used (e.g., 7812), the supply to the board should be at least 14.5 V. If only a 12-V supply is available, use an 8-V regulator (7808) — though this may reduce the output slightly — or omit the regulator altogether and insert a wire between the two outermost regulator holes.

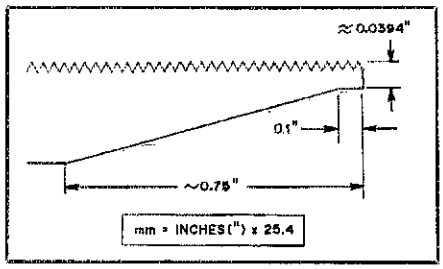


Fig. 3 — Slot-cutting tool.

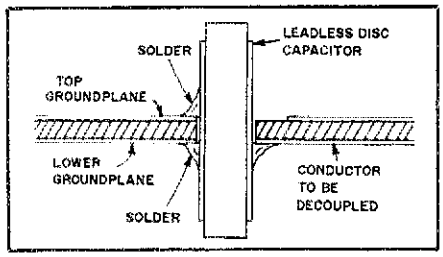


Fig. 4 — Soldering of leadless disc capacitors.

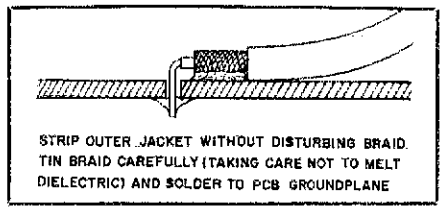


Fig. 5 — Soldering of output cable to board.

Modulation Facilities

The PA stage can be on/off keyed by Q5 and Q6; however, this pulls the oscillator frequency slightly. At 10 GHz, the keying chirp is unacceptable unless the oscillator voltage regulator (U1) is used, and even then it is still noticeable. Frequency-shift keying (fsk) is the preferred method. If you do not plan to use A1 keying, Q5, Q6 and associated components should be omitted. Ground the end of R15 previously connected to Q5.

Frequency modulation or fsk can be produced using the circuit in Fig. 6. A varactor diode varies the capacitance across L1. Reduce the value of C2 to maintain the total capacitance at 27 pF. The BB105B (C = 7 pF at −5 V), with C2 = 18 pF, should give a deviation of about 2 kHz/V at 10 GHz. Wider deviation can be obtained by using a higher capacitance diode, such as the BB110G, or a hyper-abrupt type, which has a larger capacitance swing (e.g., the Alpha DKV6520)[3].

The circuit has inputs for audio at low impedance (source impedance less than 1 kΩ), or for cw where grounding the input shifts the carrier about 1 kHz at 10 GHz; the shift can be altered by changing the 47-kΩ resistor.

The components to the right-hand side of the dashed line should be mounted directly across the tuned circuit. The rest can be mounted in place of the A1 keying circuit if this is not required, but in any case they should be mounted on the board to avoid ground-loop problems. Efficient filtering is necessary on both inputs to prevent any stray af or rf noise causing unwanted sidebands on the output.

Alignment

The tune-up for this unit requires the use of some form of output indicator. An hf/vhf SWR meter connected to the board via a short length of coaxial cable can be used, set initially on the most sensitive range, with a 50-Ω load or resistor on the output socket. We recommend, however, that the power meter described below be used, because it is a simple, yet remarkably accurate, way of measuring power in the range 100 mW to 2 W, up to at least 500 MHz. Constructional details are given in Fig. 7.

The meter indication, V, is the peak rf voltage across the load minus the forward voltage drop across the diode. This is divided by $\sqrt{2}$ to give the rms value, and the power is calculated from this using the equation

$$P = \frac{(V_{rms})^2}{R} \qquad \text{(Eq. 1)}$$

For germanium diodes, such as the OA47, the relationship will therefore be

$$P = \frac{(V + 0.25)^2}{100} \qquad \text{(Eq. 2)}$$

while for silicon diodes, such as 1N914, 1N916 and 1N4149, it is

$$P = \frac{(V + 0.7)^2}{100} \qquad \text{(Eq. 3)}$$

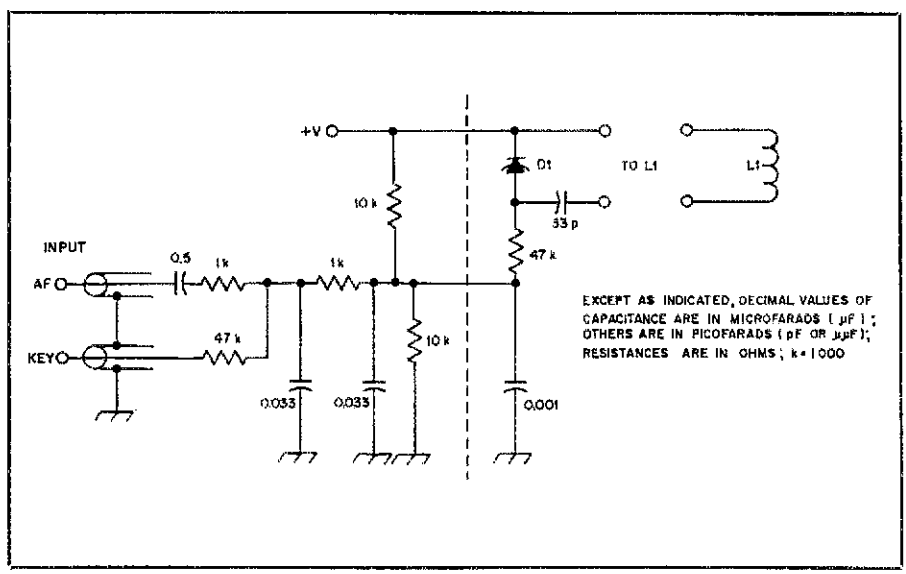


Fig. 6 — Schematic diagram of network for fm/fsk modulation. Resistances are in ohms; k = 1000. Resistors are 1/4-W, carbon-composition types. Capacitances are in microfarads, except those with whole-number values, which are in picofarads. All capacitors are disc ceramic. D1 is discussed in the text.

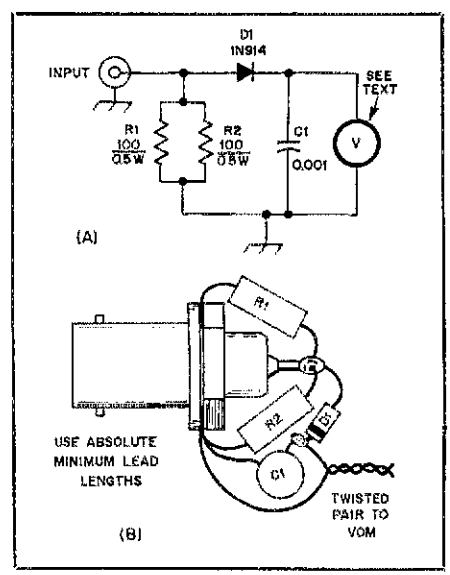


Fig. 7 — At A, schematic diagram of simple power meter used for aligning signal source. See text for discussion. At B, construction details for simple power meter.

The results from this meter using a 1N914 at 500 MHz are compared with the actual power in Fig. 8, and show the high accuracy obtainable.

Apply power to the board, and check the current drawn (approximately 150 mA). For a 96-MHz crystal, preset the trimmers to the following positions: C5 about 50% meshed, C12 about 40% meshed, C18 about 80% meshed and C23 about 50% meshed. Some output should be evident; maximize it by peaking the trimmers.

You should not be able to tune up on the wrong frequency using the component values specified, but if in doubt, check them with an absorption wavemeter or frequency counter. The position of C5 should not be too critical with regard to output power, and may be used to trim the frequency. If crystal frequencies outside the range 90 to 100 MHz are used, it may be necessary to alter the value of C2. You should be able to adjust C5 over about half its travel, with the power output staying constant and the frequency pulling smoothly. If necessary, the frequency can be raised slightly by putting a 5- to 20-pF trimmer in series with the crystal. This may reduce the power output or stability; it is preferable to put up with a small frequency offset (which can be calibrated out) rather than compromise on stability.

When the unit is tuned up it should produce a comfortable 100 mW of rf output. It may be possible to increase this slightly by optimizing certain components (e.g., R10, C8, C22). If more power is needed, it is preferable to add an extra stage, rather than risk detracting from the stability, low-noise sidebands and reliability of the oscillator board.

Decoupling, Shielding and Supply Regulation

The board is designed to fit in an STC (ITT) 6-1/2 × 3-1/2 inch diecast box (part number 46R CS00 043 A00) with the internal ribs filed to size. Mount the board with bolts in the corners, about 1/4 inch off the bottom of the box. This avoids excessive damping of the lines by the box, and ensures that the heat sink on Q4 does not touch the lid of the box. This, or similar shielding, is recommended for best results, because any feedback from subsequent stages to the oscillator can degrade the signal. It is essential to prevent any rf or af noise from reaching the board through the power-supply leads. This can cause either a noisy carrier or sidebands on the output. All connections (e.g., supply, keying, etc.) must be thoroughly decoupled. Use a feedthrough capacitor where the leads pass through the box. Install a small 10- to 100-μH rf choke outside the box, in series with the supply. If possible, check with a wide-bandwidth oscilloscope for oscillating voltage-regulator circuits — possibly at quite a low level. This can occur anywhere from audio to tens of megahertz.

Ground the board to the box at several places. Secure the lid firmly in place, because any intermittent contact here may cause frequency jumps. Ground the outer conductor of the rf output where it passes through the box by mounting a socket on the box. In general, the amount of effort that must be put into these precautions depends on the factor by which the frequency is to be multiplied.

The on-board regulator, U1, is probably only worth using if you intend to use

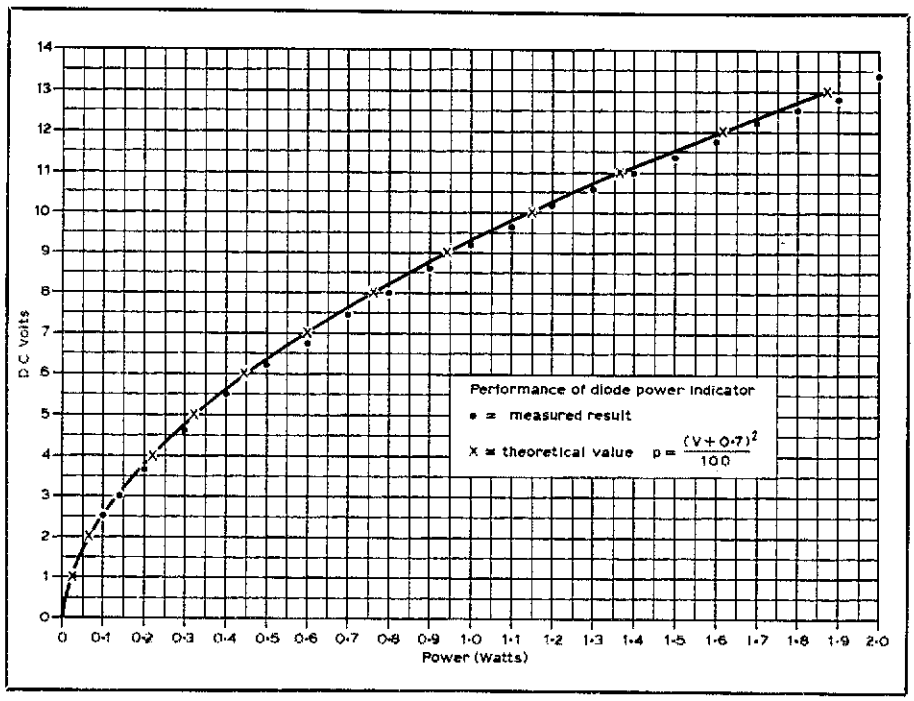


Fig. 8 — Comparison of expected values versus measured results for the power meter.

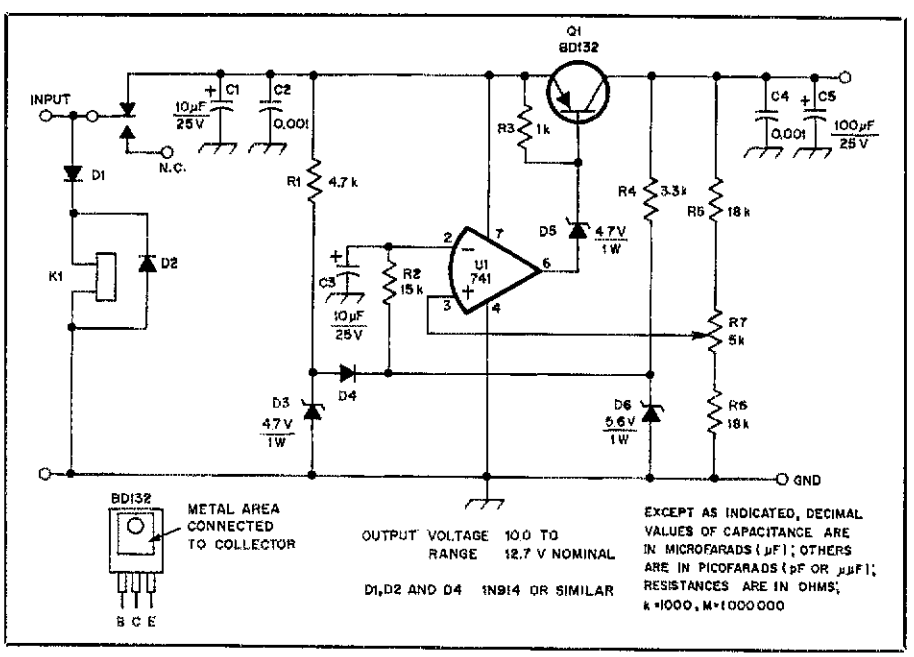


Fig. 9 — Schematic diagram of the low voltage/drop regulator circuit. All fixed-value resistors are 1/4-W, carbon composition types. Variable resistor is 1/4-W, pc-board mounting type. Capacitors are disc ceramic, unless otherwise specified.

C1, C3 — 10-μF, 25-V electrolytic.
C5 — 100-μF, 25-V electrolytic.
D1, D2, D4 — Silicon, small-signal diode, 1N914 or equiv.
D3, D5 — Zener, 4.7 V, 1 W.
D6 — Zener, 5.6 V, 1 W.
K1 — Spdt relay, contacts rated for 1 A at 28 V, Radiospares 348-510 or equiv.
Q1 — Silicon, pnp, power, 90 W, BD132 or equiv.
U1 — Operation amplifier, 500 mW, type 741 or equiv.

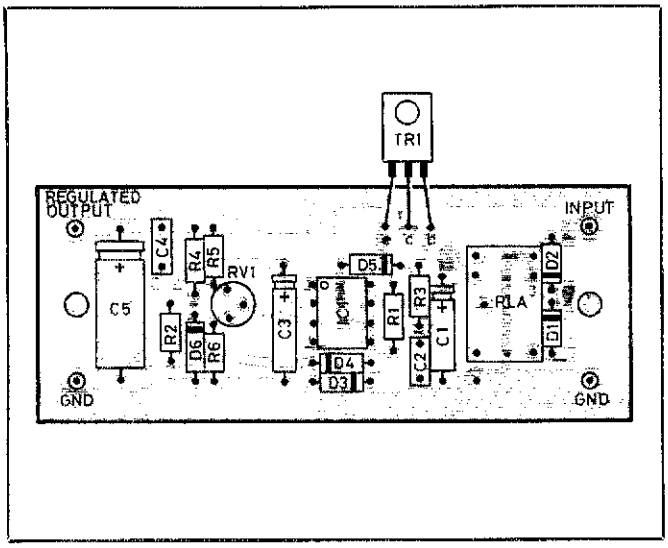


Fig. 10 — Parts-placement guide for voltage-regulator circuit. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. (The etching pattern appears in the Hints and Kinks section of this issue.) [Several parts labeled on the diagram are not in *QST* style — Ed.]

Table 2

Frequency Stability (at 10 GHz)

Variation of frequency with supply voltage

without U1: 5 kHz/V
with U1: 100 Hz/V (once regulating)
with regulator of Fig. 10: hardly detectable

Variation of frequency with temperature

2 kHz/°C (depends on crystal)

Table 3

RF Output frequencies and Crystal Frequencies for Various Applications of the Board

Application	*RF Output Freq. (MHz)*	*Crystal Freq. (MHz)*
Microwave cw/fsk/fm tx	384	96
1.3-GHz converter/transverter (144-MHz i-f)	384	96
2.3-GHZ converter/transverter (144-MHz i-f)	360	90
3.4-GHz converter/transverter (144-MHz i-f)	368	92
5.7-GHz converter/transverter (144-MHz i-f)	374.4	93.6
10-GHz converter/transverter (144-MHz i-f)	378.666	94.666
24-GHZ converter/transverter (144-MHz i-f)	381.714	95.4286

Table 1

Output Power vs. Supply Voltage

Supply Voltage (V)	*Output Power (mW)*
11	225
12	270
13.5	325
15 (without U1)	350
15 (with U1)	330

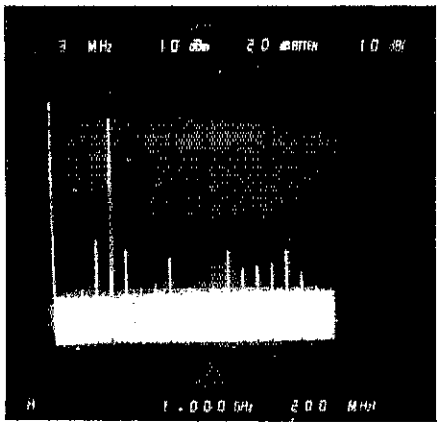


Fig. 11 — Spectral display of rf output from the signal source. Vertical divisions are each 10 dB; horizontal divisions are each 200 MHz.

the A1 keying facility, or if a + 15-V supply is available. Without the regulator, the circuit will operate satisfactorily from a supply as low as 11 V, with little drop in output.

For best frequency stability, the whole circuit must run from a regulated supply. This should be the same voltage whether for portable or fixed operation, so that the frequency calibration is maintained. This is particularly important when using car batteries, as the voltage varies somewhat according to the state of charge, current drain, etc. (perhaps as much as 11.5 V to 16 V), and the same is true of some other battery types. The circuit shown in Fig. 9 makes the oscillator insensitive to supply voltage variations, and provides over-voltage and reverse supply protection. It will regulate down to a minimum voltage drop of approximately 300 mV (governed by the transistor V_{ce} and saturation). Fig. 10 shows the parts layout for the etched board.

The relay used for reverse supply protection is rated for 1 A at 28 V. We highly recommend this circuit for all portable gear needing a regulated supply up to this rating. R1 sets the regulated output voltage; 11.2 V is a reasonable value that will guarantee a regulated output even at the lower supply voltages. Q1 is bolted to a suitable heat sink, with the usual insulating washer.

Performance

Table 1 gives typical performance figures measured on the board shown in the photograph. The output spectrum is shown in Fig. 11. This varies little with supply voltage. Unwanted products are better than 35 dB down from the main carrier. Table 2 shows the frequency stability at 10 GHz under varying conditions.

Applications

Most of the units built so far have been used on 10 GHz to provide a local oscillator for the G3JVL 10-GHz transverter[4] in conjunction with the G8DEK step-recovery multiplier design.[5] Most of our comments refer to measures required to give a good note at 10 GHz. For this application, a 94.666-MHz crystal is used to give an output at 378.666 MHz, for a final local-oscillator frequency of 10.224 GHz. An output power of about 2.5 W is needed, so some form of additional amplification is required. This amplifier should not be mounted in the same box as the board.

Amplifiers that have been used with success include the Mullard BGY22 module (which requires an attenuator[6] at the input to reduce the power from the board to approximately 50 mW) and the Wood & Douglas MD3PA. While the former is very simple and convenient, the latter has better spectral purity. We recommend the Mullard BGY22/BGY23 combination or the Wood & Douglas MD10PA[7] as higher power amplifiers for transmitter-type applications. Crystal frequencies and rf output frequencies for various applications are given in Table 3.

Conclusion

Although the unit is quite simple to construct and align, there is no compromise in performance. The built-in versatility should eliminate all problems of constructing a new local-oscillator strip design for each new microwave project.

Notes

[1]mm = in. × 25.4.
[2]Steatite-Roederstein Ltd., Hagley Rd., Birmingham B16 8QW, England.
[3]Alpha Industries, RMC House, Station Rd., Witney, Oxon OX8 6BP, England.
[4]"G3JVL 10 GHz Transverter," *Rad Com*, Jan. and April 1979, pp. 41, 342; April 1980, pp. 372-5; Feb. 1981, p. 146.
[5]"G8DEK BXY41E 10 GHz step-recovery diode multiplier," *Rad Com*, March 1976, p. 202.
[6]"Design and construction of simple attenuators," *Rad Com*, March 1979, p. 239.
[7]"Equipment review — Wood & Douglas 384 MHz MDO5T microwave drive source and MD10PA power amplifier kits," *Rad Com*, June/July 1980, pp. 650-652.

Tracking the Terrible TVI

"If I knew what the problem was, I'd fix it!" Here is some practical help toward reducing troublesome TVI.

By C. L. "Chuck" Hutchinson,* K8CH

Brass pounder, Charley the Clown,
Kills TVs all over the town,
When he dahs and he dits,
The screens have three fits,
And there isn't a trace of a sound.

TVI! Oh what will I do?
For I really haven't a clue,
Do I start here or there,
Or just stay off the air,
Until it's a quarter of two?

A neighbor just called and he's mad,
The TVI is getting quite bad,
The pass high and low,
I have given a go,
So now I am feeling quite sad.

TVI! he cried in despair.
I think I'll pull out my hair!
*But he bought him a book,***
And he gave it a look,
And now he's back on the air.

**the ARRL *Radio Frequency Interference* book

Trouble with TVI? If your Amateur Radio transmissions are interfering with TV reception in the neighborhood, you are not alone. On a recent Friday, 25 ARRL members called the Technical Information Service (TIS) desk. Every one of them had a TVI problem; there were no other calls that day.

Why do you have TVI? Where do you start to track down the source? What do you do to cure it? This article will help you answer these questions.

The usual reason for TVI is a lack of compatibility between your transmitter and the affected TV receiver. Harmonics or parasitics from the transmitter can result in unwanted rf energy in the TV band. Conversely, a TV set or amplifier may not be capable of rejecting strong out-of-band signals; the resulting overload condition causes interference to be generated in the set itself. There are various ways for rf energy to get into a TV set; not all of them may be obvious. To further complicate matters, interference may be generated in any nonlinear junction and then picked up by the TV receiver.

Rf energy can be propagated by radiation (as from an antenna), induction (as in a transformer) or conduction (as along a wire). Does all this begin to sound pretty complicated? Don't despair! By a process of elimination you should be able to locate the source and minimize the TVI that plagues you.

Where to Start

Your TVI tracking efforts should begin at home. It is easier to coordinate tests when the transmitter and receiver are in the same house — it's not necessarily easier to solve the problem, just easier to coordinate your efforts. What you have learned at home will better prepare you to deal with TVI at your neighbor's house. If you have no TVI on your own set, congratulations are in order. Without taking preventive measures, most of us are not that fortunate.

The following suggestions are for you to use on your own TV set. Be careful of what you do to your neighbor's set. It is not your responsibility to make modifications or additions to his equipment. If you and your neighbor agree to make circuit changes then you are free to do so. Be prudent and exercise your best judgment before you get involved.

FCC experience indicates that in most TVI cases, significant improvement would result if TV receivers were properly designed for RFI rejection. That was recognized with the recent enactment of P.L. 97-259.[1] This new law should help the situation after the implementation of appropriate rule changes.

Some manufacturers have taken a responsible approach to the problem and are willing to help. A list of these manufacturers, with addresses, can be found in May 1981 *QST*, or in Chapter 8 of the second edition of *Radio Frequency Interference*.

It is important that you contact the manufacturer. Any TVI or RFI problem involving consumer entertainment equipment should be put "on the record" by writing a letter. If you call on the telephone, be sure to follow up with a letter to the manufacturer. Send copies to the FCC, the EIA and the ARRL RFI Task Group.[2] The company should have

*ARRL Assistant Technical Editor

[1]Notes appear on page 35.

the opportunity to correct any deficiency and to hear your complaint. Copies to the other agencies are vital to ensure that the magnitude of the problem is understood by all. Your silence is an indication that no problem exists!

Fig. 1 is a trouble-shooting flow chart designed to help you track down TVI in a logical, step-by-step process. To begin, transmit into a dummy load and check your TV set for interference. If you see any, check transmitter tuning, neutralization and operating voltages — especially bias. If these are okay, the fault may be caused by rf traveling into the TV set on the ac line, improper shielding and bonding of the transmitter cabinet or improper grounding.

To eliminate rf energy on the ac line, you can use a brute-force ac line filter as shown in Fig. 2 (mount the filter at or in the equipment). Alternatively, you can wind most or all of the line cord around a 7-inch ferrite rod.[3] Rod permeability (U_i) should be at least 800. Sometimes a 0.01-μF 1400-V disc ceramic capacitor mounted in a power plug can help squelch rf on the ac line, when it is plugged into an outlet. You might make up two or three of these bypass plugs to experiment with. Placement is usually critical.

Don Noble, NR4V, reports an interesting CATVI problem. A neighbor experienced TVI when Don ran a kilowatt on 40-m cw. Unplugging the HBO converter box cleared up the problem. A brute force line filter did no good. Don solved the problem by wrapping the full length of the power cord on a ferrite rod. A short extension cord was added to reach the outlet. Problem cured and case closed!

Even the best transmitters generate internal harmonic and other unwanted signals. As long as these signals are confined inside the cabinet, they pose no problem. Improper shielding and bonding of the transmitter cabinet can cause TVI by chassis radiation through openings in the cabinet. In addition, it can allow unfiltered rf currents to flow on the outside of the coaxial cable braid.

Because of skin effect, a good quality coaxial cable has three rf conductors: the inner conductor, the inside of the outer conductor and the outside of the outer conductor. Currents flowing on the outside of the braid will flow unimpeded around low-pass filters and traps. Fig. 3 illustrates how to stop these unwanted currents by using a shield choke.

Obtaining an effective ground frequently requires a bit of experimentation. The normal rules of thumb apply; drive a copper-coated ground rod and keep the lead to it as short and wide as possible. If that works — fine! Don't despair if it does

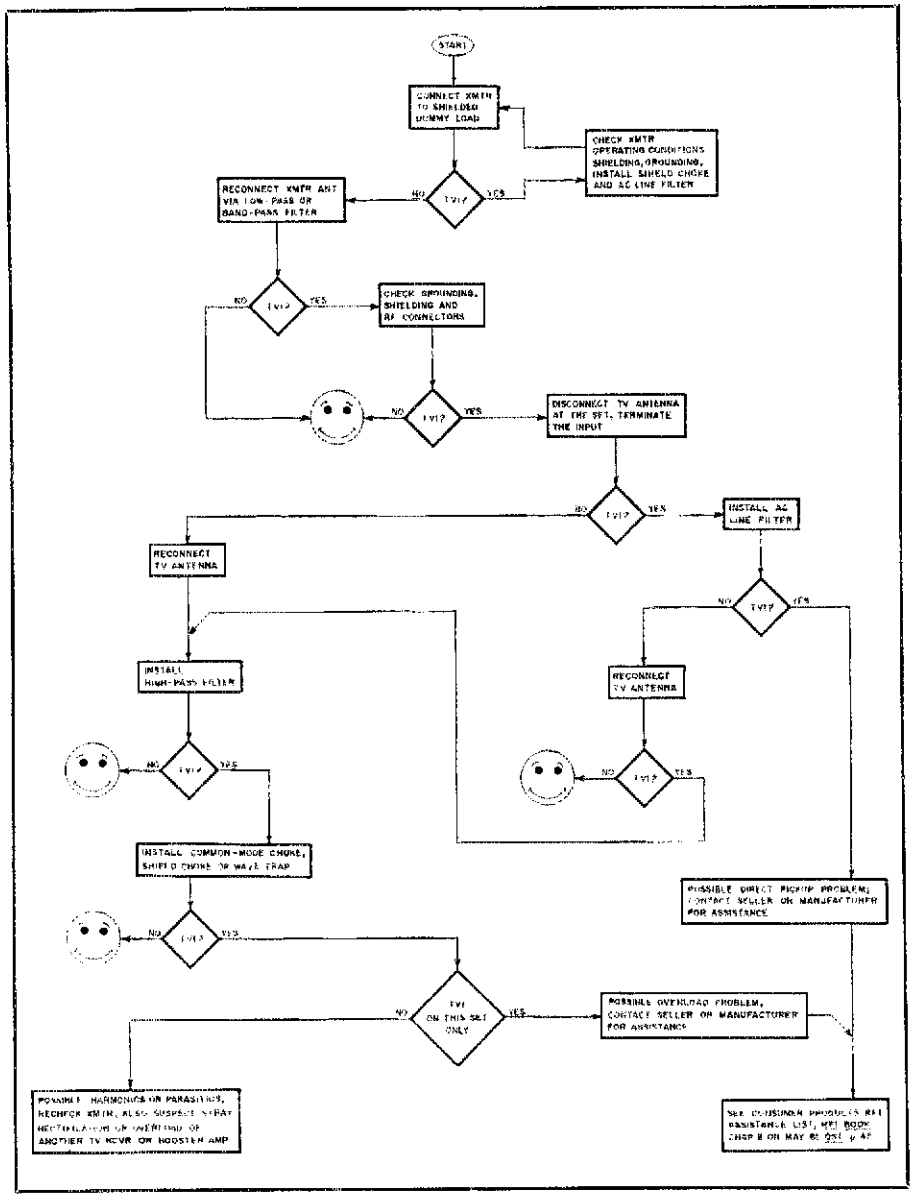


Fig. 1 — TVI trouble-shooting flow chart.

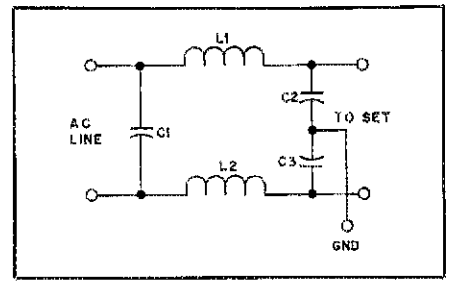


Fig. 2 — "Brute-force" ac line filter. The values of C1, C2 and C3 are not critical; capacitances from 0.001 to 0.01 μF at 1400 V can be used. L1 and L2 can be a 2-inch winding of no. 12 enameled wire (no. 18 for receivers) on a 1/2-inch diameter form. Make sure that there are no exposed conductors to offer a shock hazard.

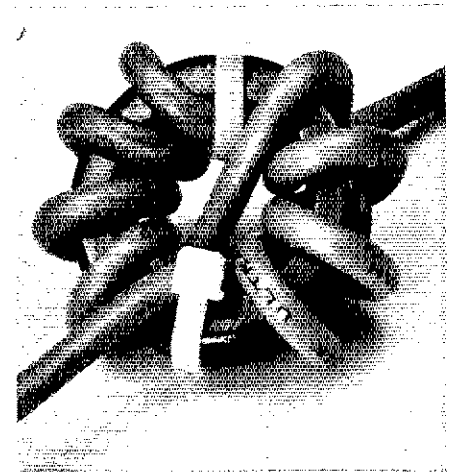


Fig. 3 — A shield choke can be formed by winding the cable on a ferrite toroid. Reversing the winding as pictured allows more turns with less shunt capacitance. The most important property of the cable is complete shielding — avoid "bargain" cable having less than 95% braid coverage.

not. You may have to put in more than one ground rod, each with its own strap connecting to the equipment. Fastening 1/4-wavelength radials to your equipment can provide a pseudo ground. Use at least two for each band you use. Bonding to water pipes and heating ducts may or may not help lower the Q and increase the effectiveness of your ground system. (Doug DeMaw, W1FB, once used a Transmatch to "tune" the ground wire that ran from his second-story ham shack.)

When the transmitter causes no TVI while it is operating into a dummy load, you are ready to proceed to the next step. Buy or borrow a low-pass or band-pass filter, and install it in the antenna feed line. If TVI persists, check grounding, shielding and the tightness of the rf connectors again. Uhf and even BNC type connectors can "leak" a lot of rf energy; type N connectors are best. If you still have TVI, it's time to go to work on the TV receiver.

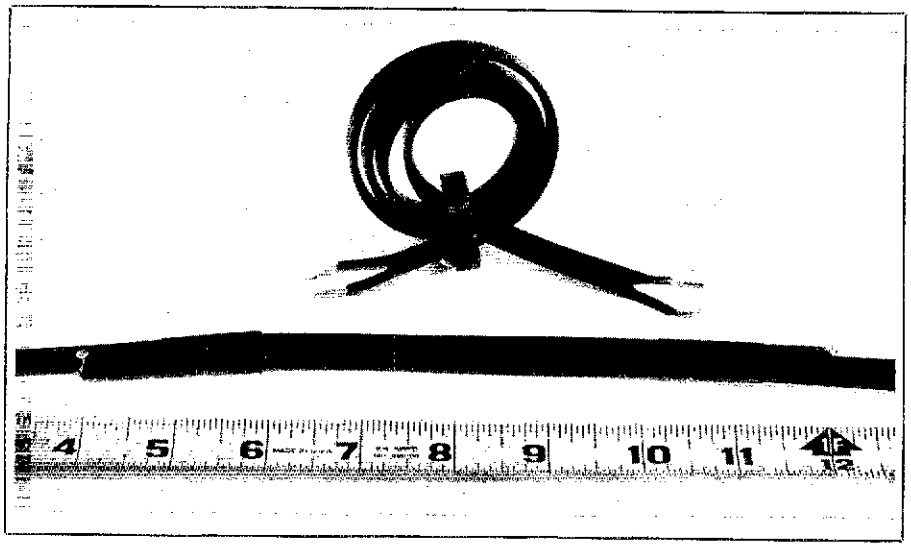


Fig. 4 — Common-mode chokes. At the top, several turns of twin-lead are taken through an FT-114-43 ferrite toroid; best results will be obtained if the twin-lead has an oval cross section. At the bottom, the twin-lead has been cut near the TV set. The conductors have been shorted at the resulting ends and the ends have been overlapped approximately 9 inches. Shrinkable tubing or tape is used to hold the two pieces together.

The TV Receiver

Unwanted rf can get into the TV set by way of the antenna terminals, the ac line cord and by direct pickup. Eliminate the antenna terminal route as the source by disconnecting the antenna and replacing it with a resistor (300 ohms for balanced, 75 ohms for coaxial, inputs; keep the leads as short as possible). If the interference persists, suspect the ac line as the source of entry.

The same ac line filtering techniques described earlier are used for the TV set. When you see no interference, reconnect the TV antenna to the set via a high-pass filter.

High-pass filters can be purchased from a variety of sources. Not all manufactured filters give satisfactory performance. Effective, low-cost filters were described in "Practical 75- and 300-Ohm High-Pass Filters," by Ed Wetherhold in February 1982 *QST*. Of particular interest is the 300-ohm elliptical filter design.

There are two situations in which a high-pass filter is ineffective. The first is when interference-causing rf is flowing on the outside of a coaxial feed-line braid. That can be cured with a shield choke. The second situation occurs when using balanced feed line. Antenna currents are push-pull or differential-mode signals; this type of signal exists as a voltage difference between the feed-line conductors. Frequently a TV feed line will act as an antenna at hf. When this happens, there is no voltage difference between the feed-line conductors; the signal exists between the conductors and ground. This is called a common-mode signal; regular high-pass filters will not stop it. A wave trap will, or you can use a common-mode choke, as shown in Fig. 4.

If you have gone through all of the preceding steps and are still plagued with TVI, try replacing the TV set with another. If the replacement is clean, then the first set is evidently at fault; if not, some other possibilities should be checked out. The first is to inspect the TV antenna and feed line. Look for loose or broken wires and corroded contacts. These can act as rectifiers, generating harmonics. (Don't forget to check your transmitting antenna, too.) Poor contact between metallic objects can be the source of stray rectification. Guy wires, pipes, rain gutters and down spouts are potential culprits. One ham found the source of cable TVI to be his old TV antenna and feed line — when they were removed, the problem went away!

Mast-mounted preamplifiers have been a source of trouble. Channel Master has a new series with improved out-of-band rejection. If a preamplifier is needed, one of these or a similar unit is recommended. Removing power from an amplifier will not eliminate it as a source of stray rectification — it may make the problem worse. An unused preamplifier and antenna combination in a neighbor's attic sent Rick Smith, WB4MRW, on a month-long TVI search. This search began after the FCC imposed quiet hours despite the clean bill of health they gave Rick's transmitter.

Conclusion

TVI can be difficult to tame even though FCC studies indicate that most cases can be cured by installing a low-pass filter on the transmitter and a high-pass filter on the TV set. A logical step-by-step approach should lead you to the interference source; the troubleshooting flow chart in Fig. 1 should help. Further information can be found in *Radio Frequency Interference* and in the interference chapter of *The Radio Amateur's Handbook*.

Most of the time you'll be able to resolve TVI problems by applying the simple remedies described here or in the ARRL publications mentioned above. If you are a League member who has tried these remedies but cannot solve the TVI problem, you can write Hq. for assistance from the TIS staff. When you write, be sure to include your name, call sign, membership expiration date and a stamped, self-addressed, business-size envelope. Describe the nature of the TVI complaint as completely as you can. Detail what steps you have taken and the results obtained.[4]

Local radio amateurs and club groups can be of help, and they are close at hand. Don't give up in despair! Seek out information and assistance, if you need help. Play the role of the great detective. Find and use your clues. Above all, be persistent! Don't stop at a dead-end — go back and recheck what you have done. It may not be easy, but you can minimize or eliminate that TVI. QST

Notes

[1]W. Clift, "RFI Bill Becomes Law," *QST*, November 1982.

[2]A sample letter can be found in the ARRL book *Radio Frequency Interference*. Copies of the letter should go to:
Federal Communications Commission
1919 M St., N.W.
Washington, D.C. 20554

Electronic Industries Association
2001 Eye St., N.W.
Washington, DC 20006

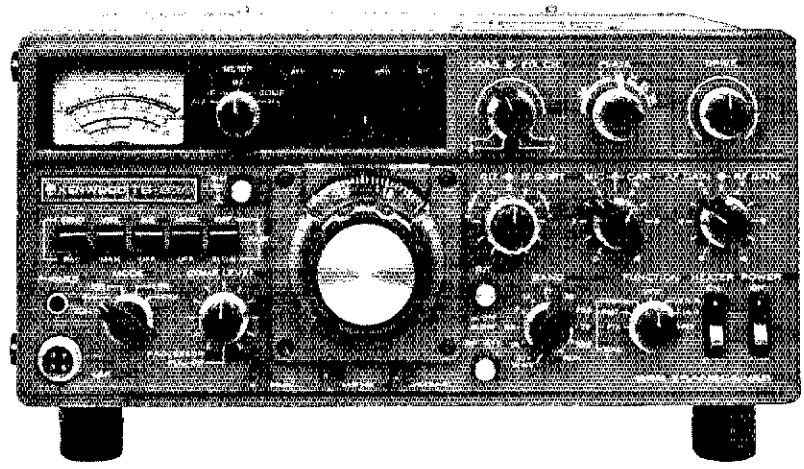
American Radio Relay League
225 Main St.
Newington, CT 06111
(ATTN: RFI Task Group)

[3]mm = in. × 25.4

[4]See December 1982 *QST*, page 23, for a complete list of TIS guidelines.

WARC Bands for the TS-820(S)

Now you proud TS-820(S) owners have one more reason to hang on to your favorite rig. These modifications will update your transceiver for operation on the WARC bands.



By Robert C. Cheek,* W3VT/ex-JF1YBU

If you purchased a Trio-Kenwood TS-820 or TS-820S shortly before WARC 79, you knew something would be missing when use of the new bands was authorized.[1] All the major manufacturers' current hf transceiver models now include the new bands

Trade or Modify?

I am reluctant (and you probably are, too) to trade in a practically new transceiver just to get the WARC-band capability. I began studying the TS-820(S) circuits to see what it would take to allow it to operate on at least one of the new bands, preferably 10.1 MHz. To make a long story short, my TS-820S is now ready to operate on all three! It retains the original band capabilities except for the 200-kHz slice from 29.5 to 29.7 MHz — a frequency range in which I don't usually operate, and don't expect to.

The modifications are simple and straightforward. They require no panel or chassis drilling and the external appearance of the unit is unchanged. You can make these modifications for any number of the new bands, for receiving only or for full transceiving capability. If you add all three bands the 24-MHz addition will require some minor surgery on the coil pack pc board. However, all the modifications are reversible, so the unit can be restored to original condition at any time.

I used the WWV position (15 MHz) of the BAND switch for the 10-MHz band. This permits reception of WWV at 10 MHz and full transceive operation in the 10.1- to 10.15-MHz segment. For 18 MHz (18.068 to 18.168 MHz), I used the AUX position and for 24 MHz (24.890 to 24.990 MHz), the 29.5-MHz switch position.

Fig. 1 shows circuit changes made in the final amplifier compartment. Fig. 2 details the coil pack board changes. PLL system changes are not shown in schematic form because they involve only direct component substitution or addition on the PD and VCO PLL system boards.

Parts and Tools Required

Table 1 lists the parts required. PLL system PD unit crystals in HC-18/U holders will have to be ordered from a crystal supplier since Kenwood does not supply crystals except for direct replacement purposes.[2]

The coils used must be similar physically to the originals. They are common pc-board mounting types. All the coils used have five mounting pins. The 10- and 18-MHz drive coils (unshielded) are wound on 5/16-inch diameter phenolic forms with tuning slugs.[3,4] The four corner pins are on a 9/32-inch square. The VCO coil for 18-MHz is in a 9/32-inch square shield can, and the terminal pins are on a 3/16-inch square. Antenna and mixer coils for 18-MHz are in 3/8-inch square shield cans with corner pins on a 9/32-inch square. Many of the coils found in the coil-assortment packs available from Radio Shack stores are wound on identical forms, with and without shield cans.

If you use forms from such an assortment, be sure they are coils that contain cores useful at hf. A GDO is essential for "home brewing" coils anyway, and the coil Q can be judged roughly when you are checking the coil tuning range. A pronounced dip should be obtained when the parallel combination of a coil and resonating capacitor is probed. Don't use 455-kHz i-f transformers, those with internal capacitors and windings of many fine-wire turns. On the other hand, 10.7-MHz i-f coils in 3/8-inch square shield cans, often found in such assortments, are ideal. Remove any link winding and check the tuning range (using a GDO) with a 100-pF capacitor across the main winding. If 18 MHz is well within the range, the coil should tune satisfactorily in the antenna and mixer circuits at 18 MHz. If not, remove some coil turns and try again. Likewise, the driver coils for 10 MHz and 18 MHz should be tunable to those frequencies with a 100-pF capacitor in parallel. The 18-MHz VCO coil should tune to 27 MHz with a 10-pF capacitor across it.

For all coils except the VCO coil, the active terminals are the outside two of the three in-line terminals. For the VCO coil, the active terminals are the left and center pins as the coil is viewed from the bottom with the three in-line pins in the bottom row.

Although I wound my own coils on some forms salvaged from surplus pc boards, a more direct approach would be to order coils handled as replacement parts for the TS-820(S). Table 1 lists the part numbers of those coils that will tune satisfactorily in the circuits shown in Figs. 1 and 2. The 8.830-MHz trap coil has no TS-820(S) replacement part equivalent and must be homemade.

The relay used for final amplifier coil and capacitor switching on 10 MHz is a 12-V, 4pdt unit (one pole is unused) that is identical to that used in the TS-820(S) for antenna switching. If you can't find one

[1]Notes appear on page 42.

*29 Center Drive, Briarcliffe Acres, Myrtle Beach, SC 29577

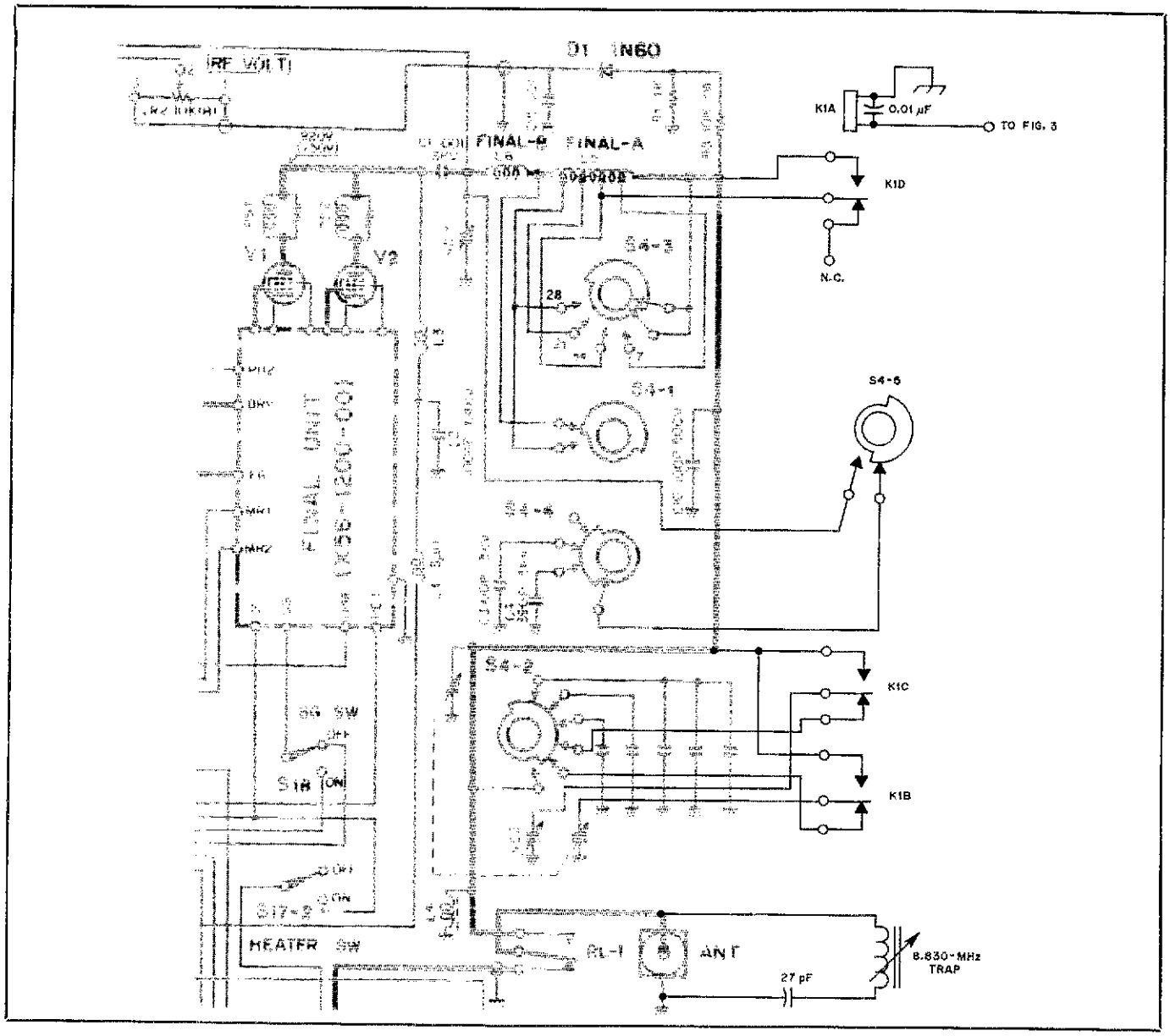


Fig. 1 — Schematic diagram of the TS-820(S) final amplifier after modification. The changes include the addition of a relay (K1) and the use of an existing but previously unused BAND switch wafer. The shaded portion of the diagram is reproduced from the service manual.

locally, the TS-820(S) replacement part given in Table 1 may be used.

A GDO, VTVM and a general-coverage receiver that will tune to 8.830 MHz (and is equipped with an S meter or BFO) are the only test instruments required. If you have a TS-820 without the digital frequency display, a frequency counter will be useful (but not absolutely necessary) for tuning the VCO coils. The TS-820S digital display can be used for this purpose, negating the requirement for a separate frequency counter.

10-MHz Modifications

To permit tuning the final-amplifier circuit to resonance at 10 MHz with the BAND switch in the WWV position, several stumbling blocks must be overcome. Refer to Fig. 1. First, the entire plate coil (used on 1.8 MHz) is in the plate circuit in this position. Second, two plate tuning padding capacitors are inserted in parallel with the variable capacitor (as on 1.8 MHz). One of these is switched out at 3.5 MHz, and the other at 7 MHz and above, by S4-4. Third, a succession of loading-capacitor combinations, both fixed and variable, are switched in and out by means of S4-2 in the 1.8- to 14-MHz positions, with only one section of the variable loading capacitor remaining in the circuit at 21 MHz and above. This one section is also the only loading capacitance in the circuit in the WWV position, and more than this amount is needed at 10 MHz.

There is one unused switch wafer in the final-amplifier compartment. It is not shown in the TS-820(S) export model operating manual schematic diagram.[5] In the domestic (Japanese) model, it is designated as S4-5 and is wired to reduce the final amplifier screen voltage during 28-MHz operation. This keeps the output power at approximately 50 watts as required by Japanese regulations. The switch wafer has only two terminals. Both are open in the WWV position, closed from 1.8 to 21 MHz, and open in the 28- to 29.5-MHz and AUX positions. This switch wafer can be used to remove the tuning capacitor padders from the plate circuit in the WWV position by placing it in series with the wiper of S4-4. Since S4-5 is closed at 1.8 and 3.5 MHz, the tuning capacitor padders are inserted and switched normally for those bands.

The plate tank coil and loading-capacitor switching is done by means of a relay. One relay pole short circuits the coil turns from the 7-MHz tap to the end, as is done by S4-3 for 7-MHz operation. Two remaining relay poles switch two variable loading capacitor sections (normally removed from the circuit by S4-2 in the WWV position) into the output circuit to

provide adequate loading capacitance for 10-MHz operation.

The relay is controlled by a simple AND circuit that operates only when the BAND switch is in the WWV position and when a transmit condition is called for. Thus, the relay is activated only during 10-MHz transmission periods, and the final-amplifier plate-circuit configuration is otherwise unchanged.

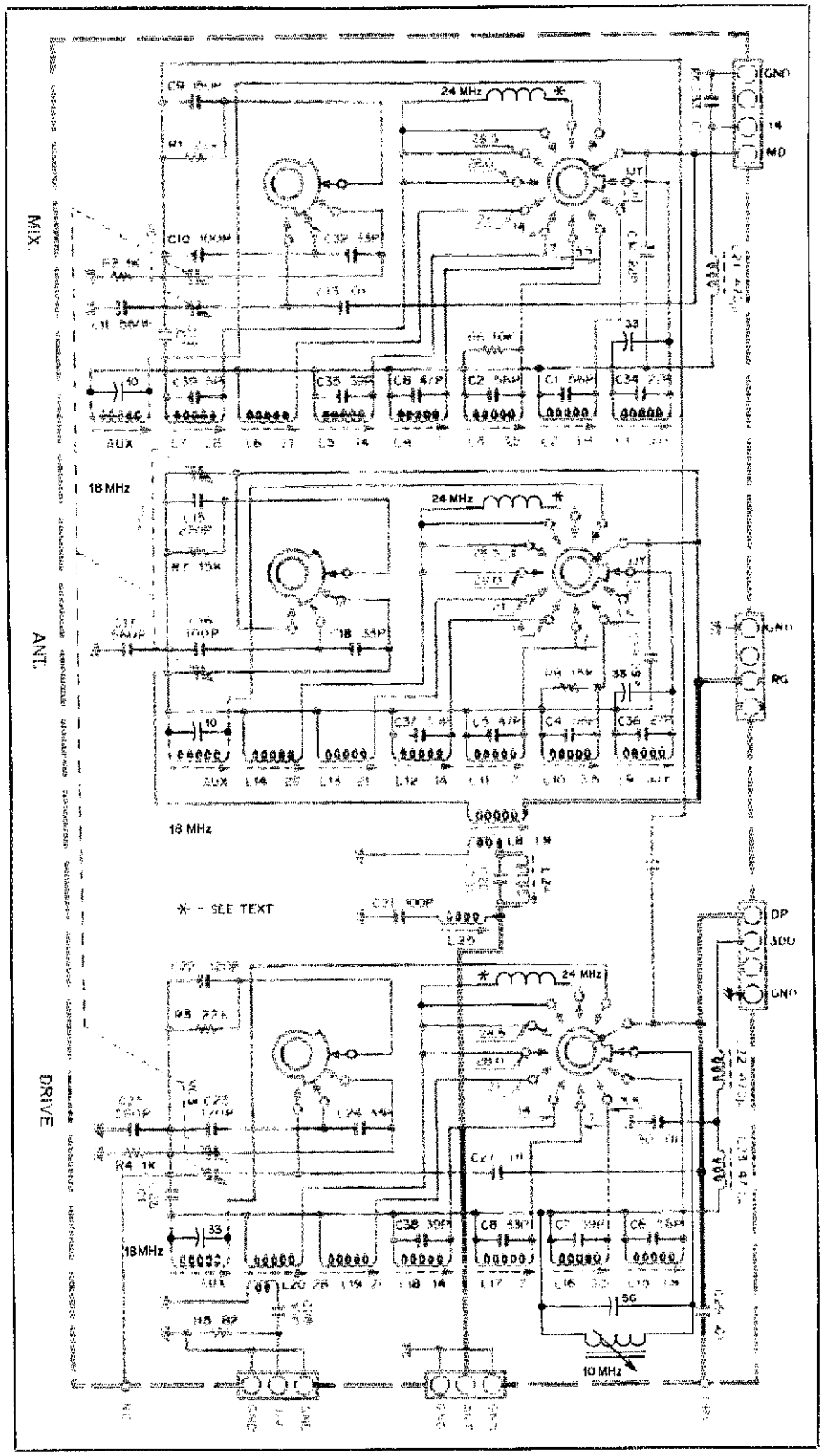


Fig. 2 — Schematic diagram of the coil pack board changes and additions. The additions include new 10- and 18-MHz driver coils, 18-MHz antenna and mixer coils, and small air-wound inductors added to the 28-MHz coils to tune them to the 24-MHz band when the 29.5-MHz BAND switch position is selected. Added capacitance values are shown in picofarads (pF). The shaded portion of the diagram is reproduced from the service manual.

One other item needs consideration. Because 10 MHz is close to the TS-820(S) 8.830-MHz i-f, there is a potential for i-f leakage through the mixer and driver stages to the final amplifier. Listening tests with a general-coverage receiver confirmed that the 8.830-MHz signal was considerably stronger during 10-MHz operation than on the other bands. Use of an antenna-matching network with any 10-MHz antenna will alleviate the problem to some extent. I also added a series-tuned 8.830-MHz trap directly at the antenna output connector in the amplifier compartment. This reduced the 8.830-MHz signal output to a level lower than that which was previously present when the amplifier was operated at 7 MHz.

One anticipated problem turned out to be no problem at all. In the TS-820S counter mixer unit is a 10-MHz oscillator from which counter timing frequencies are derived. I expected the oscillator signal to be rather strong during 10-MHz WWV reception. The oscillator signal is audible when the antenna is disconnected, but it is so weak it does not move the S meter. With the antenna connected, it totally disappears under the WWV signal.

Final Amplifier Modifications

Before starting the modifications, remove the amplifier tubes and the fan assembly. The relay location is shown in the final-amplifier compartment photograph, Fig. 3. The relay is mounted by means of its plastic cover. Remove the cover and drill a hole through the top of the cover large enough to pass a no. 4 self-tapping screw. Make sure the hole is located so that the screw head will clear the operating parts of the relay. Mount the cover on the side of the amplifier compartment in the position shown. Slip the relay into the cover with the coil terminals pointed toward the fan

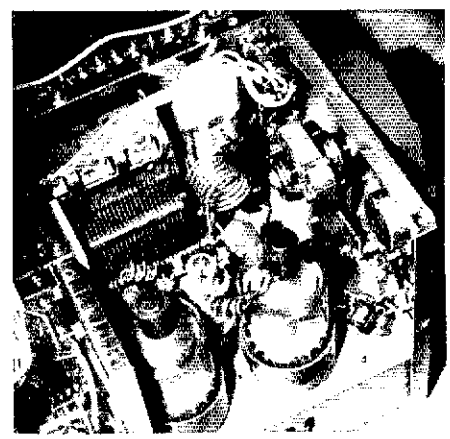


Fig. 3 — TS-820(S) final amplifier compartment after the inclusion of the 10-MHz modifications. The added relay may be seen mounted on the compartment wall behind the final-amplifier tank coil. Immediately behind the rear-most PA tube, attached to the antenna connector, is the 8.830-MHz trap.

Table 1
Parts Requirements

10 MHz

For Receiving Only	*For Transmitting*
PD board: 1 - 15.5-MHz crystal (X1).	Final amplifier compartment: 1 - 4pdt, 12-V dc coil relay, Kenwood part no. S51-4031-05 or equivalent (Radio Shack 275-214 suitable). 1 - 8.830-MHz trap coil, a 5/16-inch winding of no. 32 enam. wire close-wound on a 5/16-inch dia. slug-tuned form. 1 - 27-pF, 500-V disc ceramic capacitor 1 - 0.01-μF, 50-V disc ceramic capacitor.
VCO board: 1 - 15-pF, 50-V disc ceramic capacitor.	Coil pack board: 1 - driver coil, 1/4-inch long winding of no. 28 enam. wire, close-wound on a 5/16-inch dia. slug-tuned form, or Kenwood part no. L34-0554-05. 1 - 56-pF, 500-V disc ceramic capacitor.
Coil pack board: 2 - 33-pF, 50-V disc ceramic capacitors.	Relay control unit: 2 - 2N4400 npn transistors. 1 - 2N2907 pnp transistor. 4 - 4.7 kΩ, 1/8-W resistors. 1 - 560Ω, 1/8-W resistor. 1 - 10Ω, 1/8-W resistor. 1 - 100-PIV, 0.5-A power rectifier.

18 MHz

For Receiving Only	*For Transmitting*
PD board: 1 - 23.5-MHz crystal (X01)	Coil pack board: 1 - driver coil, 8 t no. 28 enam. wire, close-wound on a 5/16-inch dia. slug-tuned form, or Kenwood part no. L34-0555-05.
1 - 3.3-kΩ, 1/8-W resistor (R01). 1 - 5.6-kΩ, 1/8-W resistor (R02). 1 - 150-pF, 50-V disc ceramic capacitor (C01).	1 - 33-pF, 500-V disc ceramic capacitor.

VCO board:
1 - VCO coil, Kenwood part no. L32-0197-05 or equivalent. (T11).
1 - 5-pF, 50-V disc ceramic capacitor (C01).
1 - 18-pF, 50-V disc ceramic capacitor (C02).
1 - 27-pF, 50-V disc ceramic capacitor (C03).
1 - 15-pF, 50-V disc ceramic capacitor (C04).
1 - 33-pF, 50-V disc ceramic capacitor (C05).

Coil pack board:
2 - Antenna/mixer coils, Kenwood part no. L34-0546-15 or equivalent.
2 - 10-pF, 50-V disc ceramic capacitors.

24 MHz

For Receiving Only	*For Transmitting*
PD board: 1 - 30.0-MHz crystal (X10).	
Coil pack board: 2 - Air-wound, self-supporting coils, 8 t no. 24 enam. wire, 3/16-inch ID.	Coil pack board: 1 - Air-wound, self-supporting coil, 8 t no. 24 enam. wire 3/16-inch ID.

Note: All crystals are available from International Crystal Manufacturing Co., Inc., 10 North Lee St., Oklahoma City, OK 73102. Crystals are third-overtone, GP-1 types in HC-18/U (FM-1) holders. When ordering, simply use catalog number 471165 and specify the frequency desired.

Remove the wire between the tuning capacitor stator and the wiper (common) terminal of BAND switch wafer S4-4 immediately beneath the capacitor. From the underside of the chassis, remove the two screws securing the MARKER unit, and move the MARKER unit aside. This will expose a rectangular cover plate that should be removed to uncover an access hole to the unused switch terminals of wafer S4-5. This wafer is nearest the compartment front. Using no. 18 or 20 hook-up wire, connect an insulated lead from S4-4 (from which the capacitor lead was removed) to either terminal of S4-5. Connect a wire from the other S4-5 terminal to the capacitor stator terminal (from which the lead to S4-4 was removed). Replace the access cover plate and the MARKER unit.

Access to the variable loading capacitor stator terminals is difficult unless the neutralizing capacitor is moved out of the way. Unsolder the lead from the neutralizing capacitor at the driver variable capacitor frame on the coil pack board. Remove the driver tube to get at the two neutralizing-capacitor mounting screws. It may be necessary to remove the screw securing the top bracket of the rf unit and to push the rf unit aside slightly to reach the neutralizing-capacitor mounting screws.

Taking care not to disturb the capacitor setting, bend the remaining lead to move the capacitor sufficiently out of the way to gain access to the stator terminals at the two front sections of the loading capacitor. Disconnect the leads at these two terminals. *Do not* disconnect the lead from the rear section, the one nearest the plate-circuit coils. Splice a few inches of insulated wire to the end of each disconnected lead, slide some insulation tubing over the joints and reroute the leads along the compartment wall and around the plate tank coil to the relay. Be careful not to flex the wafer switch terminals unduly, as they may break off. Solder each lead to a NC relay contact as shown in Fig. 1. Remount the neutralizing capacitor and reconnect the lead to the capacitor frame on the coil pack board. Replace the driver tube and the rf unit bracing screw.

Install insulated leads from the stator terminals at the top of the variable loading capacitor sections, including the rear section, to the appropriate relay contact terminals. Keep these leads close to the capacitor frame to ensure adequate clearance for the compartment cover when it is replaced.

Connect a lead between the bottom end of the plate tank coil to a NO relay contact terminal, and another lead from the operating-arm terminal of that contact set to the 7-MHz coil tap (second from the coil bottom). The NC contact is not used.

Relay operating voltage is supplied from the relay control unit (to be described) through a piece of small-diameter shielded wire or coaxial cable (RG-174/U). The cable should be long enough to reach from the relay to the AND board mounting position when routed through the hole where the other wiring enters the compartment. Bare a short length of the shield in the vicinity of the entrance hole. Attach a ground lead from the shield to the nearby chassis ground pin and connect a 0.01-μF capacitor across the relay coil terminals.

Before it is installed, the 8.830-MHz i-f trap should be adjusted. Connect the coil in parallel with a 27-pF capacitor and adjust the coil for a GDO dip at 8.830 MHz. Listen to the GDO signal on a well-calibrated general-coverage receiver while making the adjustment to be sure the frequency is set accurately. The trap coil is mounted by soldering one active terminal pin and one unused pin directly to the antenna lead at the antenna output connector just inside the amplifier compartment. The coil should be oriented at an angle to permit the slug to be reached by a plastic alignment tool passed through the wide vertical slot in the final amplifier compartment cover. Connect the 27-pF trap capacitor between the other active pin and the nearest available ground point. Replace the tubes, fan and compartment cover.

Relay Control Circuit

The AND circuit used to operate the relay is built on a piece of perf-board (approximately 1-1/2 inches wide and 3/4 inch long) using point-to-point wiring. See Fig. 4. The board is attached to small right-angle brackets secured to the chassis by the same screws that hold the COUNTER assembly unit forward corners. The 9-V input signal is taken from the BAND switch WWV position terminal. Fortunately, this terminal is at the chassis bottom directly behind the front panel and is reached easily. It can be identified by operating the BAND switch and noting which contact is engaged when the switch is moved to the WWV position. Identification can be confirmed with a VTVM by noting that this terminal has 9 V applied to it when, and only when, the switch is in the WWV position.

The RL input can be obtained from the RL line at the external VFO socket, terminal 5. Voltage exists on this line only during transmit. The relay operating voltage is obtained from the 14A line at the input to the filter choke. This choke is accessible when the 5V-AVR unit is moved aside temporarily after removing two mounting screws. The choke input terminal is the one with a wire connected to the 5V-AVR unit.

A relay control unit ground connection is made to a chassis ground tab near the end of the COUNTER assembly. All relay control unit leads should be threaded under some cable harness ties so that they become part of the harness.

PLL System Modifications

The PD and VCO boards make up the PLL assembly, which is attached to the chassis by means of four screws. Two screws are at the outer side of the chassis and two beneath a cable harness at the underside. Remove these four screws, unplug the connectors and remove the unit. Take off the bottom cover plate and remove the four unit VCO mounting studs and two screws. The VCO board can now be unplugged from the through-connector pins which connect it to the PD unit. Remove the PD unit cover and the five screws mounting the board to the shield enclosure and remove the board.

Locate the 20.5-MHz crystal, X1. Using a low-wattage soldering iron, remove the crystal and replace it with a 15.5-MHz crystal. (If you are making the other WARC band modifications simultaneously, refer to the following sections for other changes and additions to the PD unit.)

Identify T1, the 15-MHz oscillator coil, on the VCO board. Next to T1 is a pair of convenient mounting holes for placing a fixed-value capacitor across the coil, although no capacitor is used in the original configuration. Mount a 15-pF capacitor in these holes.

If you are performing the 10-MHz modifications only, replace the PD and VCO boards in their enclosure. Otherwise, refer to the additional VCO board changes. This completes the PLL system modifications for 10-MHz, but the unit should not be replaced until the coil pack board modifications are completed.

Coil Pack Board Modifications

Locate the WWV antenna and mixer stage coils (L9 and L1), and solder a 33-pF capacitor across the active terminals of each. All the capacitors mounted on the board bottom should be located flat against the board to leave clearance for the PLL and CARRIER units.

If you are modifying for transmit, remove the two screws securing the CARRIER unit assembly to the chassis, unplug the connector and set the unit aside. This will expose the entire foil side of the coil pack board. The board need not be removed from the chassis. Refer to Figs. 2, 5 and 6. To mount the new driver-stage coil, drill three small holes (about no. 60 size) 9/64 inch apart, between the AUX coil mounting space and the driver section ground foil border. Clip off entirely the two inactive pins opposite the two active corner pins of the coil and insert the three remaining pins in the new mounting holes, with the coil body outboard of the holes to leave the AUX coil space clear. Clip short the 56-pF capacitor leads, loop them around the two outer pins, snug against the board, and solder the connections. Using a piece of hook-up wire, connect one outer pin to the foil lead which is common to all the driver-stage coils, and connect the other unused WWV switch terminal on the pc board.

If you are performing only the 10-MHz modifications, these units can now be replaced. When replacing the connectors, be careful to line up the plugs to the pins. It is easy to misalign them by one position, and the result might be disastrous when the set is energized.

Tuning and Alignment for 10-MHz Operation

The first tuning and alignment step is adjustment of the JJY/WWV VCO coil (T1 in the PLL assembly) to the proper free-running frequency. This can be done by connecting a frequency counter to TP5 (ground is at TP6) in the PLL assembly. Alternatively, a VTVM connected to TP4 can be used for an approximate adjustment. If you own a TS-820S with the digital frequency display, it can be used as an indicator of accurate coil adjustment.

Rotate the BAND switch to the WWV positon and set the main tuning dial to mid range (250 on the dial scale). If you are using a frequency counter or the TS-820S frequency display, set the PLL unit TUN-NOR switch to the TUN position. There will be no frequency indication if the VCO is oscillating out of the PLL range. Adjust the core of T1 until a frequency reading appears. Continue the adjustment until the frequency-counter reading is as close as possible to 19.080 MHz, or the TS-820S display reads approximately 10.250. Return the switch to the NOR position. The frequency indication should become stable and it should change smoothly as the dial is moved from one end of the range to the other. (Note: If you are using the TS-820S frequency display, the high-order digit (1) that appears correctly at 10.000 MHz and above *will not disappear* when you tune below 10.000 MHz. In other words, 9.9000 MHz will appear as 19.9000 MHz. This is because the initial digit is fixed by the band-switching circuit and is not a function of the frequency being measured.)

To use the voltmeter method of setting the VCO frequency, keep the PLL assembly switch in the NOR position, with other conditions as described earlier. As the core of T1 is turned, there should be a range where a voltage appears at TP4 that varies with the core adjustment. The correct core setting is that at which the voltmeter indicates 3.2 volts. After finding this setting, move the tuning dial back and forth over the entire range. The voltage reading should vary smoothly above and below 3.2 V in proportion to the dial setting.

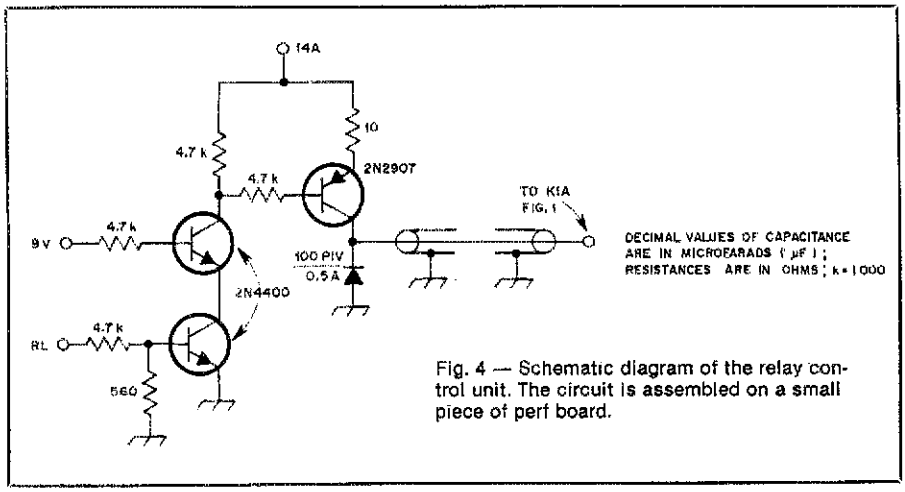


Fig. 4 — Schematic diagram of the relay control unit. The circuit is assembled on a small piece of perf board.

Connect a 50-ohm resistor or dummy load to the antenna output terminal. Turn the FUNCTION switch to the 25-kHz position and tune in the marker signal at 10.250 MHz. Set the DRIVE knob to mid-position (12 o'clock). Adjust the cores of the WWV mixer and antenna coils on the coil pack unit for maximum S-meter indication.

The adjustments are now complete for receiving in the range from 10.000 to 10.500 MHz. Check the receiving capability by connecting an antenna and tuning for signals, including WWV at 10.000 MHz.

To tune the new driver coil, place the rear panel SCREEN-GRID switch in the OFF position and connect a 50-ohm dummy load to the antenna terminal. Set the main tuning dial to 10.125 MHz and peak the marker signal with the DRIVE control. Set the MODE switch to TUN, and the meter switch to ALC. Advance the CARRIER control to about mid-scale. Place the SEND/REC switch in SEND and adjust the driver coil core until an alc meter indication begins to show. As the indication increases, reduce the CARRIER control setting so the meter shows only enough deflection to identify the peak. Without changing the DRIVE control setting, touch up the mixer coil adjustment to make sure its peak and that of the driver coil coincide exactly at 10.125 MHz. Place the screen grid switch in the ON position, switch the meter to RF, and perform the normal carrier, plate loading and tuning adjustments for maximum rf output indication with the MODE switch in the TUN position.

Last, touch up the adjustment of the 8.830-MHz trap in the final amplifier compartment. Connect a clip lead or a short piece of wire (about 3 feet long) to the center ("hot") terminal of the dummy load. Use a similar length of wire as an antenna for a general-coverage receiver tuned to 8.830 MHz. Place the two wires side by side, put the SEND/REC switch in the SEND position and accurately tune in the 8.830-MHz signal. Shorten or separate the wires as necessary to obtain a mid-scale S-meter reading or a moderately strong BFO beat note on the general-coverage receiver, avoiding receiver overload. Adjust the trap coil for minimum received signal. Be careful not to turn the slug too far from the initial setting, because if you tune it too close to 10 MHz, the coil will probably overheat and burn out during transmision. The trap will not completely remove the 8.830-MHz signal emission because there is considerable signal pickup in the receiver caused by radiation from other areas of the transceiver, particularly with the top and bottom covers off.

I did not find it necessary to change the neutralizing adjustment after completing the final-amplifier modifications. If there is any evidence of instability when the amplifier is tuned on any band, follow the operating manual procedure to re-neutralize the final stage.

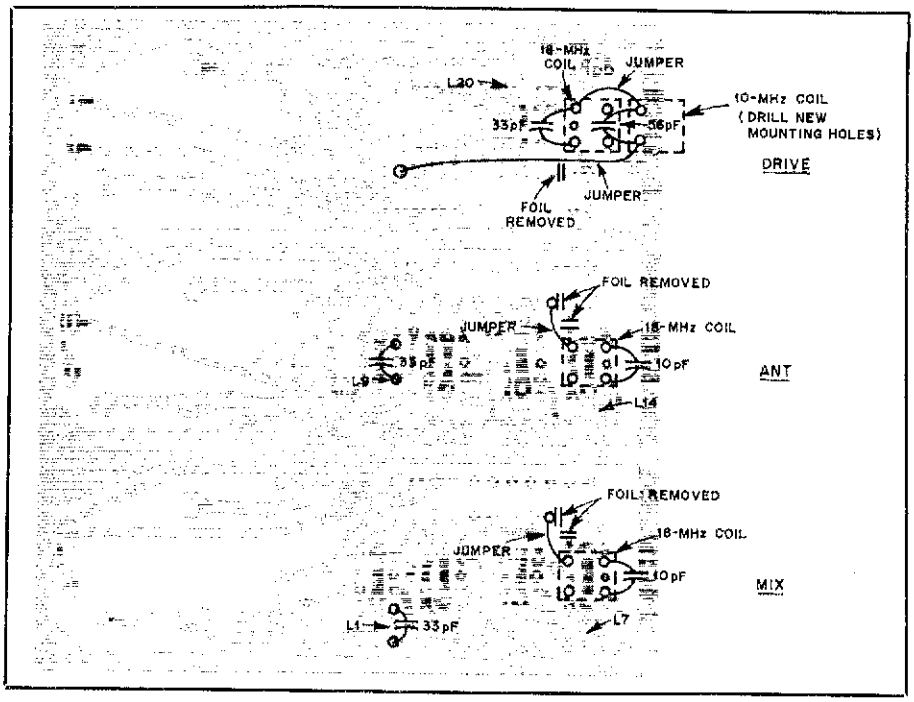


Fig. 5 — Coil pack board circuit pattern showing the physical location of the additional components. This view is from the bottom side of the board as shown in the service manual.

18-MHz Modifications

The 18-MHz band modifications uses the AUX position of the BAND switch. Mounting provisions for all the required new components for auxiliary frequency coverage already exist in the TS-820(S), and the circuit boards are marked to show their locations. The PLL unit must be disassembled as described for the 10-MHz modifications to add the new 23.5-MHz crystal and associated resistors and capacitors on the PD board, and the new VCO coil and capacitors on the VCO board. These components are listed in Table I with designations corresponding to their locations as marked on these boards

One additional step is required with a TS-820S before the PLL unit is reassembled. On the VCO board, connect a jumper from the wire-wrap post marked AUX to the post marked B2. This connection establishes a 1 as the first digit of the frequency display and selects a suitable band-pass filter in the counter mixer when the AUX position of the BAND switch is in use.

As described for the 10-MHz modifications, remove the CARRIER unit and install the new driver, antenna and mixer coils, and associated capacitors on the coil pack unit. Then reinstall the PLL and CARRIER units.

No circuit modifications or additions are required in the final amplifier compartment. The 28-MHz section of the plate coil is selected by the BAND switch in the AUX position and is used for transmitting on 18-MHz. With a 50-ohm load, the plate tuning capacitor is about two-thirds meshed at 18-MHz, and the L-C ratio of the plate circuit is rather low. This reduces the rf output slightly because of losses caused by the resulting heavy circulating tank current. Squeezing the turns of the 28-MHz plate coil somewhat closer together will raise the L-C ratio and reduce these losses, slightly increasing the output at 18-MHz. After squeezing the turns closer together, be sure the plate circuit will still tune to the highest transmitting frequency you intend to use in the 28-MHz band.

The alignment procedure is basically the same as described for 10-MHz. For 18-MHz, with the main tuning dial set at 250 and the BAND switch at AUX, the core of T11 should be adjusted to display 27.080 MHz if you are using a separate frequency counter, or 18.250 MHz if you are using the digital display of the TS-820S. When the PLL TUN/NOR switch is returned to NOR, the frequency should stabilize and follow the main tuning dial settings. The alternative VCO adjustment procedure using a voltmeter is exactly as that described for the 10-MHz modification.

To adjust the antenna and mixer coils, place a 50-ohm resistor or dummy load across the antenna output terminal, turn on the 25-kHz marker and tune in the signal at 18.250 MHz. Set the DRIVE control to the 12 o'clock position and adjust each coil core for a peak S-meter reading.

Tune to the 18.125 MHz marker signal and peak the S-meter reading with the DRIVE control. Switch the meter to read

alc and place the SCREEN GRID switch on the rear panel to OFF. With the CARRIER control turned a little past half scale and the MODE switch at TUN, put the SEND/REC switch in the SEND position and adjust the AUX driver coil core, backing off on the CARRIER control as an alc indication appears, keeping the alc indication at a level sufficient to determine the peak setting. Return the SCREEN GRID switch to the ON position and proceed with normal tune-up adjustments.

24-MHz Modification

Remove and disassemble the PLL unit as described earlier and replace the 34.5-MHz crystal (X9) on the PD board with a 30.0-MHz crystal. No other changes are required in the PLL system. Before replacing the PLL assembly, remove the CARRIER unit to provide access to the foil side of the coil pack board.

Study Fig. 5 carefully and refer to Fig. 2. In the driver circuit section, locate the four in-line switch terminals that are connected together and to L20, the 28-MHz driver coil, by the foil trace. With a sharp knife or razor blade, score the foil on each side of the small segment between the third and fourth switch terminals (29.0-and 29.5-MHz positions). Remove the foil between the scored lines, isolating the 29.5-MHz terminal.

On the antenna- and mixer-coil sections of the board, isolate the 29.5-MHz switch terminals in a similar fashion. In these cases, two segments of foil must be removed, one just to the left and one just below the 29.5-MHz terminal, as shown in Fig. 5. With a short piece of bare hook-up wire, restore the connections between L14 and the three remaining in-line terminals in the antenna coil section, and between L7 and the identically connected terminals in the mixer-coil section of the board. Replace the CARRIER and PLL assemblies, following the precautions already mentioned involving replacement of the connector plugs.

The added inductance needed to tune each of the three stages to 24.9 MHz is provided by small air-wound, self-supporting coils mounted on the upper side of the board, directly between the 29.0- and 29.5-MHz switch terminals. These are visible in Fig. 6. The coils should be close wound when they are installed and will be adjusted by spreading the turns during the alignment procedure.

To tune the VCO coil (T10, previously used for the 29.5-MHz segment), follow one of the procedures described previously for the 10-MHz band (with the BAND switch set to 29.5 MHz). In this case, the VCO should be set to 33.580 MHz as measured by a frequency counter, or 24.750 MHz as indicated by the TS-820S digital display.

Set the BAND switch to 29.0 MHz and perform the alignment of the antenna, mixer and driver coils for the 28.0-MHz segment as directed in the operating manual. These coils may need a slight touching up because of the coil pack board changes.

With a dummy load connected to the antenna output terminal, set the BAND switch to 29.5 MHz (now 24.5 MHz) and tune to the marker at 24.750 MHz. Set the DRIVE control to 12 o'clock. With a pair of plastic core-alignment tools or other non-metallic devices, slowly pull apart the ends of the added antenna and mixer coils, adjusting the spread as necessary to obtain the peak S-meter reading as each coil is adjusted. Rock the DRIVE control back and forth to determine that the peaks created by the adjustment of each coil coincide at the 12 o'clock position of the control.

Tune to the marker signal at 24.950 MHz and peak the S-meter reading at this frequency with the DRIVE control. Place the SCREEN GRID switch in the OFF position, set the MODE switch to TUN, the meter switch to ALC, the close the SEND switch. Adjust the turns spacing of the added driver stage coil to make the alc indication peak without a change in the DRIVE control setting. Switch back and forth between SEND and REC to be sure the S-meter indication and the alc indications peak at the same setting of the DRIVE control. Adjust only the driver coil as necessary to make them do so. Return the SCREEN GRID switch to the ON position. This completes the 24-MHz alignment.

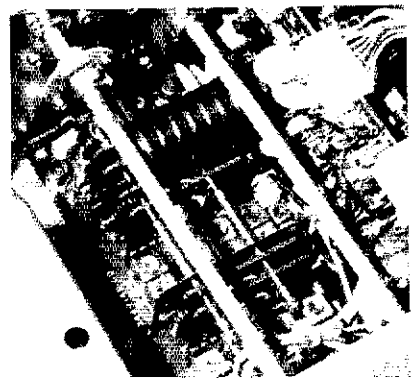


Fig. 6 — A view of the coil pack board with the 10-MHz driver coil in the outboard position beside the 18-MHz driver coil near the front wall of the PA compartment. Also visible are the small air-wound coils added directly to the BAND switch terminals in all three stages.

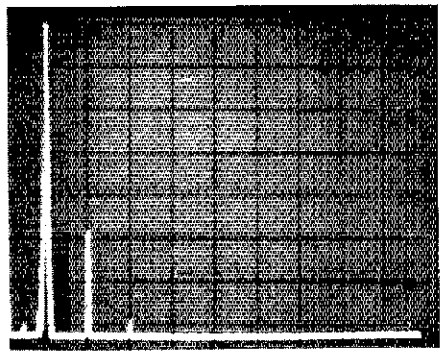


Fig. 7 — Worst-case spectral display of the TS-820S modified for 30-m operation by N1FB. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is 135 W at 10.105 MHz. All spurious emissions are at least 48 dB below peak fundamental output. The modified TS-820S complies with current FCC specifications for spectral purity.

Conclusion

If you've made all the modifications described, your '820 is ready to go on the 10-, 18- and 24-MHz WARC frequencies. Some additional parts and a few well-spent hours have given obsolescence the boot, extended the versatility of your favorite rig, and provided you with the opportunity for more operating fun. Not only that, but think of the things you can buy with the money you saved by not buying that "other" rig! Now let's see — I wonder what a three-element tribander for the WARC bands would cost . . .

[Editor's Note: I installed the 10-MHz transceive modification in my TS-820S a day after the band was opened to U.S. amateurs. It worked the first time!

Because the Kenwood replacement relay was relatively expensive ($17), I sought a substitute and found the $5 Radio Shack relay (275-214) to be suitable.

My junk box produced a Miller 46A014-2 ceramic, slug-tuned form. This I wound with 20 turns of no. 28 enameled wire for use as the driver coil; two unused lugs of the form were cut off.

The AND circuit board is mounted just above the high-voltage filter capacitors by means of a single aluminum strap secured with a COUNTER unit enclosure screw. The 14-A line may be accessed at the foil side of the 5-V AVR unit pc board. You need not remove the unit to reach the filter choke terminal if this is done.

If you're anxious about using the 40-meter tank-coil tap for 30 meters, forget it! Using that tap, my TS-820S supplies 135 watts to a 50-ohm dummy load as measured with a Bird model 43 wattmeter. That's about 20 watts more than is obtained on 40 meters (which says something about the L-C ratio of the PA tank). The PLATE tuning control pointer is positioned at the 21-MHz mark when on 10 MHz. See you on 10 — MHz, that is!]

Notes

[1]I used the designations TS-820, TS-820S and TS-820(S) as I think Kenwood intended. That is, the TS-820 is the version without the digital display, the TS-820S is the one with the digital display, and the TS-820(S) refers to either of them.

[2]International Crystal Mfg. Co., Inc., 10 North Lee, Oklahoma City, OK 73102.

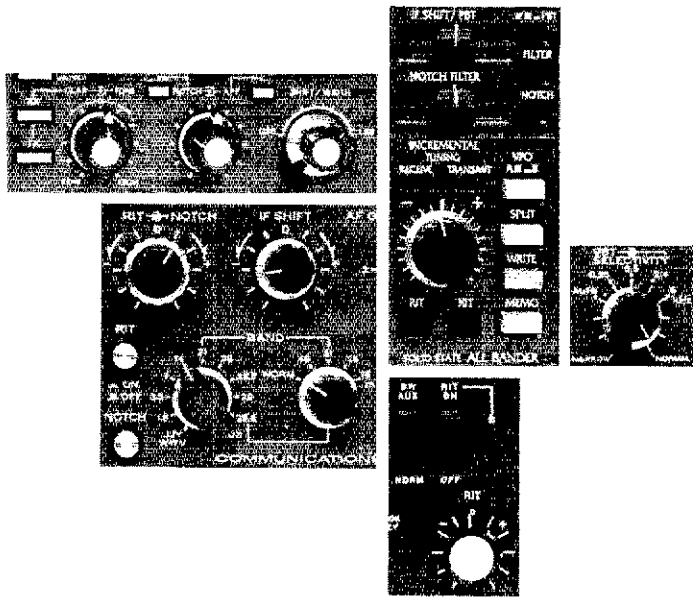
[3]mm = in. × 25.4; m = ft × 0.3048.

[4]The actual inductance values and number of coil turns used for each coil are not available. Some of the coils I used were removed from surplus pc boards. A GDO should be used to check the resonant frequency of the coil/capacitor combinations. The Kenwood replacement coils will work in the circuits for which they are specified. I took the time to temporarily tune the stock coils in my TS-820S to the appropriate frequencies to make sure!

[5][However, it is shown on the *service manual* diagram — Ed.]

BEGINNER'S BENCH

Receiver Features that Help You Beat Interference



Been plagued by "rotten QRM" lately? The right receiver features can help you copy the "weak ones."

By George Collins,* KC1V

What's the most important attribute of a modern receiver? Considering the crowded band conditions of today, most operators agree that the ability to copy signals in the presence of interference is at the top of the list. Modern receivers are provided with features to aid in this task — features that were not available a few years ago. Because most amateur stations are now equipped with a transceiver, our discussion of these features will center around the receiver section of a modern transceiver. Operation with a separate receiver differs in some ways, but much of this discussion also applies to "separates."

Crystal Filters

In one way or another, each feature we will be examining relates to *selectivity*. Basically, selectivity is the ability to reject interfering signals. In the past, receivers contained many stages of L-C (coil and capacitor) filtering to achieve high degrees of selectivity. This generally required multiple frequency conversions, which introduced problems with spurious responses and "birdies."

Selectivity in modern receivers is most often obtained through the use of crystal filters. Because these filters can be made for high frequencies (9 MHz is a common crystal-filter frequency), multiple conversions are not necessary. The crystal filter used in a receiver determines the basic selectivity. You can think of the filter as the first line of defense against interference.

Bandwidth

Receiver selectivity is specified in terms of bandwidth. A bandwidth of 2400 Hz means that the receiver will respond to signals spread over a 2400-Hz range. This range is often referred to as the passband of the receiver. Normally, the receiver bandwidth specified is that of the crystal filter being used.

Many (but not all!) transceivers are provided with at least two crystal-filter bandwidths. A filter of approximately 2500-Hz bandwidth is standard for ssb reception. For cw reception, a filter of about 500-Hz bandwidth can be selected (the cw filter is often an option). Some transceivers do not have provisions for a cw crystal filter. Instead, cw selectivity is provided through the use of an audio filter. This is a less-expensive method, and it can be satisfactory for the casual cw operator. The limitations of audio cw filters will be discussed later when we look at audio filtering.

Several newer rigs are equipped with provisions for more than the basic ssb- and cw-bandwidth filters. Some also have a 1.8- or 1.7-kHz filter for ssb reception and a 300- or 250-Hz filter for cw operation. Using these additional filters lets you select the optimum degree of selectivity for a given mode and the current band conditions.

Shape Factor and Ultimate Attenuation

In addition to bandwidth, there are other important filter specifications. One of these is the shape factor. It is the ratio of the filter bandwidth measured at a point of high attenuation on the filter response curve, to the bandwidth measured at a low-attenuation point (Fig. 1). Shape factor is a measure of the steepness of the filter skirts (or sides of the passband). Steeper skirts improve interference rejection and yield a *smaller* shape factor. Normally the −6 dB and the −60 dB response bandwidths are used to determine the shape factor.

Occasionally, however, the bandwidths at other points on the response curve are used for the calculation. Keep this in mind when comparing filter specifications, because the points chosen affect the value of the shape factor for a given filter. For example, if the −30 dB bandwidth is used for one filter and the −60 dB point is used for another, the two shape factors could have the same value, when in fact one filter has much steeper skirts.

Another critical filter parameter is ultimate attenuation. As you move away from the filter center frequency, you reach a point at which the attenuation no longer increases. At that point, the ultimate attenuation of the filter has been reached. The ultimate attenuation depends not only on the filter characteristics, but also on the way the filter is used. Poor circuit layout or improper filter placement can result in signals passing *around* the filter. Under such conditions, even the best filter will appear to have poor ultimate attenuation.

You can easily spot poor ultimate at-

*Basic Radio Editor

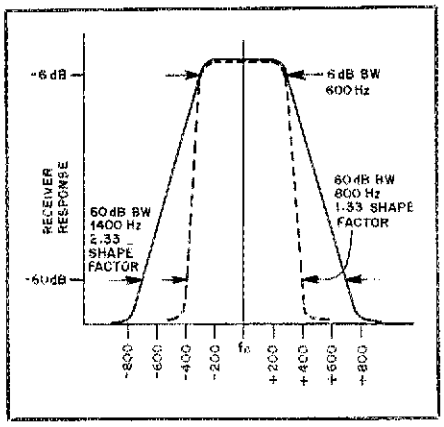


Fig. 1 — The shape factor of a crystal-filter passband is important to good receiver selectivity. A more rectangular passband provides better interference rejection and a smaller shape factor.

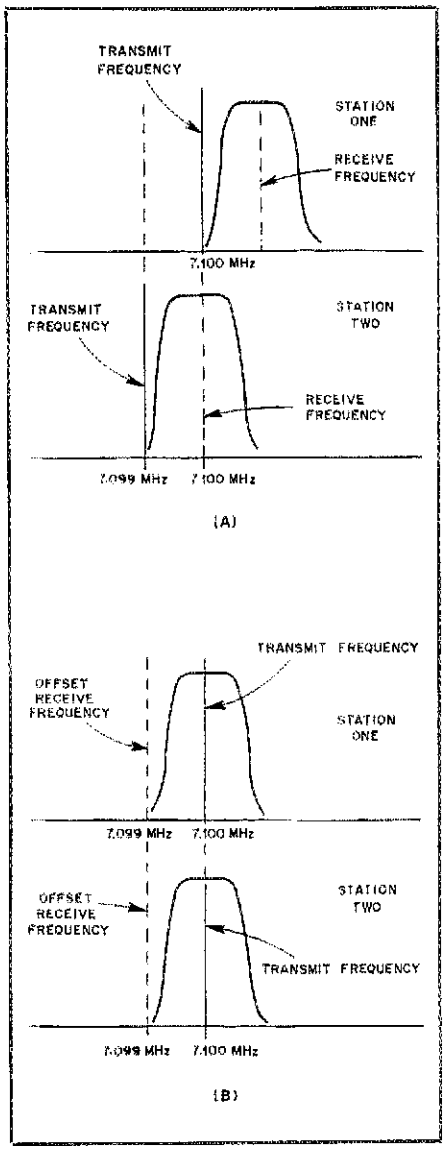


Fig. 2 — Without T-R offset, the transmit and receive frequencies differ by the audio beat note (A). Offset allows the transmitters to operate on the same frequency (B).

tenuation by tuning several kilohertz away from a strong signal. If you can still hear the signal (it will be high-pitched), the receiver suffers from leakage around the filter, or the filter has poor ultimate attenuation.

RIT and XIT

Receiver incremental tuning (RIT) has become an almost universal transceiver feature. While not changing the bandwidth, RIT helps you use the basic receiver selectivity to best advantage. RIT enables you to adjust the receive frequency without changing the transmit frequency. One important use of this feature is correcting for an operator who tunes to a beat-note frequency that differs from the transmit-receive frequency offset of his transceiver. In a transceiver, it is necessary to shift, or offset, the frequency when switching from transmit to receive. The amount of this shift is called the transmit-receive frequency offset, or offset for short. Without offset, tuning your transceiver to another station's cw signal would result in your transmitted signal falling outside the passband of the other station's receiver (Fig. 2A). You could call the other station all day this way and he would never know you were there! The solution to this problem is to offset the receive frequency of both transceivers. Now, by tuning your receiver to the other station's signal, your transmit signal automatically falls in his receiver passband (Fig. 2B).

Great — that fixes everything! Why do I need RIT?

Unfortunately, not all operators tune their receivers for a beat-note frequency equal to the offset frequency. If you adjust your transceiver tuning to obtain a desired beat note, it also causes your transmit frequency to change. Now the other operator must retune. This results in the stations "leap frogging" across the band. Having RIT enables you to avoid this situation. Once you have established contact with a station, don't use your main tuning control to adjust the pitch of the received signal. Instead, make any needed receive frequency adjustments with the RIT control. In a similar manner, RIT can be used to adjust the pitch of an ssb signal to your preference, without causing a change in your transmit frequency.

Some RIT controls will shift the receive frequency as much as 6 kHz. These controls can almost be used as a second VFO (variable-frequency oscillator), enabling you to work stations that are operating split (using different transmit and receive frequencies). DX stations often operate split to avoid having QRM on their transmit frequency cover their signal.

To set up your transceiver to work split, you first determine where the station you wish to contact is listening. Generally, this is easy, as you will hear others calling the DX station on his listening frequency. With the RIT switched off, tune to that frequency. This places your transmitter on the correct frequency. Then turn on the RIT and use it to tune in the DX station. Most transceivers have an RIT switch that you can use to turn the RIT on and off without changing the control setting. This is very useful because it enables you to easily and quickly check your transmit frequency.

A control that is related to RIT is XIT (transmitter incremental tuning). It functions in a manner similar to that of RIT, but shifts the transmit rather than the receive frequency. When a transceiver is equipped with XIT, both the XIT and RIT shifts are set by the same control. Separate on/off switches are used to select the desired function.

A potentiometer is normally used as the frequency-shift control in RIT circuits. The potentiometer is part of a voltage divider used to supply a control voltage to a varactor diode. Varactor diodes act like voltage-controlled capacitors. By placing the varactor in the VFO tank circuit, the operating frequency can be varied by changing the potentiometer setting. To turn the RIT off (and during transmit periods), the variable voltage is removed and a stable, fixed voltage is applied to the diode.

XIT circuits are the same except that the variable voltage is applied during transmit and the fixed voltage is applied during receive. Switching of the variable and fixed voltages is done by means of transistor switches or relays. A simplified RIT/XIT circuit is shown in Fig. 3.

I-F Shift

This useful receiver feature is called *passband tuning* by some manufacturers. To make things even more confusing, the term passband tuning is applied to a completely different control by others. To avoid confusion, we'll use the term *i-f shift* for the control we're discussing now. Under either name, the principle (and result) is the same.

By changing the effective center frequency of the receiver passband, without changing the frequency to which the receiver is tuned, i-f shift allows you to make maximum use of the receiver selectivity. A typical amateur receiver will have a cw bandwidth of 500 or 600 Hz. While this is fairly narrow, it is possible to have two (or more) cw signals fall within the passband.

This situation is shown in Fig. 4A. Here the desired signal has been tuned to the passband center frequency (f_0). The interfering signal, 300 Hz lower in frequency, is also in the passband. By using your i-f shift control, you can "move" the passband center frequency as shown in Fig. 4B. Now the interfering signal is outside the passband, where it can be removed by the filter.

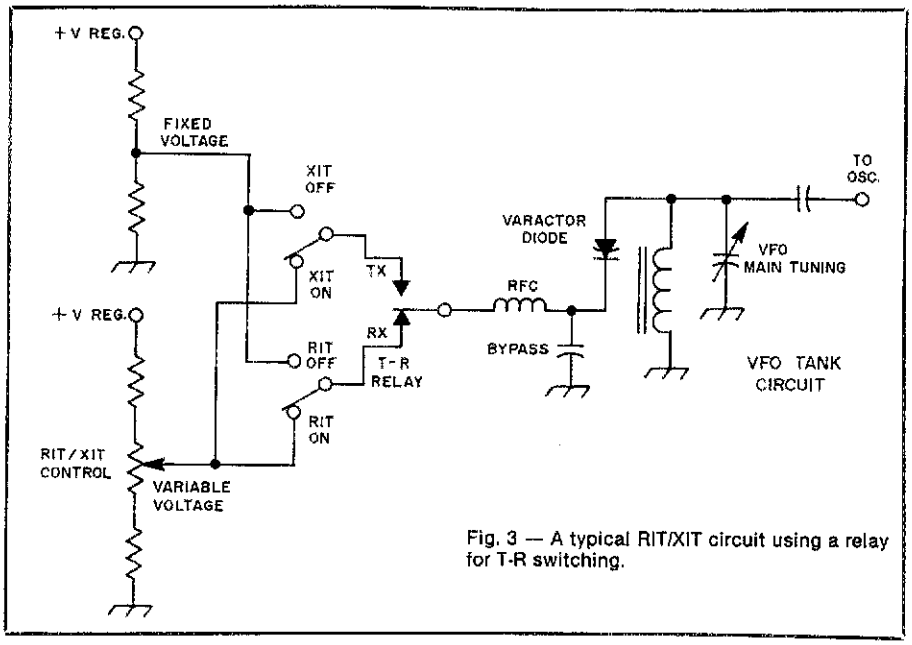


Fig. 3 — A typical RIT/XIT circuit using a relay for T-R switching.

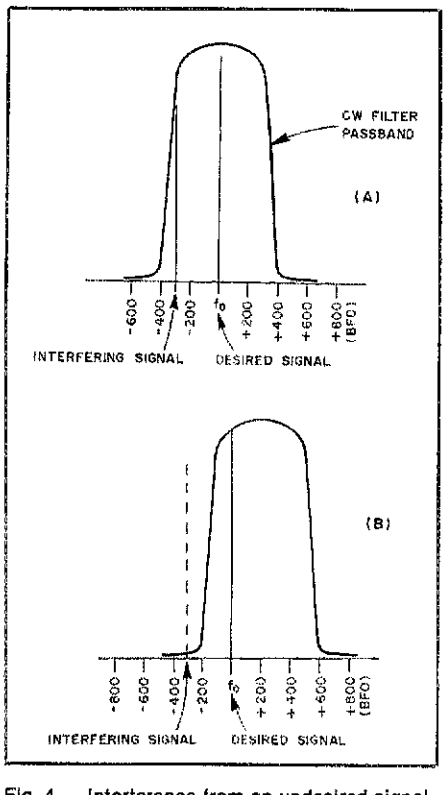


Fig. 4 — Interference from an undesired signal falling in the receiver passband (A) can be reduced by using the i-f shift control (B).

Note that this has been accomplished without adjusting the receiver tuning; thus, the pitch of the desired signal will remain the same. This is because the beat-note pitch, or frequency, is determined by the spacing between the signal frequency (f_o in this example) and the BFO (beat-frequency oscillator) frequency. In Fig. 4, the BFO frequency is 800 Hz away from the signal frequency; thus, the signal will produce an 800-Hz audio tone in the receiver speaker.

Why not just tune the receiver to move the interfering signal out of the passband and listen to a different beat note? That is a possibility, but the problem is that with a transceiver as you tune the receiver you also change the transmit frequency. It is possible to compensate for this by using the RIT control.

If you're receiving an ssb signal, you don't have the option of changing the receiver tuning to move an interfering signal out of the passband. When you're copying ssb signals, the signal frequency and the BFO frequency *must* have the proper relationship (unless you enjoy listening to Donald Duck!).

Before we examine the use of i-f shift while receiving voice signals, let's review some ssb basics. In the process of amplitude modulating a carrier signal, two sidebands are produced. One sideband is above the carrier frequency, and the other is below the carrier. In an ssb transmitter, one of the sidebands is removed, generally by filtering, and the carrier is suppressed. The resulting signal is shown graphically in Fig. 5. When you tune in an ssb signal, two things must be accomplished. First, the received signal must be positioned correctly within the receiver passband. The second requirement is that the signal and BFO frequencies have the correct relationship. If the signal is to be reproduced properly, the BFO frequency and the suppressed carrier frequency (after conversion to the receiver i-f) must be the same (Fig. 6). If they're not, you'll hear the characteristic "Donald Duck" sound of an improperly tuned sideband signal.

Now let's see how i-f shift can be used to reject interference while receiving ssb signals. If you are listening to a signal and another station begins transmitting on the *same* frequency, i-f shift won't save the day (nothing else will, either!). Fortunately, this type of interference is not the most common. More often, the interfering signal will be off to one side or the other, but close enough to overlap the desired signal. Such a situation is shown in Fig. 7A. You can see that a fairly large part of the interfering signal falls within the receiver passband. We can't change the receiver tuning to reduce the interference because that would move the desired signal away from the BFO frequency.

What can we do? Shift the passband! By using the i-f shift we can place the passband edge, or skirt, between the two signals (Fig. 7B). This can reduce the interfering effect of the undesired signal greatly. Shifting the passband will also cause part of the desired signal to be attenuated. The result is a reduction (in this example) of the higher voice frequencies. As long as we don't shift the passband too far, the voice will still be understandable. This puts a limit on how close the interfering signal can be and still be rejected. Naturally, if the interfering signal were lower in frequency than the desired signal, we would shift the passband in the opposite direction. In that case, we would lose some of the lower voice frequencies of the desired signal.

Earlier, we mentioned that the i-f shift and the RIT controls can be used together. The cw operator may find this useful to avoid the monotony of listening to the same beat note for long periods of time. Fig. 8A shows a "normal" tuning condition (no i-f shift or RIT): The signal is tuned to f_o, 800 Hz from the BFO frequency, and the passband is centered over the signal. If you prefer a lower-pitched beat note, the RIT control is used to tune the signal to the lower pitch. Then the i-f shift is used to reposition the passband center at the signal frequency (Fig. 8B). If you are using a fixed-frequency audio filter, you may want to use this technique to obtain peak receiver response at the af filter peak frequency. I-f shift can also be used to enable you to copy the standard RTTY (radioteletype) audio tones of 2295 and 2125 Hz while using a 500-Hz cw filter. Without i-f shift, these tones would be outside the cw passband.

How's It Done?

You can look at i-f shift as though it were changing the center frequency of the receiver i-f filter. Of course, it is not practical to make a variable-frequency crystal filter, so a mixing process is used to achieve the same result. In this process (Fig. 9), two mixers are used. Both receive a local-oscillator signal from the same variable-frequency oscillator. In the first mixer, the signal is converted from the i-f (455 kHz in this example) to the crystal-filter frequency. After passing through the filter, the signal is applied to the

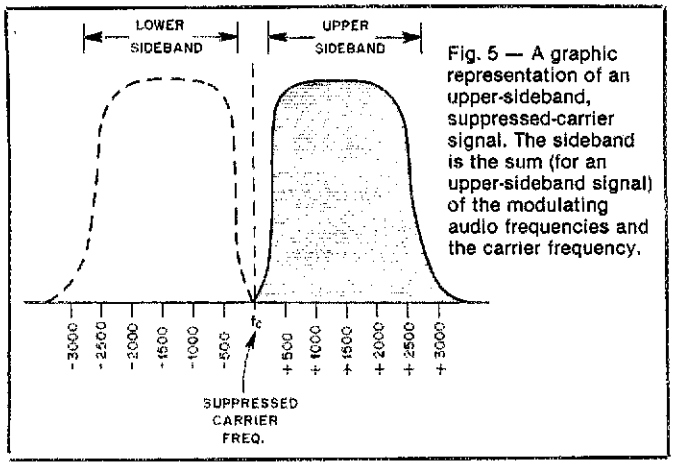


Fig. 5 — A graphic representation of an upper-sideband, suppressed-carrier signal. The sideband is the sum (for an upper-sideband signal) of the modulating audio frequencies and the carrier frequency.

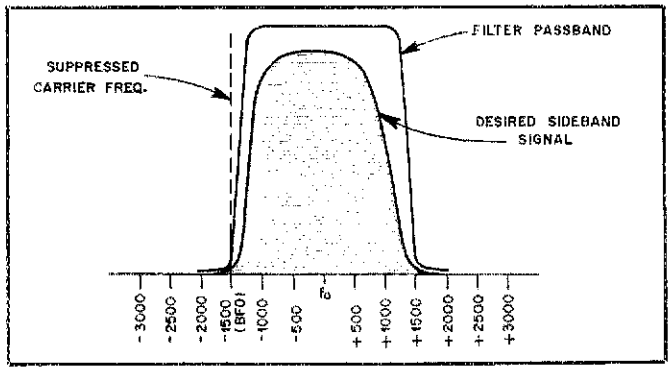


Fig. 6 — When tuned correctly, the sideband is centered within the passband, and the suppressed carrier and the BFO frequencies are aligned.

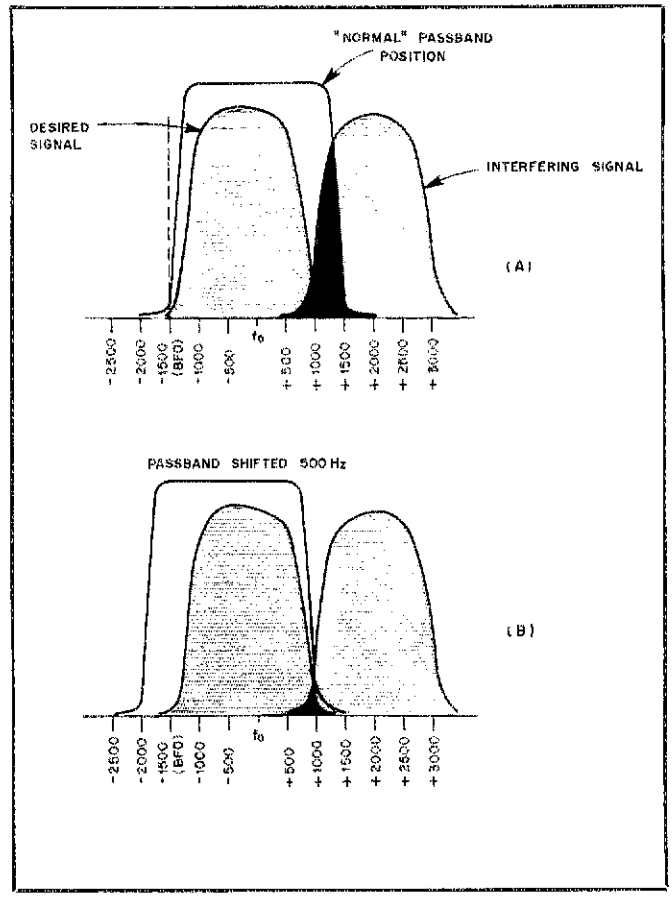


Fig. 7 — By shifting the passband, you can reject an interfering signal without disturbing the carrier and BFO frequency relationship.

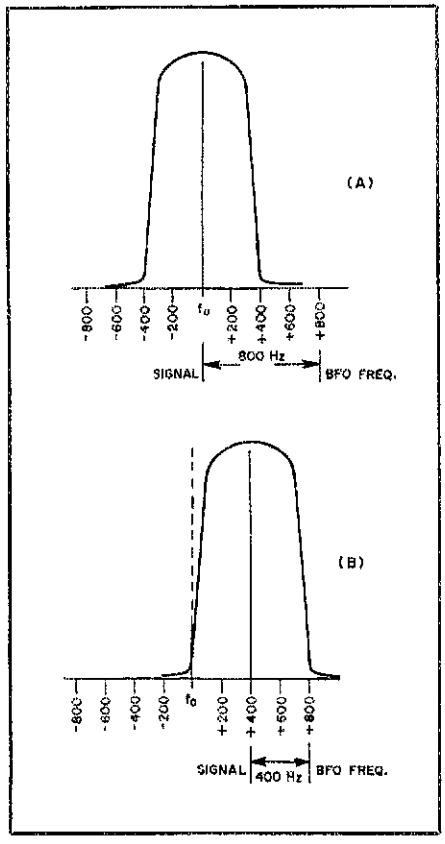


Fig. 8 — Using i-f shift and RIT allows you to select a different beat-note frequency without affecting the transmit frequency.

second mixer. Here it is converted back to the receiver i-f. If we change the oscillator frequency slightly, the input frequency (f_{sig}) that is converted to the filter center frequency also changes. The second mixer simply puts the filtered signal back where we started. The result is that we can select the frequencies that will pass through the filter without changing the receiver tuning.

As useful as i-f shift is, it is not a "QRM cure-all." We mentioned one limitation already: If the interfering signal is too close to the desired signal, i-f shift isn't going to be much help. Should there be *two* interfering signals, one above and one below the desired signal, i-f shift will again be ineffective in producing Q5 copy. In this situation, the only way out is to reduce the *width* of the passband. For example, a 1.8-kHz filter could be used for ssb reception under difficult conditions.

Variable-Bandwidth Tuning

To avoid the expense of equipping a receiver with a multitude of crystal filters, *variable-bandwidth tuning* (VBT) circuits have been developed. These circuits allow you to adjust the receiver bandwidth to fit the operating conditions.

One way of implementing VBT is to place a second filter at the output of the i-f shift circuit (Fig. 10). We now have two passbands through which the signal must

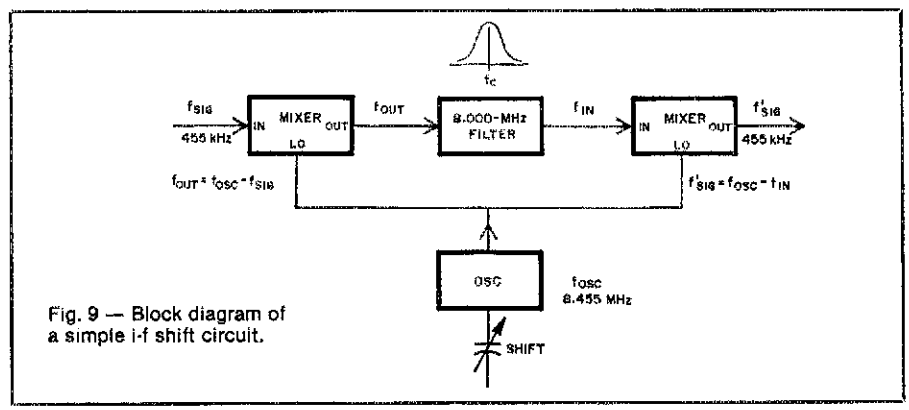


Fig. 9 — Block diagram of a simple i-f shift circuit.

pass. The first passband (that of FL1) can be "shifted" as we saw in our discussion of i-f shift. The second passband (FL2) is fixed. By adjusting the first passband so it is aligned with the second, we obtain the normal (maximum) bandwidth (Fig. 11A). If we shift the first passband, the overall bandwidth is reduced (Fig. 11B).

The maximum bandwidth obtainable with VBT is that of the narrowest filter in the system. If, for example, both filters have 2.7-kHz bandwidths, the maximum bandwidth will also be 2.7 kHz. Typically, the minimum usable bandwidth will be 100 to 300 Hz; it depends on the filters used and the design of the particular VBT circuit. Generally, cw filters will yield narrower minimum bandwidths than ssb filters. VBT is often used to achieve reasonable cw selectivity when a receiver is equipped only with ssb filters. This may prove to be very satisfactory for the operator who works cw only occasionally. When you are comparing features on different transceivers, be sure to keep in mind that VBT is called passband tuning on some rigs. If you have any doubt about the function of a control, check the owner's manual.

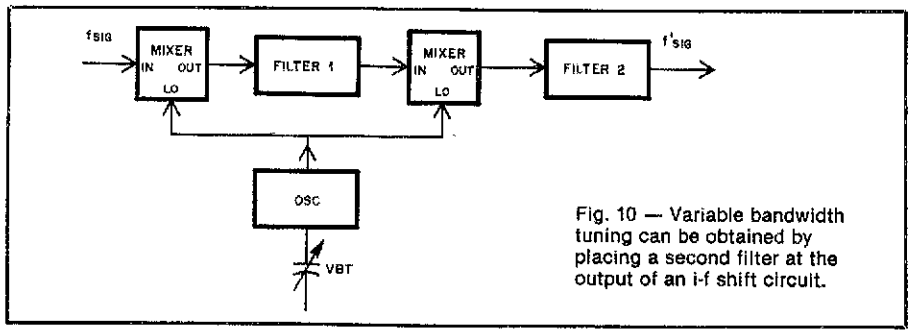


Fig. 10 — Variable bandwidth tuning can be obtained by placing a second filter at the output of an i-f shift circuit.

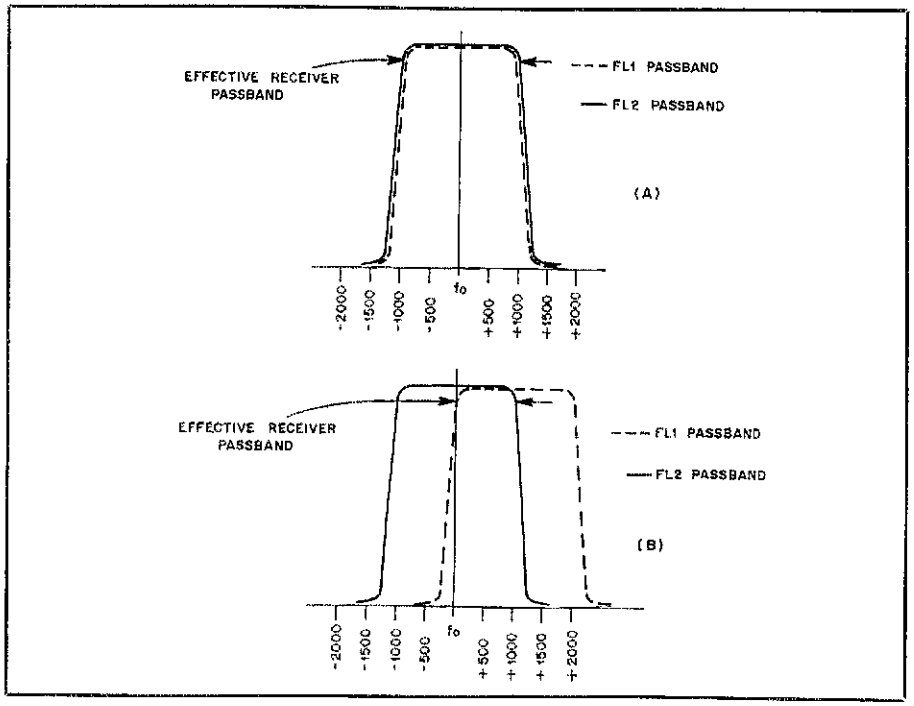


Fig. 11 — Variable bandwidth tuning requires the use of two passbands. By moving the center frequency of one passband, the overall bandwidth is reduced.

Notch Filtering

Another way of reducing interference is to "notch" the offending signal. A notch control, or filter, allows you to reduce the receiver response over a narrow band of frequencies. The notch frequency is adjustable, so you can tune it to the interfering signal. It is important that the notch be narrow; if it is too wide, it will reduce the desired signal amplitude along with that of the interfering signal.

Because the notch must be narrow, these filters are most effective in eliminating interference from signals of narrow bandwidths. A cw signal and the carrier of an a-m voice signal are examples of narrow bandwidth signals that can be handled by notch filtering.

Today, two types of notch filters are found in amateur transceivers. One type is the i-f notch. As the name implies, these filters operate at the receiver i-f. The other type is the audio notch filter. I-f notch filters are most often employed at relatively low frequencies, such as 455 kHz or 50 kHz. This is because it is easier to obtain the high circuit Q required for a narrow notch bandwidth at these frequencies. In single-conversion receivers, with an i-f in the 8- to 10-MHz range, notch filtering is generally provided by means of audio filters.

Both types of filters can be effective, although some audio notch filters do not provide as much attenuation, or "notch depth," as is afforded by a typical i-f notch filter. Typical values of attenuation range from 30 to 60 dB. If a filter has only a 30-dB notch, it will attenuate a 20-dB-over-S9 signal to a level equivalent to about S7. A 60-dB notch would reduce the same signal to approximately S2.

Audio Peak Filters

An af notch filter is one type of audio filter. Another type found in some receivers is the audio "peak filter" (APF). These filters are narrow-bandwidth bandpass filters. Usually, the bandwidth is a few hundred hertz (or less) and the center frequency is adjustable.

An APF can offer a significant improvement in overall selectivity, even in a receiver equipped with a narrow-bandwidth i-f filter. There are some drawbacks, however, when an APF is used in place of an i-f crystal filter for cw reception. Because the APF is located in the receiver audio section, a strong signal *outside* the APF passband can still be amplified to a very high level in the receiver i-f stages. In fact, the signal level can be so great that some receiver stages will be overloaded. Overload can produce distortion and a reduction in receiver sensitivity, making it impossible to copy the desired signal. A crystal i-f filter avoids this problem by removing the undesired signal before it reaches the i-f amplifiers. Even if the receiver is not overloaded, the undesired signal can activate the age (automatic gain control) circuit, reducing the receiver sensitivity to the point at which a weak signal can't be heard. Sometimes this problem can be overcome by switching to manual gain control.

Closing Comments

Well, these features are all very nice, but I don't need *all* of them, do I? Probably not. Okay; which ones do I need? That's a question each of us must answer for ourselves. Our personal operating styles and preferences will have a lot to do with what we require in a rig. If you're considering purchasing a new rig, think about the features your present equipment doesn't have the next time you operate. Would RIT or a notch filter help you out? If so, look for those features when examining a prospective new rig. If you are looking for your first rig, understanding what the various transceiver controls do (and don't do) should help when you make your choice.

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu FTV-901R VHF/UHF Transverter

It wasn't too many years ago that a glance behind the equipment installed in a ham shack — *any* ham shack — made one wonder how radio could ever have been called "wireless." A maze of interconnecting cables, external relays, and add-on boxes and gadgets of all descriptions seemed as unavoidable as QRM on 20 meters. Things began to change with the advent of the transceiver, and especially with the appearance of rigs with lots of built-in "goodies," such as the Yaesu FT-902DM. However, that only took care of the hf side of things; for vhf and uhf the rule has remained separate rigs or transverters for each band, with *ad hoc* cabling and switching layouts. It's not uncommon for hams to have different rigs for different *modes* on the same band. OSCAR satellite operation has made things even more complicated.

With the FTV-901R, Yaesu strikes yet another blow for the full-featured, integrated "wireless" station. Designed for use with the FT-ONE, FT-102, FT-101ZD and FT-901/902 series of transceivers, the FTV-901R transverter system extends station capability to the 50-54, 144-148 and 430-440 MHz bands. With the addition of an external hf receiver, a carefully thought-out switching scheme makes it possible to shift from conventional to OSCAR operation at the flick of a wrist. All this is accomplished by one small box and three cables! Even the repeater user isn't forgotten: The transverter automatically offsets the transmit frequency by the proper amount for access to 6- and 2-meter repeaters, assuming that the hf transceiver has fm capability. If you don't need all three bands right away, you can buy the basic unit with the 144-MHz rf module installed and add the other bands later.

With the FTV-901R, ssb and cw operating on vhf/uhf is as easy as on hf. All the features of the basic hf transceiver are retained except transmitter power output, which is rated at 10 watts on each band. An ac-operated power supply is built in; there is no provision for connecting the transverter to a 12-volt dc supply, although all three modules operate at that voltage.

Front-panel features of the unit include a meter which shows relative drive level and relative power output; two rows of red LEDs to indicate which band is in use for both transmit and receive, and whether repeater offset or an external receiver are in use; an RF GAIN control which can be used to reduce the gain of the active mixers in the 50- and 144-MHz receiving converters; and a 12-position band switch for selecting the vhf/uhf band segment or the mode of satellite operation desired. A TUNE control peaks the transmitting sections of the 50- and 144-MHz transverters for operation in the desired portion of each band, but it is not needed on 430 MHz. The control tunes broadly and is simple to adjust.

The circuits used in the individual rf modules are worth mentioning. Input and output are at 28 to 30 MHz. The 6- and 2-meter units are almost identical: in the receiving converter each uses dual-gate FETs for the rf amplifier and mixer, and for the transmitting mixer, an MC1496G IC. Most of the rf selectivity in the receiving converter occurs between the rf amplifer and mixer. As one might expect, the 70-cm module is quite different in design. A common doubly balanced diode mixer is used for both transmit and receive, with two stages of bipolar rf amplification preceding it on receive. Once again, front-end selectivity is provided after, not ahead of, the rf amplifiers. The 430-MHz unit has a Type N output connector instead of the UHF connector used on the lower-frequency units.

The instruction manual for the FTV-901R is excellent, and provides sufficient information to permit most servicing that might be required. Especially useful are the instructions

Yaesu FTV-901R VHF/UHF Transverter

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 50-54 MHz (optional), 144-148 MHz, 430-440 MHz (optional).	As specified.
Modes of operation: Ssb, cw, a-m, fm.	As specified.
I-f: 28-30 MHz.	As specified.
Transmitter rf power output: 10 W, 50% duty cycle.	As specified.
Receiver spurious responses: Below 1 μV equivalent to antenna input.	See Fig. 1.
Converter Noise Figure (dB): Not specified.	430-440 MHz, 2.9, except for 432-434, 2.8. 144-146 MHz, 4.4; 146-148 MHz, 4.8. 50-54 MHz not measurable because of LO signal feedthrough.
Converter gain (dB): Not specified.	450 MHz, 20; 145 MHz, 20; 53 MHz, 14.
Converter third-order intercept point (dBm); not specified.	450 MHz, −17.5; 144 MHz, −11; 50 MHz, −16.
Weight: 22 lb.†	
Size: 6.2 × 8.3 × 13.8 in. (HWD).	

†kg = lb. × 0.454; mm = inches × 25.4.

*Assistant Technical Editor

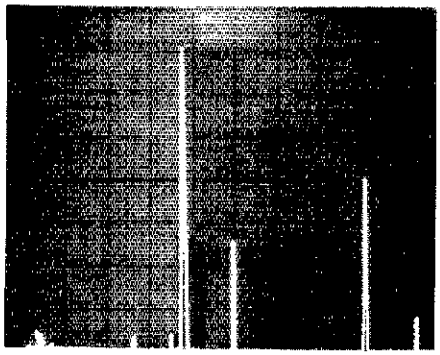


Fig. 1 — Spectral photo of the FTV-901R showing 22-MHz LO energy at the i-f port during reception on 50 MHz. The tall pip to the left of the display is the 22-MHz signal, followed by the 28-MHz signal at the center of the display. Three divisions to the right is the desired 50-MHz signal. Vertical divisions are each 10 dB; horizontal divisions are each 5 MHz.

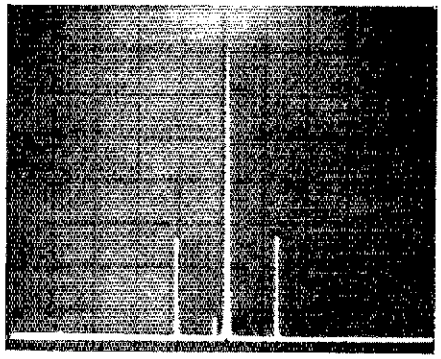


Fig. 2 — Worst-case spectral display of the FTV-901R operating at 50 MHz with a power output of 10 W. Vertical divisions are each 10 dB; horizontal divisions are each 5 MHz.

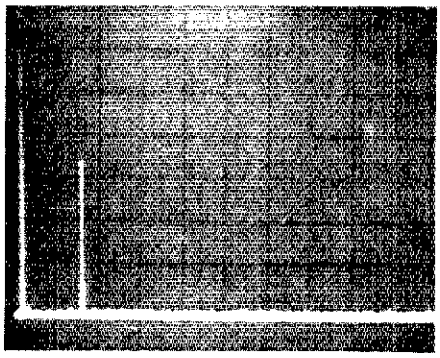


Fig. 3 — Spectral display of the FTV-901R operating at 144 MHz at a power output level of 10 W. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz.

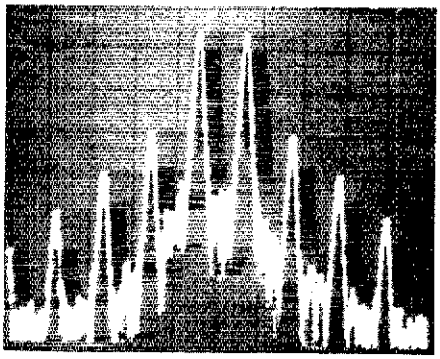


Fig. 4 — Spectral display of the FTV-901R output during transmitter two-tone IMD tests. Third-order products are approximately 30 dB below PEP and fifth-order products are about 39 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transverter was being operated at rated input power on the 50-MHz band.

for adjusting the local oscillators to exact frequency, which is essential if the frequency display of the hf transceiver is to be an accurate indicator of the actual frequency.

One inexplicable lapse in the design of the FTV-901R is the method used to switch between NORMAL and TRANSVERTER operation of the companion hf transceiver. The FTV-901R cuts the *filament voltage* on the final-amplifier tubes in the FT-101 or FT-901/902 when the transverter is switched on. Unfortunately, if the transceiver is already warmed up, the transmitting tubes will retain some emission for as much as a minute afterwards, and *damage to the transverter can result* if the operator attempts to transmit during this period. Some sort of automatic time-delay feature is needed to protect the transverter, or, better yet, a change in the design so a QSY from hf to vhf/uhf can be made instantaneously.

The only other problem encountered in use came to light during noise-figure measurements. Initial tests showed a noise figure of more than 8 dB on 432 MHz — a result that was difficult to understand, given that in on-the-air checks we had heard K8WW in Ohio on a flat band with no preamp and a single Yagi! Some additional poking around revealed that pressure on the Type N antenna connector in turn put pressure on the internal T-R relay in the transverter, resulting in an intermittent contact. The relay design is such that this problem might occur in other units as well, which is worth bearing in mind if 430-MHz performance seems to be below expectations.

Otherwise, the transverter leaves little to be desired in actual operation. In terms of versatility, the FT-902DM/FTV-901R combination has no peer. While the transverter obviously is not intended for mobile operation, the addition of a 12-volt dc power jack would make the pair suitable for battery-powered vhf/uhf hilltopping. If there was anything else overlooked in the designing of the FTV-901R, I couldn't find it! The FTV-901R is available from Yaesu Electronics Corp., 6851 Walthall Way, Paramount, CA 90723. Price class: $390 (with 2-m module installed); 6-m module $110; 70-cm module $255. — *David Sumner, K1ZZ*

ICOM IC-3AT 220-MHz FM TRANSCEIVER

This rig is truly amazing, because it still works after *I've* used it for nearly three months! That may not seem like much to some of you, but you see, I have this problem. I bought a 2-meter hand-held transceiver, but I had to ship it back to the factory, because it drains the battery while turned off. I have an hf transceiver I'm testing, but it had to go back to the factory for repairs. I assembled a kit recently, but it had to go back to factory because I put a transistor in backwards. All this happened in a two-month period, but the IC-3AT just keeps on working.

First Cousin of the IC-2AT

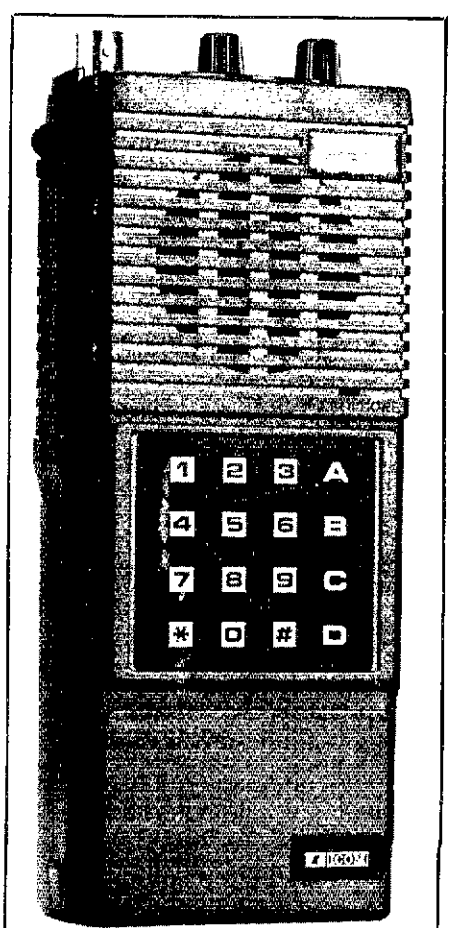
Above and beyond different operating frequencies, there are a few differences between the popular IC-2AT and the IC-3AT.[1] While the '2AT comes with a 12-button standard 2-of-7 tone pad, the '3AT has a 16-button 2-of-8 tone pad. Because of the standardized coherent bandplan for the 220-MHz band, there is no need for a switch to move the operating frequency up 5 kHz. ICOM, therefore, did not add this feature to the '3AT, but did leave the switch in place on the top panel. This switch is quite handy for adding a CTCSS pad or some similar device requiring an external ON/OFF switch. Because there is only one standard repeater offset in the 220-MHz bandplan, ICOM eliminated the third switch on the rear panel, which on the IC-2AT selects the +600 or −600 kHz offsets.

Operation of the '3AT is similar to that of the '2AT. The receive frequency is selected using the three thumbwheel switches on the top panel. Using switches on the rear panel, the operator chooses high or low power and simplex or duplex (repeater) modes of operation. The basic package is the same as for the '2AT; accessories are interchangeable, also.

On the Air

Operating the IC-3AT is a pure joy. In several months of steady use I have found nothing to complain about. Never once has there been an indication of malfunction. The receive audio is excellent; signal reports from others indicate transmitted audio is also superb. This is one radio the owner could repair, if there were a problem. The owner's manual contains voltage charts, block diagrams, a detailed schematic and an easy-to-

[1]"Product Review," *QST*, January 1981, p. 38.



ICOM IC-3AT, Serial No. 03376

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 220.000 to 224.990 MHz.	As specified.
Mode of operation: Fm.	As specified.
Current drain at 8.4 V	
Transmitting (Hi): 550 mA	
Transmitting (Lo): 220 mA	
Receiving (max. audio): 130 mA	
Receiving (squelched): 20 mA.	
Size (HWD): 4.6 × 2.6 × 1.4 inches (without battery pack)†	
IC-BP3 dimensions: 1.9 × 2.6 × 1.4 in.	
Weight: 16.6 oz. (includes IC-BP3 and flexible antenna).	
Transmitter power output (at 8.4 V):	
Hi — 1.5 W; LO — 0.15 W.	Hi — 2.2 W; LO — 90 mW.
Spurious radiation: >−60 dB.	As specified. See Fig. 5.
Receiver 1st i-f: 16.9 MHz, 2nd i-f: 455 kHz.	
Receiver sensitivity: Less than 0.5 μV for 20 dB quieting.	0.24 μV for 20 dB of quieting.
Squelch sensitivity: Less than 0.4 μV.	0.26 μV.
Audio power output: More than 300 mW.	300 mW.

†mm = inches × 25.4; g = oz × 28.35.

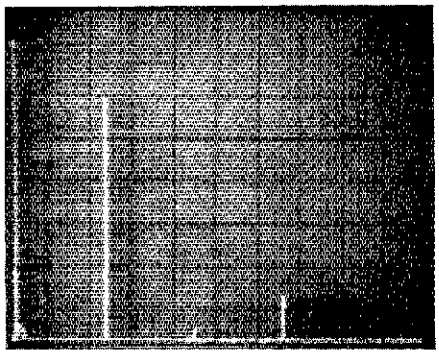


Fig. 5 — Spectral display of the IC-3AT. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 2.2 W at 224.94 MHz. The fundamental has been reduced in amplitude approximately 20 dB by means of notch cavities; this prevents analyzer overload. All spurious emissions are approximately 66 dB below peak fundamental output. The IC-3AT complies with current FCC specifications for spectral purity.

read board-layout diagram. I think this is the kind of owner's manual that every manufacturer should supply with Amateur Radio equipment — few do, though. Heck, ICOM even provides a schematic for an external microphone — they sell one, too. The IC-3AT is available from: ICOM America, Inc. 2112 116 Ave N.E., Bellevue, WA 98004. Price class $300; IC-3A (without the tone pad) $270. — *Peter O'Dell, KB1N*

ADVANCED ELECTRONIC APPLICATIONS, INC. BT-1P CODE TRAINER

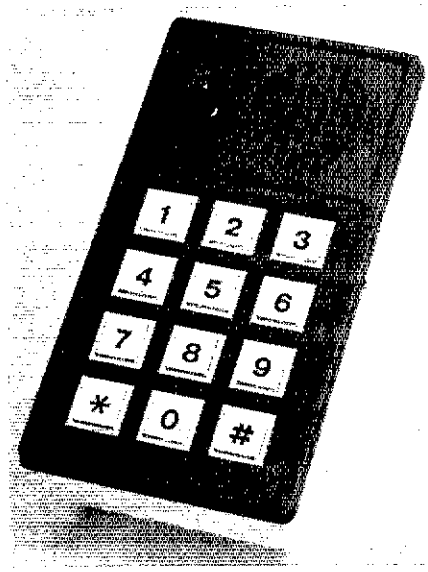
I was excited the day the AEA BT-1P Code Trainer arrived at ARRL Hq. for review! Finally, after many months of trying to increase my code speed, here was my big chance! Then I asked myself, how can this code trainer help? I have tried every conceivable code-learning method, with no luck.

How many of you have experienced the same thing? Well, now you can build up your code speed as I have done. With a previous code speed of 13 wpm, I can now copy 20 wpm with ease. I did it in eight weeks, practicing two hours per week. Even a beginner can learn the code with AEA's suggested two 20-minute sessions a day for four weeks.

Features

The BT-1P and its kin, the BT-1, are handy little gadgets that can easily be carried with you — they're about the size of a pocket transistor radio. The BT-1P is powered by means of internal NiCd batteries and is supplied with a 117-V ac-operated wall charger. The BT-1 operates from an external 12-V dc source or 117-V ac-operated ac/dc adapter. Both are computerized Morse code instructors that send random character groups and offer a total of 61 different characters. They are factory programmed to a minimum speed of 18 wpm and a maximum speed of 99 wpm. With the exception of the means of powering the units, they are identical.

The trainer is programmed by a 12-key pad to send one character continuously or in random groups of two to nine characters, with a pause between groups of 0.1 to 9.9 seconds. After you feel comfortable copying the code in groups, you then have the option of running the characters consecutively. When adding a new character, you have a choice of programming your BT-1P to have all characters equally probable, or have the new character occupy approximately 50% of the time, along with the previous characters.



The BT-1P power switch is on the volume control which may be adjusted to the listening level you prefer. The sidetone pitch can easily be increased or decreased by pressing and releasing a designated key several times until the desired pitch is reached.

I feel the AEA BT-1P Code Trainer would be valuable to instructors of Amateur Radio classes as well as to the individual who wishes to learn the Morse Code or increase his or her code speed. The BT-1P package includes a battery charger and an ear phone. Size (HWD): 2 × 2-1/2 × 4-3/4 inches; color: cream and brown; weight: 10 oz.† It is available from Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036. Price class: $80. — *Marian Anderson, WB1FSB*

TELEX HY-GAIN TH7DX BROADBAND SUPER THUNDERBIRD

What has over 700 parts, takes over 10 hours to assemble and attracts birds from all over the East Coast? If your answer is that it is just a TH6DXX with another element added, you are wrong, at least partially. Hy-Gain has added a second driven element, which significantly contributes to the broadband characteristics of the TH7DX. Adding the second driven element forced Hy-Gain to change element spacing and length, which caused some changes in gain and front-to-back ratio. It also forced them to change the matching network. Another improvement in the TH7DX over the TH6 is the switch to stainless-steel hardware.

Construction

The TH7DX comes from the factory in two boxes that are sized to permit UPS shipping — from the appearance and condition of the cartons, I surmised my antenna had arrived via the "Murphy Shipping and Demolition Service." Hy-Gain quickly replaced the few missing parts. A revised manual for the TH7DX suggests the builder read the manual three times before beginning construction. That is sound advice. With over 700 parts, the kit requires considerable care and attention during assembly. The manual could use more diagrams and improved explanations of some procedures.

According to the steps in the manual, the builder should first assemble the boom (four sections) and then construct the elements on the boom. If I were to assemble the antenna by the time AA2Z came to help with the erection, I would have had to leave the partially constructed beam in my yard for a few days. I chose to assemble the elements on my basement floor and then attach them to the boom as one of the last steps. This did not affect the assembly time or quality of work.

Hy-Gain instructs the builder to loosely assemble the beta match/phasing network to the boom before erecting the antenna. The driven elements straddle the mast; therefore, the phasing network is routed past the boom-to-mast clamp. Hy-Gain suggests rotating the network out of the way while attaching the boom to the mast. This is easier to write about than to do — particularly when you are

†mm = in. × 25.4; g = oz × 28.35.

clinging to a tower and wrestling with 70 pounds of swaying aluminum tubing.[1] I would like to see Hy-Gain modify the design so the portion of the phasing network located in front of the mast could be taken off easily during installation and removal.

Because of the broadband nature of the TH7DX, Hy-Gain provides only one set of element-length measurements. On each band (10, 15 and 20 meters) the SWR is below 2:1 from one band edge to the other. This eliminates the need to choose one mode of operation over another — it is also extremely helpful for those owning solid-state equipment.

AA2Z and I found it only moderately difficult to install the TH7DX. He placed a pulley on the mast and did the other tower work; I stayed on the ground to provide the "hauling muscle." Total elapsed time from flat on the ground to completed installation atop the 50-ft guyed tower would have been less than 20 minutes, if AA2Z had not experienced difficulty inserting two of the boom-to-mast-clamp bolts. The phasing network was in the way of the bolts. After several minutes he announced that the bolts were in. We then attached the coaxial cable to the BN-86 balun supplied with the kit.

Initial Difficulties

The first SWR curves bore no relationship to those that Hy-Gain suggested would be normal. I was up and down the tower several times in the next few days trying to discover the cause of the problem. Roger Cox at Hy-Gain thought the balun might be bad, so he sent a replacement. While on the tower to change the balun, I noticed the top boom-to-mast-clamp bolts were inserted from the wrong side. The bolt tips extended beyond the nuts, resulting in the bolts being closer to the matching network than the 3/4 inch specified by Hy-Gain. I loosened the matching network, turned bolts around and repositioned the network. Now the SWR checked closer to the specifications, but there still was quite a divergence.

After several phone conversations with Roger, and several futile attempts at curing the problem, I found out what was wrong with the TH7DX — nothing! I was using a moderately priced combination wattmeter and SWR bridge. Before resigning myself to the necessity of removing the TH7DX from the tower to check the problems, I decided to take a Bird Model 43 wattmeter home and check the SWR. With the Bird, the SWR curves were very close to those listed in the manual. I barely restrained myself from using a sledge hammer on my SWR meter!

Structure

The TH7DX is a seven-element beam antenna covering the 10-, 15- and 20-meter bands. Two of the elements are driven on each band and are fed with 50-Ω coaxial cable through a balun (included) and a combination beta match and phasing network. One reflector and two directors are active on 10 meters; on 15 and 20 meters, it is one reflector, two driven elements and one director. Boom length is 24 feet; diameter is 2 inches. The longest element measures 31 feet across, and the antenna has a turning radius of 20 feet. The TH7DX weighs 75 pounds and has a wind surface area of 9.4 square feet. It is rated to survive winds up to 100 mph; at 80 mph it presents 240 pounds of wind loading.

Hy-Gain is producing a conversion kit that will enable the user to convert a TH6 to a TH7. The kit consists of all new stainless-steel hardware and materials for the beta match/phasing network and the second driven element.

Performance

The TH7DX has been a superb performer during the months that I have used it. Good front-to-back and front-to-side ratios have been observed on local and DX signals. Received reports are also excellent. No "cold" numbers are available for these parameters, because ARRL does not have an antenna testing range to accurately measure them. Measurements performed at different station locations with the same antenna would likely produce varying results. My impression is that it performs at least as well as the TH6DXX that it replaced on my tower. In short, I am quite pleased with the performance and the broadbanded characteristics of the antenna.

Price class: TH7DX, $500; conversion kit, $200. Additional information is available from TELEX Hy-Gain, 9600 Aldrich Ave. South, Minneapolis, MN 55420. — *Peter O'Dell, KB1N*

[1]kg = lb × 0.454

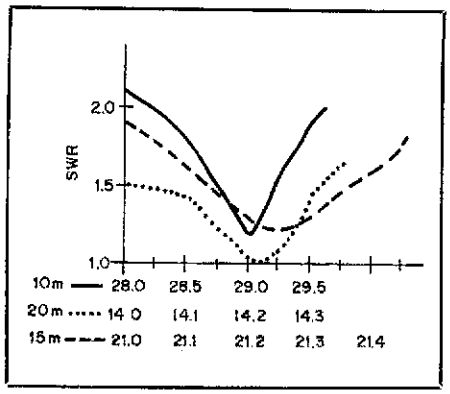


Fig. 6 — SWR curves for the Hy-Gain TH7DX installed at KB1N. The beam is mounted atop a 50-ft guyed tower. Inverted Vs for 40 and 80 meters are hung from the tower approximately 6 feet below the beam. Measurements were made with a Bird model 43 wattmeter.

New Products

ENCON INC. PHOTOVOLTAICS

The Solarex Corporation manufactured, tested and mounted the solar cells on four panels that power UoSAT-OSCAR 9. Supported by Solarex, ENCON assembles complete photovoltaic power systems for emergency and primary communications applications as well as residential, commercial and Amateur Radio packages. According to Paul DeNapoli, WD8AHO, a major priority had been to develop an emergency power supply package that ENCON is now offering to the Amateur Radio fraternity.

The SX series of photovoltaic panels offered by ENCON utilize semicrystalline silicon solar cells. These cells provide high reliability under shaded conditions because of high heat-dissipation capability and outstanding reverse-bias condition performance. Nickel-solder metallization provides excellent corrosion resistance and high-power performance. A patented tantalum-oxide anti-reflective coating ensures long-term stability and maximum cell efficiency.

Photovoltaic panels have no moving parts and require little maintenance. The Federal government offers a substantial tax credit for solar installations. Some states also offer such tax incentives.

A sample of the Amateur Radio oriented systems available (Systems I, II, III) shows capabilities of providing outputs of from 12-18 Ah to 36-54 Ah per day. Systems include the required number of solar panels, a voltage regulator, storage batteries and hardware kits. In the System III, meters and cables are included; these are optional items with Systems I and II. The price range for these systems runs from approximately $1770 for the System I to $4900 for the System III.

ENCON offers periodic free seminars on solar electricity. If you want to keep up with the latest advances in the photovoltaic industry, you might consider attending one of these seminars.

For further information, contact Paul DeNapoli, ENCON Inc., 27584 Schoolcraft Rd., Livonia, MI 48150. Tel. 313-261-4130. — *Paul K. Pagel, N1FB*

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

AMPLIFIER OUTPUT CAPACITANCE AND GAIN

☐ Some amateurs who have duplicated *QST* solid-state amplifiers, but tailored them for frequencies other than those specified in the article, have reported such maladies as low output power and instability. The syndrome seems to be most prevalent among those builders who attempt to apply vacuum-tube techniques to semiconductors. They do not understand the characteristics of power transistors — notably the change in C_o (output capacitance) with frequency and the gain increase of the device as the operating frequency is lowered. Both parameters are highly significant in a design.

Fig. 1 illustrates clearly the change in C_o versus operating frequency. The curve is for a Motorola MRF475 power transistor. Other transistors have a different rate of capacitance change per octave, and the C_o may be entirely different from that shown in Fig. 1 for a specific frequency. Therefore, one should consult the manufacturer's data sheet before starting a network design for the amplifier. The C_o must be included in the design equation if the output network is to be correct.

As an example, let's assume that we want to use an MRF475 in the circuit of Fig. 2. Since a Q_L (loaded Q) of 4 is a good "ballpark" value for amateur work, let's use it. Assume in this case we are designing for a cw power output of 5 W and an operating frequency of 3.5 MHz. The collector impedance will be approximately $V_{ce}^2/2P_o$, where V_{ce} is the collector-to-emitter dc voltage and P_o is the output power in watts. Hence, for 13.6 V and a 5-W output the impedance is 18 ohms. Fig. 1 shows the C_o to be approximately 2300 pF (X_c = 19.7 ohms) at 3.5 MHz. These are equivalent parallel values and must be transformed to series equivalents by use of the following equations:

$$R_s = \frac{R_1 X_{co}^2}{R_1^2 + X_{co}^2} = \frac{(18.5)(19.8)^2}{(18.5)^2 + (19.8)^2} = 9.87\ \Omega \qquad \text{(Eq. 1)}$$

$$X_s = \frac{R_1^2 X_{co}}{R_1^2 + X_{co}^2} = \frac{(18.5)^2 (19.8)}{(18.5)^2 + (19.8)^2} = 9.23\ \Omega \qquad \text{(Eq. 2)}$$

From this we can apply the following equations to obtain correct values for the simple network we have chosen:

$$X_{L1} = Q_L R_s + X_s = 4 \times 9.87 + 9.23 = 48.7\ \Omega \qquad \text{(Eq. 3)}$$

The required inductance for L1 (μH) can now be determined from

$$L = X_L/2\pi f(\text{MHz}) = 2.22\ \mu\text{H} \qquad \text{(Eq. 4)}$$

Next, X_{C2} is obtained from $A \times R_L$ where

$$A = \sqrt{\frac{R_1 (1 + Q^2)}{R_L}} - 1 = 1.535 \qquad \text{(Eq. 5)}$$

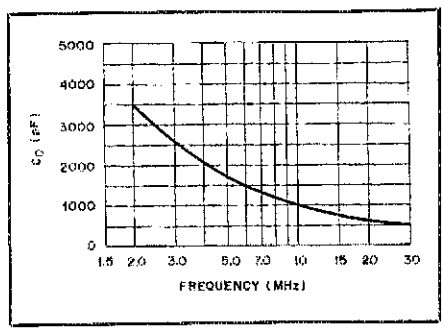


Fig. 1 — Curve showing the change in output capacitance versus operating frequency for an MRF475 power transistor.

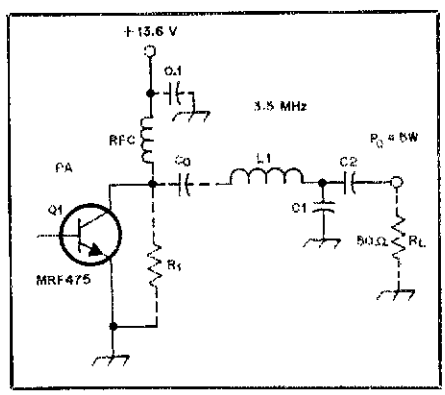


Fig. 2 — Example circuit of an MRF475 rf amplifier that contains a simple collector network to match 50-ohm antennas to the 18-ohm collector impedance. C_o must be included in the network design equations.

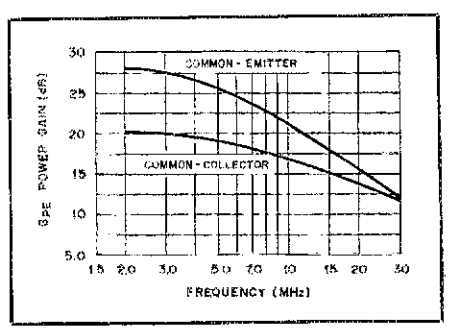


Fig. 3 — Curves showing the increase in transistor gain as the operating frequency is lowered. Common-emitter and common-collector curves are as shown.

Hence, $X_{C2} = 1.535 \times 50 = 76.74\ \Omega$ or 593 pF.

Finally, we can determine the value for C1 from the following:

$$X_{C1} = \frac{B}{Q - A} = 68\ \Omega, \text{ or } 669\ \text{pF} \qquad \text{(Eq. 6)}$$

where

B equals $R_s (1 + Q^2) = 168$.

The C_o of Q1 has now been absorbed into the network design, and a matched condition will prevail from 18 to 50 ohms. Note that at 28 MHz, for example, the C_o (Fig. 1) will be 500 pF, as compared to 2300 pF at 3.5 MHz. C_o can also present design problems when working with broadband transformers. An improperly designed collector network will result in an impedance mismatch, and, as a consequence, it will be impossible to realize maximum power transfer to the load, R_L. Mismatches can also cause amplifier instability.

Instability can be attributed to another factor — device gain versus operating frequency. This is seen in Fig. 3, where the theoretical gain of an MRF475 is 15 dB greater at 2 MHz than it is at 30 MHz. The gain figure is based on the transistor operating with forward bias in the linear mode, idling at 20 mA — yielding a PEP output of 12 W. This inherent gain increase explains why some solid-state amplifiers may be stable at 15 meters while being difficult to tame at, say, 1.8 MHz. All of this calls for great care in layout and bypassing. Also, less driving power will be needed for a given output power as the operating frequency is lowered. For this reason, an amplifier that covers several amateur bands must have some type of compensating network at the input to provide only enough excitation for the desired output power. Such networks generally consist of a combination of L, C and R components, to cause a gradual loss in driving power as the operating frequency becomes lower. — *Doug DeMaw, W1FB, and Phil Accardi, AJ1N, ARRL Hq.*

THE REALITY OF REFLECTED POWER

☐ From time to time, articles concerning transmission-line techniques appear in various Amateur Radio journals, promoting the erroneous notion that reflected power is fictitious.[1,2] Tragically, many amateurs are misled by authors who are misinformed on the subject, while specialists in wave and field propagation are dismayed at seeing this erroneous concept in print. The truth is, reflected power is as real as the power delivered to the line by the transmitter, or that radiated from the antenna.

While there are many analytical proofs that are unfailing, such proofs are often disbelieved by those who do not understand them. Here's one easy laboratory proof, with physical evidence that can't be denied: Energy reflected by a mismatched line termination can be entirely separated from the forward-traveling wave, and then be dissipated in a temperature-calibrated resistor and accurately measured as

[1] J. Kroenert, "What Your Wattmeter Really Reads," *QST*, Feb. 1981, p. 26.
[2] S. Gibilisco, "How Important Is Low SWR?" *Ham Radio*, Aug. 1981, p. 33.

*Assistant Technical Editor

I^2R heat. If the power associated with the reflected energy were fictitious, no heat would be generated! Within the accuracy of the measuring equipment, the power measured as heat in the resistor equals the reflected energy calculated from the known relationship between the impedances of the mismatched load and the line. The power measured in the load equals the source power minus the reflected power, giving further proof. I have performed these measurements many times.[3]

A semantic problem with the term "power flow" also fuels the erroneous belief that reflected power is fictitious. This brings us to the question: "Does power flow?" To help us understand the answer, let's examine an analogy that involves current.

When we talk about "current flow" we take the meaning for granted. However, does *current* really flow? The basic electricity sections of engineering textbooks (also the ARRL *Handbook*) say that current does not flow — *charge* flows. Current is defined as the quantity of charge flowing past a point per unit time. Once we leave basic electricity and move on to circuit analysis, the term "current flow" is used almost exclusively — and yet we know exactly what is meant.

The same problem applies to the term "power flow." Engineering textbooks define power as the "quantity of energy passing a point per unit time." Thus, power does not flow — *energy* flows. Except when reciting the definition of power, most textbooks on wave propagation use the term "power flow" interchangeably with "energy flow." As with "current flow," we know what is meant because of the common usage, which often overshadows the strict definition. Apparently unaware of the common usage of "power flow," Woods has misinterpreted its meaning in an attempt to show not only that reflected power is fictitious, but also to challenge several other proven textbook principles of transmission-line phenomena.[4] His definitions of power and energy are correct, but the remaining portion of his article is not.

Another reason many amateurs believe reflected waves contain no power is because they misinterpret certain characteristics of standing waves. First, let me state the facts: Because the voltage and current components of the forward waves are always in phase, and those of the reflected waves are always 180° out of phase, the resulting standing-wave plots of voltage and current are always separated on the line by a distance of 90°.[5] The distance between the plots conveys no phase information, but at every point where either the voltage or current standing wave is minimum the phase angle between voltage and current [of the reflected wave — Ed.] is exactly 0°. At points in between, the phase angle may vary between 0° and ±90°, depending on the degree of mismatch, but reaches 90° only when the mismatch results in total reflection of power (an infinite SWR). Now for the classic misconception: The 90° distance between the standing-wave plots is misinterpreted as the phase angle between the voltage and current of the reflected wave. At least two authors have drawn the erroneous conclusion that because cos 90° = 0, reflected waves contain no power![6,7]

I can further prove that reflected power is real by using the Poynting Vector Theorem. Consider an imaginary unit-cube with its sides parallel to the x, y and z axes, containing a quantity of energy, E. If this cube moves forward with a velocity v, the energy will be carried past a given point along the z axis at the rate of Ev joules per second, which is equal to the power in watts per unit area xy. In vector notation, $E_x \times H_y = P_z$ (watts per unit area). E_x and H_y are energy field vectors; E and H represent the magnitudes, and x and y the mutually perpendicular directions of the electric and magnetic fields contained in the cube. The Poynting Vector P_z represents the power passing the point in the z direction, at right angles to the xy plane formed by the E and H field vectors. When a flow of energy encounters a change of impedance (a mismatch), the magnitudes of both the E and H fields change, causing a motor-generator effect on the circuit elements, which converts the mismatch to a virtual source generator (of the reflected wave) in series with a matched load.[8]

According to Lenz's law on counter-electromotive force, in any energy not absorbed by (or transmitted past) the mismatch, the vector direction of either the E or the H field must reverse. (Which field reverses depends on the character of the mismatch.) When either the x or y direction reverses, the Poynting Vector of the unabsorbed energy must also reverse to the $-z$ direction — launching the reflected wave. The energy now flowing in the $-z$ direction is a portion of that flowing earlier in the $+z$ direction, only its magnitude has changed and its direction reversed. An exact analogy is that of light energy reflected from a mirror. Wave energy reflected from a mismatch can be totally separated from the energy traveling in the forward wave. After separation, the Poynting Vector, P_{-z}, of the reflected wave is the cross product of the E and H field vectors of the reflected wave:
$E_{\pm x} \times H_{\pm y} = P_{-z}$ watts per unit area, again proving that reflected power is real power. — *Walter Maxwell, W2DU, ARRL TA, DeLand, Florida*

PACKET RADIO — A SOFTWARE APPROACH

☐ Packet Radio using a 1200-baud rate on 2 meters is thriving in western New York and southern Ontario. Most all the active stations are using the Vancouver Area Digital Communication Group's printed circuit board with the rather expensive ($50+) Intel 8273 SDLC (synchronous data link control) chip.

It is interesting to note that most anything done in firmware (the SDLC 8273 chip) may also be done in software. As such, I have written an assembly-language software program for the TRS-80® Model I microcomputer that simulates the 8273 SDLC chip, when used for synchronous packet-radio communications. A number of two-way contacts have been made with VE3MWM, VE3DSP, VE3DVV and others. The only external hardware required is an EXAR 2211 demodulator, a 1200-Hz/2200-Hz afsk generator and a port-zero decoder for the 48-k memory TRS-80.

No RS-232C interface is required, as all the parallel-to-serial and serial-to-parallel conversion is done with the software. Since the Model I TRS-80 utilizes a 1.774-MHz clock, the receive-mode software must be broken down into three steps to perform functions that the 8273 MSI chip performs simultaneously:

1) A software equivalent of a DPLL (digital phase-lock-loop) automatically "centers" each incoming serial bit for sampling and then stores the sampled value in memory. Interrupts are not utilized.

2) A short subroutine scans the input binary bits to determine the end of the opening flags, skips over any message less than 4 bytes long (illegal), and determines the memory location of the first bit of the address byte of the packet.

3) A subroutine converts the binary packet message to ASCII decimal, stores it in high memory and displays it on video, and finally checks the IBM CRC16 (modulo 1) checksum for an error-free packet.

The above items 2 and 3 take less than 90 milliseconds to execute, so the program can send an acknowledgment if the packet was received without error; if not, it can automatically request retransmission.

I have no intention of suggesting that the popular SDLC chips, such as the Intel 8273, Western Digital 1933 or Zilog 8035, be replaced with software, but I want to illustrate the fact that almost any firmware can be replaced with software if the data rates are relatively slow; i.e., this software program is only good up through 4800 baud. Faster data rates would require a higher-speed clock or, better yet, the previously mentioned dedicated SDLC chips that can handle data rates over 1000 times faster. — *Robert M. Richardson, W4UCH/2, Chautauqua Lake, New York*

Feedback

☐ A correction should be made to the "correct formula" in the December 1982 Product Review of the Instant Software Electronic Breadboard Program. Eq. 2 on page 48 should read

$$R_{EQ} = \frac{R_1 R_2}{R_1 + R_2} \qquad \text{(Eq. 2)}$$

☐ In Part 2 of "Antenna Gain Measurements" by Fred Brown, December 1982 *QST*, Q1 and Q2 are indicated as the wrong type of transistors in Fig. 9, page 28. The correct type is 2N5179. Further, Fred's correct ZIP code is 92069.

☐ A sentence in the article by Clifford Appel, "Semi-conductor Testing — in or out of the Circuit," December 1982 *QST*, may be misleading. On page 25, the sentence is located in the center column, midway through the first complete paragraph. It should read: "Note the drop is 0.625 V, *about* what we expected."

☐ In the photo Stray on page 85 in December 1982 *QST*, the two coils in the W4DN receiver are Basketweave coils, not Reinartz coils.

☐ Although the photo accompanying "The Ultimate QSO" (Dec. 1982) may imply otherwise, no one at SRI International is involved in the NASA SETI program, nor are there any plans to use the SRI 150-foot dish in the program.

[3] W. Maxwell, "Another Look At Reflections — Part 3," *QST*, Aug. 1973, p. 36.
[4] H. Woods, "Exploding the Power Myth," *73 Magazine*, Dec. 1976, p. 120.
[5] See note 3.
[6] H. Woods, "Power In Reflected Waves," *Ham Radio*, Oct. 1971, p. 49.
[7] C. Drumeller, "Logic and Reflected Power," *73 Magazine*, June 1973, p. 65.
[8] Everitt, *Communication Engineering*, 3rd ed. (New York: McGraw-Hill, 1956), p. 330.

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

MOTOR-DRIVEN ROLLER-INDUCTOR LIMIT SWITCHES

☐ In my October 1982 *QST* article I recommended the use of a slip-clutch drive mechanism for motor-driven roller inductors.[1] Since writing that article, I have tried to use a coil that had too much drag for any of the slip clutches that were available. Others may have run into the same problem when they tried to build the remote mobile-antenna matching circuit.

Fig. 1 shows a simple method of adding limit switches to stop the drive motor when the roller contact comes to the end of the coil. The polarity at pins 1 and 2 on the tuner board is reversed to change the direction of the motor. The limit switch at each end will open the positive lead to the motor. When the polarity is reversed, the diode will bypass the now-negative lead around the open limit switch, allowing the motor to start.

If the direction of travel is such that the limit switch opens the negative lead, then just change the direction of both diodes. I am sure this principle can be applied to other problems as well. — *Don Johnson, W6AAQ, Esparto, California*

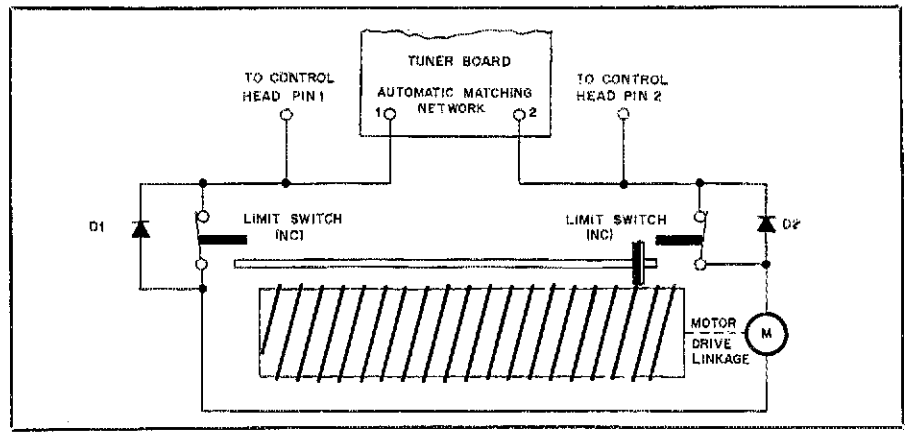


Fig. 1 — Sketch showing a method devised by Don Johnson to use limit switches with a motor-driven roller inductor.

TS-820(S) SIDETONE MONITOR MODIFICATIONS

☐ Once I became aware of the click in the sidetone signal of my Kenwood TS-820S, I couldn't bear to listen to it. Something had to be done! I also wanted to lower the normal sidetone frequency (about 850 Hz in my unit) to approximately 500 Hz. Both of these tasks were accomplished in less than an hour.

The sidetone-circuit components are located on the FIX-VOX (X50-1350-00) board. As shown in Fig. 2, the sidetone oscillator is a phase-shift type, with R48/C35, R45/C36 and R46/C37 determining the oscillator operating frequency. I used 15-kΩ, 1/4-watt, 5% resistors to replace the 10-kΩ units at R45, R46 and R48. The resulting sidetone frequency is now about 545 Hz.

To eliminate the sidetone click I tried different values of capacitance in place of C38. I found that a 0.25-μF unit resulted in a smoother-sounding sidetone, and the click disappeared. Capacitance values up to 0.25 μF have virtually no effect on the rf output waveform. As the capacitance is increased beyond this point, the decay time of the rf-output waveform increases. This causes the on-the-air signal and sidetone signal to sound soft.

If you wish to determine the replacement capacitor value for C38 experimentally before removing the FIX-VOX board, use a probe to make contact with the above-board lead of R47 that is connected to C38. Connect the capacitor(s) between the probe end and chassis ground. Use caution during the procedure, because power is applied to the transceiver, and high-voltage dc and ac line voltage are present at nearby component areas.

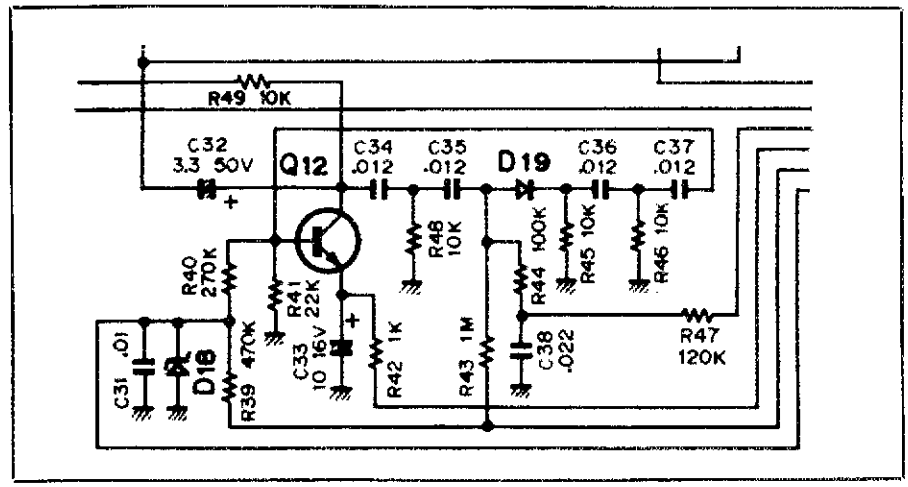


Fig. 2 — Partial schematic diagram of the TS-820(S) FIX-VOX board. This has been reproduced from the TS-820(S) service manual.

The physical size of the replacement capacitor(s) is large compared to the small 0.022-μF disc-ceramic unit originally used for C38. Board space is at a premium. I paralleled two 50-V disc-ceramic capacitors and a 50-V Mylar capacitor to achieve the required value. These capacitors are what I had on hand. The Mylar unit is mounted on the component side of the board in place of C38, leaving lead lengths sufficient to act as tie points for the two disc-ceramic capacitors, which are mounted beneath the board. (A viable substitute may be a Radio Shack 0.22-μF capacitor, part no. 272-1070.)

If you mount the capacitors beneath the board, be aware that there is a limited amount of room between the board and the bottom of the chassis. Also, the capacitor body cannot extend too far beyond the edge of the board, as it might interfere with a compartment shield that is nearby.

The FIX-VOX board is removed by extracting the four mounting screws, removing the on-board connectors and the two-pin connector attached to the shielded wire that connects to the I-F (X48-1150-00) board. Use a 25-W iron and solder wicking to remove the components from the board.

Operators who use audio filters with a fixed center frequency should note that changing the sidetone frequency may not be desirable. For instance, if the filter center frequency is 800 Hz, some attenuation of a 500-Hz sidetone signal will result. — *Paul K. Pagel, N1FB, ARRL Hq.*

HW-101 TROUBLESHOOTING CHART

☐ The troubleshooting chart in my HW-101 manual does not list a check of R316 on the audio circuit board when the sympton is loss of audio in the headphones and speaker. When I experienced this problem with my rig, the S meter indicated lots of signal in the receiver. A continuity check of R316 gave an approximate reading of 22 kΩ (the correct value for that

[1] D. Johnson, "Mobile Antenna Matching — Automatically," *QST*, Oct. 1982, pp. 15-20.

*Assistant Technical Editor

resistor). A voltage check at this point revealed that when power was applied the resistor heated up, the resistance increased and reduced the audio to almost zero. With a lighted magnifying lens I was able to see only a slight discoloration of the resistor. — *Dick Cromer, WD4MZK, Bedford, Virginia*

CHEAP, POLARIZED POWER CONNECTORS

☐ I have been using the top connectors from old 9-V transistor-radio batteries as inexpensive polarized power connectors. After removing the top from a battery, I solder the power leads from the equipment to the connector. Another connector is used on the leads from the power supply. Be careful to maintain the correct polarity. (Positive and negative leads go to the opposite sides of the connector compared to the one on the equipment. See Fig. 3.)

Connecting leads must be of a sufficient wire size to handle the required current. After the wires are soldered to the connectors, I apply a layer of epoxy over the wires to provide insulation and strength. — *Ron Zornow, N9AHU, Dundee, Illinois*

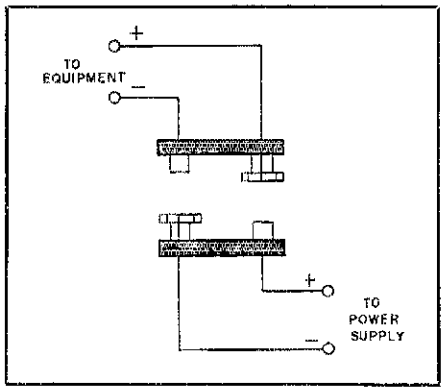


Fig. 3 — Tops from old 9-V transistor-radio batteries can be an inexpensive source of polarized power connectors.

COMPONENT REPLACEMENT ON PC BOARDS

☐ Have you ever had to replace a resistor or diode in the middle of a crowded pc-board circuit? Here is an easy way to get such a nasty job done.

Heat the wire where it comes out of the unit to be removed. The heat will flow down the wire and melt the solder. Lift that end of the component with a pliers, or use a knife blade to pry it up. Repeat the process on the other lead. A small drill bit will clear the solder from the hole. Then a new part can be soldered into the circuit. Don't use this method with a double-sided board that has plated-through holes. In this case a piece of dirty copper wire can be heated and pushed through the solder to avoid damaging the plating. This is much easier than trying to find the right place to unsolder from the bottom of the board. — *Lew Stapp, WØPHY, Hays, Kansas*

MEASURING ALTERNATING CURRENT: AN UPDATE

☐ I believe I have a better method for measuring alternating current with a VOM than the one described by Edwin Walker, WA4OFS, in

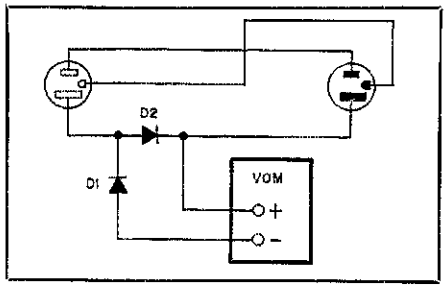


Fig. 4 — Diagram showing the method used by K2SE to measure alternating current with a VOM. Be sure the diodes and meter connect to the neutral side of the ac line for safety.

the June 1982 Hints and Kinks column. My method, shown in Fig. 4, uses diodes in place of the resistor. The diode method introduces only about a 0.6-V drop in applied voltage, regardless of load power. The resistor method produces a voltage drop that varies directly with load power. This drop amounts to 7.1 V, or almost 6% of the applied voltage at the power limit of the resistor. The diode drop would amount to only 0.5% of the applied voltage.

A second advantage of the diode method is that the power dissipation varies linearly with load power, but the resistor-circuit dissipation varies with the square of the load power. In a circuit drawing 7 A, the resistor will dissipate nearly 50 watts, but the diodes would only dissipate 1.9 watts each. The accuracy of the WA4OFS method depends on the tolerance of the resistance, but the accuracy of my method does not depend on the diode parameters.

The maximum load that can be handled by this method calculated to be 2.22 times the line voltage times the maximum dc current capability of the meter. My Radio Shack VOM can handle 2665 W on the 10-A scale. To find the required diode current rating divide the load power by 85. If you are measuring a 500-W load (even though the meter can measure a lot more) you will need 6-A diodes. The diode PIV rating need not be considered because the peak inverse voltage across either diode will be the forward voltage drop of the other diode.

One drawback of my method is that the meter does not read rms current directly. The meter reading must be multiplied by 2.22 to obtain the rms current in the circuit. For those who are curious where this "magic" number comes from, I will show a simple derivation. I'll skip the details of the integral calculus that derives equations 1 and 2, however.

$$I_{rms} = \frac{I_{pk}}{\sqrt{2}} \qquad \text{(Eq. 1)}$$

$$I_{pk} = \pi \times I_{dc} \qquad \text{(Eq. 2)}$$

Combining these equations we get

$$I_{rms} = \frac{\pi}{\sqrt{2}} \times I_{dc} = 2.22 \times I_{dc} \qquad \text{(Eq. 3)}$$

Please note that if this circuit is wired into an electrical box as suggested with the other circuit, you should not leave the load connected without the meter, since this results in half-wave rectified dc being supplied to the device under test! If the leads that should go to the meter are left dangling, one of them will be "hot" and would present a safety hazard. Plug the leads into your meter before plugging in the power cord. — *Edwin Solov, K2SE, Wayne, New Jersey*

[Editor's Note: George Woodward, W1RN, suggests that a full-wave bridge rectifier could be used, with the meter connected between the dc terminals of the bridge. In this configuration, the load would be disconnected from the line if the meter was not connected. The dc meter reading would have to be multiplied by 1.11 to obtain ac rms current. This would result in a 1.2-V drop in applied voltage instead of 0.6 V as with Solov's circuit. The diodes in this type of circuit should have a PIV rating of 400 V if the circuit is to be plugged into the power outlet with the meter disconnected.]

THE TRS-80® COLOR COMPUTER AND THE STATE-OF-THE-ART TU

☐ The State-of-the-Art Terminal unit[2,3] works well with the mechanical RTTY machines, and with only minor modification will also work with the TRS-80 Color Computer. For an RTTY beginner this TU seems to be an economical approach.

The modification to make the TU transmit with the Color Computer is the easiest to accomplish. Fig. 5 shows the circuit changes required. Remove the wire from pin 9 on U2, the XR-2206 tone generator. Add an spdt switch

[2]M. Di Julio, "State-of-the-Art Terminal Unit for RTTY," *QST*, Dec. 1980, pp. 20-22.
[3]R. Witmer, "Auto-start and Anti-space for the State-of-the-Art TU," *QST*, Nov. 1981, pp. 28-30.

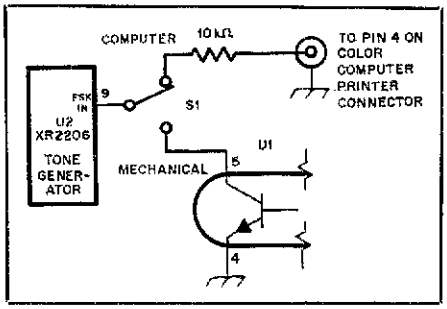


Fig. 5 — Schematic diagram of the transmit modifications for using the State-of-the-Art TU with a TRS-80 Color Computer. Additions are shown with heavier lines.

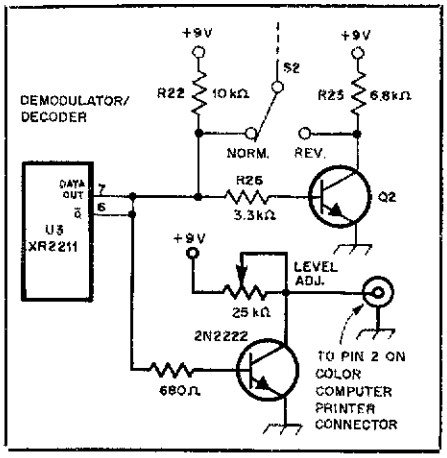
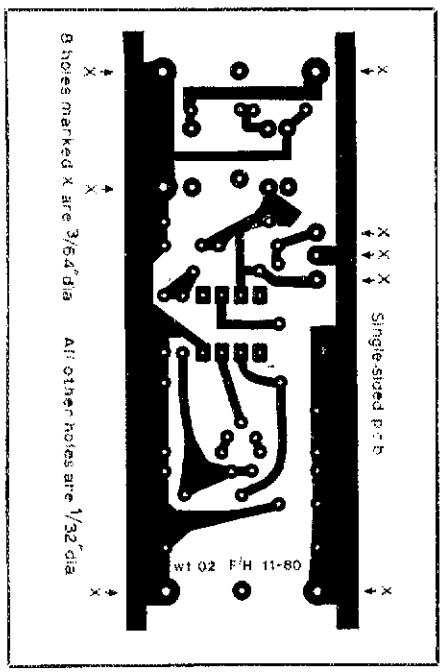


Fig. 6 — Schematic diagram of the changes to the State-of-the-Art TU for receiving with the TRS-80 Color Computer. Additions are shown with heavier lines.

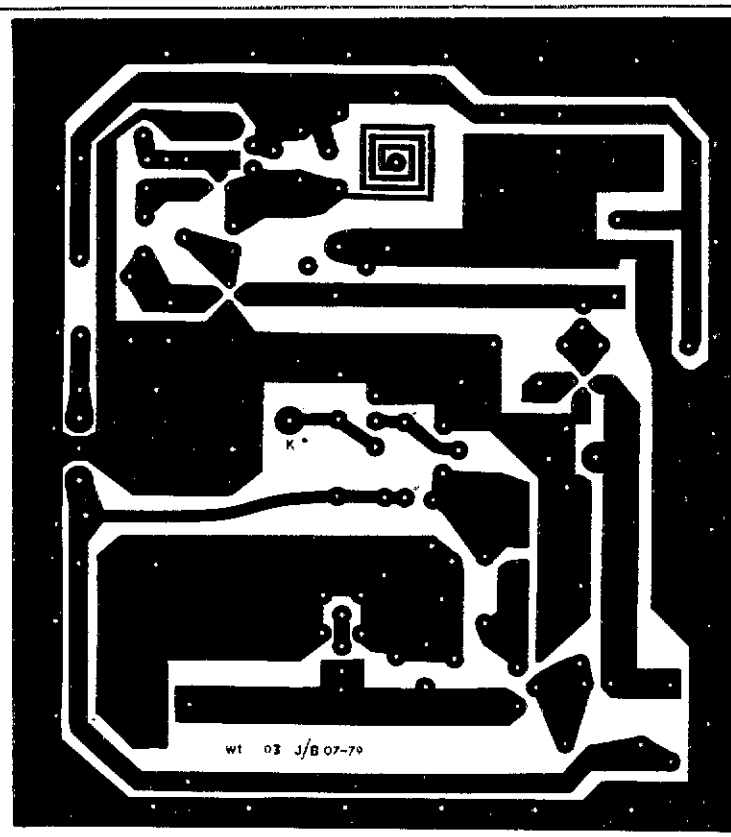
between this pin and pin 5 of U1. This gives you the option of using the TU with your computer or a mechanical device. The other switch pole connects to a 10-kΩ resistor in series with a lead to pin 4 of the printer connector on the back of the computer.

The receive modification is a bit more involved, and requires some planning. There are three components to be added to the existing board. If you are using one of the boards sold by the author of the original article, then you will have to solder these leads to the components on the top of the board. Find the proper locations for the added components shown in Fig. 6, and solder them into the circuit. A 680-Ω resistor connects between the base of a 2N2222 transistor and pins 6 and 7 of U3, the XR-2211 demodulator/decoder. The transistor emitter connects to ground, and the collector goes to the center terminal of a 25-kΩ, 10-turn, pc-mount potentiometer. One side of the potentiometer connects to the 9-V supply, and a wire is connected from the 2N2222 collector to pin 2 of the printer connector on the computer. I mounted phono jacks on the back of the TU for the connections to my computer.

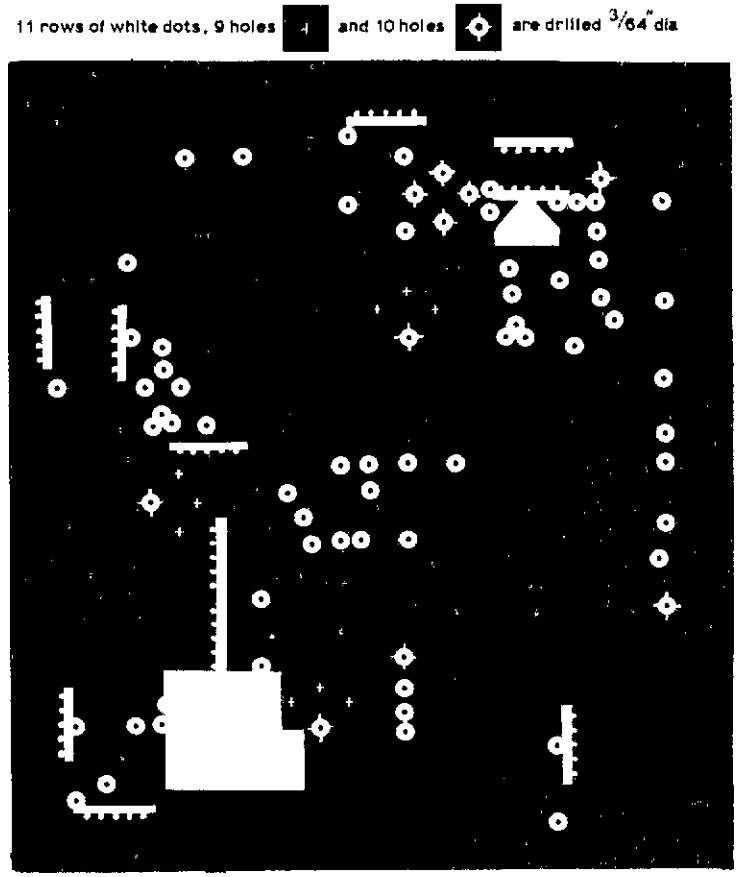
Final adjustments are made after the station equipment is turned on and the RTTY program is loaded into the computer. Turn on the TU and tune the receiver to a clear frequency. Connect a VOM between the 2N2222 collector and ground. Adjust the 25-kΩ potentiometer for a reading of 2.6 V on the VOM. Now tune the receiver to an RTTY station. You should see the monitor begin to print. If not, check the keyboard to be sure the computer is in the receive mode, check all connections and the position of the new switch. With the receiver properly tuned on an RTTY signal adjust the potentiometer again until the printing starts. This completes the circuit adjustment. Here's looking for you on 20-meter RTTY. — *Bill Sepulveda, N5EIF, San Antonio, Texas*



Circuit-board etching pattern for the uhf signal source voltage regulator (see the parts layout of Fig. 10, p. 32 of this issue). Black represents copper. The pattern is shown actual size from the foil side of the circuit board.



(A)



(B)

Circuit-board etching patterns for the uhf signal source (see parts layout of Fig. 2, p. 29 of this issue). A is the pattern for the circuit side of the board. B is the pattern for the ground plane (component) side of the board. The patterns are shown actual size. Black represents copper.

Solar Sails in the Sunset

By Dr. John J. Champa,* K8OCL

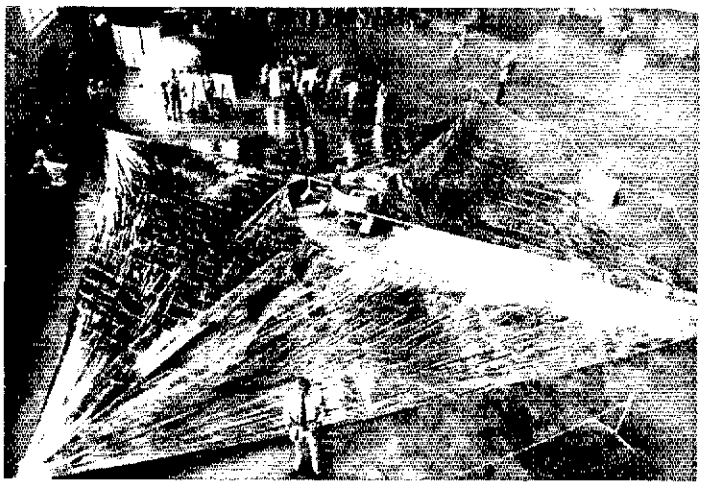
When the Space Shuttle *Columbia* touched down after its first flight into space, the astronauts onboard were told to "prepare for exhilaration."[1] This same advice may apply to Amateur Radio operators who have been actively involved with, or at least closely following, the recent exciting events within the Amateur Space Program.

It is difficult for some of us to believe that the first Amateur Radio satellite was launched more than two decades ago (OSCAR I, 12 December 1961) by Project OSCAR in California. Much progress has been made in the intervening years. Amateur spacecraft have gradually grown larger, heavier and more sophisticated.

The big step forward we anxiously await is the launch of the AMSAT Phase IIIB later this year. One significant difference between this satellite and all previous amateur spacecraft — aside from increased size and complexity — is the addition of a small internal rocket motor. Fired at the appropriate moment, this rocket will raise the angle of inclination and perigee of the orbit.[2] Furthermore, using a liquid-fuel rocket instead of a solid-fuel rocket will allow Phase IIIB command stations on earth to stop and restart the motor, adjusting the orbit in stages. If this fine tuning is very carefully executed, the desired orbit will be achieved at exactly the moment the fuel runs out. The real revolution in Amateur Radio communications will have begun.

As significant as this is, once the final orbit is attained, it will remain essentially the same for many years. We will see no adjusting of the orbit to provide more orbital time for geographical areas with higher activity levels, no raising the satellite orbital height to increase its range and no changing orbital characteristics except as nature may dictate. What we will get is a final orbit. Nothing more, nothing less.

But what if we had an unlimited amount of perfectly safe fuel? The orbital characteristics could then be adjusted at will. The satellite could be dropped to a lower orbit, raised to a higher orbit or parked in a geostationary orbit. Better yet, it could be parked above geostationary altitude as a longer-ranged "drifter," a satellite slightly above or below the geostationary orbit height of 22,300 miles (35,970 km).



Visitors at Planetfest '81 witnessed the successful deployment of the world's first prototype solar sail at the World Space Foundation exhibit.

With an unlimited source of fuel, the satellite height would be changed by speeding it up or slowing it down, lengthening or shortening its pass time over a specific area. We could even guide the satellite out to the distance of the moon's orbit, where it might travel along with it in space. With comparatively small, simple antennas and low power, any amateur could work EME-type contacts. Impossible? Not at all.

Solar Sailing

Solar sailing uses no rocket engines and no fuel tanks that run dry. Photons of light striking a large sheet of lightweight aluminized plastic provide the push. To be sure, the push is so small that the spacecraft sail cannot be deployed until it is placed by conventional means (i.e., rocket launch) well above the earth's atmosphere. Once the sailing spacecraft begins to accelerate, however, an interesting thing happens. Unlike a rocket that provides high acceleration for a relatively brief period, the solar sail provides constant acceleration for an indefinite period. A little high school applied physics will show how a small push applied *constantly* in the low gravity environment of space will result, in a few weeks or months, in tremendous velocities.

Solar sailing offers more than just high velocities without resorting to large, bulky and expensive rocket motors that must lug their fuel along. Ever-present sunlight provides a push indefinitely that can be used to increase *or* decrease velocity. Therefore, the spacecraft can be maneuvered to a higher orbit, lower orbit, different inclination, or other changes, at the direction of radio commands from Earth and with the assistance of an onboard computer. With an Amateur Radio beacon, transponder or other equipment onboard, hams around the world could give new meaning to the term solar power!

An amateur (not Amateur Radio) space group, The World Space Foundation, plans to launch a solar sail in the next few years to demonstrate its practicality. The Foundation is now associated with The Radio Amateur Satellite Corporation (AMSAT) and other interested organizations to make just such a spacecraft possible.

World Space Foundation

The World Space Foundation is a nonprofit corporation established to provide an opportunity for all who wish to contribute to and participate in opening the space frontier. Space exploration and development projects are sponsored directly by the Foundation on behalf of its members. Management personnel and consultants are drawn from the aerospace profession. The Foundation's *Solar Sail Engineering Development Mission* is

[1]Notes appear on page 58.

*P.O. Box 287, Mount Vernon, OH 43050

conducted with the cooperation of the University of Utah (which recently conducted experiments aboard the space shuttle), the University of California, the Jet Propulsion Laboratory and AMSAT. The Foundation is supported in part by the Charles A. Lindbergh Fund, with the balance coming from corporate and individual donors.

The Foundation's goal is a fully controllable solar sail spacecraft to be launched into high Earth orbit in the mid-1980s. The mission objective will be to make an engineering evaluation of the spacecraft design by maneuvering the vehicle to increase orbital energy. The spacecraft is in the design phase, with developmental testing of the sail and primary structural components in progress. At the Planetfest '81 symposium a half-sized prototype solar sail was deployed successfully.

Even with today's most advanced technologies, moving useful payloads from one orbit in space to another requires that a great deal of propellant mass be exhausted. As this propellant cannot be obtained in space, it must be brought at considerable cost from the surface of the Earth. Conversely, light, low gravity and vacuum are three commodities available in prodigious quantities in outer space. These resources constitute the key to solar sailing, a promising technology for space propulsion. By being a part of this adventure, Amateur Radio is again demonstrating that it remains on the cutting edge of technology.[3] QST

In addition to holding several appointments with the ARRL and AMSAT, Dr. John J. Champa, K8OCL, is the World Space Foundation's AMSAT Liaison Coordinator. Dr. Champa was elected senior vice president of AMSAT in December.

Notes

[1]T. Ferris, "Prepare for Exhilaration," *Science Digest*, September 1981 (Vol. 89, No. 8), p. 49.

[2]Inclination: angle the orbital plane of the satellite makes relative to the equator.

[3]If you wish to obtain more information regarding the Amateur Radio Space Program, contact the Radio Amateur Satellite Corporation (AMSAT), P.O. Box 27, Washington, DC 20044. If you wish to obtain more information on solar sailing, contact The Solar Sail Project, World Space Foundation, P.O. Box Y, South Pasadena, CA 91030.

Suggested Additional Readings

Amateur Satellite Report (ASR), Number 29, March 22, 1982, available from the *Amateur Satellite Report*, 221 Long Swamp Rd., Wolcott, CT 06716 (subscription rate is $18 per year).

Drexler, E. "Sailing on Sunlight May Give Space Travel a Second Wind," *Smithsonian*, Vol. 12, No. 11, Feb., 1982, pp. 52-61.

Eberhart, J. "Riders of the Light," *Science News*, Vol. 120, No. 21, November 21, 1981, pp. 328-334.

Orbit magazine is published six times per year for $10 (inseparable from AMSAT membership dues of $16 per year).

Price, H. W. *Solar Sail Engineering Development Mission*, available from the American Institute of Aeronautics and Astronautics, *Student Journal*, Summer 1981.

Stachle, R. (President, WSF) "Volume One, Number One," *Quarterly Bulletin of the Solar Sail Project*, Vol. 1, No. 1, July/Sept. 1980. Available as a back issue from WSF.

Uphoff, C. "The Origin of Solar Sailing," *Quarterly Bulletin of the Solar Sail Project*, Vol. 11, No. 2. Available as a back issue from WSF.

Wright, J. "A Recent History," *Quarterly Bulletin of the Solar Sail Project*, Vol. 1, No. 2, Oct/Dec, 1980. Available as a back issue from WSF.

Ongoing solar sail information is available in *The Foundation News*, supplied with a subscription to The Solar Sail Project ($25 per year) or by becoming an associate of the Foundation ($15 per year).

Strays

Southeastern Division Director WA4ABY (right) and Atlanta Radio Club President WA4PNY present a 1983 ARRL *Handbook* to Cable News Network engineer WA4ACP for his successful efforts in getting an ARRL public service announcement aired over the broadcaster's nationwide system.

MOVING? UPGRADING?

☐ When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.

HANDI-HAM RECEIVES DONATION

☐ The Courage HANDI-HAM System was the recent recipient of a donation from the New England ARRL Convention. Convention staff matched contributions for the System made at the door, for a total of $500. The donation was presented by the Federation of Eastern Massachusetts Amateur Radio Associations. The Courage HANDI-HAM System is an international organization devoted to assisting the handicapped amateur community through training, equipment loans and special programs. For more information, write to the ARRL, or to the Courage HANDI-HAM System, 3915 Golden Valley Rd., Golden Valley, MN 55422.

MORSE CODE INSTRUCTION MADE EASIER

☐ Active Morse code instructors are invited to send for an international Morse code instruction manual. Leon Rosenfeld, W2QNL, is making an out-of-print technical manual (TM 11-459) available to interested Amateur Radio class instructors. Originally published in 1957, this manual has detailed chapters on how to teach the Morse code, evaluate student progress and conduct practice and tests. Other topics include speed printing, typewriting and keyboard operation.

To obtain a copy of this manual, send an 8-1/2 × 11 in. envelope and 75¢ in postage ($1.25 for two copies) to Leon Rosenfeld, W2QNL, 13-30 Saddle River Rd., Fair Lawn, NJ 07410.

50-YEAR-OLD RADIO OPERATION REENACTED

☐ Radio amateurs associated in the past or present with the Mount Washington (New Hampshire) Observatory celebrated the 50th anniversary of radio use on that mountain when, on October 16, 1982, they reestablished radio contact with the observatory Weather Club and Museum on Great Blue Hill in Milton, Massachusetts. Radio equipment had been installed on Mount Washington at the site of a structure that housed the Observatory from 1932 to 1937.

The initial commemorative contact occurred on 6 meters when this writer (a radio operator at the Observatory in 1932) talked with David G. Doe, K1HRV, over the 142.5-mile path from the "top of New England" to the Boston area. Additional contacts were made on 6 meters with amateurs in Maine, Massachusetts and New Hampshire. The same procedure was followed on 2 meters and 450 MHz, until nearly 50 contacts were recorded.

The celebration nearly failed to happen on schedule. A snow storm made the road to the Mount Washington summit temporarily impassible, but the amateurs were able to take their equipment to the operations site in a four-wheel-drive truck. — *Alexander McKenzie, WIBPI, Eaton Center, New Hampshire*

Philadelphia Mayor William J. Green looks on while members of the Holmesburg ARC operate commemorative station W3WP, located at the Port of History Museum at Penn's Landing. The club operated on October 23-24 to celebrate the 300th anniversary of the founding of Philadelphia and the 338th birthday of William Penn. *(WB3EVY photo)*

Assisting Public Safety Agencies — The First Steps

By Gerald W. Boyd,* WA6CUP

At the first sound of the alarm, members of the Tri-County ARES were on the move. Call-up went quickly and smoothly, and the first amateurs arrived on the scene within moments. It looked like the start of a perfect public service operation — with but one exception. Public safety officials at the scene didn't know who the amateurs were or why they were there. No one had thought to get to know the officials they'd be working with in an emergency!

CORONADO POLICE DEPARTMENT
Volunteer Amateur Radio Operator Program

Purpose:

To provide the Coronado Police Department with a cadre of qualified, trained, licensed volunteer radio operators whose services may be utilized for regular tests of radio equipment; staffing of mobile emergency communications vehicle; special and unusual events; major emergencies and disasters.

Qualifications:

Must live in a close proximity to the City of Coronado. Must be of good character, without significant medical problems, and must possess a valid Amateur Radio license as issued by the Federal Communications Commission.

Training:

Specific training relative to Department procedures will be provided, as will cross training by fire department and other emergency services personnel.

Uniforms/Equipment:

No uniforms are required. Those who wish may wear a plain tan or khaki jumpsuit, provided at their own expense. It is recommended that only ARES, Red Cross or other emergency services identification be worn along with a name tag. A white, construction-type, visored hard hat may be worn.

For special assignments the availability of a two-meter mobile or hand-held transceiver with mobile/portable antenna is desirable.

Activities:

In addition to weekly "check in" and actual emergencies, certain training exercises will periodically be held. In addition, communications support for the City's annual Fourth of July parade may be requested.

Guidelines that the author uses in his department's successful amateur volunteer program.

Developing a close working relationship with municipal officials is of crucial importance to all community-minded radio amateurs. A number of letters in response to my January 1982 *QST* article suggested a followup, to focus on ways in which such working relationships can be established.[1] Specifically, readers asked how amateurs might open the door to police, fire and emergency medical service agencies, a problem in which little or no inroads have been made in the past. Of particular concern is the all-too-familiar skepticism on the part of police and fire officials; worse yet are cases in which past volunteers left a negative impression with public safety administrators.

The ideal situation, of course, is one in which public safety administrators have a long-standing, positive association with amateur volunteers. This is enhanced when these administrators themselves are amateurs, and thus are not only aware of, but very open to, involvement of the Amateur Radio community in public service activities. Unfortunately, this is seldom the case.

One factor, above all, may serve to open channels of acceptance: cuts in government spending. Several years ago, California experienced the impact of Proposition 13, an initiative designed to reduce property taxes. An immediate effect of this referendum was a rollback of revenue for government services, including public safety. Other states already have or may soon experience similar budget cuts. That factor, in combination with present economic conditions, dictates that public safety services will be reduced unless some alternate means are developed. For most of us in public safety the only viable means of maintaining an appropriate level of service may be to open the door to volunteers.

Ingredients for a Successful Public Safety Program

- A statement of the purpose and role of radio amateurs in regard to public safety
- Placement of amateur groups in the public safety organization structure
- A department policy on the use of amateur volunteers
- An application process that effectively screens potential volunteers
- Identification that permits authorized radio amateurs access to emergency scenes
- An organized call-up
- A training program covering areas that both the public safety agency and amateurs deem important

Gaining Acceptance

How Amateur Radio volunteers are accepted depends on their establishing a track record of competent performance in important activities. And it begins with convincing officials that amateurs offer a cost-effective (otherwise known as free) substitute for functions previously paid for by the taxpayer. Local radio amateurs also must demonstrate that they are organized, disciplined and reliable, and have a sincere interest in community service.

The most effective way to accomplish this is to have the local ARRL Emergency Coordinator (EC) or the Radio Amateur Civil Emergency Service (RACES) coordinator initiate the contact with public safety agencies in an official capacity. This is better than having individual amateurs, particularly those outside the Amateur Radio Emergency Service (ARES) structure, making uncoordinated and poorly prepared contacts that often

[1] G. W. Boyd, "An Amateur's Guide to Assisting Public Safety Agencies," Jan. 1982 *QST*, pp. 54-55.

*Chief of Police, P.O. Box 1234, Coronado, CA 92118

result in an impression that the local ARES group is disorganized.

The Presentation

1) Approach that first meeting with municipal officials well-prepared, and give a concise presentation of Amateur Radio's capabilities. Illustrate accomplishments with newspaper clippings, *QST* articles, etc., highlighting Amateur Radio public service. Discuss the existing ARES/RACES structure, emphasizing that a certain number of qualified operators will be able to respond in a timely manner during emergencies (you might provide them with a copy of your call-up or ARES roster).

2) Demonstrate the reliability and clarity of amateur gear. Nothing is more impressive than asking for a roll call on a 2-meter repeater, using a hand-held radio in the police or fire chief's office and having amateurs respond with full-quieting signals from locations where municipal radios are normally ineffective. Such a demonstration two years ago convinced officials in Laguna Beach, California , to ask for the assistance of the South Orange County ARES, the wisdom of which became evident a short time later when that seaside resort community was hit by a series of local emergencies.

3) Suggest specific ways in which amateurs can be of assistance. Indicate you are aware that police and fire radio frequencies are usually saturated with tactical or operational traffic in emergencies, and offer to provide an administrative frequency for use in the overall management and coordination of the emergency relief effort. More important, offer to demonstrate what you are capable of doing by supplying communications for the next city or county disaster training exercise, or by handling communications for an upcoming parade. It is of tremendous importance that you emphasize that the services supplied by your group will free public safety officers for other duties.

4) Demonstrate how easily amateurs and their equipment can interface with public safety efforts. Equipment that can be made operational quickly inside the headquarters building, in a mobile command post or in field units is ideal.

5) Express your group s willingness to meet the needs of the agency with which you are dealing. Show a readiness to provide training to your membership. Offer public safety officials the opportunity to have their own representatives appear before your group and provide orientation and training they feel is essential.

Finally, be realistic and objective in terms of what your group promises to provide to public service agencies. Be fully prepared to keep all promises you make. Remember to be organized and competent. Once you have implemented these suggestions, be patient. The requests for your services *will* be forthcoming, perhaps in a volume you had not anticipated. QST

Strays

QEX: THE EXPERIMENTERS' EXCHANGE

Wonder what you've been missing by not subscribing to *QEX*, the ARRL newsletter for experimenters? Among the features in the January issue were:

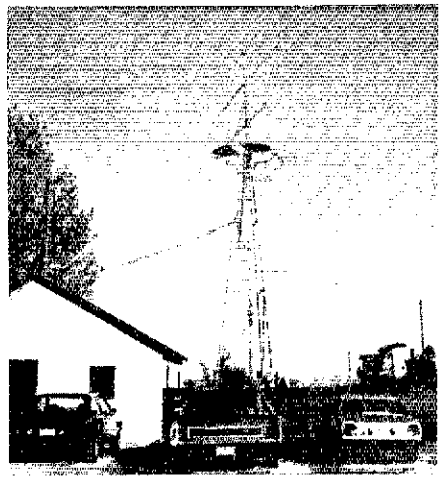
- Second ARRL Packet Conference Call for Papers
- Teleconference Radio Net (March 3 and June 2 talks)
- Index to *QEX* 1-12
- "Digital Voice Modulation," by G. W. Horn, 14MK
- "Microwave Alignment Probe," by Ivo Chladek, ZS6AXT
- "Modifying the VADCG TNC to Use 2716 EPROMs," by Robert R. Anderson, K2BJG
- "Data Communications," by David W. Borden, K8MMO.

QEX is edited by Paul Rinaldo, W4RI, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the U.S.; write Headquarters for details.

QST congratulates . . .

☐ James O. Wilkinson, N8ACL, of Fremont, Michigan on being awarded the Boy Scouts of America Silver Beaver Award, the highest award for local volunteers.

☐ Eric Ludwig, KA7MAA, and Eric Campbell, KA7LZK, both of Medford, Oregon, on earning their Eagle Scout awards.



Friends of Dick Carnahan, WAØIJY, of Harrison, Nebraska, had a sure-fire way of showing him they cared, as evidenced by the antenna tower in Dick's backyard, part of the equipment bought for the ailing ham with nearly $1200 donated by friends and family.

West Gulf Division Director Ray Wangler, W5EDZ (right), presents an ARRL Club Charter to John Rakestraw, KA5BJE, who accepts it on behalf of the Centroplex ARC (Texas). KA5BJE is vice president of CARC.

STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most readers of *QST*. (2) Submit your material before deadline — the 8th of the second month preceeding desired publication (i.e. arrive at Hq. Before March 8 for May *QST*). (3) Any photographs you send should be good quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce well.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

Follow the above hints and maybe your Stray will find a home in *QST*. — *Andrew Tripp, KA1JGG*

I would like to get in touch with . . .

☐ anyone with information or spare parts for restoring an AN/PRC 70 (XE2). Tony Grogan, WA4MRR, 5 Rollingwood Dr., Taylors, SC 29687.

☐ any other YMCA Amateur Radio clubs. Dr. David Hutchinson, GI4FUM, Chmn., City of Belfast YMCA Radio Club, 12 Wellington Pl., Belfast 1, Ireland.

☐ any hams who are veterans of or on active-duty with the U.S. Armored Forces and are interested in joining a net. A 4-1/2 × 9 in. s.a.s.e. to Harry B. Thomsen, W2PJH, 348 Jefferson Ave., Apt. 15, Canandaigua, NY 14424.

Happenings

Conducted By Carol L. Smith,* AJ2I

- *Bioeffects Regulations Still Threaten Amateur Radio*
- *ARRL Asks for Delay on No-Code*
- *League Proposes Station, Operator, Grace-Period Extensions*
- *Comments on RM-4229 — Yes, and . . .*

ARRL Again Comments on Proposed RF Radiation Standards

The Commonwealth of Massachusetts has clarified its position on the pending proposal to regulate sources of nonionizing rf radiation. Amateur Radio stations will clearly be required to comply with Commonwealth standards, except that "all intermittent sole source emitters of less than 1 kW average output are excluded from the requirements of §122.021." This means that Amateur Radio operators will not have to obtain *prior approval* of the director of the Department of Public Health before exercising their FCC license privileges. Should a complaint about an amateur's operations be received, however, the amateur will have to demonstrate to a Department of Health inspector that he or she is operating in accordance with Commonwealth regulations.

The League, in filing formal Comments addressing proposed regulations 105 CMR 122, takes the position that there is "more than sufficient justification for *completely* exempting Amateur Radio stations from the Department's proposed regulations governing devices which generate electromagnetic fields." It argued:

• *Amateur Radio's contribution to the rf energy environment is negligible.* Amateur Radio operations use relatively low powers and are intermittent by nature. Most amateur operators spend only a few hours per week transmitting signals (see Table 1). Amateurs' preferred mode of operation is hf phone, with a duty cycle from 30 to 40%. Furthermore,

1) amateur operators are authorized to use no more than 1-kW power input. In fact, amateur stations are *required* to use the minimum amount of transmitter power necessary to carry out the desired communications.

2) most amateur operators do not use or have the capability of using the maximum power authorized.

3) according to a 1980 survey of U.S. Amateur Radio operators, only 26% spend more than three hours per week operating (including transmitting *and* receiving) hf phone, and only 9% spend more than nine hours per week.

• *the Department's regulations will create and reinforce an erroneous perception that Amateur Radio poses a hazard.* With the increased public interest in rf radiation effects on biological tissue, lay people will think that Amateur Radio is a threat *because the Department of Health is regulating it.* Also, a radio amateur suspected of causing harmful levels of rf radiation will be required to explain in detail the operations of his or her station, and make that explanation understood by lay people.

• *a complete exemption for Amateur Radio would make the proposed regulations more consistent.* It doesn't make sense that Amateur Radio, which contributes negligibly to the rf environment, is not excluded from the regulations, but other services, such as "facilities maintained by the Federal government," CB radios and all scientific and medical equipment, *are* excluded.

The ARRL further argued that:

• *there is no known rationale for a standard five times as strict as the latest ANSI standards.* ANSI Standard C95-1982 (see Jan. 1983 *QST*, p. 58) best represents the latest scientific knowledge of human exposure to rf radiation fields. This standard recognizes that the human body's susceptibility to rf energy is frequency dependent, incorporates this factor, then reduces the permissible exposure levels by a safety factor of 10. The standard, as proposed by Massachusetts, is five times more strict than the ANSI standard. The League asserts that this is overly restrictive and unnecessary.

• *the ARRL, on principle, opposes state government regulation of FCC licensees.* The attempted regulation of federally licensed Amateur Radio stations, as proposed by the Department, is an *unwarranted incursion into an area preempted by the federal government.* Through the Communications Act of 1934, the federal government has delegated to the Federal Communications Commission exclusive jurisdiction over radio communications. As the law states:

> For the purpose of regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all people of the United States a rapid, efficient, nation-wide, and world-wide wire and radio communication service . . . and for the purpose of securing a more effective execution of this policy by centralizing the authority hereto granted by law to several agencies and by granting additional authority with respect to interstate and foreign commerce in wire and radio communication . . . — *47 U.S.C. §151*

• *inherent supremacy, preemption and exclusive jurisdiction over radio transmission, equipment and operation has been uniformly recognized by the United States Supreme Court and other federal and state courts.* Several court cases and Congressional reports indicate that it is intended that "the field of radio transmission, equipment and operations" be "occupied" by the federal government. This *preempts* state or local regulations that would unreasonably burden radio communication. Additionally, Section 301 of the Communications Act of 1934 claims complete jurisdiction over radio *energy* by the federal government. To quote from the law:

> It is the purpose of this Act, among other things, to maintain the control of the United States over all the channels of interstate and foreign radio transmission; and to provide for the use of such channels . . . under licenses granted by Federal authority.

• *Amateur Radio is undeniably interstate commerce.* A 1927 judicial finding established federal control over Amateur Radio and found

"If the Massachusetts Department of Health is successful in promulgating its proposed rules, other state and local governments are certain to follow."

Table 1

Time (in hours) Spent Operating by U.S. Amateurs

	0	*1-2*	*3-8*	*9+*
Hf phone	48%	26%	17%	9%
Hf SSTV	99%	1%	0.3%	0.1%
Hf cw	62%	23%	10%	5%
Hf RTTY	96%	3%	1%	0.4%
Vhf/uhf a-m, cw or ssb	82%	10%	5%	3%
Vhf/uhf fm	52%	25%	15%	8%
Vhf/uhf other	96%	2%	1%	0.1%
Satellite Communications	98%	1%	0.3%	0.1%

*Membership Services Assistant, ARRL

that it was unquestionably interstate commerce not to be taxed or regulated locally. Furthermore, radio in general has long been held to be inherently interstate in nature.

The ARRL concluded its Comments with:

> The regulation of the emissions of Federally licensed Amateur Radio stations is a matter of uniquely national concern. There is a need for a nationwide, uniform rule on the permissible levels of rf energy emanating from Federally licensed communications stations if all areas of the country are to benefit equally from the benefits of Amateur Radio specifically, and the electronic information age in general. Furthermore, there are no peculiarly local characteristics involved in the regulation of rf energy levels. Radio frequency energy is a uniform phenomenon nationally and even worldwide, affecting everyone in a uniform manner. . . The ARRL urges the Department to carefully rethink its policy on regulating FCC licensees in general and Amateur Radio stations in particular. *We are very concerned that the Department's adoption of these standards will result in an evolution of state and local standards which would place intolerable burdens on the Amateur Radio Service.* (Emphasis added)

LEAGUE ASKS FCC TO DELAY ACTION ON NO-CODE LICENSE

ARRL President Victor C. Clark, W4KFC, recently sent a letter to the FCC Chairman and all Commissioners requesting an 18-month delay on any action on a possible no-code license. The League's Executive Committee last November adopted a motion to request the deferment. It reasoned that the volunteer licensing proposals allowed by Public Law 97-259 would have such a major impact on the Amateur Radio community that more time would be needed to thoroughly study no-code license proposals.

President Clark's letter read:

December 7, 1982

Dear Commissioner:

At the July 1, 1982, Open Agenda meeting of the Federal Communications Commission, the Private Radio Bureau was directed to prepare a draft Notice of Proposed Rulemaking looking toward addition of a new license class in the Amateur Radio Service which would not require code tests. One form of license envisioned by the Commission would employ the existing Technician Class written examination but omit the Morse Code test. The other is patterned after the Digital Class license in Canada, scaled down to a level achievable by a "bright 12-year-old computer enthusiast." Work on this proposal was to have been completed at staff level in the first quarter of fiscal 1983, the end of which is rapidly approaching.

Since this decision was made by the Commission, an important new factor has intervened — adoption of Public Law 97-259. Among the varied provisions of that Act is Section 104, amending Section 4(f) of the Communications Act of 1934 to permit the Commission to use volunteers in the examination of candidates for licenses in the Amateur Radio Service. Already, one Notice of Proposed Rulemaking (PR Docket 82-727) has been adopted to implement this legislation. Another is likely soon in response to RM-4229, filed by the American Radio Relay League October 22, 1982. The latter requests amendment of Part 97 of the Commission's Rules to permit the use of volunteers in examination preparation and administration in the Amateur Radio Service.

The amateur community faces a considerable task in assuming a license examination burden which has consumed a reported one million dollars per year of Commission resources. It seems unwise and perhaps unfair to contemplate enlarging the license examination burden by an additional burden of unknown dimensions until the amateur community has responded to the principal challenge involved in examination questions, developing procedures, organizing resources, administering Technician, General, Advanced and Extra Class licenses, grading the papers and certifying the results of successful examinations to the Commission.

Accordingly, the Executive Committee of the American Radio Relay League meeting at Newington, Connecticut, on Saturday, November 20, 1982 adopted the following:

"On motion of Mr. Holladay, it was voted that, in light of the impending transfer of amateur license examination responsibilities to the amateur community and its attendent workload, the possibility of *deferring for at least 18 months* the issuance by FCC of a Notice of Proposed *Rulemaking seeking to establish a new codeless license* class *be explored with the Commission.*" (Emphasis added)

We respectfully request that any action which might lead to a class of amateur license not requiring a test in the International Morse Code be deferred by the Commission for at least 18 months. The amateur community needs time to absorb the Commission's license examination task before it as a result of PL 97-259 before it contemplates additional license examination assignments from the Commission.

Respectfully submitted,
Victor C. Clark, W4KFC
President

At presstime, no response from the Commission had been received.

LEAGUE PROPOSES EXTENSIONS FOR LICENSE TERMS AND GRACE PERIODS

In a move that should delight both busy Amateur Radio operators and the FCC, the ARRL has requested in a recent Petition for Rulemaking that the

- *Commission extend amateur operator and station license terms to 10 years from the date of issuance.*
- *FCC extend the station-license grace period to two years.*

The League cited P.L. 97-259 as authority for its Petition. Specifically, the Communications Act of 1934, as amended, states:

> Upon the expiration of any license, upon application therefor, a renewal of such license may be granted from time to time for a term of not to exceed five years in the case of television broadcasting licenses, for a term of not to exceed seven years in the case of radio broadcasting station licenses, and *for a term of not to exceed ten years in the case of other licenses*, if the Commission finds that public interest, convenience and necessity would be served thereby. (Emphasis added)

A means of reducing the financial burden on the public and the Commission by decreasing the number of renewal applications filed in the Amateur Radio Service is set forth in the ARRL proposal. "For example," the League stated, "in radio services where specific frequency assignments are not made to individual stations, ten-year license terms would decrease the burden of filing and processing renewal applications without adversely affecting the Commission's spectrum management capabilities."

The ARRL suggested that this proposal, which could theoretically halve the number of renewal applications, would decrease the financial burden on the FCC and the public. Additionally, the amateur would be relieved of an unnecessary paperwork burden.

Especially troubling at present is the system of allowing only a one-year grace period for amateur station license renewals. Should an amateur not file during this grace period because of an untimely absence from the country, a long-term illness, forgetfulness or *any* reason whatsoever, he or she will lose their old call and routinely be assigned a new one. Extension of the station-license renewal grace period to two years "would provide a reasonable time in which almost everyone, regardless of externalities, should have filed a renewal or reinstatement request."

The League requested that the Commission amend Section 97.59(a) and (b) of the Rules in the suggested fashion. A rule making number has not yet been assigned to this proposal. Details of any action will appear later.

Regulations Threaten Massachusetts Repeater

The operations of the Mt. Greylock repeater (146.31/91), famous on the East Coast for its reliable, long-distance coverage, have been put in jeopardy. The machine had been located atop a tower on its namesake mountain as a guest of the State Police. When the State Police moved their antennas off the peak, the amateur repeater was next housed inside the lodge. It was operational, but with the handicap of that location the repeater was "but a shadow of its former self."

According to WB1HIH, SEC for Western Massachusetts, this surprising situation leaves the Amateur Radio repeater at the mercy of the Massachusetts Department of Environmental Management, which said that the tower and antennas were "unsightly." It had ordered the Mt. Greylock amateur repeater to be taken down in the first place.

Local amateurs, clearly seeing the severe threat to their important public-service communications capabilities, sprang into action. They garnered the support of two State Representatives and a State Senator, who introduced a bill in the legislature that would allow the repeater to remain on the state-owned and -controlled tower and property.

The bill, H-6749, passed the House unanimously, but stalled in the Senate Ways and Means Comittee. Massachusetts amateurs are urged to contact their state representatives to press for passage of H-6749. Timely action could help save this vital communications link. [At press time, the repeater has been reinstalled on an interim basis on the original tower. However, legislative action is still imperative to ensure that it *stays* there. — Ed.]

COMMENTS ON RM-4229 SPIRITED, SUPPORTIVE IN PRINCIPLE

Comments on the League's petition to use volunteers to prepare and administer Amateur Radio examinations, RM-4229, were filed by the Quarter Century Wireless Association, the Capitol Hill Amateur Radio Society, John A. Carroll and the ARRL.

The League's Comments were "in the nature of an addendum, clarifying certain issues raised in the Petition." One of those issues is the FCC's Novice exam proposal (see January *QST*, page 57). The League had included a proposed Novice exam system in RM-4229, and found its proposal "somewhat similar to that proposed by the Commission. The League, however, stands by its proposal to have all Novice written examinations created by qualified volunteer examiners from an FCC-approved bank of questions to ensure uniform standards in Novice licensing throughout the Commission's jurisdiction without significantly adding to the burden on either the Commission or the Amateur Radio Service."

The ARRL also addressed these further issues:

- *examination coordinating organizations selected by the Commission should be allowed to issue interim upgrade permits at the testing site, allowing successful applicants to operate immediately with their newly acquired privileges.*
- *volunteer examiners should be allowed to certify an applicant's proficiency on a code credit certification that would subsequently be used within the volunteer examining program.*

The QCWA, CHARS and John Carroll's Comments basically supported the League's proposal. Some important issues they raised for discussion are:

- *whether any three amateur licensees, instead of an accredited organization, could create and administer exams.*
- *would the League's proposal mean a significant financial drain on the "accredited organization," thus undermining the permanency of the system?*
- *only citizens or permanent residents of the United States should be volunteer examiners.*

All commenters urged the Commission to grant RM-4229 expeditiously. The next step will be a Notice of Proposed Rule Making, which will probably propose options for a volunteer examination plan.

ARRL 1983 BUDGET APPROVED

The ARRL Management and Finance Committee has approved an operating budget of almost $6.6 million for the year 1983. The budget plan was prepared by the staff and is based upon there being no increase in membership dues during the year, but with a 10% advertising rate increase to be effective with the April issue of *QST*. Included in the plan are expenses of almost $100,000 associated with the Volunteer Examining Program, should ARRL involvement be approved. Also included is $25,000 for a film project proposed by Roy Neal, K6DUE, with another $25,000 to be raised from sources outside the League. Capital spending plans include the acquisition of additional data processing, typesetting and word processing facilities for Headquarters.

The 1983 budget plan is based upon conservative projections, which yield essentially a break-even financial result for the year. While the League is a tax-exempt, non-profit organization, a provision for federal income taxes of $173,000 is included because the League is required to pay taxes on the "unrelated business income" generated by the sale of advertising space in its publications. Though the 1982 books are not closed at this writing, net income after taxes is expected to exceed $400,000 from total revenues of $6,440,000; for 1981 the final, audited result was a net income, after taxes, of $261,249 from total revenues of $6,168,647.

The League's By-Laws call for the Management and Finance Committee to review and approve the budget for each coming year. The budget is then forwarded to the full Board for ratification.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Alberta, Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Utah, Maryland-DC, New Hampshire and Eastern Massachusetts sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. In accordance with the restructuring of the ARRL Field Organization, the position of Section Manager will supersede the position of Section Communications Manager in each section. Incumbent SCMs are listed on page 8 of this issue.

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 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)

General 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 Manager for this Section for the next two-year term of office.

(Signature . . . Call . . . City . . . ZIP . . .).

An SM candidate 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 be received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 4, 1983.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on April 1, 1983. Returns will be counted May 24, 1983. SMs elected as a result of the above procedure will take office July 1, 1983.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1983. If no petitions are received for a section by the specified closing date such section will be resolicited in July *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by appointment by the General Manager.

You are urged to take the initiative and file a nominating petition immediately.

David Sumner, K1ZZ
General Manager

SECTION MANAGER ELECTION RESULTS

The following were elected for a two-year term of office beginning April 1, 1983:

Uncontested

Arizona — Erich J. Holzer, N7EH; Iowa — Bob McCaffrey, KØCY; Montanta — Les Belyea, N7AIK; Northern Texas — Phil Clements, K5PC; Wyoming — Richard G. Wunder, WA7WFC.

WILLFUL INTERFERENCE ALONE ENOUGH TO COST AMATEUR HIS LICENSE

Gilbert, ex-KB6TG

The FCC Review Board has affirmed an Administrative Law Judge action revoking the station license KB6TG and the Advanced class operator license of Kenneth L. Gilbert of Monterey Park, California. A 1981 decision has found that Gilbert used his station to transmit indecent language and "willfully interfered with other amateur communications," engaging in a self-described "type of Amateur Radio argument of sorts."

KB6TG protested the decision, "objecting," according to the FCC, "generally to the Administrative Law Judge's conclusion that he had engaged in malicious interference and had used indecent language." Gilbert also argued that the original Notice of Violation made no mention of a Section 97.119 violation [barring the transmission of obscenity] but alleged only that Section 97.125 [barring willful interference to radiocommunications] had been violated. He proposed that a one-year suspension of his licenses instead of complete revocation would be more appropriate.

In reexamining the case, however, the Review Board affirmed that "willful interference with radiocommunications is a serious offense specifically prohibited by the Communications Act and warrants the removal of a station license and suspension of an operator license." Questions of indecent language and lack of candor were not even considered. The Review Board agreed with the "Administrative Law Judge's findings of fact as well as ultimate conclusion that [subject to appeal] Gilbert's amateur station license should be revoked and his amateur operator's license suspended."

FCC WANTS TO ELIMINATE CB, R/C LICENSES

Citing the now familiar "savings" rationale, the Commission has proposed to get rid of individual licenses for radio-control (R/C) operators and for operators in the Citizens Band Radio Service. Individual station call signs would also be eliminated, and there would be no minimum age requirement.

The FCC emphasized that it will enforce R/C and CB rules even though station licenses are eliminated. The Commission is seeking comments on whether:

- *license plate numbers are the most appropriate means of identification for the CB Service.*
- *rules requiring CB identification would help resolve interference problems without FCC intervention.*
- *effective use of voluntary and uncompensated CB radio operators would require some sort of unique CB identification.*

Swift action on these proposals is expected.

FCC SAYS "NO" TO CB EXPANSION

The Commission has denied three petitions to expand the Citizens Band Radio Service and to create ssb-only channels. *CB Magazine* requested that frequencies above Channel 40 (27.405 MHz) be set aside for ssb-only operation. The Washington State CB Radio Association wanted to create a "hobbyist class" in the Amateur Radio Service using ssb to operate on frequencies above CB channel 40. The Personal Radio Operators International Federations petitioned for a broad restructuring and expansion of the personal radio services to provide four CB-type radio services at 26, 220 and 900 MHz, and to set aside frequencies for ssb-only operation. The ARRL opposed these petitions.

The Commission didn't consider the petition to create a "hobbyist class" within the Amateur Radio Service without a Morse code proficiency exam because it "would violate the International Telecommunication Union's regulations." Referring to the other proposals, the Commission said that "while the number of users per channel (loading) is still high, the CB Service overall is shrinking and expansion of channels is not warranted. Finally, allocating more frequencies above CB channel 40 would increase the problem of CB interference with television reception and would exacerbate the Commission's enforcement burden. . . There is no compelling need to expand the service or to set aside sideband-only channels within the Service. To the extent that the problem still exists, the public interest plainly lies not in more channels, but in more cooperation among users."

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Pioneer of the Airwaves

Gwen Burnett, VE3AYL, is 1982 CRRL Amateur of the Year. We are grateful to the publishers of The Toronto Star *for giving permission to reprint this article.*

The 75-foot tower outside the large, comfortable Willowdale home is a dead giveaway. It informs passersby that Gwen Burnett is still keeping up the passionate love affair with Amateur Radio begun back in 1930 when she received her license.

Her husband, Sid, who ran a radio and appliance store and once had a column in *The Star* called "What's Wrong With Your Radio?", also built an Amateur Radio station in their home, from which he and Gwen called to other radio enthusiasts around the globe. Sid died in 1970.

Daughter Corinne and her husband, Tom Poole, who now live north of King City both had amateur licenses too, though they've since let them lapse. "We've always been a radio family," Gwen says. "I'd have to say I've often been a lot closer to people I know only by their call letters and names than I've been to neighbors just a couple of doors down the street."

Her call letters are VE3AYL, and though there's nothing to be made of the first three figures — which merely identify the Ontario zone — she still interprets the last three letters to mean "A Young Lady." The call letters filled the air during Hurricane Hazel, when the Burnetts set up a mobile radio station in Bradford, 25 miles north of Toronto, and relayed messages to people whose phones had been cut off or washed away by the flood waters. They received an official citation for their round-the-clock operations during the disaster.

Besides being a distinguished pioneer of the airwaves, honored wherever she goes, Gwen Burnett is an excellent musician. Every day she practices on both the piano and Hammond organ, not only for pleasure, but because the exercise keeps her hands supple for sending Morse code, which she does as easily as others might darn a sock. Kathleen Stokes, star of the old CBC radio show, *The Happy Gang*, lived nearby and used to come over and play organ duets with Gwen, many of them arranged by Gwen herself.

She is also a collector, mainly of music boxes and clowns, both porcelain figures and pictures. Red Skelton is a favorite. In her basement she has a huge replica of the dog who used to be featured on "His Master's Voice" phonograph records. "It has a record player inside it," Gwen explains. "But people are often surprised to hear music coming from its head."

Gwen regularly "skeds" with friends as near as Bancroft and as far away as England, both on radio phone and Morse code. But her favorite method of communication for the last 17 years has been via amateur radioteletype, the system whereby a message is typed on a keyboard and shows up on the sender's screen and the distant receiver's screen as well.

Since 1970, Gwen has been editor of a monthly bulletin called *RTTY News*, the house organ of CARTG, the Canadian Amateur Radioteletype Group. The group has some 300 members, some as far away as Saudi Arabia and Zimbabwe.

Gwen is not only the editor, but the whole staff of *RTTY News*. She types the 10-page bulletin, makes stencils, does most of the technical drawings, collates, stamps and handles the mailing. The range of her interests can be seen from a recent issue, which has one story with the incomprehensible (to this writer at least) title of "ST-6 Mods for 110 Baud ASCII." It also carries a plug for Scarborough teacher Joan Cable Forge, whose book, *Teach Yourself the Keyboard*, guarantees to teach anyone to manipulate a typewriter, computer terminal or word processor in less than eight hours. "In this age, this is a skill everybody ought to know," Gwen says.

Astonishingly, for one surrounded by the most modern electronic equipment and musical instruments, Gwen Burnett prints the bulletin on an ancient hand press. She has to laboriously crank each of the 3000 pages through separately. But she doesn't complain. "Like the piano and the organ, it helps keep me active and out of that old rocking chair."

Next to traveling the world on the airwaves, Gwen's greatest interest is probably traveling the world in person. In the past few years she's been to most European countries, to Mexico, Hawaii and Alaska twice, and to virtually anywhere else in North America that she can drive her beloved air-conditioned Cadillac.

Everywhere she goes, she's among friends, because she's a member of the Quarter Century Wireless Association, the Canadian Radio Relay League, the Radio Society of Ontario, the Canadian Amateur Radio Federation, the British Amateur Radio Teleprinter Group, and many others. A close friend claims that, by her own example, she has induced close to 150 other women to take up the fascination and useful hobby of ham radio, in Ontario alone.

Gwen is modest about her own contributions to the radio field, and mentions instead the thousands of wonderful and interesting hours of enjoyment radio has brought her. Her most thrilling moment? "That's easy," she answers with a nostalgic smile. "It was just after I got my license and heard my own name and call letters being used over the air. I was so proud and happy I could hardly breathe." — *William Stephenson, The Toronto Star*

HAPPENINGS

☐ If you've been reading *QST*, you know that League field organization is changing. Section Managers are replacing Section Communications Managers. Duties are similar, but Section Managers are also responsible for club liaison, public information work and much, much more. Section managers will be working closely with their elected ARRL division directors, but in Canada that will likely be the elected CRRL regional directors. Canada is too big for the ARRL Canadian Director to relate effectively to section managers who may be 3000 miles apart. Besides, the ARRL Canadian Director has his hands full as president of CRRL. Final details of how the new League field organization will be implemented in Canada will be worked out cooperatively with the seven Canadian Section/Section Communications Managers during the year.

☐ On November 24, CRRL Director Ray Perrin, VE3FN, met with the technical executive of CCTVA, the Canadian Cable Television Association, in Ottawa. Discussions centred on the problem of interference on mid-band cable television channels. CCTVA reps pledged to cooperate with amateurs in every way possible. They also agreed to the reporting procedure developed by VE3AR, VE3CDM and cable television reps at an earlier meeting in Toronto. Amateurs experiencing interference to or from cable television systems should report the interference in writing to the local cable company. Copies should be sent to the nearest office of DOC and to the Canadian Cable Television Association, Suite 405, 85 Albert St., Ottawa, ON K1P 6A4. One related item: Just before this meeting, a Halifax cable television company was forced to stop using mid-band channel E because of interference to 2-meter amateur operation.

☐ CRTPB, the Canadian Radio Technical Planning Board, met in Ottawa on December 9. Amateurs were represented by Ray Perrin, VE3FN, of CRRL, and Bill Wilson, VE3NR, of CARF. The Electromagnetic Interference Committee reported that complaints of interference had increased 29% over the number received the previous year. DOC reported it would soon release results of interference-immunity tests performed on a sampling of current-production television sets.

☐ Also in December, DOC announced it would release a discussion paper dealing with fee increases for all radio licenses. This would include Amateur Radio licenses. At press time, it appeared that there would be no increase this year. There could be a small increase next year, consistent with the federal government's 6 and 5% restraint programme. The earliest for any major increase would be April 1985.

NOTES FROM ALL OVER

☐ Amateurs across Canada will be saddened to learn of the deaths of Walter Dolphin, VE2TD, and Len Sumner, VE3DOR. Both gave outstanding service to Amateur Radio. Walter was editor of the independent *VE2TD Newsletter*. Len was founder and first manager of the CRRL Central QSL Bureau.

☐ Once again, the Northern Alberta Amateur Radio Club is sponsoring code practice on the air. Listen Mondays, Thursdays and Saturdays at 0300 UTC (that would be Sundays, Wednesdays and Fridays local time) on 3747 kHz. Code is sent at 8 wpm, increasing to 18 wpm before the end of each session. Operator is Bill Gillespie, VE6ABC.

*163 Meridene Crescent West, London, ON N5X 1G3

IARU News

Conducted By Richard L. Baldwin,* W1RU

New ITU Secretary-General Salutes Radio Amateurs

On the eve of World Communications Year 1983, International Telecommunication Union Secretary-General elect Richard E. Butler had the following words for radio amateurs worldwide:

> At the moment I take office as secretary-general of the International Telecommunication Union and at the beginning of World Communications Year 1983, I have pleasure in sending a message of goodwill to all Amateur Radio enthusiasts throughout the world. The pioneers of Amateur Radio distinguished themselves by opening up the frequency bands now in daily use for broadcasting and commercial radio services and thus made a memorable contribution towards technical progress. You have been called upon, in times of disaster such as floods, earthquakes, fires, hurricanes and epidemics to play a humanitarian role in mobilizing help and saving lives. Radio amateurs have not only adapted themselves to technical progress but have often been its forerunners. The rapid growth and worldwide diffusion of technological change and its application to all aspects of life, coupled with the rising expectations of all peoples to secure material well-being, makes it certain that international order will remain at risk if the distribution of the benefits of technological resources is not continuously the subject of international decision-making. Radio amateurs have of course the opportunity to contribute to the decision-making process at international level, either through the respective telecommunications administration or through IARU. I also appreciate that Amateur Radio is, above all, a fascinating educational activity whose universality fosters friendship, goodwill, technical know-how, technical assistance for developing countries and greater understanding among peoples all over the world. The recent ITU Plenipotentiary Conference, held in Nairobi, in 1982, has once again recalled the vital importance of all telecommunications services for social and economic development and the achievement of a new world information and communication order. The conference hailed also the designation of 1983 as World Communications Year. In proclaiming the Year, the United Nations General Assembly sought to encourage the in-depth examination and analysis of national communications development policies and the accelerated development of communications infrastructures. The Nairobi Conference decided also to establish during World Communications Year 1983 an independent "International Commission for Worldwide Telecommunications Development" to be composed of representatives of the highest decision-making authorities with specific term of reference to examine and recommend a range of methods both tried and untried "for stimulating telecommunications development in the developing world using appropriate and proven technologies" leading to "progressive achievement of self reliance. . .and the narrowing of the gap between the developing and developed countries." The coming years will be years of innovation and dialogue between all partners in the world of telecommunications including radio amateurs — a meaningful, realistic dialogue that should take account of the needs of all. Thus, as 1983 opens, I am confident that radio amateurs all over the world will actively contribute to the success of World Communications Year — development of communications infrastructures — either through participation in projects and events of their national amateur radio societies, the national WCY committees, through IARU and finally through the World Communications Year Secretariat at ITU headquarters. I wish you all a successful World Communications Year 1983.

RAST HOSTS SEANET

The SEANET Convention (Southeast Asia Net), hosted by the Radio Amateur Society of Thailand, held in Bangkok November 12 to 14, 1982, was acclaimed by the attendees as the largest and best SEANET convention to date. With more than 150 registrants from 20 different countries, all three IARU Regions were represented. The convention was formally opened with the Friday evening banquet, at which time the deputy minister of communications of Thailand welcomed the delegates and set the theme for the three-day meeting. Authorization was granted for operation of a station at the Imperial Hotel, where HSØSEA went on the air and was given a good workout.

The convention program included a visit to the megawatt transmitter site of the Voice of America, with Ray Sigda, W1RPW/HS1ANJ, as the host, and a trip to Ayutthaya, the ancient capital of Siam, where the governor of the province welcomed the group and was the host for lunch. The Saturday evening buffet had a social theme and was attended by 200 delegates and local amateurs. The convention closed on Sunday with a business session for SEANET members, followed by a slide presentation by JA1AD that highlighted the position of leadership held by the late General Kamchai Chotikul, HS1WR. The convention theme was a memorial to his devotion to Amateur Radio in Thailand, Southeast Asia and throughout the world as a strong force in IARU.

On Monday evening, ecumenical religious rites were conducted at the Wat Sommanas Viharn by Buddhist Monks as a memorial to HS1WR, with eulogies by JA1AD, representing JARL; 9V1RH, representing IARU Region 3; and WØBWJ, representing ARRL and IARU Hq. — *WØBWJ*

At the 1982 SEANET Convention, l-r: HS1NG, HS1FG, 9N1MM, HS1ANL, HS1YL, K3ZO/HK3NBB, W2NSD/1, WØBWJ.

9N1MM operating HSØSEA at the SEANET Convention, Bangkok 1982. Backup operator is WØBWJ.

MEXICAN AMATEUR RADIO BOOKS

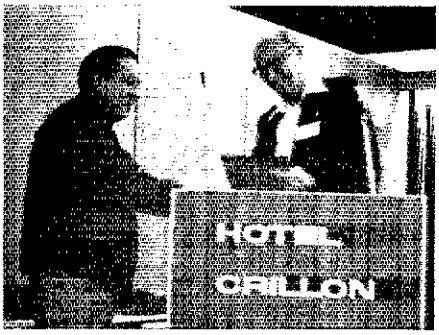
Liga Mexicana de Radio Experimentadores, 1981 publisher of *Red Nacional de Emergencia — Manual de Tecnicas de Operacion* and *Guia de Estudios para la Licencia de Radioaficionados*, has recently published its third book. This latest title, *Manual de Tecnicas de Operacion en el Servicio de Radioaficionados*, consists of 310 pages, covering various aspects of operating. This operating manual, although designed for use by Mexican amateurs, will also be helpful to other amateurs who have a knowledge of Spanish and who wish to know more about Amateur Radio operating in Mexico. Further information on all three titles is available from LMRE, Box 97, Mexico, 06000 DF, Mexico.

VE3CJ HONORED BY RSGB

In recognition of his years of service as president of IARU, the Radio Society of Great Britain has elected Noel Eaton, VE3CJ, an Honorary Member of that society. VE3CJ joins a rather select group, as the honor is not frequently bestowed.

HP1GD, A SILENT KEY

Jorge Ernesto Dawson, HP1GD, passed away on October 21 in Panama, R.P. He was a past president of the Liga Panamena de Radioaficionados and for the past three years had served faithfully and effectively as net manager and control station for the weekly IARU Region 2 Net. Jorge served as a delegate of the LCRA to the IARU Regional Conference in Panama in 1978 and Lima in 1980, receiving an award at the latter for his outstanding performance of his net managerial responsibilities. Jorge was completely at home conversing in both English and Spanish, and was uniquely suited to the task of managing an international bilingual net. He is greatly missed by all who had the privilege of knowing him.



Jorge Dawson, HP1GD (l), receives his net manager's award from Victor C. Clark, W4KFC, president of ARRL and vice chairman of Region 2.

*President, IARU

Correspondence

Conducted By Peter R. O'Dell,* KB1N

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

NO-CODE — A "COHN" JOB?

☐ That was a real heart-rending letter from Charlie Cohn, KB9XV, about how he and his Mensa friends couldn't get additional amateur privileges because of the Morse code requirement (Correspondence, Dec. 1982 *QST*, p. 73). Now I know just what he means. I used to be in Mensa. There were lots of really neat people in it in those days, and most of them had similar laments: "Here I am with this high IQ, but nobody will give me my due." I guess some of us are just plain old doers and not thinkers. I'm just a plain old bona fide, certified, card-carrying red-neck that likes to do good ole down-on-the-farm things like copyin' 30 wpm and tossin' pasture pizzas. Actually, what got me to thinkin' back then was some old buzzard who asked, "If yur so dad-blamed smart, why ain't you rich?" Come to think of it, my frustrated Mensa friend, if yur so dad-blamed smart, how come you can't master a "mere" secretarial skill like copying code? — *B. B. Turner, K2SJM, Fairfax, Virginia*

☐ My heart bleeds for the "fellow Mensa members" of KB9XV who, despite all of their intellectual superiority, lack the "low-level neuromuscular skill" to master cw. I can only assume that they also lack the ability to walk and chew gum at the same time, and that they have to be spoon fed to prevent severe stab wounds in the facial area. Why don't these guys just go ahead and admit they lack the desire and tenacity? — *Roy Moses, KS5Q, Denton, Texas*

☐ I find it quaint for Mr. Cohn to "weasel" out of a task he hates. If he can't or won't learn faster cw, fine; "to each his own," they said, when the old lady kissed the cow.

He mentions low-level neuromuscular skills, typically typing and shorthand (by implication, unsuited to high-level intelligences such as Mensans). Are Mensans really far above learning skills like typing, shorthand, etc.?

Just think of the "weasels" now open to me. But for a few low-level neuromuscular skills I could play anything with strings like Roy Clark, paint like Dali and type like a Mensan named Isaac Asimov. — *Harold Halvorsen, KE3X, Silver Spring, Maryland*

☐ As a former Mensa member and current Amateur Extra Class, I cordially invite Mr. Cohn to take his little yellow Mensa map pin and sit on it. — *Mike Fusco, KA5NNG, Los Alamos, New Mexico*

☐ If deregulation were to eliminate all technical requirements for the phone license, phone operation would still demand the skill required to operate an electric toaster. My cat, Bunky, has that now, but like so many other phone buffs she detests the Morse code requirement because she can't learn it. What more can you expect from a dumb animal? — *Jim Pentland, W2VGO, York, Pennsylvania*

☐ I just read President Clark's article in the December issue. I like his style of writing — very lucid and well put. However, I can't understand how his excellent defense of cw relates to the "no-code license" controversy. I'm sure it's been very clear right along that, if a no-code license ever is promulgated, it will only allow operation in the vhf and higher bands. In fact, international agreements require a knowledge of Morse code for operation below 30 MHz. I don't think any knowledgeable person would propose changing that.

As logical as his arguments are, it is also logical to look at the type of operations most often used in the vhf and uhf bands. Outside of occasional cw work (auroral, EME, etc.), most operations are strong-signal mode — primarily fm. F2 has become the accepted mode for RTTY and ASCII work above 144 MHz. Cw is certainly a rarity on these frequencies.

The excellent band plans allow for uniformity and ease of operation. This, combined with the perceived utility of repeater operation for emergency help, autopatch, public service work, etc., adds up to a strong appeal to a lot of people. The most intelligent (and most desirable) aspirants, however, often find the cw requirement to be unreasonable, because they view it as unnecessary for their immediate, primary interest in communicating: short-range fm vhf. A great deal of the time it is viewed as so unreasonable as to be a "turn off" to the whole Amateur Radio scene. Once introduced to the amateur world, these same people may very well develop a strong enough desire to learn the code so they too can enjoy the thrill of "talking" to distant lands.

It's also interesting that the League does not see fit to publish any pro no-code arguments, except for asinine comments like those of KB9XV. You may be interested to read my piece in November *Worldradio*. I also submitted it to *QST* about five months ago. It seems once the League takes a stand on something they want to prove they were right.

So, I'm in favor of the no-code license. I see no conflict there at all. In fact, a no-code license would stimulate the growth of Amateur Radio and actually increase the code activity. — *David A. Ernest, WD8OYO, North Ridgeville, Ohio*

[Editor's Note: Well over 90% of the people writing to this column about the no-code license have indicated their opposition to it. More than 30 writers commented on KB9XV's letter; all, including Mr. Ernest, were critical. We will consider any letter that is not obscene, indecent or libelous. This column belongs to the reader — you. We simply pick a representative sampling of your opinions.]

☐ Praise and high marks should be bestowed on Vic Clark for his timely article "Some Thoughts on the Morse Code." His intelligent, articulate thoughts should set the record straight once and for all regarding Morse code as a requirement for an Amateur Radio license in the USA. — *Ervin Jackson, Jr., N4BIG, Charlotte, North Carolina*

☐ I would like to add my thanks and applause for Vic Clark's article. This is a very thoughtful and beautifully written piece, and I am sure it expresses the opinions of all dedicated cw people. — *Fred Rosenbury, KA1GEN, Natick, Massachusetts*

FAVORS STIFF REQUIREMENTS

☐ I feel that no radio amateur should be allowed a license if he or she does not know the fundamental relationship between frequency, wavelength and speed! To my surprise and delight, the wonderful hobby of Amateur Radio still survives. No doubt this is due to the licensing requirements of stiff code, electronics theory and regulation requirments! If high standards and touch enforcement are relaxed, the "dam will break" and pandemonium will reign on the amateur bands!

This "old-timer" must admit there has been some improvement because in the "old days" I never heard:

"Is this frequency in use?"

"Yes it is. Thanks for asking." — *Sparky Barr, W9KJU (ex-9AOQ), Lake Geneva, Wisconsin*

THE ARRL LETTER

☐ Received the new *The ARRL Letter* on schedule and find it very informative, and hope that it is a success. — *George Chaet, W1RGH, San Diego, California*

☐ My hearty congratulations to your staff who put together the "members only" *ARRL Letter*. I have received and enjoyed the first two issues. Most interesting. — *H. A. Arsenault, K1PLR, Stamford, Connecticut*

☐ Whoa! Back up! As a member of ARRL, I depend on *QST* to keep me informed. I may be missing something by not also subscribing to some of the other publications, but I expect *my own* organization not to hold out *and charge separately* for in-depth treatment of many important subjects. If you must issue a newsletter, I either expect to get it at no-extra charge as a part of my membership, or it will eventually appear unabridged in *QST*. — *Bruce E. Lackey, WB3HAE, Rockville, Maryland*

[Editor's Note: Nothing is being "held out" of *QST*. The lead time for news to appear in *QST* or any of the Amateur Radio magazines can be two months or more. *The ARRL Letter* is turned over to the printer at 2 P.M. on alternate Thursdays and is in the mail by 5 P.M. the next day. For instance, details of the new 30-meter band were in the mail (First Class, too) the day after the FCC acted.]

*Public Information Officer, ARRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Broadcasting

From time to time, amateurs find themselves in situations such as the following: a news reporter for a city broadcasting station asks a ham at the scene of a disaster to provide backup broadcast remote pickup assistance. Or hams at the scene will be asked to relay information via Amateur Radio back to the media in the city. Are these cases of broadcasting and illegal business communications? Or valid Amateur Radio public service functions? This month we'll examine these issues and more.

Q. What are the rules governing Amateur Radio and broadcasting? Business Communication?

A. First, broadcasting is prohibited by Sec. 97.113 of the Rules: "an amateur station shall not be used to engage in any form of broadcasting, that is, the dissemination of radio communications intended to be received by the public directly or by the intermediary of relay stations, nor for the retransmission by automatic means of programs or signals emanating from any class of station other than amateur."

In plain English, this means you can't do broadcasting; that is, transmit information to or for the general public. And, you can't retransmit signals of other-than-amateur stations. As a general policy, it is not good amateur practice to use Amateur Radio as an alternative to other communications services that are regulated by rules developed through the rulemaking process.

Business communications are prohibited in the Amateur Radio Service. Business communications mean "any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party" (97.114[c]). Business messages have no place in Amateur Radio except in a bona fide emergency situation when there is immediate danger to life or property.

Q. Are there any exceptions to the broadcasting prohibition?

A. No, but there are two related provisions that should be mentioned. One, certain one-way communications are permitted in Amateur Radio, and are not construed as broadcasting: emergency communications, information bulletins consisting of material of interest to amateurs only, net-type operations and code-practice transmissions. And two, amateurs *may* give their consent to having their amateur transmissions be transmitted by broadcast stations provided the amateur signals contain no reference to the broadcast. (Secs. 97.91 and 97.113). For example, a *PM Magazine* crew from Hartford TV Channel 3 visited the Maxim Memorial Station W1AW to film a segment for its show. During the filming, scenes were shot showing how hams talk with each other over the air. It is all right under the Amateur Rules for a broadcast station to transmit these scenes, as no mention of the impending broadcast by TV Channel 3 was contained in the amateur transmissions. (The broadcast station may have to obtain permission from the FCC, however, to retransmit the ham conversations per §73.1207[c]).

Q. Why can't I broadcast world news to the public?

A. Check the basis and purpose of Amateur Radio. There is no way that broadcasting to the general public fulfills the purpose of Amateur Radio. Communication in Amateur Radio means noncommercial communication solely for the personal aims of the amateur, without business interests. (Secs. 97.1 and 97.3).

Q. Why, then, can W1AW transmit information bulletins?

A. W1AW transmits information bulletins of interest to amateurs *only*. This is provided for in Sec. 97.91 of the Rules. No general-interest bulletins or information is transmitted. W1AW operation is not construed as broadcasting.

Q. Can I retransmit weather broadcasts that I pick up on my vhf scanner?

A. No. The Rules specifically prohibit the retransmission by automatic means of programs or signals emanating from any class of station other than amateur. (Sec. 97.113). However, there is no problem with listening to the wx bulletin, and then passing the info along on an amateur weather or emergency net.

Q. Our local radio club was asked recently to provide a remote pickup for a downtown broadcast television station KICE. Its news reporter would use one of our members to relay a "live" report back to the station newsroom. Would this be permitted by the Rules?

A. No, simply because such operation is *not* what Amateur Radio is intended for. You would be engaging in a form of broadcasting (97.113) and facilitating the regular business affairs of the broadcast station, which is a violation of Sec. 97.114 specified earlier. To do so would constitute poor amateur practice (97.78), and be inconsistent with the very basis and purpose of Amateur Radio (97.1).

Q. Could we simply relay news information from a disaster scene back to the KICE newsroom?

A. Again, no, because of the business and commercial aspects outlined above — you would be *providing an exclusive service to KICE, thus giving it a competitive edge*, and facilitating its normal business.

Q. A local TV station here in Needham wants to do a story on our club's Field Day exercise. Is there any problem with having them rebroadcast our Amateur Radio FD transmissions either live or delayed?

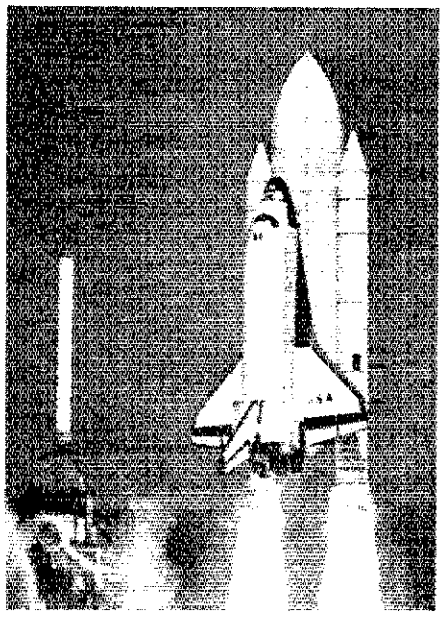
A. No problem. In fact, it's a great way to gain Amateur Radio some public exposure. Simply bear in mind that your operators must not make any reference to the TV station's rebroadcast in their amateur transmissions. (97.113). For example, don't say "thanks for the FD contact, and you're a celebrity at this very moment on Channel 3 News!"

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

The Space Shuttle Story

Many hams have asked "Is it okay to retransmit the communications signals of the Space Shuttle *Columbia?*" The answer, of course, is no. Sec. 97.113 prohibits the retransmission of signals of other radio services. Recently, however, the exciting sounds of Space Shuttle communications were heard on the ham bands. So what gives? The answer is that a special *Order* issued by the FCC granting a 90-day waiver of Sec. 97.113 to the Jet Propulsion Laboratory Amateur Radio club (W6VIO) and the Johnson Space Center ARC (W5RRR) allowed for just this operation. The waiver allowed W6VIO and W5RRR to retransmit Space Shuttle communications on the amateur bands for the November 11, 1982, NASA mission *only*. The retransmitted communications were for the *sole* benefit of licensed amateur radio operators. Retransmitting Shuttle communications from either of these stations, or from other Amateur Radio stations, is okay. The general public was *not* invited to listen on the amateur bands for the special retransmissions. Special permission was obtained from NASA in advance of the flight. The Commission said the waiver provides for experimental uses of radio frequencies, and encourages "the larger and more effective use of radio in the public interest."

Perhaps we'll witness similar Space Shuttle/Amateur Radio waivers in the near future. And even more exciting is the possibility of onboard Amateur Radio activity in just a few months! Stay tuned.



*Assistant Manager, Membership Services, ARRL

On Line

Conducted By Stan Horzepa,* WA1LOU

Translation Programming

We are in the midst of the personal computer revolution. Today, a complete computer can be brought through your front door for under $100. During the past holiday season, some of you may have joined the revolution upon opening a certain gift, and now you are thumbing through the ham radio and computer magazines looking for programs to key into your machine.

There are a lot of programs available today. The problem is that there are also a lot of different computers available; that interesting program you find listed in *QST* may be written for a computer other than the one you own. Don't despair; in many cases it is possible to translate a program written for a Brand X computer to your brand. This installment of On Line will explain how to translate programs written in machine language and BASIC.

On Line Lexicon

Instruction — one of a number of statements that command the central processing unit (CPU), a microprocessor, to perform a function.

Instruction set — the complete list of "instructions" that command a particular microprocessor, for example, the Z80 instruction set.

Object code — the result of an assembled "source code" program; it may be executed directly by a computer's CPU.

Source code — programming statements, usually three-letter mnemonic symbols, that represent the "instructions" that command a computer's CPU; the source code must be converted, "assembled," into object code before it can be executed by a CPU.

Microprocessor Equality

Translating machine language programs from one computer to another may be very easy or impossible; it depends on the microprocessor, μP, used in each computer. With machine language programs, it's not a translating process but rather a transferring process, as you shall see.

To transfer machine language programs, the μP in each computer must be the same. For example, a machine language program written for a computer using a 6502 μP may be used with any other computer that has a 6502 μP, but not with a computer using another μP.

Also, machine language programs may be used with computers that have μPs that are upwardly compatible to the μP used to write the original program. For example, a program written for a computer using an 8080 μP may be used with a computer that has a Z80 μP; the Z80 is an expanded version of the 8080 and is upwardly compatible.

Downward compatibility is not necessarily so; that is, programs written for a computer with the upward-compatible μP may or may not be used with the computer using the lower-order μP. Downward compatibility depends on the *instructions* used in a program. (The accompanying sidebar defines the italicized words.) For example, the Z80 μP *instruction set* includes all of the 8080 μP instructions, plus instructions that are unique to the Z80. So, if a program written for a Z80 μP limits itself to instructions used by the 8080 μP, then the Z80 program may be used by the 8080 μP. If the Z80 program uses instructions that are uniquely Z80, however, then the program may not be used by the 8080 μP.

Go to the Source

Once you have determined that the program you wish to transfer has been written for the same (or a compatible) μP as the one used by your computer, the actual transferral process may begin. If life were easy, all computers would use the same methods for loading programs. That would mean that a Radio Shack TRS-80® Model I machine language program (a Z80 μP program) saved on cassette could be loaded into any other computer that had a Z80 μP and cassette interface. But, life is not easy. Very few computers are so compatible; therefore, to transfer machine language programs with relative ease and without requiring a degree in machine language programming, follow the procedures I am about to describe.

The first step is to obtain a *source code* listing of the original program. If the program is published in a magazine or book, the source code is usually included. If the program is one you have purchased off the shelf in a cassette, disk or plug-in cartridge format and no source code listing is available, you must obtain a listing from the computer for which the program was originally written. Assuming you have access to that computer, you will have to use a disassembler program that converts the machine language program *object code* into source code. (Disassemblers are available for many computers, but not all.)

Once you have obtained the source code listing, it is a simple matter to key the code into your computer using an assembler program. Once the program is keyed in, you command the assembler to convert (or assemble) the source code into the machine language program that may be run on your computer. Save the program on cassette or disk, and you have successfully completed the transferral.

BASIC Dialects

BASIC is the universal language in personal computing. Basically, the version used in one computer is the same as the version used in another computer, in that BASIC words, at (commands, functions and statements) perform the same task in each version. For example, GOTO 1000 will get you to line 1000 no matter which computer you are using.

If BASIC programs were limited to the most common words, they would be interchangeable among all computers. All you would have to do is obtain the listing of the BASIC program you desired, key it into your machine, and enter RUN.

Again, life is not easy. Nearly every version of BASIC has something that another version lacks. Some versions have obscure words not found in other versions. Invariably, this obscure word will pop up throughout the program you wish to use, and it so happens that your computer's BASIC lacks that word.

In some cases, you can get around this problem. If you determine the function of the word, you can write a program routine that will perform the same function. It is a good idea to study the original program to get a feel for how it works and to understand how the word fits into the program. If you can't write a routine as a direct substitute for the word, you still may be able to get the program to run on your computer by programming around the word.

There are some books that can help you in this effort. One is *The BASIC Handbook* by David A. Lien, W6OVP (CompuSoft Publishing), which covers the various versions of BASIC now running on the more popular personal computers. This book defines each BASIC word and, when possible, presents BASIC program routines for versions of BASIC that lack particular words. If you intend to do a lot of BASIC program conversions, a book such as this will save you a lot of blood, sweat and tears.

Graphics, PEEKs and POKEs

Converting BASIC graphics from one computer to another requires patience — lots of it. The video displays of most computers are incompatible; therefore, the same BASIC graphic words will produce different results in different computers. To make matters worse, many computers have BASIC graphic words that are unique to their systems.

To convert BASIC graphics, you must study the original program to determine what the graphic words are trying to accomplish. Then, you can to try to duplicate their results in your computer using the tools at hand, that is, the graphic words in your BASIC. Sometimes this task is impossible, and you will have to scrap your plans of duplicating the graphics. If the graphics are an integral part of the program, you can design your own; however, if the graphics are unnecessary, skip them.

PEEK and POKE statements are the downfall of many BASIC conversions. The complexity of converting PEEKs and POKEs would require more pages of explanation than *QST* can contain, and the work involved would likely dissuade anyone but the hardiest (or hardheaded) among us. So, if the program you wish to convert is full of PEEKs and POKEs, look elsewhere.

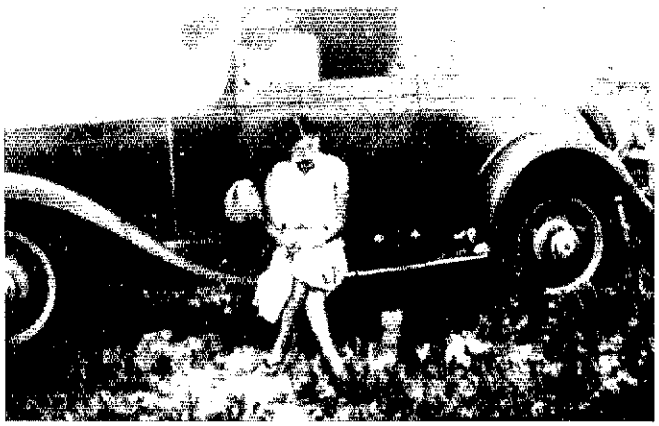
That's it! With this information, you now know what is involved in translation programming and how to get through it with a minimum of difficulty. So, get your hands dirty and do some program converting. As some old wise guy once said: "Practice makes perfect."

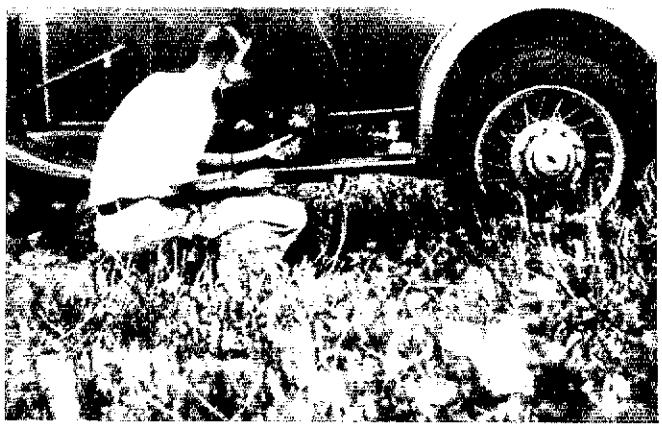
*72 Stiles St., Waterbury, CT 06706

How's DX?

Conducted By Ellen White,* W1YL/4

Durability — KH6IJ





Even back in 1932, K6CGK (KH6IJ) had the interest and support of YL Matsuyo (left) while Nose checked the band on his early mobile.

Fifty years ago, a junior at McKinley High School in Honolulu got bitten by the Amateur Radio bug and, fostered by faculty advisor K6CIB, wound up as K6CGK. This half century of hamming by the now-inimitable Katashi Nose, KH6IJ, has touched the lives of countless aficionados of our craft. His contributions have enriched us all.

When he first started out, Katashi lived quite a ways up in Nuuanu Valley, on the old Pali Road, hemmed in by low mountains on two sides. To radiate to the mainland he had to aim for the Pali gap. In those early days, much of the equipment was homemade; his first station included a 201A, later a 245, and then 210s.

KH6IJ graduated from the prestigious University of Hawaii in 1937, a time when jobs were scare. For a brief period he repaired radios, until a high school on the Island of Kauai hired him to teach chemistry (along with electronics!). Naturally, Nose turned out almost as many hams as chemistry students — hams who have become very successful in their professional lives. On Kauai, he enjoyed a superb DX location plus access to an antenna testing range, which he used to experiment and develop his beam antenna. *(The ARRL Antenna Book* has carried his design for years.) After 22 years on the "Garden Island," Katashi was invited to join the faculty of the University of Hawaii in Honolulu, a post he held for 17 years. He retired in 1979 following a stroke earlier that year. His service as Associate Professor of Physics was recognized by the University in 1971 with its "Excellency in Teaching" award. In the '70s, he installed a low-cost communications system in the South Pacific (the Marianas and New Caledonia) for Peacesat, a University Project. The system was previously described in *QST* and is still in operation.

DXing in those early days held many thrills, particularly on 40 meters! One of his first 7-MHz DX contacts was with OB2SK, an advisor to the Sultan of Brunei. South Africans were on nearly every morning and regularly worked. Other good DX included Tibet's AC4YN and stations in the Belgian Congo, Reunion and Mauritius.

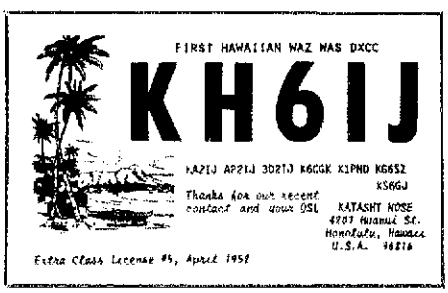
Within the confines of this column, it is almost impossible to fully cover the life and times of this superb ham. In fact, it will be necessary to list some of his many activities/accomplishments briefly in lieu of a narrative, to be sure we touch on some of the high spots! KH6IJ has written the Honolulu *Star Bulletin* column, With Hawaii's Radio Amateurs, since 1936. It is the oldest column in the islands, including those syndicated. He has been a contributing author for ARRL publications since 1947, and holds Extra Class license no. 4, issued in April 1952. His commercial telegraph and telephone licenses and endorsements have been current since 1940. He holds the first Hawaiian WAS, the first issued outside of the continental United States (no. 153, 1937); the first Hawaiian WAZ (no. 62, 1948); the first Hawaiian DXCC (no. 255, 1948), and has 354 countries confirmed. His contest certificates, medals, pins, cups, plaques, etc., number in the hundreds. He has earned the 1974 *QST* cover plaque award. KH6IJ was president of the Honolulu Amateur Radio Club for several terms, was a charter member of the WARC-79 Advisory Committee and served on the ARRL Contest Advisory Committee (representing *all* of the 6th Call Area) for two terms. In addition, he was an Advisor to the University of Hawaii IEEE Amateur Radio Club, an AMSAT Area Coordinator and a member of the Harvard Wireless Club. His calls over the years have included K1PND (Massachusetts), AP2IJ (Pakistan), KA2IJ and JH1YZT (while in Tokyo), 3D2IJ (Fiji), KG6SZ (Micronesia) and KS6GJ (Samoa).

In recent years, his compact Honolulu QTH has housed a Collins S-Line and a homemade 3-1000Z kilowatt linear, two FT-101s and homebrew transverters for 432, 144 and 50 MHz, and 1.9 MHz; TH6DXX and random wires and Yagis, as well as a 160-meter loop.

This ham's love of operating is legend, his fame as the consummate operator an acknowledged fact. This writer remembers back to the days of the two-weekend Sweepstakes, when Nose would keep on operating after the 40-hour limit was reached — not for *his* score, but to help others with a KH6 multiplier. His biggest thrill over the years has been to see youngsters he taught radio to from 1940 to 1962 become well established in commercial radio and government service.

His succinct style of operating is unique, as with so many other facets of his life. To those of us privileged to know this man, we've fondly joked for years: "If you want to know how to work DX, ask Katashi. Katashi Nose."

KH6IJ and Matsuyo today, in Nose's compact shack.



There's hardly an active ham worldwide who hasn't earned one of these distinctive KH6IJ pasteboards.

*19620 SW 234 St., Homestead, FL 33031

Peter McLennan, VKØAP (left), with Gil Sones, VK3AUI.

South Florida DX Association member WB4OSN/C6A looks somewhat stunned by his 28-MHz single-band performance during the CQWW. Joe worked 1400 contacts with plenty of EU activity. The rig was a Drake C-Line and a TA-32 Jr. at 80 feet. Oh yes, energy was supplied by a case of Molson ale under the operator!

English "actives" G3MCS (left) with G3KMA. (Thanks K9VV)

MACQUARIE ISLAND 6-METER OPERATION BY VKØAP

The Wireless Institute of Australia makes note of this welcome operation from this past October for a 12-month period. The station is located at 45° S. lat., 159° E. long., and is operated by Peter McLennan using the call VKØAP. Pete's gear includes a 6-meter multimode transceiver, a 100-W output linear and a 4-element beam. The keyer frequency is 52.100, but it may be shifted to 50.1 should VKs be allowed on 6 meters. The keyer sequence: six calls followed by a listening period. The keyer sends AR K following the last call sign before listening. The CQ calls take approximately 80 seconds, and the listening period is approximately 30 seconds. Normal output power is 10 W, with 100 W for making contacts and while initiating the keyer sequence. Direct cards via VK3FR, including cards plus s.a.s.e. or other means of return postage (airmail return with 2 IRCs). Peter's VK3FR address is 29 Woodcrest Rd., Vermont, 3133, Victoria, Australia. Cards, of course, via Bureau (VKØAP via VK3FR). VK3GJ developed the keyer program, and the equipment is courtesy of VK3NM and VK3AUI.

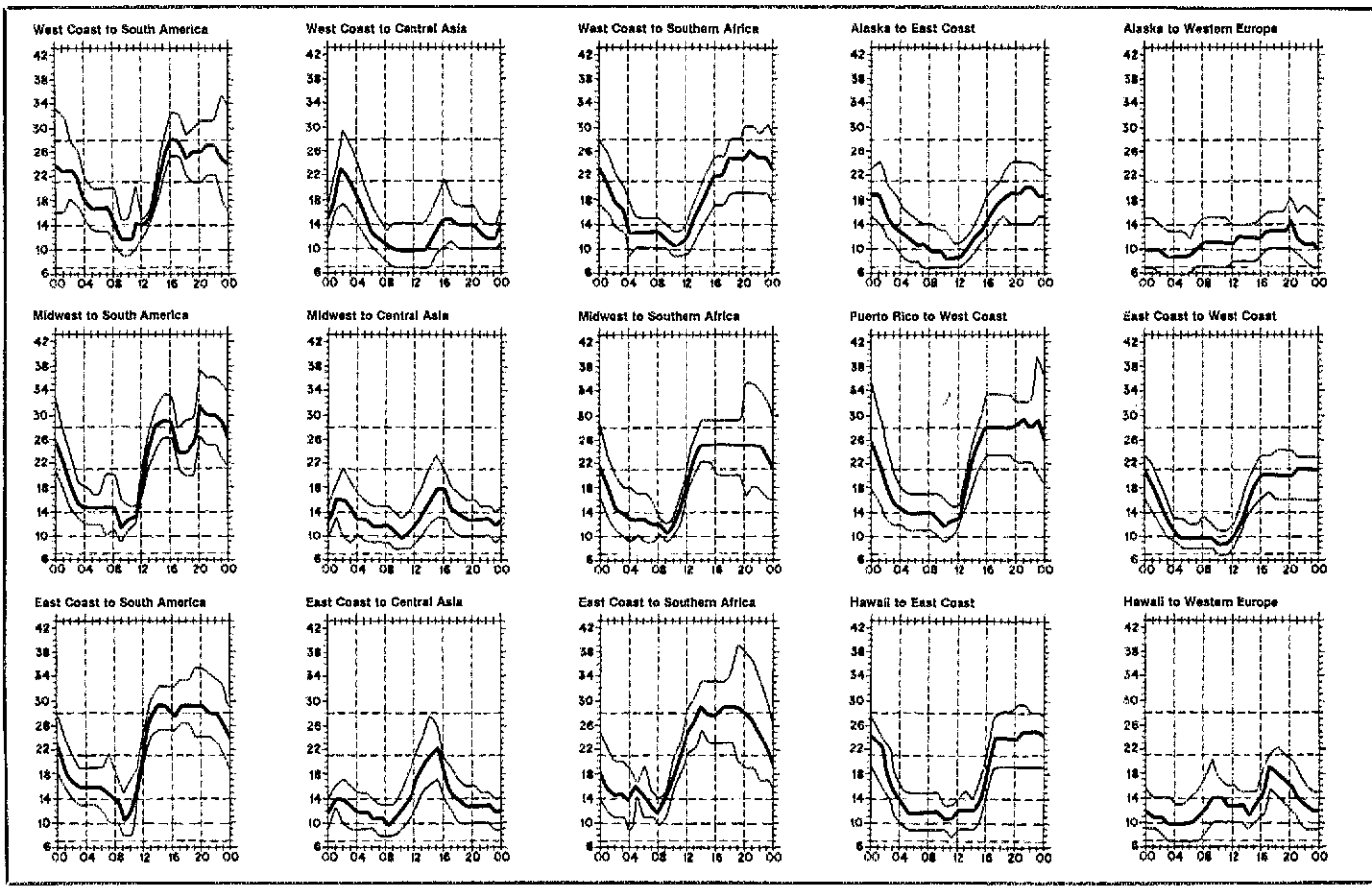
THE CIRCUIT

☐ Turks and Caicos, Feb. 28 to March 9 for the ARRL DX Phone Test. VP5XX or VP5X by WB8LDH, W8UVZ, WB9TIY and others. Before and after the contest concentration on cw and DX phone bands, 160 to 10 meters. QSL VP5XX to WB9TIY, others as announced.

☐ St. Vincent, J87LTA, operated by K4LTA, KØOSN and others from the Oak Ridge, Tennessee, area, will be active during the ARRL cw fracas and all bands cw and ssb the following 10 days. The crew will then join other Oak Ridge DX group member KR4C and WA4CDH on Antigua, March 4, where they plan to operate a multi-single effort in the phone DX Test plus a few days after all bands/modes with a V2 call.

☐ Curacao: W1BIH/PJ2 will be QRV through part of April, and plans on using special call P42J in both the ARRL cw and phone events, as well as CQ WPX. Please note that P42J cards (with s.a.s.e.) go to W1RM, Box 1188, Burlington, CT 06012, and the W1BIH/PJ2 cards go only to John's home call (hold and mail after May 1 and include an s.a.s.e. if a direct reply is desired).

☐ 9M6WW/KC6YA last Fall by W9GW reports reasonably good conditions on the band with about 4500 QSOs on 10-40 meters. Exceptionally good con-



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. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

DK2WH is a 31-year old exceptional-child teacher and an activer DXer since 1968.

ditions were experienced on 15 meters to mainland USA 0130-0330. QSL to W9GW.

☐ FK8CE (since Sept. 22, 1980) and FRØGWE (Jan. 23, 1982-Feb. 27, 1982) can be confirmed via stamp collector K2ROR.

☐ Market Reef: Outstanding color QSLs are now ready for OJØMA (via OHØNA, Kee Eriksson, SF-22430, Saltvik, Finland) and for K5KG/OHØ/OJØ (whew!), direct to K5KG for the all band/mode early August operation.

☐ Indonesia: YB9VA's old manager was W5GZI; the new one is KD7EC, Box 1051, Safford, AZ 85546. Hal reports that Rudy, YB9VA, still needs Vermont for WAS and that his daughter holds YC9VB. YB9VA's wife, Julia, hopes to hold a call soon. Rudy was appointed to the Indonesian Congress for five years, besides being rector of the University in Jayapura.

☐ VP5KP was manned by W6SZN from Oct. 24-Nov. 3, 1982 on Grand Turk, making 8550 two-ways. Kip still has lots of blanks left for last year's CQWW FOØKP stint. He's now contemplating TR8/FHØ for late this year.

☐ Iraq: YI1BGD or YI4SC QSL-seekers (via Box 5864, Baghdad) may have found out that the address doesn't work too well. Try via Kamal Abdul Hadi, Al-Kadimiyah, Al-Ayimmah Bridge, House No. 26/4, Baghdad, Iraq. (Send card, s.a.s.e. and $2 U.S. for return postage since IRCs are not exchangeable at their local p.o.)

☐ QSLs for any of the calls listed below, for the periods indicated, may be claimed with s.a.s.e. to Bob Arceneaux, American Embassy Brasilia, APO Miami, FL 34030. 5A4TH (March 1957-September 1958, only), EL2AC (August 1963 and August 1965 only), PY1ZAZ (1973-1974), CT1AVW (1980 through June, 1982), PT2ZAI (November 1982 to present).

☐ Macau: Over the recent holiday season, VS6CT hoped to be on with the call CR9CT; cards via KB2XS.

QSL Corner

Administered by Joan Becker, KA1IFO

Here is some information for those of you who would like to QSL direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

A71BJ (G4HPN)
CN8AD (F8JL)
CN8CX (K4CEB)
C53CG (K4YT)
C6AES (N4AFG)
EL2AD (WA3HUP)
HI8CH (WB2LCH)
JX6RE (LA6RE)
J3ACM (WB2LCH)
J6LT (WB2LCH)
J87BI (KA2GMT)
P42E (WA2SPL)
TR8JD (F6AJA)
T32AF (WB6AIF)
T32AL (WB7SIC)
T32AM (WB7SIC)
T30AT (G3XZF)
VK5ATB (WB2LCH)
VP2MO (KA4BOT)
VP8AOE (KØJW)
V3ZZ (N6MM)
XT2BG (F2BS)
ZD9BX (KA1DE)
ZF2GI (W4OWY)
5W5EE (W6OUL)

QSL Manager Volunteers

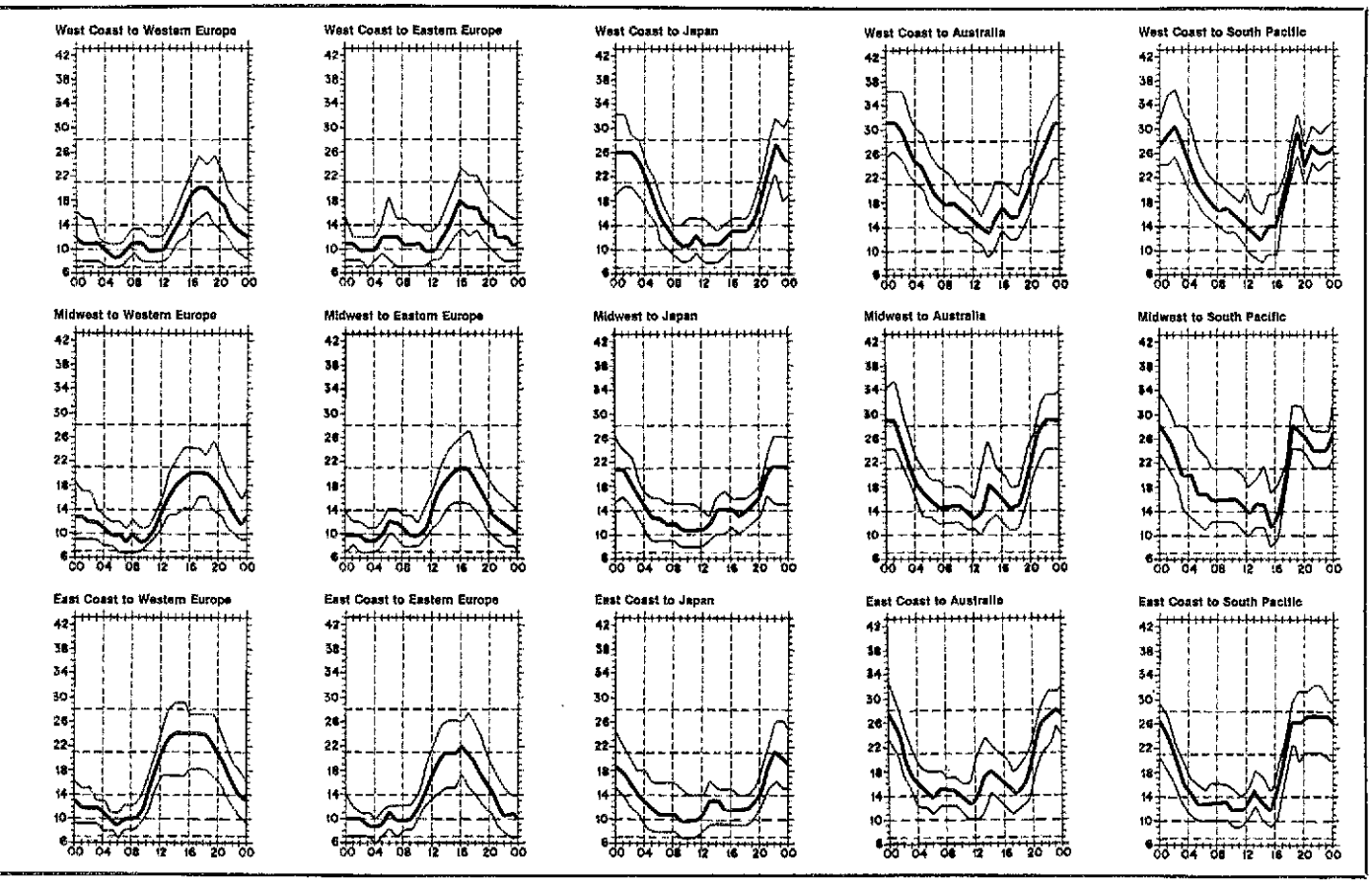
W5TXK
ON1BXS P.O.B. 44, 8900 Ieper, Belgium
W2PCS
KA3DSW

Special Notes

☐ AD3C is not manager for HV3SJ.

☐ Correct mailing address for QSLs for Hungary: Magyar Radioamator Szovetseg, P.O. Box 214, H-1358 Budapest, Hungary.

☐ December 1982 QSL Corner, page 77, contains information and addresses for the Incoming bureaus. September 1982 QSL Corner, page 65, contains information on the operation of the ARRL-Membership Outgoing Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for February 15 to March 15, 1983, assume a sunspot number of 76, which corresponds to a 2800-MHz solar flux of 126.

DX Century Club Awards

Administered by Don Search, W3AZD

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New Members

Mixed

DF6OI/106	G3MCS/322	VP2MFL/104	WA2JIW/102	K4NYV/286	WB4PRX/256	W6KZN/140	K9PPW/111	KØLCI/133
DJ7OB/146	G4BKU/129	AK1P/106	K3SAE/109	K4RBR/100	WD4LDH/101	WB6GDI/114	KE9U/275	KØPK/112
DJ8DT/148	JA1SDV/183	W1JJ/307	N3CDT/101	N4CRI/102	WD4RAF/105	KB7SD/110	W9CC/101	KØVZR/131
DJ8NKA/323	JA2GUT/189	WB1EAZ/264	W3DMB/106	W4KGH/177	K5AY/161	KO7G/147	W9NG/105	KBØAG/109
DJØTC/110	KP2I/114	KB2IZ/125	WA3GSC/107	W4LRO/164	WB5NOG/107	KA8CMR/100	WA9MRU/112	KCØHK/107
DK1YF/104	LA1PBA/106	KC2FK/104	WA3HOU/105	W4WKB/103	KA6DSW/102	KE8M/104	WA9OAK/102	KBØU/293
DL7NS/HBØ/109	LA3TB/103	W2ATC/153	AA4WJ/101	WA4MBG/102	KA6HLX/181	W8ZET/337	WB9VJU/100	WDØHCA/107
DLØHI/102	SP5LM/110							

Radiotelephone

DJ8NKA/322	I2IAU/155	VE2FSU/159	K2ROP/103	WA3HOL/102	W4UNP/265	W5TSJ/109	KB7WN/104	WA9OAK/100
EA3DBU/108	I2YBC/316	VK3NAJ/101	KB2IZ/125	WA3NHO/110	WA4CTA/260	WB5RCS/232	KO7G/134	WD9GIG/134
EA4EO/102	JA1SDV/182	ZL4PX/104	W2ATC/134	WB3JUC/123	WA4YOK/219	K6PFW/111	N7BEK/102	KØVZR/130
EA5AMR/134	JH1MQC/112	ZP5MJV/222	WB2HYO/104	AB4U/103	WA4YWR/172	KA6HLX/109	W7JXP/103	KBØXR/104
EA7BXL/127	JA2GUT/189	ZS1BR/106	K3KHG/105	N4BSN/199	WB4JHR/105	W6DUB/163	W7OTL/106	WØJLC/105
EA7SJ/102	JAØBUH/100	9X5PM/102	KA3EMR/108	N4CFL/211	WB4PRX/179	W6RDL/250	K8ABF/105	WAØROI/152
HI3VAK/126	TU4AT/148	W1SPP/163	N3KR/116	N4FAC/171	KA5FZL/104	W6KZN/133	W8TLC/109	

CW

EA3AQS/100	F6GOS/114	G4DVP/110	OZ2JZ/105	KA1AE/103	N3QA/105	K5YY/149	W7IHC/104	KM9L/115
EA5AMR/102	G2FFO/102	I4EAT/106	Y23SN/110	KB1U/107	K4JSI/129	KA6HLX/119	K9PPW/101	WØANZ/125
F6ENN/108	G3CWW/100	JH1NRV/105	K1MKP/102	KB2ID/102	AD5E/190	KD6DJJ/100		

RTTY

SM5EIT	WB5HBR	WØLHS						

5BDXCC

N4UB	HB9HT	IT9HLO	KH6AQ	HB9BEI	VE3JKZ	W7XN	ON5KL	UO5GR
HB9AMO	VE4JK	KØGT	LZ2SC	UQ2MU	WØPT	K4KUZ	WB7NCD	SP7KTE
W1NW	WA8SXQ	JH1GZE	W9ZA	JA2MGE	EA2HW	DL7LV	KB8MR	

Endorsements

Mixed

DF4FO/229	HB9AQS/157	PY2BBO/258	KA1RC/172	K3CR/127	N4RA/323	KC5M/270	KC7WZ/149	W8QWI/324
DF4RU/135	HB9RZA/261	SM5EC/231	N1BHC/208	K3DR/261	NF4A/316	KR5X/263	KI7I/175	K9XJ/320
DF7VO/151	HP1AC/263	SM6BGG/256	W1CUH/200	N3ACU/229	NS4L/218	N5HB/279	W7BCT/300	KB9DO/250
DF9ZO/247	I2LAG/331	SM7TV/314	W1GNU/273	W3CV/335	NV4Z/151	N5IH/287	W7DAZ/266	WA9UCH/175
DJ1PT/208	IT9AF/301	SMØDJZ/308	W1IUU/311	W3EVW/361	NW4L/137	W5JLU/301	W7IHC/126	WB9KOY/132
DJ2AA/345	IT9RAN/254	SP7KTE/239	W1JDE/277	W3HDH/251	W4FCC/161	W5LVD/320	W7IIT/219	WB9LFD/279
DJ9HX/179	JR1TNE/300	VE2CU/175	W1LQQ/327	W3KFQ/327	W4OMQ/310	W5POG/130	W7KT/222	WB9QPG/263
DK5WS/299	JA2JRG/255	VE2DPJ/226	K2BSM/248	WA3DVO/288	W4RIM/316	WD5ETI/128	W7LI/171	KØGSV/318
DL1BS/309	JA7COE/226	VE3DGX/297	KA2GER/140	WB3DWH/259	W4VN/280	WD5GXI/208	W7ND/201	KØLD/291
DL1JW/353	JA7HMZ/266	VE3GJH/302	KA2GMT/200	AB4H/326	W4WXZ/280	WD5HUH/252	WA7MOK/255	KAØDIL/146
DL1KAI/179	JH7NRE/228	VE3HD/350	KA2JMH/133	K4BYK/290	W4YOK/247	AF6D/251	K8DB/287	KAØIQR/180
DL2FAG/136	JA8EAT/318	VE3LJA/151	KB2RZ/269	K4CXY/298	W4ZMC/294	KA6QPL/152	KA8IUM/160	KBØX/295
DL7LV/309	KH6CF/306	VE3MV/283	KC2PO/169	K4OP/131	WA4ICB/201	W6DUB/245	KB8FJ/167	KCØLG/150
DL7RT/287	KL7AF/270	VE4OX/337	KU2X/175	KB4KA/236	WA4WPO/279	W6KNH/336	KC8PX/192	KJØH/244
EA2HW/296	KP4BJD/261	VO1CA/260	W2BTG/272	KC4UH/154	WA4YWR/167	W6MJY/199	N8AVK/227	NØAT/286
EA5AMR/179	LA4YW/226	VP2MM/150	W2IQB/303	KV4F/300	WB4FTU/280	W6OK/286	N8BTT/163	WØANZ/275
EA6BH/292	LA6TW/150	YU1DD/320	W2NY/286	KZ4D/206	WB4HSA/228	W6OL/306	N8CLJ/187	WØBA/288
G2FFO/299	LA9HC/293	YU2DX/335	WA2AHP/150	N4AIG/150	WB4NFO/270	W6YA/345	N8DL/199	WØRT/270
G3CWW/135	OH2DW/168	AA1K/302	WB2CLL/200	N4AXR/290	WB4TLX/146	W6RPK/225	N8TT/280	WØWJ/167
G3YBH/251	OH4NS/341	K1AR/301	WB2KCI/251	N4BAA/234	WD4HRO/176	K7UR/319	W8BKP/345	WBØRSH/200
G5CW/128	OK3WM/280	K1EFI/293	AE3C/278	N4FAC/174	AD5E/200	KB7SB/246	W8ELL/276	
GM3AWW/280	OZ1CEX/207	K1WC/293	AG3H/175	N4TL/219				

Phone

DF4FO/176	IØCEP/302	VE4OX/318	W2XN/344	KC4UH/131	WD4HZQ/157	W6KNH/335	N8BTT/162	W9DRL/228
DJ7AX/152	JH1IED/224	YV1EAH/275	WB2CLL/186	KG4DI/204	K5TSQ/251	W6MND/213	W8MFU/225	W9OKL/250
DK5WS/299	JA2JRG/188	7X2LS/218	WA2WJL/198	KV4F/293	KC5M/268	W6OK/283	W8QWI/217	WB9JXT/271
DL1BS/253	JA7HMZ/260	K1AS/255	WB2KCI/249	N4AXR/289	KC5TF/206	WD6GFF/151	W8ZET/337	WB9QPG/259
DL2FAG/127	JH7NRE/224	K1EFI/266	WB2TKU/153	N4RA/305	KD5GB/143	K7UR/293	WA8YTM/153	WB9ZBG/201
DL2NAR/146	LA4HW/290	KA1ACC/253	WB2VEG/323	N4TL/219	N5IH/286	KB7M/126	WN8GUE/126	KØGSV/300
DL7LV/294	LA6RU/150	KA1RC/172	KA3BTH/160	W4BLB/124	W5BPT/234	KB7SB/244	K9LKA/334	KØLD/284
EA4YL/221	OE1KW/254	W1JJ/307	KB3DH/151	W4KGH/176	W5OPZ/150	KC7WZ/142	K9LWT/252	KBØHJ/251
EA7EM/282	OE3SAA/300	W1LQQ/300	WB3GOP/269	W4WKQ/173	W5VVD/227	W7BCT/299	K9MD/300	KBØU/284
G3MCS/321	PP8DD/270	WB1EAZ/264	WB3IIQ/228	W4ZMC/245	WA5HLQ/221	W7BKR/300	K9TI/275	KBØX/275
G3YBH/250	SM6BGG/256	KB2EF/201	AB4H/317	WA4MMO/313	WD5HUH/252	W7OGT/231	KB9CO/161	NØAT/283
HB9AQS/156	SMØDJZ/290	KB2RZ/269	K4BYK/282	WB4FTU/271	K6EID/280	K8ZZU/261	KB9KD/277	WØBA/288
HI8LC/296	VE2DPJ/175	KC2PO/151	KA4D/301	WB4HSA/228	KE6ALI/126	K8DB/285	KB9SV/205	WØKU/290
I1POR/289	VE3DGX/297	N2BAT/179	KB4KA/236	WB4NFO/270	N6AFD/260	KB8FJ/153	KE9U/273	WØWJ/142
I2LAG/331	VE3GJH/297	W2GHV/287	KC4AL/176	WB4TIN/300	W6BCQ/306	KC8PX/164	W9BM/321	WBØTEC/248
I3ADI/320	VE3MV/283	W2IQB/285						

Cw

DJ2AA/221	JH1LME/150	OH2BN/280	VE2EAR/193	W1LQQ/206	WA2CDD/195	W3HDH/227	K6KR/254	K8LJG/270
DL1BS/226	JR1TNE/225	ON5KD/272	VE6CHW/131	WA1AER/280	WB2FFY/175	W3TVB/250	AF6D/201	KA8DJZ/201
DL7LV/266	JA2JRG/205	PY1WDS/135	AA1K/282	W2IQB/179	KA3R/225	AB4H/269	K6TS/178	W8QWI/258
EA5QR/181	JA7HMZ/250	PY2BBO/164	K1EFI/218	KU2X/124	N3KR/201	K4CEB/284	WB6ZUC/290	KE9U/209
IT9RAN/235	JA8EAT/291	SMØDJZ/269	N1RW/163	W2MD/250	N3RL/253	K4CXY/257	W7IIT/200	KJØH/188
IT9VDO/151	LA7XB/133	VE2CU/175						

Strays

HOW TO SPEAK MISSOURIAN

❑ When she first moved from Arkansas to her new home in Macon, Missouri, Maria Evans, KT5Y, had a communication problem: She had difficulty understanding what Missouri operators were saying on the air. To remedy this and maybe aid other operators in Midwest linguistics, KT5Y devised this "Missourian" primer.

Ampli-far: Used to increase output power. (Also called a *leen-yer.)*

At: Used to indicate QTH. ("Where you at?")

Bame: The kind of antenna that goes on a tar.

Dahpo: An antenna. ("I'm usin' a 40-meter dahpo at 30 feet.")

K'yar-em: Interference. ("You got a lotta k'yar-em on your signal.")

Missourah: The state south of Ah-way and west of Elluh-noiz.

Mo-beel or mo-bile: When you put your rig in your car.

Tar: A tall, steel or aluminum structure.

DX Century Club Awards

Administered by Don Search, W3AZD

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New Members

Mixed

DA2TR/218
DF4FAP/107
DF9ZN/108
DJ9RQ/307
DL3GG/104
DL3NAT/106
DL7HK/185
DL7JR/118
G3RPB/100
IV3JWR/226
JA1NQI/266
JH1KRC/261
JH1PWX/100
JJ1EEA/109
JA2WYN/204
JA3BXF/316
JA7ECT/105
JA8MKZ/247
JAØGTL/108
LA4XX/149
OE6WK/136
OE8ROK/117
OZ6EI/227
SMØBSB/103
SV1IW/265
T3ØAT/101
TG9ML/141
VE1GG/105
VE3CEY/113
VE5XZ/100
YB4AEP/143
YO4PX/140
YU1VM/121
YU2LH/193
YU7CB/186
ZL1PN/270
K1LPS/103
KA1X/180
WB2QJY/250
WB2VPV/280
KA3DSW/162
W1HOF/167
K2ONP/100
K2POF/100
K2QIE/210
K2VVF/240
KB2E/198
W2NHM/101
WB2QJY/250
WB2VPV/280
KA3DSW/162
KA3IEA/100
WA3MVP/101
KB3NQ/103
N3CTB/100
W3RYE/121
K4KCS/231
KD4LO/109
KD4TQ/104
KZ4G/136
KZ4Z/100
N4BXB/107
KB5XO/121
W5HY/134
W5UFI/222
W5XC/105
WD5JPE/150
K5AC/309
KA6BIM/102
KA6MKY/110
W6JAZ/106
KA7EQO/103
KD7O/101
W7QZI/100
WB7UGD/105
WB7VHC/101
KW8H/139
W8NJR/105
WD8QGE/106
K9EXY/111
KA9HTE/115
KC9PI/102
W9LMT/164
W9XU/101
KAØP/106
KØOTU/108
K5ØB/108
NØAEF/101

Radiotelephone

A4XJL/109
DF4YG/110
DJ9RQ/305
DK6AY/148
EA7BUD/128
EL2AO/100
FY7BD/128
GM4JRG/100
HI3PGJ/204
I4TGW/204
JA1NQI/111
JH1KRC/253
JH1WLY/108
JA2WYN/204
JA3BXF/230
JA8MKZ/228
JHØGTL/108
KV4JC/100
OE5HGL/210
OE8JNK/112
ON7FK/104
OZ1CSR/105
PP2JK/110
VE2CUA/100
VE3CEY/108
VQ9JB/101
YB4AEP/140
ZP5CDV/189
5D5LM/103
8P6KX/113
9U5JM/100
KA1GLA/102
KA1YN/101
W1AIM/105
W1HJF/109
K2QPM/103
KB2E/103
W2EOE/216
W2JFW/109
WB2QJY/111
KA3DSW/153
KB3TC/104
W3AEC/115
W3AMQ/106
W3RYE/118
KE4LY/105
W4JHE/276
W4WKB/102
WA4JGV/109
NA5C/229
WB5HGR/105
WD5CQG/100
WD5JGQ/103
K6DMY/126
KA6BIM/100
KD6ER/110
N6DHX/103
W6JAZ/104
WA5IVO/108
WD6EAW/102
KJ7F/100
KU7F/107
K8MID/108
N7AUV/110
WB7PMV/101
KW8H/139
N8CRB/101
N9ASC/154
W9LMT/159
WD9IRO/110
KØOTU/108
KBØAG/110
KRØB/103
NØBJF/130
WØPT/274

CW

DF4ZF/110
DF9VB/114
EA3CTI/103
EA7BZN/105
JA1NQI/212
JJ1FSK/104
JH3CNM/104
LA4XX/141
OE8ROK/109
SMØBSB/103
VK9NS/126
YO4PX/109
K1HDO/109
W1NW/101
AJ2Q/103
N2KA/122
W2FC/265
W2GTN/101
WB2ENW/110
KD3A/102
KK4Y/105
W4WKG/100
KA5GEX/108
KX5L/100
W5POG/101
WA5TOD/111
K6VL/172
W7SX/101
W8LNO/101
W8NE/164
KA9FYZ/101
WB9MSV/135
KRØS/100
KSØB/102
WØPT/200

RTTY

DL5GAS
EA5ACA

5BDXCC

N4AH
DL8MAG
OZ8BZ
KE9A
JA4CSQ
HB9BCI
N4HU
UA3FT
JA5AUC
HB9AHL
K9TI
K6CBL
JA1IFP
KBØU
N1TZ

Endorsements

Mixed

CEØAE/295
DF7BZ/278
DJ1QX/200
DJ2BV/206
DJ3TF/253
DJ6GK/252
DJ9RR/150
DL1CF/344
DL1DA/305
DL3DK/157
EA3CTI/229
F6DZO/205
G3FKH/176
G3HTA/330
GI3IVJ/353
HA9RE/178
HC4JL/253
HK3AXT/232
I4ANDI/302
I4EAT/292
I7TGT/317
JA1AFF/132
JA1ATF/260
JA1GTF/325
JA1HGY/314
JA1IFP/330
JE1GBI/138
JA2JSF/316
JA3APL/329
JA3EMU/321
JA3GAK/204
JA4AFT/328
JA4BBN/301
JA6HUG/245
JA7AD/345
KL7JC/200
LA2KD/203
LA7QI/282
OH2BLD/292
ON4UN/335
OZ8XW/205
PY1APS/336
YU2WV/200
SM4AMJ/186
SM6CST/321
SM6EQS/309
SM7EXE/328
VE2AGP/272
VE2JQ/250
VE2QV/254
VE3BHZ/300
VE3FRA/316
VE3IR/309
VE3MJC/134
VE4ADA/174
VE4ADG/230
YU2OP/250
YU3TFC/202
ZL1BCG/151
6Y5HN/150
AK1L/205
K1AP/297
K1HDO/276
K1LLU/209
K1OXD/200
K1VSJ/153
KA1QY/353
KA1RC/175
N1TZ/296
W1AGA/301
W1GUW/294
W1HRI/330
W1WLW/320
WA1UDH/150
AI2K/251
AJ2E/320
AJ2P/179
K2DSU/127
K2IJ/296
K2QIL/270
K2RZ/175
K2TWI/221
KB2RZ/271
KO2Q/179
N2JD/281
N2JE/129
N2KA/308
W2BAI/321
W2CC/316
W2HI/333
W2RSJ/300
W2TUJ/148
WA2PID/203
WB2BNJ/305
WB2JBJ/296
AF3T/290
K3AV/340
K3LWM/302
K3MNW/297
KB3MC/225
N3TO/251
W3ARK/280
W3GOH/306
W3VRT/314
WA3BZM/125
WA3YLN/159
WA3YVN/154
K4JYS/302
K4PVZ/303
K4YT/321
K4YXJ/300
KC4B/270
KC4IH/202
KC4QT/152
KE4UC/125
KE4XW/204
N4AH/305
N4PB/297
NF4U/306
NI4H/240
W4EEE/356
W4HY/300
W4JAT/261
W4KFC/349
W4OMY/260
W4RA/284
W4UKA/330
W4YKH/312
W4YN/336
W4YOK/250
WA4ZBK/231
WB4EGX/125
WD4HLK/275
WD4KRK/219
WD4OCO/155
WB4PRU/292
AE5V/225
K5OT/259
K5RJ/322
K5YCP/301
KC5P/204
KX5V/262
N5CB/250
N5FW/309
NA5C/231
W5GC/343
W5HNS/251
W5JM/276
W5QI/315
W5QK/352
W5QLD/208
W5UCY/154
W5XJ/325
WA5SKY/156
WA5TOD/158
WD5ELJ/166
K6MSK/157
K6RQ/350
KA6HNY/204
KB6XD/176
KJ6V/315
NA6F/207
ND6U/153
W6MND/283
W6NLG/279
W6OAT/295
W6OMM/311
W6PMT/300
W6QNM/350
W6RFF/253
W6XU/330
W6YQ/290
WA6AJP/281
WA6GFY/304
KB7ND/225
N7BUP/131
W7AQB/353
W7CE/281
W7SX/176
WB7NCD/300
WB7TFT/175
AD8V/226
AE8B/303
K8AQM/256
K8BPL/218
K8ES/250
KA8DAO/134
KI8B/132
N8AA/331
N8ACA/271
W8BE/327
W8ILC/333
W8JQ/339
WA8KEM/293
WD8NVA/214
AA9M/305
AI9R/292
K9BB/313
K9GX/300
K9IL/311
K9KA/334
KO9Q/225
N9CAP/151
N9CLM/134
N9CPW/200
W9OPD/250
W9PIO/310
WA9TVM/313
WB9NKH/303
WD9JKZ/150
KCØQ/277
KNØQJY/252
NØAKZ/202
NØSS/289
WØJCB/277
WØPT/335
WØRIC/208
WAØUJO/127

Radiotelephone

CE3TZ/187
CN8AK/285
CT1XKA/305
DF3AO/256
DF7BZ/276
DF7QD/232
DJ2BV/131
DJ8TP/203
DK3HL/314
DL2KC/282
DL2NAR/159
DL6NX/315
DL8UI/311
EA2HX/343
EA5ACA/250
EA9IB/240
G3KOZ/160
GI3IVJ/350
HB9RG/205
HI8MFP/300
HK3AFD/155
HK3AXT/231
HK3YH/202
I1GEA/325
I2SYG/153
I4AND/259
I5HOR/214
I5WRI/301
I7TGT/317
JA1GTF/299
JA1IFP/313
JE1GBI/136
JF1PHJ/153
JA2JSF/302
JA3APL/325
JA3GAK/204
JA4AFT/324
JA8UJY/171
LA7QI/259
OE1BKW/177
ON4UN/335
PP5UG/331
SM6SA/191
SV1IW/264
SV1JG/260
VE2QV/191
VE3LRU/203
VE4ADG/227
VK6RU/362
XE1XF/260
ZP5MJO/150
K1HDO/258
KA1RC/175
KA1ZO/226
N1TZ/292
W1BAL/269
W1DO/326
W1HRI/293
W1ONK/356
W1WLW/260
AI2K/221
K2DSU/126
K2QIE/207
KB2RZ/271
N2KA/282
N2KW/300
W2CC/316
W2IJB/291
W2HAP/273
W2INJ/126
W2RBK/284
W2XL/150
WB2BNJ/303
WB2VPV/277
WB2SZH/280
N3TQ/203
W3ARK/161
W3KBZ/224
WA3BZM/125
WA3YGQ/178
K4KKQ/132
K4YT/320
KC4IH/201
KD4TS/176
KT4P/283
N4BQB/225
N4JA/301
N4PB/295
NF4U/299
NI4H/231
W4EEE/356
W4MOM/200
W4RA/278
W4TBF/200
WA4ZBK/157
WB4KTG/282
WD4CRG/182
K5RJ/315
K5YCP/296
KB5PJ/198
KC5P/204
W5GC/343
W5HNS/224
W5JM/262
W5JME/286
W5QLD/208
W5UFI/222
W5ZKJ/228
WA5SKY/155
WA5ZIJ/275
WD5ELJ/151
KA6HNY/200
KB6HW/135
N6BRV/131
N6UC/331
ND6U/144
W6NLG/277
W6PMT/300
W6XI/314
WB6KQI/201
K7KDS/227
KB7HB/247
KB7SU/237
N7ASL/275
W7ILR/287
W7KOI/248
W7TE/297
WB7NCD/296
WB7TFT/170
AD8V/209
K8ES/237
K8ZZU/267
K8BDE/188
KB8XT/128
N8ACA/270
N8DFO/127
W8BE/287
W8GKM/331
W8ILC/327
W8JJK/281
W8NVP/310
W8SDE/206
WA8KEM/224
WD8NVA/214
WD8PUG/268
WD8SDL/128
AI9R/283
AI9U/264
K9BB/294
K9KA/329
K9KJS/151
K9MM/332
K9VKJ/176
KB9DU/261
KC9MF/125
N9AZK/200
N9CAP/151
N9CPW/200
N9JK/269
W9ABM/305
WB9NKH/295
KNØQJY/228
NØSS/265
WØJCB/270
WØRIC/197

Cw

DJ2BV/164
DL3RK/251
I1SBU/268
I4AND/214
JA1GTF/294
JA1HGY/235
JA1IFP/280
JH3JYS/161
JA6HUG/219
JA7IC/185
SM4AMJ/176
SM5DQC/253
SM6CST/271
SV1JG/158
TG9ML/137
YU7CB/183
N1TZ/182
W1WLW/272
WA1FCN/197
K2IJ/275
K2UFM/253
N2KW/294
AI3E/202
K4EFZ/252
K4KKQ/148
KV4F/200
NI4H/184
WA4ZBK/167
WB4CSK/165
K5OT/152
W5CJZ/150
W5XJ/158
N7MC/251
W7TE/251
WB7NCD/157
K8AQM/206
N8BM/250
W8GKM/257
AI9R/251
AK9Y/132
K9MM/311
W9KNI/315
KØGUG/227
KCØQ/254
WBØOQV/155

YL News and Views

Conducted By Jean Peacor,* K1IJV

The Ralph Batcher Memorial Award

Louise Ramsey Moreau, W3WRE, of Glenolden, Pennsylvania, who characterizes her ham activities as being "99.9% cw," received the Ralph Batcher Memorial Award at the 73rd Awards Dinner in November at the New York Sheraton Hotel. The event was conducted by the Radio Club of America. This top recognition is awarded "to the member who is considered to have contributed to insuring a permanent place in history of important radio and communications activity." It has been granted to seven recipients since 1976 and includes such distinguished names as John F. Rider, W2RID; Bruce L. Kelley, W2ICE, curator of the Antique Wireless Association museum in Holcomb, New York; and Ed Raser, W2ZI, of Trenton, New Jersey, collector of historic radio artifacts and memorabilia.

Louise's outstanding collection of telegraph keys, started in 1955, currently consists of 322 instruments spanning 134 years of telegraphic history. It includes such keys as the handcrafted "Camelback" series of 1848, through the spark era, the military keys of World Wars I and II, manual and semiautomatic senders and foreign types. She says that the telegraph key is entirely and truly an American invention, conceived, born and first operated in America. Lou has written many articles on telegraph keys and their involvement in emergency and disaster communications, including the three Johnstown, Pennsylvania, floods of 1889, 1936 and 1977.

Louise Ramsey Moreau, W3WRE *(KA9DYS photo)*

As editor of YL News & Views for *QST* from 1966 through mid 1979, Lou has written articles on the role of women in both past and present communications. She still edits the "Key and Telegraph" column of the Antique Wireless Association *Old Timer's Bulletin*. She has been the recipient of the Harry Houck Award and the President's Award of YLRL (Young Ladies Radio League), and is a member of the Telegraph Hall of Fame. Lou has made BPL (Brass Pounders League) countless times and once handled a 200 string of disaster traffic on 80 meters at a pace "slightly under 35 wpm." As a Fellow of the Radio Club, she is truly a BPL — a Brass Pounding Lady. — *courtesy of Ero Erickson, KA9DYS*

EXCITEMENT ON THE NEW BAND

The FCC made a historic announcement on October 28, 1982 that portions of the 10-MHz (30-meter) band had been released for General, Advanced and Extra Class licensees. Exactly 25 hours and 12 minutes later (October 29 at 2112 UTC), Maria Evans, KT5Y, of Macon, Missouri, sat talking with KA5HGG. This was Maria's first 30-meter QSO making her perhaps the first YL in the U.S. to operate on the brand-new band. Just about everyone Maria contacted on this band (she already has worked 30 states) has said she is their first YL QSO on 30 meters. Recently, Maria contacted Eileen, K2AGJ, in New Jersey — Maria's first YL. Maria says: "being someone's first YL on 30 is as exciting as being a Novice's first QSO." Her ultimate Amateur Radio fantasy is to be the first YL to operate a ham station from space, perhaps on the Shuttle one day.

Maria is 22, holds the Extra Class license, is an ARRL Life Member and a YLRL member, and lives in Macon with her miniature collie, J. R. She works for an amusement company as a coin machine service technician. "Basically, that means I fix Pac Man and his friends for a living." She recently was named ARRL SEC, Affiliated Club Coordinator and Public Service Officer by KØPCK, SM-elect.

Maria's becoming licensed in April 1976 resulted from a lucky situation. Her chemistry teacher in high school was Dale Bagley, WBØELJ. After school one day, Dale was teaching his student-teacher the code in preparation for the Novice exam. Maria was taking it all in while washing test tubes when she heard the student teacher miss a letter. Without looking up from the sink, she hollered out: "That's a 3." Dale's jaw really dropped! Then and there he talked her into getting a Novice ticket.

She operates both cw and ssb on 10 and 75 meters, a little OSCAR, a little DX and 2-meter fm/ssb, and handles lots of phone traffic. She checks into the Daytime 10th Region Net, is alternate net control for the N.E. Missouri Emergency Net, and is net manager for the Missouri SSB Net. Most of all, Maria enjoys ragchewing. With her many interests, she can discuss just about anything and enjoy it. She fishes, is a motorcyclist, enjoys photography and collects anything that has pigs on it. While in college, she was a member of the Varsity Rifle Team. She is an avid sports fan and is first baseman for a local softball team. If you hear her on 15, 20, 30 or anything in between, Maria says, "Give me a holler!"

Maria Evans, KT5Y, with J. R.

*Country Club Drive, Monson, MA 01057

MARY SUSAN KITTEL, N3DAU

Mary Kittel, age 12, of Norristown, Pennsylvania, started the seventh grade in the fall as a newly licensed General class Amateur Radio operator, N3DAU. She took and passed the General code exam the day before school began.

Mary first showed an interest at the age of 11, when she asked her dad about code tapes. Given the ARRL code tape, she amazed her father just a few days later by asking how to tune in WIAW. Thinking that she wasn't quite ready for 5 wpm yet, he tuned it in anyway. In short order, Mary was copying 5 wpm solid, 7-1/2 fairly solid, and getting bits and pieces at 10 wpm. Mary was on her way. The big hurdle would be theory, since fifth grade had not taught her even simple equations. Hours were spent on series and parallel circuits. Knowing it would take a few weeks for the exam to come, Mary took and passed the code test for the Novice exam.

Study continued while waiting the many weeks for the written exam. When it did come, was taken and passed, Mary became KA3IEU just a few weeks after entering sixth grade. Her first contact was with EA2AHA on 15 meters, and the rest of that school year found her chasing DX on that band.

Mary spent the following summer studying theory while her friends played and swam. Last August, she made the trip to the FCC and earned the Technician license. Two weeks later, she passed her General code exam. You'll find her most often on 15- and 20-meter cw. She enjoys hamfests, is a member of a competitive gymnastics team, and is the daughter of Gordon, W3GK, and Jeanne, WB3EAA, deservedly proud parents.

ATTENTION MICHIGAN ARCs

At their annual meeting, the TASYLs voted to sponsor the Michigan Amateur Radio Operator Lady of the Year Award. The first two awards, to W8QOY in 1980 and to K8ZJU in 1981, were given by an anonymous donor. In 1982, W8QOY and K8ZJU sponsored the award to make sure it was continued. Any Michigan radio club wishing to nominate a YL for this award may do so by sending a letter to Donna Burch, W8QOY, 281 Crescent Dr., Portland, MI 48875. Copies of the criteria are available to interested clubs for an s.a.s.e. to K8ZJU.

Mary Susan Kittel, N3DAU *(W3GK photo)*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AL, Guy R. Entwistle, Wollaston, MA
W1ASD, Sam Moses, West Hartford, CT
W1BFL, Raymond R. Neri, Stafford Springs, CT
W1DZX, Ralph L. Carter, Edgewater, FL
WA1FFB, John M. Johnson, Worcester, MA
KA1FPX, Henry A. Snow, Rindge, NH
W1FS, William J. Fake, Lewiston, ME
WA1GLG, Schley A. Warren, Sr., Chicopee, MA
K1GRC, Henry "Ray" Alexander, Warwick, RI
*W1ICQ, Adolph S. Goodsell, Meriden, CT
K1VPA, Weaver L. Bush, Ashland, MA
WA1YCV, Richard G. Hurd, Maynard, MA

W2BDS, Michael D. Ercolino, Wanamassa, NJ
N2BRH, Fred W. Young, Jackson Heights, NY
W2CJX, Sherman J. Mallery, Ridgefield Park, NJ
W2EJA, John Lindon, Whiting, NJ
W2EOZ, Joseph K. Zook, Atco, NJ
KA2NTC, Conrad W. Heuer, Staten Island, NY
WA2SPF, George T. Mayer, Fulton, NY

W3CSM, Alfred F. Anderson, Erie, PA
W3IEA, Ernest Ayers, Plymouth Meeting, PA
W3MTR, Merrideth D. Wilson, Brookville, PA
K3PET, Louis Mesard, Silver Spring, MD
W3TNK, R. G. Petts, Williamsport, PA

W4AEK, Vestor "Ves" Thurmond, Hialeah, FL
KB4CDO, Dallas F. Chappell, Winston Salem, NC
K4DEU, A. Wesley Clement, Hollywood, FL
W4EAO, Robert S. Jordan, Chesapeake, VA
K4HRC, T. D. "Ted" Childs, Anderson, SC
KA4HSG, Carl W. Kokes, Largo, FL
K4IAJ, Aulton "AC" Ferebee, Norfolk, VA
W4LIU, Blair Pearson, Riverview, FL
K4LOL, Jack G. Schultz, Bowling Green, KY
AA4MC, Monte Cohen, West Palm Beach, FL
K4NZF, Robert D. Turner, Lancaster, SC
WA4PPW, Albert "Al" A. Schmid, Kenneth City, FL
WB4VVT, Ernest W. Creech, Cumberland, KY
KA4WMT, Daniel H. Treloar, Palmharbor, FL
WB4ZWW, Jack L. Morgan, Stone Mt., GA

W5AUT, Glen D. Hallmark, College Station, TX
WB5AVS, Ralph R. Dailey, Jr., Dugginsville, MO
W5BAJ, Vernon A. Qualls, Midland, TX
W5EI, Forrest H. Ward, Houston, TX
WB5EUM, Edward J. Lohmeyer, Corpus Christi, TX
W5JZF, Eugene R. Hellmus, Corsicana, TX
K5MUG, Gregory E. Fifield, Denver, CO
W5ZYO, Edward D. Graham, Clarksdale, MS

W6EHG, Dorval C. "Jim" Sprong, Encino, CA
W6ERB, Albert D. Paul, Goleta, CA
W6FQC, Robert G. Burk, Panorama City, CA
W6FQF, Harold "Hal" J. Shimota, San Jose, CA
W6KXZ, Walter H. MacLean, Van Nuys, CA
KA6LTL, Clair L. Crouch, Little Rock, CA
WA6MYP, Richard E. Lewis, Grass Valley, CA
W6OAO, George A. Johnson, Dublin, CA

N7AHO, Clyde B. Alexander, Bremerton, WA
WB7AQC, Elmer R. Rhoads, Tacoma, WA
W7BOH, Donald L. Kelsey, Olympia, WA
N7BZG, Robert P. Morley, Florence, OR
KA7LMK, Robert E. Homan, Modesto, CA
W7OB, James N. Gilliam, El Granada, CA
W7SFJ, James F. Crum, Pasco, WA

W8ANT, Joseph N. Davies, Hamilton, OH
N8BKB, Howard V. Koelble, II, Canton, OH
WA8CDF, George D. Marquedant, Sr., Brooklyn, MI
N8CJZ, Alva R. Grupe, Cleveland, OH
W8CXK, William J. Kingsbury, Cincinnati, OH
W8DH, Roland V. Courtad, Independence, OH
KF8G, Stephen L. Lewis, Toledo, OH
KA8GYO, Ned B. Huffman, Berea, OH
W8MOG, William B. Haines, Columbus, OH
W8UN, Clark E. Foltz, Findlay, OH
K8ZUD, Chester L. Gamble, Cuyahoga Falls, OH

W9CYO, Walter C. Druse, Milwaukee, WI
WB9HFZ, Robert C. Lid, Villa Park, IL
W9MDG, Elden J. Belanger, Los Osos, CA
W9PQI, C. V. "Wally" Wallenberg, Evanston, IL
W9QHH, Rudolph J. Bartz, Fort Myers Beach, FL
W9QV, Ethel M. Sando, Hayward, WI
*W9VPU, Charles F. Hill, Northbrook, IL
W9ZHS, Richard H. Weston, Indianapolis, IN

WØBOH, Bernard C. Burden, Lincoln, NE
WØGM, Donald "Happy" Kent, DeWitt, IA
WØIG, Harold Larson, Spearfish, SD
WØRIH, Joseph M. Morison, Crawford, NE
WØRIL, Beryl M. Millett, St. Cloud, MN
WØRIS, Verlin E. Karli, LeMars, IA
WØVJF, Howard J. Graack, Sioux City, IA

VE1AQW, Gilbert E. Shupe, Halifax, NS
VE2AN, Adrien Plamondon, Montreal, PQ
VE2TD, Walter P. Dolphin, Ville Ste-Catherine, PQ
VE3AMB, Allan E. Wilson, Washago, ON
VE3DOR, Leonard Sumner, Islington, ON
VE3HDU, Graham M. MacLachlan, Willowdale, ON
VE4ABK, David G. Cooper, Winnipeg, MB
VE5PA, Ralph M. Allbright, Prince Albert, SK
VE7CZ, Edward "Ted" Holmes, Sidney, BC
VE7EX, Alexander Haydamak, Chilliwack, BC

C6ANR, J. A. Verne Roberts, Nassau, Bahamas, W.I.
G3AWZ, George P. Pearson, Street, Somerset England
SM2BPE, Nils-I Grahn, Lulea, Sweden

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgement only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgement from Hq.

Note: All Silent Key reports sent to Hq must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

February 1933

☐ Secretary Warner details events that led to the successful retention of all our band privileges at the Madrid international conference.

☐ George Grammer's 47-46 rig in an earlier issue was highly popular, and now he adds an amplifier using a pair of 46s in parallel with grid (not blocked grid) keying and 20-watts power.

☐ Construction of a velocity ("ribbon") mike is a project feasible in the workshop, and C. W. Melotte details fabrication of a d.c. field type, while W9ADZ describes the permanent magnet approach.

☐ We've been using regenerative circuits and detectors for years without really knowing their specifics. W3LW summarizes results of his extensive lab experiments, stressing the importance of working close to the critical point of regeneration, and the need for high stability to keep close to that point.

☐ The Fifth International Relay Competition (DX contest, that is) will run for nine days (!) in March. Ws and VEs swap six-figure number combinations. Special 'phone awards may be made if enough participants use that mode.

☐ In an earlier event, aiming at the most DX mileage in one's 20 best contacts, W2BSR racked up 203,000 miles. W1CSV had only 2762 miles, but did it with 1.5 watts.

☐ W1CTE relates, enviously, the elaborate transmitting setup he saw while visiting KEL, RCA's station at Bolinas, California, for transpacific commercial communications.

☐ Those "good old days": The new *Handbook* is still $1.

☐ As most of us have limited space, Grammer details methods of using comparatively short wires with various tuning systems to make them resonant on lower frequencies.

☐ D4AAR suggests a simple circuit for a vacuum tube oscillator to fire a relay at slow speed and provide dots for easier keying.

☐ Our ranks are growing rapidly, and "Bud" Budlong urges one and all to extend a hand of welcome and assistance to the incoming "nippers."

25 Years Ago

February 1958

☐ W1TS makes good use of the new RCA 7094, a bottle more efficient than the 813. His bandswitching single-tube amp produces up to 500 watts on c.w., with only 5-watts drive.

☐ W2OLU uses surplus 500-kc. crystals in a transistorized band-edge marker, with tone modulation available for easy signal location.

☐ Another application for surplus xtals is W6YBR's i.f. amplifier, which cascades a few of them at 1690 kc. to achieve narrow bandwidth and steep skirts more economically than some earlier methods.

☐ And W1CUT uses surplus (8-Mc.) crystals in his design of a simple 108-Mc. converter with 7-Mc. output. Its total cost of $13 should appeal to the satellite trackers.

☐ Sunspot numbers are peaking, so W5LFM lists both domestic and foreign TV stations near 50 Mc. as potential indicators of propagation openings on 6 meters.

☐ As four pages of pictures in this issue attest, dealers and manufacturers around the country are sponsoring code and theory classes to promote interest in and assist aspirants toward the Novice license.

☐ W1HDQ suggests some improvements in v.h.f. converter design, particularly to alleviate problems of i.f. leak-through, as well as cross-modulation and overloading.

☐ W1ICP, in response to numerous questions from Novices about pi-network output tuning, gives a step-by-step routine to achieve best results.

☐ Of 13 employees cited by General Electric for public service, five are radio amateurs who were outstanding in fields from Boy Scout work to free TV service for poor persons.

☐ In a sort of domestic DXpedition, W3UN and W3IPO journeyed to Delaware for a week of frenzied ham activity, providing that rare state for many WAS-seekers, including dozens of DX stations.

☐ Gil's cover shows a typical ham proud of accomplishing his New Year's resolutions — all aimed at getting his gear in top shape for the coming DX contest — *W1RW*

QST Profiles

Conducted By Andrew Tripp,* KA1JGG

Joe Walsh, WB6ACU: Tuned into the Amateur Bands

Well, I don't really suppose I qualify as an "old-timer," but I've been a ham for about 20 years. I remember 11 meters — it was quite a band. I also remember the a-m guys poking fun at single sideband, how it made you sound funny, and the daily arguments as to whether it was a passing fad. And when 6 and 2 were a-m.

In 1959, my family moved from Columbus, Ohio, to New York City. I was 12 then. There was a Mosley TA-33 Jr. on the roof of our apartment building, and I used to wonder why it would turn around only on weekends. Eventually, I traced the coax down to the first floor, got my courage up and, one Saturday, knocked on the door and introduced myself. I spent hours with my new friend, Jim (then W2IEY), watching him operate and asking countless questions. I guess from that point on I was hooked on ham radio. Jim gave me my Novice exam, and I got my first call in 1961 — WV2KAC. There's an obsolete prefix!

I've seen many changes in the Amateur Service since then. I've tried just about every mode, and have worked my fair share of DX — maybe 50 countries or so. Now, I just like to get on the air, get through all the standard raps ("My rig is . . . The weather here is . . . ") and have a good, intelligent conversation. I guess I still prefer cw, but the standard cw conversation format is very boring for me and rather "cloney." Personally, I regard the ability to exchange code as a very valid mode of communication, and a part of the amateur tradition. I think it should be kept as a requirement for licensing. It's not easy to learn, agreed, but I cannot conceive of a qualified radio operator who does not have this knowledge.

I'm proud to be a ham. It's more than a hobby to me, and I love it. If the bands open to California late at night, look for me. We'll talk about it. — WB6ACU

When he's not tuned into the amateur bands, Joe Walsh, WB6ACU, is turning out records. A winner of two Grammy awards while a member of the California-based Eagles rock group, Joe is a record producer, a songwriter and an accomplished guitarist who can be heard backing up many contemporary recording artists. He plans to release his fifth solo album sometime this year.

QST: *Has being a radio amateur helped you as a musician, particularly in light of the use of state-of-the-art electronics in music?*

Walsh: Ham radio has helped me immensely throughout my musical career. Although musicians deal with audio frequencies about 98% of the time, I have always been able to experiment with troubleshooting and modification better than most of my contemporaries. Knowledge of how my equipment works has given me an edge over musicians who can play circles around me but are lost if they blow a fuse.

I remember a concert in Florida when my road crew called me at the hotel with a problem: Rf was coming through everything on stage, to the point that we might not be able to play that night. On my way down to the hall I noticed a television transmitter about 200 yards away. We managed to shield our equipment enough to be able to play that night, but I wrote a letter to the FCC complaining about the interference. The hall manager later told me the television station sent someone over to check out the interference and the problem was quickly resolved.

QST: *Some celebrities like Amateur Radio because it offers anonymity with the opportunity to meet many new people. Is this an appealing aspect of the hobby for you?*

Walsh: Being a celebrity can be draining, so ham radio has been a great form of therapy for me. I love to talk to some "good ole boy" late at night who doesn't know who I am, and probably wouldn't care anyway. Social conversations, and occasionally even QSOs, can change drastically if the other half of the conversation discovers my career identity ("My daughter will just kill me if she finds out I was talking to you and didn't get an autograph"). I greatly enjoy and need a straight-across, good rap. Ham radio gives me anonymity and allows me to be myself and enjoy other people.

QST: *Traveling obviously plays a major role in your life. Do you take any amateur gear with you on the road?*

Walsh: We travel extensively during concert tours, but I really don't have much time to operate. I'll take a 2-meter hand-held rig along with me so I can scan and have local splits. With the schedule and logistics of a concert tour, however, I have found it best to leave serious operating for when I'm home. It's something to look forward to. I have been very tempted to go through the procedure to get foreign operating privileges, but when you're hitting six countries in 10 days the paperwork is formidable, and I wouldn't have the time to enjoy operating, anyway. Mostly, I'll take a receiver and enjoy SWLing. I suppose some hard-line DXers would croak at the missed opportunities, but if they had to do what I have to do they wouldn't go in the first place.

QST: *When you're home, what Amateur Radio activities do you enjoy?*

Walsh: I wish I could be more active, especially in local communications. But one thing I do each year is sign up for the ARRL UHF Contest. I go with the Santa Barbara ARC to Santa Cruz Island, about 30 miles off the coast of California. We backpack everything to the top of Mount Diablo — a good 2-hour hike over some pretty rough terrain. Everything is solar powered, and we operate from 220 MHz to 10 GHz. We reach from Mexico to Canada from up there. It's a great propagation site for uhf!

QST: *Bob, W6POU, tells us that you rented a helicopter one year to transport a blind operator to the top of the mountain.*

Walsh: That was in 1981, the year we took fifth place in our division (K6TZ, multioperator). Dennis Schwendtner, WB6OBB, a local piano tuner, wanted to go, but the hike up there would have been too much for him. So, I got permission to make a helicopter drop. We dropped Dennis, some of the more delicate equipment and about 40 gallons of water on the peak. Dennis was a world of help up there. He even hiked down the mountain with us, his hands on my shoulders. Dennis is a great guy, and I'm really glad he was able to go.

QST: *Are there any other interesting experiences, on tour or at home, that you can tell us about?*

Walsh: When we were completing the last Eagles album *(The Long Run)*, we were in Miami for about three months. I set up a station in the maintenance shop of the studio. While the other guys were dubbing in their instrumental and vocal parts, I worked all over South America and built an HW-8. The head maintenance technician got hooked. He's a whiz kid at fixing anything, and always wanted to be a ham. We had a few late-night rf/propagation seminars and some operating-procedure drills, and darned if he didn't learn the code. I gave him his Novice exam about four months later, and he passed! It's a great feeling to bring someone into the amateur community from scratch. And somehow I feel I have paid back my first ham friend, W2IEY, for being so patient with me.

*QST Features Editor

In Training

Conducted By Steve Pink,* KF1Y

TEACHING THE BASICS OF ELECTRICAL THEORY

For the last three months, In Training has covered the high points of upgrading on the Amateur Radio ladder from Novice through Extra Class. We've looked at the code and theory requirements for the three higher classes of license and tried to speak to the major challenges.

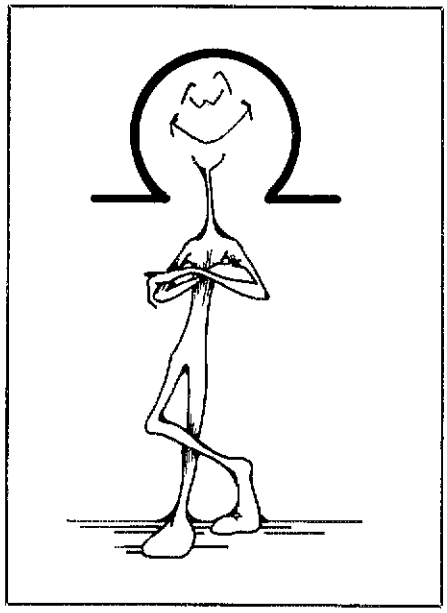
Since the series on upgrading began, mail at the Training Desk has made it clear that the chief obstacle to upgrading for the written part of the examination is the lack of a firm foundation in electrical theory. Many experienced amateurs have trouble understanding the rudiments of bipolar transistor and op-amp theory because they have forgotten how to apply Ohm's Law or the formula for the output of a voltage divider circuit.

The most likely explanation of this problem is not that these hams never learned electrical basics, but that the amateur who is upgrading learned some of these formulas 20 or more years ago. The Training Branch has been asked to help an increasing number of older amateurs (whose last bout with the FCC was for their Class B licenses in the first few years following WW II) study for their Advanced tickets. Even those in our hobby with the best memories would have trouble jumping into some of the sophisticated topics on the present Advanced and Extra Class syllabi that long after their examination.

What is the solution? We recommend careful review. There are at least two ways of reviewing elementary topics in an advanced-level course. The instructor can either delve immediately into the advanced subject and fill in the necessary review theory as the subject is being laid out, or he or she can devote a portion of the course, probably best at the beginning, to a review of electrical fundamentals. The first alternative will work when a few students need only a small amount of refreshing in basic theory. A majority of students in an Advanced or Extra class having difficulty with voltage and resistance calculations may signal that a structured review of basics is in order before beginning to discuss the points on the syllabus.

At the start, this process may seem tiresome and time-consuming. In the end, though, it should prove worthwhile to student and teacher alike. The proof is "in the pudding," and reports from the field show that preliminary review sessions result in a higher passing rate.

*ARRL Training Program Manager



Perhaps the best method to use for a preliminary review for Advanced and Extra Class courses is to create a "mini-course" from the General class syllabus. The most recent FCC Study Guide (see March 1980 *QST* and the 78th edition of the ARRL *Radio Amateur's License Manual*) contains the topics found in the General class exam (Element 3). Section E of this syllabus can be used as an outline for a review course. It contains the electrical and mathematical fundamentals necessary for more advanced discussion of Amateur Radio concepts. You might design a review course as follows:

I. Electrical Principles
  A. Concepts
    1) Impedance
    2) Resistance
    3) Reactance
    4) Inductance
    5) Capacitance
    6) Impedance matching
  B. Electrical Units
    1) Ohm
    2) Microfarad, picofarad
    3) Henry, millihenry, microhenry
    4) Decibel
  C. Mathematical Relationships
    1) Ohm's Law
    2) Current and voltage dividers
    3) Electrical power calculations
    4) Series and parallel combinations of resistors; of capacitors; of inductors
    5) Turns ratio; voltage, current and impedance transformation
    6) Root-mean-square value of a sine wave alternating current

The order in which you present these subjects need not be the same as in the outline. For instance, you might want to teach impedance after a thorough treatment of resistance, inductance, capacitance and reactance because these are, in one sense or another, components of impedance. It would also make more sense to explain the electrical unit "ohm" in a discussion of the concepts of resistance, reactance and impedance.

The point is that these topics should be mastered by students for all classes of license above the Novice. The text of choice for ARRL upgrading classes is the League's *License Manual*. The material in the outline given earlier is readily available in the General class chapter. It is arranged to facilitate review of topics in the outline. The study questions at the end of each section allow the instructor to gauge student's progress through the course. If more study questions are needed to complete the review, use the *ARRL Technician/General Q&A Book* to put the finishing touches on your refresher course.

We have been addressing these remarks on review preparation to instructors of Amateur Radio courses, but an individual who chooses to study by himself will find this review method just as valid. The League offers a course of self-study in electronic basics called *A Course in Radio Fundamentals*, by George Grammer, W1DF. The first half, serves as a refresher on electronic fundamentals, and the second half gives you an in-depth treatment of some of the active devices listed in the Advanced and Extra Class syllabi. An instructor might very well build an Amateur Radio course around this well-written text. If you do use this in *your* course, drop a line to the Training Branch and let us know how it works out. We appreciate your input.

Special Events

Conducted By Mark J. Wilson,* AA2Z

Monterey, California: Naval Postgraduate School ARC will operate K6LY during the 42nd Bing Crosby National Pro-Am Golf Championship at Pebble Beach from 1800 to 2400Z *Feb. 3-6*. Operation in lower part of 40- and 15-meter General class phone bands. Special QSL from WB6ZSB, 831 Avalon Pl., Monterey, CA 93940.

Vernon, British Columbia: North Okanagan ARC will operate VE7NOR from 2100 to 2400Z daily *Feb. 4-12* during the Vernon Winter Carnival. Frequencies: 14.295 21.375 28.575. Certificate for s.a.s.e. to NORAC, Box 1706, Vernon, BC V1T 7T9 Canada.

International Falls, Minnesota: Robbinsdale ARC will operate KØLTC from 0000Z *Feb. 5* until 0600Z *Feb. 6* from the frozen surface of Rainy Lake during Operation Icebox. Operation 10 kHz up from lower 80-10 meter General class phone band edges. Certificate for large s.a.s.e. to Bob Arel, WDØBQP, 3042 Wisconsin Ave., Crystal, MN 55427.

Savannah, Georgia: WB4APG will operate from 1500 to 2000Z *Feb. 12-13* in honor of the state's and Savannah's 250th birthday. Frequencies: cw — 21.130-21.170; phone — upper 25 kHz of all General class phone bands, and 146.52. Certificate for large s.a.s.e. to *Callbook* address.

Beaverton, Oregon: Oregon Tualatin Valley ARC will operate KA7CPT from 1700Z *Feb. 13* until 0300Z *Feb. 14* in celebration of Oregon's 124th anniversary of statehood. Frequencies: phone — 14.280 21.360 28.510. Certificate for large s.a.s.e. to *Callbook* address of station contacted.

Miami, Florida: America RC DX Group members will be active from 0400Z *Feb. 15* until 2400Z *Feb. 16* to enable hams worldwide to earn Special Silver and Gold QSL Awards. Contact two members for the silver award, three for the gold. Operation phone and cw, 40-10 meters. Award available from America RC, P.O. Box 3576, Hialeah, FL 33013.

Washington, Texas: Brenham ARC will operate WB5STR/5 from Washington on the Brazos State Park from 2000 to 0400Z *Feb. 25-27* in celebration of Texas Independence Day. Operation mainly on 21.125 and 21.175, and in 20-10 meter phone bands. Special QSL for QSL and s.a.s.e. to BARC, P.O. Box 44, Brenham, TX 77833.

Newark, Ohio: Newark ARA members will operate *Feb. 26-27* to allow hams throughout the world to earn the "Land of Legend" certificate. Any amateur contacting 10 Licking Co., OH hams on the low end of the hf General class cw and phone bands may win the award. Certificate for QSL and list of stations worked to NARA, Box 149, Newark, OH 43055.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by March 15 to make the May issue.

*Assistant Communications Manager, ARRL

Hamfest Calendar

Conducted By Marjorie C. Tenney,* WB1FSN

Florida: The Martin County ARA will hold its annual free hamfest on Saturday, Feb. 26, 8 A.M. to 4 P.M., at Langford Park, Rte. 707, Jensen Beach. Free admission, free table or tailgate space. Food available or your own picnic. Talk-in on Stuart repeater, 146.46/147.06. For more information write to MCARA, P.O. Box 1901, Stuart, FL 33495.

†**Florida:** Orlando Hamcation '83, sponsored by the Orlando ARC, will be held March 18-20 at a great new location, Orlando Expo Centre. This facility provides a completely air-conditioned 100,000 sq. ft. exhibition and meetings area. Over 400 swap tables available and a greatly expanded commercial booth section expected to draw interest of leading manufacturers exhibiting new products. All seminars, meetings, forums on site. Many prizes. Food and drink available on site. Advance registration is $5, $7 at the door. Swap tables are $15, no limit. Hours will be Friday, 5 to 10 P.M.; Saturday, 9 A.M. to 5 P.M.; Sunday, 9 A.M. to 2 P.M. All orders and info requests (s.a.s.e. please) to Hamcation Chairman, P.O. Box 191, DeBary, FL 32713. Orders after March 4 will be held at the door.

Indiana: The LaPorte ARC Winter Hamfest is Sunday, Feb. 27, at the LaPorte Civic Auditorium. Donation is $2.50 at the door. Tables are $1 each. Talk-in on 52 simplex. For information or reservations, send s.a.s.e. to P.O. Box 30, LaPorte, IN 46350. Help available to unload dealers starting about 6 A.M.

†**Iowa:** The Davenport RAC will hold its 12th annual hamfest on Sunday, Feb. 27, from 8 A.M. to 4 P.M., at the Davenport Masonic Temple, Hwy. 61 (Brady St.) and 7th St., Davenport. Tickets are $2 in advance, $3 at the door. Tables are $5 each, with $2 additional charge for ac electrical hookup. Talk-in on 28/88 WØBXR repeater. Table reservations and advance tickets available by writing to: Dave Johannsen, WBØFBP, 2131 Myrtle St., Davenport, IA 52804.

Kentucky: Glasgow is the site of the annual Glasgow Swapfest. The date is Saturday, Feb. 26; time is from 8 A.M. (Central) until everyone goes home. Location is the Glasgow Flea Market Bldg., located 2 miles south of Glasgow, just off Hwy. 31E. Large heated building, prizes, large flea market. Admission is $2; no extra charge for exhibitors. One free table per exhibitor; extra tables available at $3 each. Talk-in on 34/94 or 63/03. Additional information from WA4JZO, 121 Adairland Ct., Glasgow, KY 42141.

Massachusetts: The Algonquin ARC will hold its annual flea market on Sunday, Feb. 20, at the Marlborough Jr. High School, Marlborough. Doors open at 9 A.M. for dealers, 10 A.M. for buyers. Admission is $1, children under 12 admitted free. Advance table reservations are $7 before Feb. 12; $10 at the door. Talk-in on 01/61 and 52. For advance table reservations or more information, contact Algonquin ARC, P.O. Box 258, Marlborough, MA 01752.

†**Michigan:** The Livonia ARC presents its 13th annual Swap 'n Shop on Sunday, Feb. 27, from 8 A.M. to 4 P.M., at Churchill High School, Livonia. Plenty of tables, prizes, refreshments and free parking. Reserved table space of 12 ft minimum available. Talk-in on 144.75/5.35 and 52. For further information, send s.a.s.e. (4 × 9) to Neil Coffin, WA8GWL, c/o Livonia ARC, P.O. Box 2111, Livonia, MI 48151.

†**Minnesota:** Midwinter Madness Amateur and Computerfest is once again being sponsored by the Robbinsdale ARC, KØLTC. It will be held on Feb. 26 at Sacred Heart Church School Auditorium, 4087 W. Broadway, Robbinsdale. Doors open for commercial exhibit and flea market setup at 7 A.M. General admission open at 8:30 A.M. Activities include seminars on antennas, towers, computer interfacing and a slide presentation on the Voyage of the Viking Ship *Hjemkomst*. Prizes. Lunch available in building. Admission is $2 in advance, $3 at the door. Commercial exhibit space available at $15 per table; contact Bob Reid, NØBHC, 19725 Jackie La., Rogers, MN 55374. Flea market space available at $3 per space; contact Barry Blazevic, WBØFBN, 5437 Virginia Ave., N., New Hope, MN 55428.

†**Missouri:** An FM Bash, sponsored by the 34/94 group, will be held on Feb. 20 at the National Guard Armory, 4900 Ozark Rd., Kansas City. Contact Bob Atkeisson, WØAT.

New Jersey: The Split Rock ARA will hold its sixth annual electronics auction on Friday, March 4, at V.F.W. Post #3401, SR 53, Morris Plains. Doors open at 7 P.M. to unload and inspect equipment; auction will commence at 8 P.M. sharp. Admission is $1. Items to be sold must be in working condition. Loose parts must be bagged in largest quantity possible. A commission of 10% will be taken on first $50 of each sale, above which a flat fee of $5 will be charged. Commissions payable in cash only. Refreshments available. Prizes awarded. Hall is located a short distance from U.S. 202 and NJ 10, and easily reached via I-80, I-287 and U.S. 46. Talk-in on SARA repeater WR2ADB, on 385/985 and on 52. For more information, write to SARA, P.O. Box 3, Whippany, NJ 07981.

†**New Jersey:** On March 6, the Old Bridge RA will hold its third annual auction of Amateur Radio, computer and electronic equipment at the K of C Hall on Pine Street, just off Rte. 18, Old Bridge. New location; plenty of seats and free parking. Doors open for registration and inspection at 9 A.M.; sale begins at 10 A.M. Admission $2.50. Club commission, on successful sales only is 10% on first $100 of sale price, 5% on remainder. Food and drink available. Prizes. Talk-in on 72/12, 34/94 and 52. For more information, call Fred, WA2BJZ, tel. 201-257-8753.

†**New York:** Long Island Hamfair, sponsored by the Long Island Mobile ARC, Inc. (LIMARC), will be held on Feb. 20, at the Electrician's Hall, 41 Pinelawn Rd., Melville, from 9 A.M. to 4 P.M. Admission is $3. Vhf Tuneup Clinic, social meeting area, ARRL booth, awards, free parking, food and refreshments. Table space, $10; bring your own table, $6. All table reservations sold in advance. Talk-in on 25/85. For information and reservations, contact Hank Wener, WB2ALW, 53 Sherrard St., East Hills, NY 11577, tel. 516-484-4322.

New York: The Rookies ARA will sponsor a midwinter mini hamfest at the New York State Armory, Big Flats, on Feb. 26, from 8 A.M. to 4 P.M. Admission is $2. Flea market tables are $3 extra. Food and beverage available. Talk-in on 36/96. For further information, tel. 607-734-3184.

†**North Carolina:** The sixth annual Elkin Winter Hamfest will be held on Sunday, Feb. 20, at the Elkin National Guard Armory, two miles off I-77, Exit 85 in Elkin. Doors open at 8 A.M. Breakfast and lunch will be served by the sponsoring clubs, the Foothills ARC of Wilkesboro (NC) and the Briarpatch ARC of Galax (VA). Talk-in on 144.77/145.37, 22/82 and 69/09. For ticket inquiries and table reservations, contact George Reeves, WD4BMG, Rte. 6, Box 412, North Wilkesboro, NC 28659, tel. 919-670-2803, or Tommy Lineberry, WD4BTF, 308 Poplar St., Galax, VA 24333, tel. 703-236-8424.

†**Ohio:** The Mansfield Mid-Winter Hamfest sponsored by the Intercity ARC and Mansfield Amateur Service Emergency Repeater, Inc., will be held at the Richland County Fairgrounds, Mansfield, on Feb. 13. Doors open at 7 A.M. for dealers and at 8 A.M. for general public. Advance admission is $2, at the door $3. Large heated building. Hamfest, auction and prizes. Tables go early; advance reservations are advised. Talk-in on 146.94 and 444.7. For further information and table reservations, contact Harry Frietchen, K8HF, 120 Home Wood, Mansfield, OH 44906.

†**Ohio:** The Cuyahoga Falls ARC 29th annual Electronic Equipment Auction and Hamfest will be held on Sunday, Feb. 27, at North High School, Akron, from 8:30 A.M. to 4 P.M. Tickets are $2.50 in advance, $3 at the door. Sellers bring your own tables, or some available for $2. Plenty of room for buyers and sellers — over 32,000 sq. ft. Easy access from Tallmadge Avenue, off ramp of North Expressway

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

Coming Conventions

February 5-6
Southeastern Division, Miami, Florida

February 26-27
Ohio State, Sharonville (Cincinnati)

March 19-20
Roanoke Divison, Charlotte, NC

March 26-27
Arkansas State, North Little Rock

March 26-27
Georgia State, Columbus

April 9-10
Missouri State, Kansas City

April 16-17
Midwest Division, So. Sioux City, NE

April 23-24
Mississippi State, Jackson

ARRL NATIONAL CONVENTIONS

October 7-9, 1983
Houston, Texas

July 20-22, 1984
New York, New York

September 27-29, 1985
Louisville, Kentucky

OHIO STATE CONVENTION
February 26-27, Cincinnati

It's time to mark your calendar for this year's Ohio State Convention at the Great Oaks Career Development Center just off I-275 near I-75. This all-indoors activity, again organized by Hamilton County ARPSC, will be open Saturday and Sunday from 9 A.M. to 5 P.M. Saturday evening will feature a banquet with Rick Palm, K1CE, as ARRL representative, and the traditional Wouff Hong at midnight at the Howard Johnson, 11440 Chester Rd., Cincinnati, OH 45241, tel. 513-771-3400. Special convention rates good until Jan. 25 if you mention the convention. Forums on QRP, DXing, Cable TV interference, Computers and Transistors, as well as commerical vendors, exhibitors, displays and large flea market.

Registration is $4, flea market space $3 and the banquet $12.75. For information and tickets, contact Cincinnati ARRL '83, P.O. Box 46311, Cincinnati, OH 45246, or call Bill McMannis at 513-671-7066.

(Rte. 8). Talk-in on 87/27 or 04/64. Details from CFARC, P.O. Box 6, Cuyahoga Falls, OH 44222, or tel. K8JSL, 216-923-3830.

Pennsylvania: The 1983 Lancaster Hamfester will be held on Sunday, Feb. 20, at the Guernsey Sales Pavilion, US Rte. 30 East, Lancaster. Hours are 8 A.M. to 4 P.M.; dealer setup at 6 A.M. by reservation. Table fees: $10 in main display area, $6 in annex area. General admission is $3 for all hams and dealer personnel. Tailgating if weather permits. Talk-in on 01/61, 615/015 or 52. Send reservations to Hamfest Committee, RD 1, Box 56V, Blue Ball, PA 17519. Checks should be made payable to SERCOM, Inc.

†Virginia: The 10th annual Vienna Winterfest, sponsored by the Vienna (Virginia) Wireless Society, will be held on Feb. 27. Displays by major electronic manufacturers and dealers, indoor flea market and outdoor "Frostbite" tailgating, cw copying contest and other attractions. Many prizes. Vendor tables are $5 and $10. (Most $10 tables already sold out.) Frostbite parking is $1. General admission tickets $3. Doors open for vendor table setup at 6:30 A.M.; general admission at 8 A.M. Talk-in on 31/91 and 52 simplex. Winterfest is held in Vienna (just out of Washington, DC), at the Vienna Community Center, 120 Cherry St. This is the 20th Anniversary of the Vienna Wireless Society. For full information, send s.a.s.e. to Winterfest '83, Vienna Wireless Society, P.O. Box 418, Vienna, VA 22180, or call Jim Dickson, WA4YPC, 703-938-6516.

West Virginia: The Plateau ARA will sponsor the 5th annual hamfest on Sunday, Feb. 13, at the Fayetteville High School, Fayetteville. Doors open at 9 A.M. Donations $2.50, children under 12 free. Food, prizes, tailgaters. For lodging and other details, contact John Whitt, W8OQC, 111 Fayette Ave., Fayetteville, WV 25840, tel. 304-574-0532.

Wisconsin: The Wild Rivers ARC will hold their annual mid-winter swapfest at the Minong Village Hall, Minong, on Sunday, Feb. 20, from 10 A.M. to 3 P.M. Admission is $3. Tables free. Talk-in on 21/81 and 52. For more information contact Bob Paulik, K9HPR, P.O. Box 68, Cable, WI 54821.

Club Corner

Conducted By Sally O'Dell,* KB1O

THE AFFILIATION PROCESS: WHY AND HOW

It shall be the policy of the League to affiliate with itself, organized, non-commercial Amateur Radio groups or societies of kindred aims and purposes with a view of forming a homogeneous organization for unity of action in matters affecting amateur welfare.[1]

Currently, close to 1800 clubs in the U.S. and Canada are affiliated with the ARRL. It may be that your club has met the necessary requirements and has been approved for affiliation. Perhaps affiliation has been considered, but your group is not quite sure of the process. Or, you may not even be aware that your organization is affiliated with the ARRL.

Why Affiliate?

Most clubs, before deciding to seek League affiliation, will discuss the topic at length. If a survey were conducted to find the reasons a club should choose to affiliate, we could expect to receive a wide variety of interesting answers. We would probably find unity to be the common denominator, however. Just as individuals unite for a common cause, organizations also seek to combine their efforts for a common goal. Perhaps you are already aware of this and are wondering what's involved in becoming an affiliated club and what the cost will be. Well, the process is fairly simple and straightforward, and can be completed with a little effort. The cost to the club? Absolutely zero. In fact, active affiliation usually puts money back in the treasury, as affiliated clubs retain $2 for each membership sent to ARRL Hq. by a club officer.

How to Affiliate

So, you've decided that affiliation sounds interesting, but are not quite sure how to begin. To start with, all the material needed to apply can be obtained from the Club and Training Department at Headquarters simply by asking for a *club kit*. The packet contains all necessary information, instructions and guidelines needed to get the job done. Essentially, all that's required is a copy of the club constitution and bylaws, plus membership information. Assuming that your club has a constitution, send two copies with the application. If your group lacks such formalities, the ARRL Club Kit contains a sample that can be adopted (although you might want to modify it to fit your club needs). The membership information, in most cases, can be found in club records. One important requirement to remember is that 51% of all voting members must be ARRL members.

Three categories of affiliation exist within the club system. They are: *Category 1* — Local Amateur Radio clubs (this is the most common class); *Category 2* — Regional or national organized Amateur Radio groups; *Category 3* — Local school or youth group Amateur Radio clubs (in this class, only the sponsor or the trustee need be a League member). After the application is received at league headquarters (and sent to the club branch), the staff sorts through the material, checking to see that everything has been completed properly. Has the group applied for the correct category? Are 51% of the voting club members ARRL members? Has the club been affiliated before? Club members are often quite surprised to learn that their club was affiliated before, but for a variety of reasons (foremost among them that the organization never corresponded with Headquarters or even responded to queries) they were placed in the inactive files. When this happens, the club has only to file an annual report form to be reactivated. Once affiliated, always affiliated.

Assuming that everything has gone smoothly and your ARRL director has no objection, the application will be presented to the Executive Committee (EC) of the ARRL Board of Directors for formal approval. Because the EC meets at least four times a year, the waiting period for approval is usually short.

Life After Affiliation?

After your club has received its charter of affiliation, what next? Does the club pat itself on the back, then sit down and forget the commitment? We hope not. With a little effort, affiliation will be the beginning of a strong, well-organized club that can be enjoyed by its members. Keep in mind that, as an ARRL affiliated club, you should receive periodic correspondence. *Radio Club News (RCN)* for example, is published quarterly and is mailed to all affiliated clubs. If you haven't seen a copy lately, ask your club officers to pass it around to the membership. Better yet, have them read aloud the articles of interest at club meetings. Are you aware of the benefits your affiliated club is eligible for, and do you make use of them? Is your organization interested in recruiting new members? Affiliated clubs can receive lists of ARRL full members in the club's area of coverage once each year for (noncommercial) membership solicitation purposes. This is one of several benefits offered by the ARRL to its affiliated clubs.

Recently, the League adopted a new category for affiliated clubs that want to establish a strong local presence for Amateur Radio: the Special Service Club (see Dec. 1982 *QST* for details). The extra category has opened up new directions for affiliated clubs. The SSC will be far more involved within both the amateur fraternity and the local community, and will work more closely with the League than clubs typically have in the past.

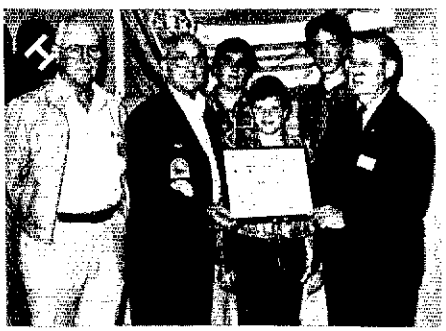
Whether your club membership is five or 50, League affiliation can help motivate your club to achieve its full potential. Become aware of how the ARRL and clubs can work together, particularly in the new field organization structure, and talk about it at your next meeting. If your club is not affiliated, ask why. It should be the central topic of your next meeting. Discuss it, and join the 1800 clubs already affiliated that, in many ways, are the League. — *Ed Raso, WA2FTC, Club Program Assistant Manager, ARRL*

[1]Articles of Association and By-Laws, p. 13. For a copy, send an s.a.s.e. to Club and Training, ARRL, 225 Main St., Newington, CT 06111.

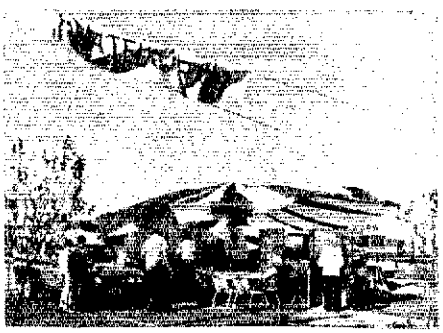
*Club Program Manager, ARRL

Film Library Additions

A new audio cassette (T-12) is now available from the ARRL Film Library. Harry Dreyer, K4NAR, whose ham career spans more than 60 years, was on the air during the sinking of the *S. S. Titanic*. His reminiscences of this and other early ham radio events are recorded here in his own free-flowing but lucid style. The tape is 40 minutes long. To order the tape or to obtain further library information, write to Karl Townsend, ARRL Film Librarian, 225 Main St., Newington, CT 06111.



The 4-H Radio Operators Club, K2UQK, had a charter party recently at the 4-H center in Rosenhayn, New Jersey. Hugh Turnbull, W3ABC, Atlantic Division Director, and Ted Wood, N2CER, Section Traffic Manager, spoke to a group of hams from other local Amateur Radio clubs and members from other 4-H clubs. Left to right are N2CER, W2MAS, KA2PBZ, Horace Crane, KA2MSX and W3ABC.



As a tribute to Amateur Radio, and to celebrate 25 years of amateurs' service to the community, the Victor Valley (California) ARC was pleased to accept a proclamation signed by Victorville Mayor Jean DeBlasis declaring the week of October 17-24 as Amateur Radio Week. During the week, the club prepared a public demonstration of the art of ham radio and set up a display in a local shopping center.

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

Phase IIIB Satellite Promises New Excitement and Communication Capability

A new era in the world above 50 MHz, as well as a fresh new chapter in the history of Amateur Radio itself, is about to burst upon us. The event that is to open the door to this new and exciting epic in the annals of our hobby is the launch, sometime in April, of the Phase IIIB satellite. This newest in the series of OSCAR satellites was constructed by AMSAT, and is now awaiting a ride into space aboard a European Space Agency, Ariane launch vehicle.

As with its predecessor, Phase IIIA, which was lost three years ago in a failure of an early engineering test flight of the same type of rocket, this newest amateur spacecraft is to go into a high, elliptical orbit with its apogee, or high point, some 24,000 miles over the Northern Hemisphere of the earth. From there, its 11-hour orbit will take it to a low point of about 1000 miles in the Southern Hemisphere. This unusual orbit will enable communication with stations virtually anywhere in the world. True, Northern Hemisphere stations will have access to the satellite for longer periods, but even such places as South Africa, New Zealand and Australia will be able to communicate through it for useful periods of time, and we in North America will be able to work these areas on a predictable basis.

The Phase IIIB satellite carries two transponders. The "Mode B" transponder is 150 kHz wide, with an input band centered on 435.1 MHz and an output band centered on 145.9 MHz. The "Mode L" transponder provides 800 kHz of bandwidth. Its input is centered on 1269.5 MHz, while its output is at 436 MHz.

No, that's not a typo. It is 1269, not 1296. In making available an amateur satellite band at 23 cm, the WARC-79 treaty specified that the band lie between 1260 and 1270 MHz, and that its use must be limited to uplinks. This provision is the reason that frequencies in the vicinity of 1296 MHz were not selected, as all of us would have preferred. It is also the reason that the 23-cm band is the input, or uplink. A 70 cm to 23 cm arrangement would certainly have provided a more convenient situation for most users, and would have meant that both transponders might have been operated at the same time if sufficient power were available to handle the additional load. Since the transmit band for the Mode L transponder is in the receive band for the Mode B unit, however, both cannot be operated simultaneously. AMSAT's plan is to use Mode B most of the time in the early years of the satellite's life and make the transition to more Mode L time as a greater number of people acquire appropriate 23-cm gear.

Both bands will require an uplink effective radiated power of approximately 1 kW. Excluding feedline losses, this could be attained with a 10-W transmitter and a 20-dB-gain antenna, or a 100-W transmitter feeding a 10-dB-gain antenna, or any combination in between yielding approximately the same erp. Naturally, using a smaller, lower-gain antenna simplifies tracking. However, since Phase IIIB will appear to move quite slowly much of the time, a higher-gain antenna, coupled with a lower-power transmitter, might be the least costly way to get on the satellite. For best results, all ground-station antennas for use with Phase IIIB should provide circular polarization. Either crossed Yagis or a helix should do the trick. Tracking information will be available from a number of sources, including AMSAT and Project OSCAR. However, many may wish to obtain a program for running on their own computers. Suitable elliptical-orbit programs should also be readily available. A few of you will wish to write your own. They should serve as a source of programs for the rest of us.

Receiving signals from the satellite should be quite easy with conventional amateur ssb/cw equipment for 2 meters or 70 cm. On 2 meters, an antenna-mounted preamp should not be necessary, but one may help on 70 cm, especially if a rather long feedline is involved.

The intent of this discussion has been to introduce some of the fundamentals associated with operating through the Phase IIIB satellite. Vhfers can certainly be expected to be in the forefront of those on the new bird as soon as it is opened for general operation. This will probably occur a month or so after launch, following attainment of the final orbit and checkout by specially equipped AMSAT ground stations. The Mode L transponder, especially, should offer a real technical challenge and a chance for you to be a trailblazer. We who are familiar with the equipment and techniques that the higher frequency bands demand should be prepared to assist other, less knowledgeable, hams in their efforts to get going on this, the most useful and exciting amateur satellite yet.

POSSIBLE EME TESTS COMING IN MAY

We may have the opportunity to participate in a series of moonbounce tests from two large dishes, and from a rare state, too! Tom Clark, W3IWI, tells me that plans are being made to conduct amateur moonbounce tests using both the 140-foot- and 300-foot-diameter radio telescopes at the National Radio Astronomy Observatory, Green Bank, West Virginia. The larger of the two dishes would be used on 2 meters, and possibly 1-1/4 meters, while the other would serve on 70 cm. Tests, which are tentatively slated for May, are to be conducted as part of a celebration of the 50th anniversary of the discovery by Carl Jansky (then at Bell Labs) of radio emissions emanating from the center of our galaxy, the Milky Way. Tom cautions that plans are still very tentative. Whether or not the tests actually occur depends on obtaining the proper authorization, as well as locating suitable equipment.

As another feature of the celebration, the original antenna system used by Dr. Jansky in 1933 to detect 15-meter signals from far out in space has been reconstructed at Green Bank. It is to be used in a reenactment of his famous experiment that contributed to the birth of the science of radio astronomy.

ON THE BANDS

6 Meters — The sun continues to bring forth surprises. We certainly experienced better conditions during the fall of 1982 than many of us had expected. But, as November gave way to December even the most optimistic were sure that the party would be over. We reckoned without considering that "old sol" might have a few more tricks in store. During the first few days of December, solar activity increased dramatically, with the 10.7-cm flux going from 170 November 30 to a peak of 279 10 days later. It then declined slowly, not dipping below 200 until December 17 when it stood at 198. Much of this was from new highly active spot groups that produced many X-ray type flares.

But, back to November for a moment. The last part of the month was highlighted by two DXpeditions and several transcontinental openings, one of tremendous proportions. W6JKV was at it again, this time as W6JKV/KHØ on Saipan. The 23rd was Jim's best day, producing contacts as far east as Texas. During his stay, about a hundred western state stations were provided the new country. Unfortunately, none of us Easterners were quite so lucky. The other operation was V3DX from Belize. N6ADI writes that the group went there for an hf DX contest, so 6 meters was an afterthought. Its addition was the suggestion of WA6IJZ, who along with KD6GP, provided the gear. The setup ran 10-W to a 3-element beam. About 50 stations were worked, almost all west of the Mississippi. Fortunately, WA6IJZ was among them. They may try it again next spring.

Certainly, the best transcontinental opening of the year, and one of the best of Cycle 21, could not have been better timed, arriving as it did with a bang on November 25, Thanksgiving Day. It began here about 1730Z and was still going strong when this conductor had to leave the house for a previously scheduled turkey dinner. Before I had to tear myself away, I

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 and record your message.

worked some 35 West Coast stations, most of them in the vicinity of 50.2. Many of the signals were very strong, and some stations contacted were running as little as 3 W. Later in the day, about 2200Z, KH6IAA put in an appearance but didn't have too many takers. I guess many of the gang were still at the table or sleeping it off! That inveterate muf-watcher WA5IYX noted F2 propagation to the south, well into TV Channel 2, between 1500 and 1600Z that day. Pat was able to get a picture but no audio at his San Antonio QTH. The following day brought a good, although short, Caribbean opening to the East Coast about 1430Z.

Two much-sought-after stations this fall have been OA8V and OA8CW. Many need Peru, and this father/son team has been very active and diligent in trying to work as many of the gang as possible. They have also been available on 28.885, which has helped a great deal. One of the surprises of the season was an evening opening on November 27 when a number of New England stations worked OA8V at about 0100Z. CT2EE/CT2YJ are another pair that have helped breathe life into the band. And they can't even operate on it! Their dedicated crossband activity illustrates how fine propagation is from the Azores. There have been many occasions on which the only unusual conditions prevailing involved 10- to 6-meter crossband contacts with either John or Kathy. Speaking of crossband contacts, not unexpectedly, there have been few across the North Atlantic this season. But there have been exceptions. Saturday, December 4, was one of those days. VE1YX and WA1UQC both made the grade with G4BPY. The following weekend was also quite productive, with a number of contacts taking place along the East Coast, although details are sketchy at this writing.

December 16 through 18, when this is being written, were also very productive days. On the 16th, PJ9EE made some 35 contacts as far west as New Mexico, while 9Y50JW completed in the neighborhood of 70 QSOs. KH6IAA worked the western part of the country as far east as Oklahoma. The following day, the western states were the recipients of a four-hour opening to PJ9EE extending as far as KH6IAA. K4GOK reports that KH6IAA was also in for about an hour the same day at his QTH 30 miles west of Washington. Marion said that Al's signals exceed S9 at times. Apparently resulting from a severe magnetic storm arising from the many strong solar flares, the morning of December 18 produced an excellent opening from the East Coast to the Caribbean and northern South America, with PJ9EE, 9Y50JW, 8P6CX, DI3ZM/YV5, YV4ASC and TI2HL very much in evidence. OA8CW was also on, working a few stations in the southeastern part of the country. Later in the day, the western states were given a treatment to about the same bill of fare.

In addition to the F2 goodies, the end of the year is also the time for the winter E_s season. While not as good as the 6-meter staple served up in the summer months, it can still provide some fine openings. One of the best so far was on November 30, lasting for most of the day and providing VE1YX with some 200 QSOs in the W1 through WØ call areas plus an E_s crossband contact with CT2EE.

Regular readers of this column will recall my describing, from time to time, the exploits of JA1VOK. I had the pleasure of meeting Hatsuo while he was on a trip to this country and spent a very pleasant day with him. Among the items discussed was the 6-meter world record. As I have stated previously, it must be the geographical distance, not accounting for "long path" etc. He convinced me with actual coordinates of the stations involved that JA5HTP, operating portable JA6 at 25° 50' N. and 131° 15' E., in company with PY5BAB, operating portable PY5 at 25° 52' S. and 48° 47' W., have the record with a distance of 20,008 km or 12,433 miles. This appears to be within about two miles of halfway around the earth, so it should be hard to beat. Unless someone can show evidence why this should not be accorded the record, it will be published in a subsequent column listing the distance records for the various bands.

Minute 63 of the ARRL Board Meeting in July 1982 directed the VHF/UHF Advisory Committee, in consultation with the VHF Repeater Advisory Committee, the Six Meter International Radio Klub (SMIRK) and other interested groups, to review the 50-MHz band plan adopted by the Board at its March 1982 meeting. The SMIRK Board of Directors has endorsed a similar set of recommendations for mode utilization on the band, the main difference being the use of 50.2 MHz as the DX calling frequency. The VUAC is preparing a report for submission to the ARRL Board prior to its April 21, 1983 meeting.

W9JMS has been putting his computer to good use and has come up with a listing of SMIRK members alphabetically by call. Those wishing information on how to obtain a copy should send an s.a.s.e. to Howard T. Grounds, 8102 Anemone La., Indianapolis, IN 46219. There is a slight charge, but it is nominal considering the amount of work involved.

WA4LYS proudly displays the QSLs that represent a 2-meter WAC. Paul is pleased that he has been able to accomplish this, and much more, with a four-Yagi antenna system.

In the December column, I urged that SMIRK members send $3 for annual renewal of membership. K5ZMS tells me that he has received many envelopes from nonmembers containing $3 and no list of "Klub" members worked. The SMIRK annual renewal rate is $3. Initial membership was, and still is, $6, and the application must be accompanied by a list of at least six SMIRK members contacted.

2 Meters — One of the unquestioned highlights, at least for East Coasters, of the mid-November to mid-December period was the outstanding tropo that began Saturday November 20 and lasted for several days. It lay along the Atlantic Coast from New England to Florida as an offshore high-pressure system held warm, humid air over the Eastern States. This conductor became aware of what was happening Sunday morning, the 21st, when a local, W3OTC, informed me that he had just worked W2MCF/1 Rhode Island and N4CNN South Carolina. I immediately switched over from 6 to 2 and hooked up with two South Carolina stations, WB4EPZ and W4CPZ, with good signals in both directions. Many contacts were being made, with the South Carolina and Georgia stations working all the way up to New England. As if that weren't enough, Sunday evening brought a strong aurora, with W3OTC reporting working a number of stations, including WB8KAY Michigan, K9MRI Indiana and W1EJ New Hampshire, all for new states. The combination of aurora and tropo enabled Bob to add four states to his total, bringing it to 28. The stable air mass was still very much in evidence the following evening, Monday the 22nd. After finishing a fine QSO with K1RZ Connecticut, this conductor looked south to hear a tremendous signal from N4CZT near Greensboro, North Carolina. After telling him to listen very carefully, I took my 2-1/2 W portable, a Yaesu FT-290R, out in the backyard, pulled out the built-in, 19-inch whip and gave him a call. Doug came right back with a 5 × 3 report. The distance is approximately 250 miles. It is amazing what can be done when tropo conditions are right.

The Midwest also had some pretty fair tropo a few days earlier. WAØVIF reports from Wichita, Kansas, that the evening of November 17 produced a good opening to Oklahoma and Texas. Jon's log shows 14 stations worked between 0200 and 0500Z November 18. Best DX was about 700 miles to WB4CLB/5 Corpus Christi.

Two interesting 2-meter accounts come from W5UWB Kingsville, Texas, near Corpus Christi. The first involves moonbounce. A number of single-Yagi EME contacts have now been completed, but almost all have been with one of the big-dish special event stations or K1WHS and his array of 24 Junior Boomers. W5UWB is one of those who have made a moonbounce contact using only a single Yagi — in his case a Junior Boomer — but the station on the other end was WA1JXN/7 in Montana. Lance must have his system working well, indeed. I'm sure that now that its capability is well demonstrated, he will be willing to try additional skeds with single-Yagi stations. WA1JXN can usually be found on the EME Net, which meets weekends on 1700Z on 14.345 MHz.

W5UWB's other news concerns contacts he made about 0200Z December 16 with Florida stations WA4SXZ, W4VTJ and K4KCF. Although his location often affords good tropo across the Gulf of Florida, there was no sign of tropo that evening. However, there was E_s propagation, as evidenced by signals on 6 meters and TV frequencies. Beam headlines for stations at both ends of the path peaked well north of the direct bearing, and signals displayed an auroral quality. These observations point to the FAI propagation mode discussed by K4GFG in *QST* for January 1982. This is, however, the first reported instance of such propagation at this time of year.

KC5IJ sends along a report on the 1982 SWOT Contest. Top scorer in the country was my neighbor W3CQH with 111 QSOs and 5106 points. Len expresses thanks to K5IS, who handled the contest paperwork. For budding editors out there, KC5IJ is looking for someone to take over the reins of the very fine *SWOT Bulletin*.

1-1/4 Meters — It appears that a new 220-MHz terrestrial world record is only a matter of time. The only reason that a record-breaking two-way contact was not completed between KP4EOR and LU7DJZ on November 26 was that KP4EOR's transmitting converter was not yet finished. The two did work crossband 1-1/4 to 2 meters. The 220.3-MHz signal from Buenos Aires was 5 × 5 on a home-brew receiver converter and a mast-mounted preamp at David's QTH near San Juan. The antenna is a 17-element Boomer. On the southern end, an 80-W transmitter feeds two 10-element Yagis. The path is about 3700 miles, which exceeds the current California to KH6 record by some 1200 miles. Now that KP4EOR is fully operational on the band, the tests are continuing. As of this writing, however, conditions have not been cooperating. As Transequatorial Propagation tends to peak in November and February, success should not be long in coming.

W3GPY writes from his Slatington, Pennsylvania, QTH that his 1-1/4 meter state total now stands at 40. Mike added Missouri last summer by virtue of a Perseids contact with NØJA. Then, in October, he snagged WØPW Colorado and WØSD South Dakota, both via the lunar route. He also reports trying an interesting experiment during the Perseids. He ran two schedules with KØALL, one at a time when the elevation of the ray angle of the shower at the center of the path was fairly low, 18 to 30°, and the other seven hours later when it was 70 to 75°. Unfortunately, no signals were heard at either time. The distance of approximately 1130 miles may have contributed to this. This is about 250 miles farther than the path to NØJA. Possibly, some of the 2-meter m.s. chasers would like to attempt similar tests. W3GPY also notes that 46 states now have serious ssb/cw activity on the band. One of these is Wisconsin. That stalwart 1-1/4-meter ambassador, K5FF, reports that she worked K9XY via EME on December 1 for Chuck's first moonbounce QSO on the band. Both Lee and OM Fred, W5FF, were able to complete contacts in less than 15 minutes with "FB copy." That brings K5FF's total of different stations worked on 1-1/4 meter EME to 32. Lee says that another converter to 1-1/4 meter moonbounce is WA8VPD in Michigan, who made his first EME contact on any band November 28. You guessed it. The first station Bob worked was K5FF, followed closely by W5FF! Lee notes that their 32-foot dish, with ability to rotate to feed, helps a great deal. Michigan represents state number 30 for K5FF and also completes all 10 continental U.S. call areas.

It seems only fitting that K1WHS should be on one end of the first 1-1/4-meter single-Yagi EME contact. After all, how many single-Yagi, 2-meter stations has Dave treated to their first contact via the earth-moon-earth route? But this time, the tables were turned. On December 6, using a single 220 Boomer temporarily lashed to his tropo tower and vertically polarized because of space limitations, K1WHS completed a moonbounce contact with K5FF in just 20 minutes. The FF's 32-foot dish scores again! This proves that it can be done. Who'll be next?

70 Cm and Down — The aurora of November 21, mentioned in the 2-meter section, made itself felt in the Pacific Northwest and resulted in a new 70-cm state for K7BBO Tacoma, Washington. Dave considers himself fortunate to snag W7HAH Montana via the buzz mode.

K3QCQ Pennsylvania writes that his new EME setup is functioning well and he is steadily adding states. However, Bill says that his biggest thrill was working ZL3ADD for WAC. He felt fortunate, indeed, to be able to copy Graham's signal well enough to give an "M" report despite 14 dB of line noise.

From the *432 and Up Newsletter* put out by K2UYH, it is learned that NP4B was operational from the 1000-foot dish at Arecibo, Puerto Rico, during the second weekend of the fall EME Contest. Despite the fact that they were using only 3-W output, it is said that they were stronger than some of the other active stations. In the short time that the dish was available, they managed 18 contacts, 10 of them on ssb. It is reported that most of the signals heard were S7 to S9!

The higher bands also benefited from the big East Coast tropo section described in the 2-meter section. One of the outstanding contacts that has come to my attention is one on 23 cm between WB4ZIA Charlotte, North Carolina, and K1PXE Milford, Connecticut. It is understood that WB4ZIA was running just 2 W at the time!

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

Power Splitters

The antenna system is one of the most important parts of any station. A good antenna system not only helps on transmit, but also on receive. The most common way to improve an antenna system is to stack a number of smaller antennas together to increase the system gain. The antennas are connected in parallel, and so the effective impedance of an array of antennas will no longer be the same as that of the original antennas unless some kind of impedance transformer is used.

Fig. 1 shows some simple cases. Take first the two-way power splitter. Two 50-ohm impedance antennas are connected in parallel and, therefore, present an effective impedance of 25 ohms at their common connection, point A in Fig. 1. It can be shown that an impedance Z1 can be transformed into an impedance Z3 by a 1/4 wavelength of transmission line of impedance Z2, where $Z2 = \sqrt{Z1 \times Z3}$. Using this formula, you can calculate that a 1/4 wavelength of a 35.8-ohm transmission line will transform the 25-ohm impedance at point A into a 50-ohm impedance at point B. The two-way power splitter for 1296 MHz described on this page is just such an impedance transformer.

It is interesting to note that a four-way power splitter may be constructed entirely of 50-ohm line. With reference to the four-way power splitter in Fig. 1, two antennas are connected in parallel to produce a 25-ohm impedance at point C, and similarly at point E. A 1/4 wavelength of 50-ohm line will transform this 25-ohm impedance to 100 ohms; therefore, point D represents the point of parallel connection of two 100-ohm impedance lines, giving a final impedance of 50 ohms. Thus, a four-way splitter may be made using only 50-ohm coax, or even just coaxial connectors (Ts and barrels, etc.).

Before assembling an antenna array, you should be sure that each of the individual antennas is first matched to 50 ohms. If they are not, not only will the impedance of the array as a whole probably not be 50 ohms, but also the power will not divide equally between the antennas, which will lead to a loss of gain.

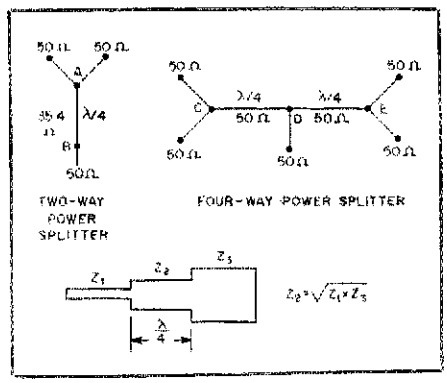


Fig. 1 — Power-splitter arrangements and impedance transformers for antenna arrays.

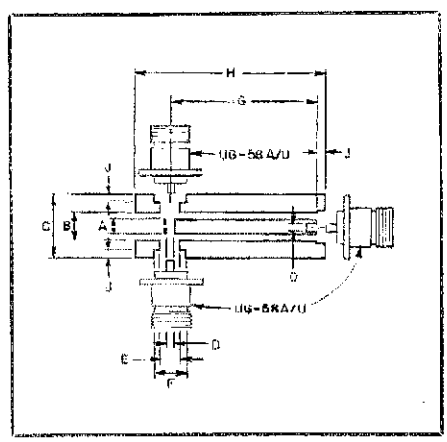


Fig. 2 — A two-way power splitter for 1296 MHz.

A — 1/4-in (brass rod).
B — 7/16 in.
C — 1-in. (square section aluminum).
D — 1/8 in. (center pin diameter of UG-58).
F — Measure socket, typically 1/2 in.
G — 1/4 wavelength, 5.8 cm at 1296 MHz.
H — 4 in.
J — Measure socket, typically 1/8 in.

A 1296-MHz Two-Way Power Splitter

The construction of the 1296-MHz power splitter shown in Fig. 2 proceeds as follows. Some of the dimensions may depend on the particular N sockets you are using. Sockets made by different manufacturers may have slightly different external dimensions.

1) Take a 4-in.-long piece of 1 × 1 in. square cross section aluminum bar and drill a 7/16-in.-diameter hole axially down its center.

2) Take a 2.4-in. length of 1/4-in.-round brass rod and drill a 1/8-in. hole in one end to a depth of about 1/4 in. (this hole takes the center pin of one of the N sockets).

3) 5.8 cm (1/4 wavelength at 1296 MHz) along this brass rod (from the end just drilled), drill a 1/8-in. hole diametrically across the rod (this takes the center pins of the other two sockets).

4) In the undrilled end of the rod, drill a 1/8-in. hole to meet the 1/8-in. cross hole (used to aid in soldering the socket center pins in the cross hole).

5) Take the aluminum bar and drill out the hole on one end to a diameter F and a depth J so a UG-58 socket mounts with the flange flush to the surface of the aluminum.

6) Mark out drill and tap four 4-40 holes to secure the socket to the end of the block.

7) A distance of (5.8 + J) cm (see Fig. 2, typically about 6.2 cm) along the aluminum block from the end just drilled and tapped, drill a 9/32-in. hole across the block through the center of two flat faces.

8) On each side of the block, enlarge the hole to a diameter F and a depth J (see step 5 and Fig. 2) so the sockets mount with their flanges flush with the block surface.

9) Drill and tap 4-40 mounting holes for these sockets.

10) At this stage, it should be possible to loosely assemble the power splitter as shown in Fig. 2. If you have all the dimensions correct, it should fit together. If it doesn't, now is the time to correct any errors.

11) Assuming all the parts do fit together, take the brass rod and insert the center pin of one of the sockets in the end with the single 1/8-in. hole drilled in it. Solder the pin in the hole. Make sure the pin goes all the way in. Try to align the cross holes so they will be coaxial with the cross holes in the aluminum block when the socket is bolted to the end of the block.

12) Install the socket in the block. Take the other two sockets and install them so their center pins pass into the cross hole in the brass rod. Now comes a tricky part! With a thin soldering iron tip, try to fill the hole in the end of the brass with solder. The solder should then flow down and solder the center pins of the sockets to the brass rod.

That should complete the power splitter. If the splitter is intended for outdoor use, some weatherproofing may be necessary. Square-section aluminum block and brass rod may be obtained from Small Parts, Inc., 6901 NE 3 Ave., P.O. Box 381736, Miami, FL 33138.

*103 Division Ave., Millington, NJ 07946

Results, 1982 IARU Radiosport Championship

By Mark J. Wilson,* AA2Z and Bill Jennings,** K1WJ

"Thank goodness for 20 meters" is what many of the 1363 official entrants from around the world were thinking as the 1982 IARU Radiosport Championship drew to a close last July. Solar flares laid waste to 10 and 15 meters — at least for the first half of the contest — and high noise levels made 160 and 80 difficult. These conditions made stars out of 40 and 20, relatively speaking. Because not everyone has enough antenna to compete on 40 meters, 20 was the place to be. As the contest progressed, the two higher bands livened up some, while the low bands quieted down, making the contest more reminiscent of Radiosports past. K5GA managed to work several Europeans on 80, while stations as far west as Texas were treated to a short direct opening to Europe on 10, instead of the marginal skew-path openings that are the norm in the summer.

Generally speaking, the poor propagation shows in the scores, which are down from last year. KN6M was the only W/VE single op to break 1 million points, and no new W/VE or world records came to pass. The number of entries is also down from last year's 1483.

The cw mode is exceptionally popular for this contest, as witnessed by the intense competition and high scores in the cw-only category. In fact, the number of entries breaks down as follows: Mixed Mode — 229; Cw-Only — 492; Phone-Only — 307; Multi-operator — 159; Checklogs — 176.

Europeans in general, and Soviets in particular, go wild during this contest. Check out the number of logs from zones 28 and 29, as well as the other zones in that part of the world. As one local commented, "I've never worked so many UB5s in my life!" Hats off to all of the stations worldwide who helped to make the contest successful.

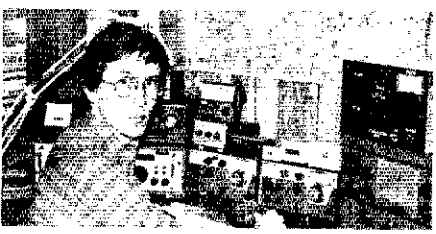
Certificates are scheduled for a February 15 mailing. The next edition of Radiosport is July 9-10, 1983. CU then?

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL

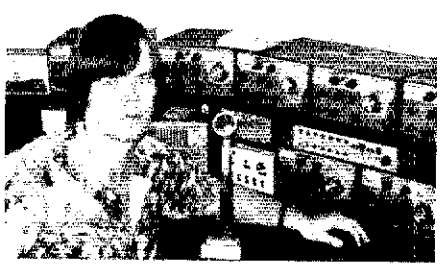
Bill, K1WJ, one of seven operators of VE1SPI on St. Paul Island in zone 9.

Pat, LU3YL, is very active in contesting portable W4 from Virginia.

John, KK9A, turned in the number 7 W/VE phone-only score from his comfortable station in Illinois.



Pete, SM2CEW, says that with the aurora and the super summer weather it was kind of hard to concentrate on the contest, but he hung on for over 200 QSOs just the same.



Number three W/VE codeman Tree, N6TR, from Simi Valley, California.

Top World Scores

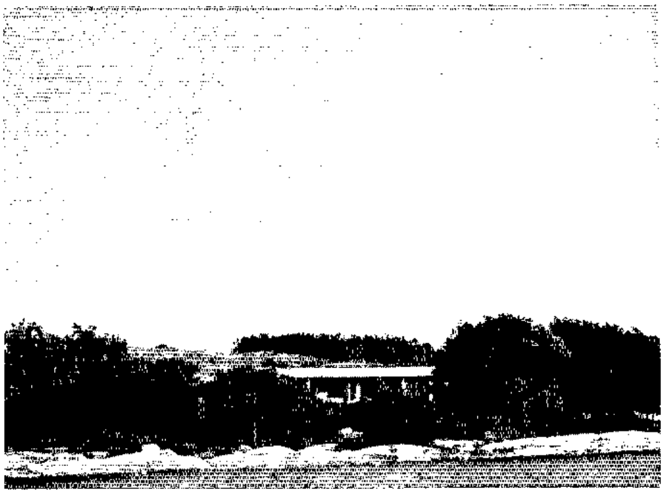
Mixed		*Phone*	
UB5AAF	1,072,643	LZ1KDP	
Y22OM/A	1,054,625	(LZ2CJ)	1,224,868
UQ2GDQ	1,026,201	KN6M	
UF6CR	710,737	(WA6VEF)	1,175,871
K5KG	700,077	OE6MBG	975,295
WA6DBC	674,460	UB5FDF	927,384
OHØBH		KZ5M	850,756
(OH2BH)	662,496	TYA11	848,300
W3XU	657,500	UA6ALL	778,092
OK2BLG	647,829	Y33XB	740,620
YU2OG	573,500	LZ2AB	726,852
		K6HNZ	655,524

CW		*Multiop*	
LU8DQ	1,409,484	R6L	2,795,156
UA1DZ	1,106,991	UK2PCR	2,358,156
K5GA (K5GN)	931,956	UKØAMM	2,344,923
N5JJ	733,752	HK3A	2,217,801
N5RM/NHØ	732,807	UK2BAS	2,005,348
N6TR	720,440	UK5MAF	1,927,354
K5TA	678,156	N5AU	1,848,000
UV9AX	593,856	HG5A	1,776,976
OH2BHV	589,038	N4WW	1,700,496
ON4FD	562,198	UK9AAN	1,601,046

Top W/VE Scores

Mixed		*Phone*	
K5KG	700,077	KN6M	
WA6DBC	674,460	(WA6VEF)	1,175,871
W3XU	657,500	KZ5M	850,756
K8NZ (KQ8M)	523,270	K6HNZ	655,524
WB8JBM		WB5VZL	567,620
(N8DCJ)	523,143	AG7M	545,400
N5DDO	413,364	K5DX	511,110
WB6FCR	345,600	KK9A	386,650
W9PL/5	287,568	KØVUW	375,928
AC8Y	268,576	VE3GCO	355,140
K1AR	265,816	KC8JH	314,962

CW		*Multiop*	
K5GA (K5GN)	931,956	N5AU	1,848,000
N5JJ	733,752	N4WW	1,700,496
N6TR	720,440	W5XZ	1,372,410
K5TA	678,156	VE2HQ	1,165,180
K6LL	531,382	K4CG	962,048
K1XA	525,312	K5JX	950,212
AI9J	490,784	VE5DX	879,407
W3GM	425,662	K5QY	711,848
WA6JAH	376,180	W6UE	684,213
K4BAI	350,450	KB5FU	649,609



Leena, OH2BE (left) and Martti, OH2BH, at the OHØBH station in the '82 Radiosport. Martti did a single-operator number in this year's contest while Leena enjoyed the scenery at the "new" OHØ station location.

Charlie, NØTT/7, did his Radiosport operating Field Day-style from the mountains of Carbon County in Wyoming. He was up about 9000 feet, and the nighttime temperatures went below freezing.

SOAPBOX

I was very disappointed with my catch of zones. Nearly all of my QSOs were with Europe or Asiatic Russia, with a few Ws, VKs and JAs thrown in. Not a squeak out of Africa (9V1TL). A lightning strike that damaged about half of my gear several days before the contest dampened my enthusiasm this year. One of the items hit was my remote coax switch. With it out of commission, I had to run to the base of the tower every time I wanted to change bands (KFØH). Conditions were so bad that I had trouble hearing the "woodpecker." (W6KRO). This was my first "DX" contest. . .My biggest thrill was getting through to St. Paul Island using only my vertical antenna and a barefoot rig (KA6RGC). Due to lousy conditions, this contest was a bizarre cross between the ARRL DX Contest and the November Sweepstakes. Let's hear it for three pointers! (W8FN). This was my first cw contest, and trying to set a goal was difficult. I tried for 250 QSOs, but things seemed slow when the radio broke down with only 125 QSOs in my log. It took me four hours to make the repairs (a Zener diode). I borrowed a keyer; then things really picked up. I made it. (VE2FWE). My biggest disappointment were the stations who gave me 599s when I *know* that I was no better than a 449 — I was running 1-W output (AD1C). My first Radiosport contest and the first contest that I've worked when 10 meters was out. Both 10 and 15 were dreadful. 20 meters was in fine fettle throughout, but I could only manage to drive a wedge in the big U.S. signals once to get a half decent pileup going. (H44SH).

FEEDBACK

Please refer to February 1982 *QST*, page 78, for the following correction to the results of the 1981 Radiosport contest: WD9BDP, not WD8BDP, is the call sign of the top cw-only entrant in the Indiana section.

SCORES

Scores are listed by ITU zone, then by country within that zone. The line score (example — KL7Y 42,942-227-51-A) indicates the call sign used, the total score, the number of valid contacts, the number of ITU zone multipliers and the entry class. The entry class letters indicate: A — single operator, mixed mode; B — single operator, cw only; C — single operator, phone only; D — multioperator, single transmitter.

ZONE 1

Alaska

KL7Y 42,942- 227- 51- A
KL7CQ (+AL7DN,KL7s HEQ,GO,OR,SK,SL,VB,VC,VD,VN VT,NL7P,WB7SFO,WL7U)
140,454- 696- 51- D

ZONE 2

Alberta

VE6CNV 27,340- 254- 32- B

British Columbia

VE7AAQ 15,831- 263- 27- B
VE7IQ 18,259- 193- 31- B

ZONE 3

Manitoba

VE4RF 7696- 94- 26- B

Saskatchewan

VE5BBQ 16,984- 265- 31- B
VE5OX (+VE5MRE,VE5s RG,AE)
879,407-2769-101- D

ZONE 4

Quebec

VE2FWE 20,376- 237- 36- B
VE2HQ (+VE2s EZ0,FOO,FU)
1,165,180-2726-115- D

Ontario

VE3GCO 52,776- 348- 63- A
VE3HOV 5328- 100- 16- B
VE3GCO 335,740-1056- 90- C
VE3IJA 4161- 65- 19- C
KB2KP/VE3 1810- 31- 10- C

ZONE 5

Greenland

OX3OA 21,625- 202- 21- B
OX5RD (KC4II, opr.)
4620- 74- 15- C

ZONE 6

W6

East Bay

WB6FCR 565,600-1068- 96- A
K56O 1846- 50- 13- A
K56B 23,647- 466- 51- B
KN6M (WA6VEF, opr.)
1,175,871-2637-137- C

Los Angeles

AI6Z 76,296- 300- 66- A
N6YJ 221,937- 740- 87- B
N6DHV 65,668- 474- 59- B
N6IC 4482- 50- 12- B
W6CN 78,264- 563- 72- C
WB6KSX/6 25,659- 236- 41- C
AA6S 16,682- 129- 38- C
KA6RGC 6200- 137- 17- C
W6OS (AA6RX,WA6OTU, oprs.)
664,213-1613-131- D

Orange

N6PE 129,024- 488- 84- A
KE6VY 24,900- 292- 30- A
WA6JAH 376,180- 938-106- B
W6IBD 154,676- 508- 86- B
AA6DF 67,060- 522- 56- B
AC6H 24,330- 296- 30- B

Sacramento Valley

KE6G 66,310- 388- 63- A
K6FU 85,727- 425- 59- B
K76H 46,293- 334- 49- B
N6KW 33,478- 305- 38- C

San Diego

WA6UBC 664,380-1971-108- B
N6ND 329,071- 547-109- B
AA6EE 41,209- 258- 49- B

San Francisco

WB6SRM 84,724- 489- 59- A
W6SG (K6LRN, opr.)
5185- 105- 17- B
KA6V 2322- 38- 18- B
K6QU 35,788- 261- 44- C
W6RIP (+WA6DII)
315,594-1033- 89- D

San Joaquin Valley

W6SX 9964- 116- 26- A
WA6HKP/6 310,296-1118- 84- C
WD6FLB 93,872- 504- 72- C

Santa Barbara

N6BR 7026- 93- 24- A
N6IR 270,640-1663-174- B
W2KS/6 93,625- 501- 55- B
KA6CSU 6212- 112- 16- B

Santa Clara Valley

N6NF 62,008- 500- 46- A
N6UW 41,902- 155- 54- A
KA6YK/M 16,560- 195- 30- A
N6MC 42,200- 272- 50- B
N6QW 21,014- 355- 19- B
KA6HNZ 635,524-1530-151- C
KA6HDK 3824- 51- 16- C
W6YX (N1OO,WA1STE,N3ER,W5RD,N6s FDM,OP,WB6LML,W7SW,WB8RUQ, oprs.)
296,504-1178- 84- D
KF6PQ (+ net)
27,555- 252- 33- D

W7

Arizona

K6LL 531,182-1692- 94- B
KC4WQ/7 87,360- 560- 56- C

Montana

KS7T 63,498- 535- 36- A

Nevada

WA7UEC 182,665-1029- 57- B
WB7VVB 6624- 126- 18- C

Oregon

KA7OEM 94,155- 357- 55- A
W7IR 123,366- 716- 58- B
KF7KM 40,640- 234- 50- B
K57P 1420- 29- 14- B

Utah

K7UJO 8138- 107- 26- A
N75M 58,719- 462- 41- C
N7BHC 15,040- 178- 32- C

Washington

K17L 51,695- 346- 49- B
N67U 26,500- 260- 25- B
AA7M 545,400-1644-108- C
WA6NBB 32,976- 469- 64- C

Wyoming

NØTT/7 41,501- 513- 11- B
K87M 5045- 72- 15- C

ZONE 7

W5

Arkansas

AJ5O 32,650- 225- 50- C

Louisiana

W5WG 87,522- 489- 58- A
K5UR 36,480- 199- 48- B
N5BMD 17,790- 176- 30- C
N5BGX 2015- 103- 23- C
W5KR (+K5s EOA,FUU,KB5AS)
1,372,410-2772-153- D
W5FA (AE5V,KA5s GAE,OGM,KC5CZ,KU5H, oprs.)
746,376-1944- 99- D

Mississippi

N5AA 100,254- 634- 49- B

New Mexico

K5TR 578,156-1557-124- B

Northern Texas

W9PL/5 257,568-1214- 72- B
K1SO 48,675- 249- 59- B
N5EYF 192- 24- 8- B
WB5VZL 567,620-1870-101- C
N5AU (+K5ZD,KM5X,KV5B)
1,848,000-3274-168- D
K5QY (+AF5K,KM5K,KY5N)
711,848-2195-101- D

Oklahoma

W5AS 50,140- 346- 46- B
WB5YWO 25,184- 307- 32- C

Southern Texas

K5RC 200,077-1987-111- A
K5OOO 411,364-1688- 84- A
N5BA 116,608- 600- 64- A
KA5L 58,881- 588- 33- A
WD5BKP 4738- 64- 23- A
K5CA (K5GN, opr.)
111,956-1763-148- B
N5II 735,752-1688-129- B
K5AW 302,500- 888-100- B
KA5GRX 77,850- 547- 50- B
AA5E 29,403- 365- 27- B
W5NR 16,236- 117- 51- B
K25M 530,756-2610-106- C
K5DY 511,110-1819- 90- C
K5RZO 198,487- 829- 73- C
KC5CP 100,878- 498- 69- C
WA5IYX 39,420- 370- 45- C

K5JX (+K5TSQ,KA5BIH)
650,212-2372-124- D
KB5FU (+K7FNO,WA5s LVE,WRR)
649,609-2116- 97- D
N5GPU (+N5EMF)
8694- 216- 27- D

WØ

Colorado

ADØO 261,209-1343- 71- A
KØMT 246,075- 937- 85- A
NØZA 138,528- 549- 78- A
ACØS 177,078- 781- 66- B
WØGOR 30,380- 425- 28- C
KAØFPJ 21,049- 263- 31- C
KØUK (+K9MWM,KØYBX,NØs AFU,BRI,
UBY,DVL,WØKEA,WDØASM)
604,754-1574-122- D

Iowa

KFØR 136,812- 665- 52- A
KCØDM 35,902- 527- 23- A
WØYBV 61,674- 371- 57- B
KØØY 2604- 50- 14- B
KAØD 61,442- 372- 62- C
KCØGM 19,048- 354- 46- C
WØANZ 27,687- 255- 33- C
WØPPE 18,678- 181- 33- C
KAØLUY (+WBØUFL)
132,797-1018- 73- D

Kansas

WBØJYT 14,880- 198- 31- A
KØVKU 81,596- 431- 54- B
KAØIKD 2688- 30- 16- B
NØBLD 32,550- 283- 42- C
KAØMMD 30,022- 254- 34- C
NØDEE 8762- 127- 26- C
WAØOMU (+KCØTH,KOØU)
188,440-1045- 56- D

Minnesota

NØBSH 49,720- 362- 44- A
KAØM 54,191- 394- 47- B
KFØI 10,281- 155- 21- B

Missouri

WØGAX 23,052- 210- 51- A
KØEEE (WBØZGD, opr.)
172,017- 787- 69- B
KØRWL 150,731- 747- 61- B
KMØL 112,310- 603- 55- B
WDØAUT 72,846- 362- 57- B
KØSI 42,076- 324- 47- B
KØVDW 375,928-1296- 98- C
KIØY 11,900- 194- 34- C
WBØUXI (KØs GS,RWL,TLM,UAA,KBØD,
SCØB,WØFI, oprs.)
575,174-1368-101- D

Nebraska

AKØG 34,020- 336- 36- A
KBØAC 55,685- 390- 43- B
FØDL 34,180- 476- 35- B
KCØKY 19,104- 234- 24- C

North Dakota

KIØP 13,368- 164- 34- A

South Dakota

KØIV 1122- 26- 11- A
KAØNAW 31- 5- 3- A
KAØNAV 493- 19- 9- C

ZONE 8

W1

Connecticut

WA1FCN 31,936- 294- 68- A
K1XA 525,312-1544- 96- B
W1CNU 9306- 105- 22- B
AA2Z 1581- 31- 17- B
KA1YR 58,476- 470- 54- C
KA1BIB 30,880- 287- 40- C
K1NCD 16,678- 154- 31- C
AB1U 9168- 166- 16- C
KA1YP 8832- 131- 23- C

Eastern Massachusetts

K1AR 565,816-1336- 68- A
K1XM 126,336- 658- 64- A
KC1X 110,422- 581- 62- A
AD1C 11,845- 267- 23- A
W1EM 5040- 85- 20- A
WB1EYI 4860- 111- 20- B
K1VUT 4384- 99- 16- B
KA1GHR 2208- 64- 16- B
W1OPJ 1512- 42- 12- B
AA1Q 31,752- 575- 27- C
KA1R 29,700- 312- 33- C
WB1FCI 6988- 295- 14- C
KA1UI 6602- 97- 23- C
N1ADY 2343- 113- 11- C
C4BIN/W1 (+G4s DUA,KHU,DAN)
41,676- 318- 46- D

Maine

KA1GQR 25,160- 298- 30- A
KA1MP 13,390- 191- 26- A
K1SA 10,212- 100- 21- B
WB1GLH 6090- 172- 15- B
KA1GGE 47,430- 390- 45- C
K1BZ (+K1CZ,KA1AKS,N1ATN)
39,976- 473- 49- D

New Hampshire

W1END 77,888- 329- 64- B

Rhode Island

KC1G 39,410- 460- 35- A
K1MXO 34,200- 319- 40- B

Western Massachusetts

WB1HIH 833- 59- 7- B

W2

Eastern New York

KC2QF 179,538-1109- 69- A
KA2MNJ 72,000- 500- 56- A
W3MR 55,320- 364- 53- A
K2LYQ 747- 31- 9- A
W2XL 226,341- 847- 83- B
N2CAP 99,924- 456- 66- B
N2AZS 37,440- 350- 39- B
AA2Z 21,812- 200- 38- B
W2DW 10,150- 110- 29- B
KB2MG 277,612- 956- 77- C
W2YV (+K1s BW,EB,KA1R,KB1BO,
KC1Q,W1XK,WA1TZV,K2s EK,VV,KF2A,
KR2J,N2NT,W2s PA,RQ,SQ,YX)
237,930-1140- 70- D

Northern New Jersey

WA2PID 54,688- 319- 55- A
WA2ODT 23,188- 256- 34- A
K0ZI 159,810- 817- 70- B
WA2ASQ 5420- 105- 20- B
N2BNC 38,732- 306- 46- C
KC2DE 15,538- 145- 34- C

New York City-L.I

KA2ALV 171,421- 753- 81- A
W2GKZ 74,240- 400- 58- A
KR2G 40,256- 436- 34- A
K2SA 764,150-1073- 90- B
WB2OEU 28,720- 277- 40- B
N1EE 23,715- 225- 31- B
KC2DH 8303- 143- 23- B
WB2DLA 6220- 129- 20- B
N2BZK 23,440- 258- 40- C
KS2G 12,028- 125- 31- C
AC2P 6060- 100- 15- C
N2ANN (+WA2ANV)
120,776- 682- 62- D

Southern New Jersey

WB2YDP 47,560- 368- 41- B
KC2ME 201,918-1147- 67- C
WA2JSG 10,511- 149- 23- C

Western New York

K2ZR 51,350- 345- 50- A
W2FTY 90,919- 479- 59- B
W2FUI 39,710- 346- 55- B
KA2GGV 30,615- 269- 39- B
W2OW (KA2CDE,KF2X,KI2P,N2s BXC,
CFN,HR,N6IN,oprs.)
199,848- 962- 66- D
KA2ECV (+AC2X,N2CZX)
36,600- 669- 60- D

W3

Delaware

N3XU 657,500-1867-100- A
N3AHA 40,953- 543- 33- B
K3WGR/3 6604- 104- 26- B

Eastern Pennsylvania

K3FN 187,880- 739- 77- A
W3GM 425,662-1424- 82- B
W3ARK 69,408- 422- 48- B
KA3BIE 15,022- 265- 29- B
N3KR 5654- 87- 18- B
K3ND 24,600- 160- 40- C
WA3DMH 14,756- 110- 28- C
WA3YEI 9672- 125- 26- C
K3PZX 4040- 59- 20- C
KC3Q (WA2DLH,KA3DSW,KC3AF,N3s
CBL,CFR,WA3VUE,WB3s KPW,FPA,
FYL, oprs.)
148,221- 733- 67- D

Maryland-D.C.

WB3FSB 95,648- 498- 61- A
WA3VPL 58,646- 328- 59- A
W3ECM 12,930- 202- 30- A
W3EE 12,285- 117- 35- A
K3VY 30,392- 251- 51- C
KA3AAH 1332- 45- 12- C

Western Pennsylvania

K3UA 44,854- 329- 41- A
WB3KKX 57,379- 355- 49- B

W4

Alabama

KA4RDW 25,630- 338- 35- A
N4QB 73,488- 594- 34- B
WD4PZN 50,732- 443- 44- B
WA4QBI 34,364- 550- 22- B

Georgia

AA4GA 221,520-1092- 78- A
K4BAI 350,450-1465- 86- B
KS4Q 313,097-1365- 73- B
AA4U 48,898- 371- 46- B
W4CLS 39,351- 393- 39- B
KA4MNS 32,040- 256- 45- B

Kentucky

WA4QMQ 104,098- 591- 62- A
NO4R 44,000- 396- 32- B

North Carolina

WA6BJH 136- 34- 4- B
WD4AAN 113,920- 638- 64- C
WD4AVY 44,157- 362- 41- C
WA4Y 28,862- 262- 33- C
N4AYJ 25,830- 363- 30- C

Northern Florida

W4DU (KW4T, opr.)
223,284-1032- 92- A
W4WKQ 118,470- 675- 66- A
KA4MOJ 44,979- 316- 47- A
KE4UD 33,855- 330- 37- A
WB4WBQ 18,538- 253- 31- A
W4DFU (WA9YNE, opr.)
219,186- 913- 81- B
NW4L 155,652-1071- 51- B
W4VO 59,392- 300- 58- B
KO4KU 12,360- 281- 24- B
KC4ZT 11,070- 145- 30- B
N4WW (+K2YNU,AA4NA,N4s EF,SA,
NA4N, oprs.)
1,700,496-3050-168- D

South Carolina

K4CNW 134,883- 735- 63- B
N4LQ 42,044- 312- 46- B
KX4H 67,545- 426- 57- C
WB4AFP 7348- 141- 22- C
K8UM 6084- 124- 18- C

Southern Florida

WB4TDH 206,368- 886- 62- B
WD4AHZ 86,178- 688- 53- B
W4BV 58,520- 328- 55- B
WA4OML 38,688- 390- 32- B
W4BAA 33,337- 155- 51- B
K8UNP/4 23,920- 142- 40- B
N4BFY 15,579- 265- 27- B
W4YN 5984- 64- 22- B

Tennessee

W4DCG 6324- 145- 17- A
AA4AK 276,600-1208- 75- B
WB4PHW 16,500- 170- 33- C
KB4FX 1200- 58- 12- C
N4GEA (+WD4LHR)
6466- 102- 23- D

Virginia

K4FPF 52,800- 314- 50- A
W4XD 25,715- 251- 37- B
WB4UNL 10,260- 216- 19- B
N4MM 71,360- 365- 64- C
UD3YL/W4 29,574- 134- 53- C
W4KMS 17,856- 150- 36- C
K4CG (K4PQL,K7SV, oprs.)
362,048-2143-128- D

Mississippi

KR5K 13,949- 237- 29- B

W8

Michigan

AG8Y 268,576-1217- 77- A
KS8Q 66,715- 397- 55- A
WD8LCD 27,960- 250- 35- A
K8CV 11,594- 150- 22- A
N8COA 5940- 114- 20- A
WA8RRB 314,902-1078- 83- B
K8DU 68,040- 340- 60- B
K08J 34,128- 350- 36- B
KT8T 17,199- 253- 27- B
N8DEQ 84,336- 661- 48- C
KB8UF 72,522- 454- 54- C
WB8VPQ 11,256- 144- 28- C
K1BV 1209- 43- 13- C
KN8P (+KN8R)
526,720-1450-128- D
WA8MIX (KA8s EEA,IRC,GAG,KKO,LAQ,
LAR,KC8K,KK8K,KM8Y,W8YX,WA8VPU,
WB8SEZ,WD8s QKJ,QMB, oprs.)
274,808- 946- 76- D
N8CXX (+N8BTU)
90,780- 650- 51- D
W8JUU (KL7EZ,KA8s GNW,IZN,JPU,
FIBZ,N8ECP,WB8WXE, oprs.)
42,168- 402- 42- D

Ohio

K8NZ (KQ8M, opr.)
523,270-1366-110- A
WB8JBM (N8DCJ, opr.)
523,143-1413-111- A
N8TM 167,152- 908- 62- A
W8UPH 75,449- 561- 49- A
K1IT 28,082- 263- 38- A
WN8ODT 1560- 69- 12- A
KA8MMQ 1476- 49- 12- A
W8FN 272,217-1080- 73- B
WD8AUB 270,075-1195- 75- B
WB8KKI 135,395- 723- 65- B
N8BJQ 130,812- 667- 66- B
K8BC 112,050- 626- 50- B
AA8S 103,104- 412- 72- B
W8LNO 99,887- 500- 59- B
K8MR 70,875- 293- 63- B
KW8J 57,300- 520- 41- B
K8EF 30,180- 305- 52- B
W8EAD 3055- 95- 13- B
KC8JH 314,962-1275- 82- C
W8KRF 202,312- 585- 76- C
N8ATR 103,275- 487- 75- C
K8SWB 31,960- 260- 47- C
W8ANM 17,440- 157- 32- C
W8OXT 6292- 127- 22- C
KI8O 3696- 83- 16- C
KA8CBE 3406- 64- 19- C

West Virginia

KN8D 45,738- 269- 56- A
WA8YTM 31,949- 305- 43- A
K8OQL 19,278- 131- 42- A
KD8G 137,459- 626- 73- B
K8IZ 132,492- 582- 61- C
N8VEN 16,120- 190- 31- C
WB8WEZ 292- 31- 4- C

W9

Illinois

WB9TBU 31,390- 262- 43- A
K9UQN 16,718- 251- 26- A
WD9DGE 12,792- 198- 26- A
AI9J 490,784-1319-112- B
K9MFI 280,665-1219- 77- B
WB9JKI 185,256- 899- 72- B
WD9DBC 119,336- 795- 56- B
W9RY 56,036- 381- 36- B
KN9A 386,650-1672- 95- C
KB9AW 46,640- 342- 55- C
WD9HMQ 32,250- 286- 43- C
W9REC 8062- 91- 23- C
KB9II 1661- 57- 11- C
K9SD (+K9s BCL,OZY,FD,HWO,
KC9AL,KD9M,WB9CIA,KØFU,KRØY)
615,750-1835-114- D
AJ9D (+N9AEJ,WD9FEN)
486,766-1664- 98- D

Indiana

W9XD 49,450- 359- 50- A
KC9FC 40,655- 304- 47- C
WD9EME 4598- 81- 22- C
KM9R (+KB9YD,N9NB)
568,640-1364- 90- D
N9AYC (+KA9s FUC,LHE)
85,344- 572- 36- D

Wisconsin

KB9S 84,504- 541- 56- B
K9GDF 65,490- 252- 37- B
N9CYB 32,360- 377- 40- C
N9AKV 7200- 112- 25- C
KA9KHV 354- 27- 6- C

United Nations HQ

4U1UN (DJ6LV, opr.)
65,424- 411- 58- B

ZONE 9

Maritimes-Newfoundland

VE1CCM 135,560- 913- 53- A
VE1AXT 163,530- 538- 79- B
VO1AW 3105- 53- 15- B

St. Paul Island

VE1SPI (AK4L,K1WJ,VE1s AI,ASJ,
FH,W1s GNC,XX, oprs.)
1,028,640-3797- 80- D

ZONE 10

Mexico

6D5OX 172,656- 736- 72- C
6D5LIS 71,588- 545- 44- C

ZONE 11

Puerto Rico

KP4FI 494,628-1386- 94- B
KP4V 431,799-1241- 93- B

Dominican Republic

HI8LC 3840- 120- 8- B
HI8GB 138,336- 865- 44- C
HI3AMF 3592- 275- 7- C

Guatemala

TG9FW 200,912- 980- 58- C

Ivan, KP4FI (ex-WP4BDS), made the top cw score from zone 11.

A welcome multiplier from zone 12 came from PZ5JR (left) and PZ5RC, operators of station PZØAA.

Tim, KQ8M, operated K8NZ to the number 4 mixed-mode position for Ws and VEs.

Costa Rica

TI2LU 24,154- 261- 26- C

ZONE 12

Colombia

HK3GI/HK1 441,128-1376- 62- B
HK3A (HK3s AED,AXI,KIZO, oprs.)
2,217,801-3513-127- D

Surinam

PZØAA (PZ5s JR,RG, oprs.)
79,292- 461- 43- D

ZONE 14

Argentina

LU9EIE 221,339-1159- 91- A
LU8DQ 1,409,464-1952-146- B
LU1EWL 53,300- 256- 50- B

ZONE 15

Brazil

PY1ZFO (W4VA, opr.)
45,032- 200- 44- B
PY1VT 42,114- 157- 18- B
PY2BPR 9207- 66- 31- B
ZY2AT 600- 20- 6- B
PP2ZDD 528,982-1301- 83- C
PY1NEZ 210,595- [illegible] C
PT9OK 21,461- 139- 31- C
PY1BFZ 8064- 56- 21- C
PY1DBB 4465- 47- 19- C

ZONE 16

Argentina

LU2WM 52,939- 227- 39- B
LU1VZ (LU1VK, opr.)
104,082- 372- 57- C

ZONE 17

Iceland

TF3YR 3210- 66- 15- A

ZONE 18

Svalbard

JW5OD 15,522- 163- 26- B

Norway

LA4YW 145,270- 653- 65- B
LA9HW 122,078- 602- 62- B
LB5AB 51,435- 375- 45- B
LA1IE 10,064- 85- 34- B
LA2TO 8998- 117- 27- C
LA4HH 7532- 76- 28- C
LA2CBA 2835- 60- 15- C
LA4DCA 1755- 60- 9- C
LA1PBA 1400- 41- 10- C
LA6LBA 696- 28- 8- C
LA5QK 498- 25- 6- C
LA5JX 240- 16- 5- C
LA9GX (+LA1JBA,LA9ZV)
794,303-1652-113- D

Finland

OH2BFS 3264- 60- 16- A
OH1VR (OH3HC, opr.)
532,201-1350-103- B
OH1RZ 90,279- 411- 65- B
OH3RU 87,730- 610- 62- B
OH5UO 79,758- 609- 54- B
OH6RC 43,288- 209- 56- B
OH2BAH 10,222- 126- 19- B
OH2BQG 6590- 125- 15- B
OH1FM 1917- 46- 13- B
OH2XX 155- 10- 5- B
OH1JJ 939,218-1576-107- C
OH6HI 1118- 26- 13- C

Aland Islands

OHØBH (OH2BH, opr.)
662,496-1576-101- A

Denmark

OZ7IZ 210,936- 763- 68- A
OZ1GRS 45,474- 330- 39- A
OZ6EI 7372- 95- 19- A
OZ7BW 58,338- 223- 63- B
OZ8SJ 41,032- 242- 56- B
OZ1HET 18,730- 225- 25- B
OZ5EV 560,189- 907- 93- C
OZ1CTR 235,788- 749- 84- C
OZ1LAH 32,947- 215- 47- C
OZ8T 18,520- 132- 40- C
OZ2BM 18,318- 114- 43- C
OZ8MB 9372- 141- 16- C
OZ1APA 3278- 39- 22- C
OZ9QW 1482- 30- 11- C
OZ3RE 1152- 25- 12- C

Sweden

SM5ALJ 131,767- 559- 63- A
SK7OT (SM7WT, opr.)
62,314- 345- 46- A
SM7IV 12,950- 148- 25- A
SMØLPO 9570- 124- 22- A
SL5ZZQ (SM5DAC, opr.)
57,154- 338- 41- B
SM6LAZ 48,960- 178- 65- B
SM5ABK 33,550- 146- 61- B
SM2CEW 20,275- 232- 25- B
SM5AF 10,102- 152- 38- B
SM7KIL 13,293- 144- 21- B
SM4AZD 1784- 80- 28- B
SM7CZC 405- 9- 9- B
SM7LWU 93,334- 620- 46- C
SM7AIO 38,458- 268- 41- C
SM5GXW 7847- 132- 19- C
SM6JY 3120- 73- 20- C
SMØMVX 3384- 134- 9- C
SM5AQD (+SMØs GMG,GNH)
1,561,258-2777-131- D

ZONE 19

European R.S.F.S.R.

UA1DZ 1,106,993-1981-141- B
UA1ALZ 173,524- 761- 52- B
UA1NBD 156,924- 638- 54- B
UA1ZEF 65,910- 516- 39- B
UW1YY 48,692- 254- 47- B
UA1ADA 120- 10- 4- B
UA1CAX 170,312- 784- 61- C
UA1NBF 2781- 93- 9- C
UK1AFA (UA1AAF + 2 oprs.)
466,156-1428- 94- D

ZONE 20

Asiatic R.S.F.S.R.

UA9XSQ 143,192- 583- 56- A
UA9XWZ 12,195- 165- 31- A
UA9XN 260,040- 982- 60- B
UA9XWU 164,198- 606- 58- C
UA9XWR 66,763- 476- 31- C
UK9CDG (UA9s CGC,CPL,CQS, oprs.)
464,983-1284- 77- D

ZONE 21

Asiatic R.S.F.S.R.

UKØBAA (3 oprs.)
54,196- 373- 34- D

ZONE 22

Asiatic R.S.F.S.R.

UAØSLP/Ø 150- 10- 5- B

ZONE 23

Asiatic R.S.F.S.R.

UAØDWN 15,717- 131- 31- B
UAØQBR 132,666- 484- 62- C

ZONE 27

Republic of Ireland

EI7CC 296- 21- 8- B
EI5DP 33,306- 263- 42- C

France

F9BB 29,854- 169- 46- B
F8TM 19,194- 136- 42- B
F6CCI 10,051- 113- 23- B
F6HDY 196,384- 738- 68- C
F5KAB (F6s CVM,DEX, oprs.)
195,990-1191- 57- D

England

G4GIR 463,912-1217- 99- B
G3KDB 196,868- 627- 79- B
G3RTT 173,221- 517- 83- B
G3SXW 151,028- 600- 68- B
G3KBF 67,600- 375- 50- B
G3TXF 51,686- 342- 43- B
G5GKL (K6PU, opr.)
44,768- 337- 32- B
G4MVA 25,440- 354- 20- B
G4BUO 19,173- 257- 21- B
GB5BA (K9FOH, opr.)
14,421- 216- 19- C

Jersey

GJ5EMB 94,450- 508- 50- B

Scotland

GM3RAO 21,489- 307- 19- B
GM4HOF 22,390- 374- 33- C

Wales

GW3MPB 24,500- 200- 35- B

Belgium

ON4FD 562,198-1603- 91- B
ON6FT 83,979- 535- 43- B
ON4XG 51,504- 447- 52- B
ON7LB 31,320- 555- 24- B
ON5WL 27,624- 202- 32- B
ON7JJ/P (ON4s ABN,ALC,APS,PU, UM, oprs.)
112,805- 570- 55- D

The Netherlands

PAØUV 30,570- 146- 36- B
PAØDIN 16,500- 80- 55- B
PA3AWI 7416- 117- 18- B
PA3BLU 4788- 252- 19- B
PAØKHS 56,458- 327- 52- C
PA3ATK 42,398- 272- 43- C
PAØLJM 24,387- 181- 33- C

ZONE 28

Federal Republic of Germany

DL5LAW 27,075- 363- 25- A
DL7YS 4900- 80- 20- A
DK7OB 47,515- 316- 43- B
DL1TH 44,931- 374- 31- B
DL1AM 17,872- 134- 38- B
DL3GW 10,1[illegible]4- 110- 22- B
DL8PC 448,500-1101- 92- C
DF6VE 86,820- 431- 60- C
DK5OS 41,117- 310- 37- C
DL8AAE 24,904- 168- 64- C
DK5KJ 16,441- 115- 61- C
DL9MAA 4788- 80- 18- C
DF8HS 3294- 55- 18- C
DC2AK 2805- 49- 17- C

Hungary

HA7SU 54,500- 309- 50- B
HA5JK 31,005- 193- 33- B
HA7KLJ (HA7LJ, opr.)
18,564- 178- 34- B
HA9PP 9009- 287- 13- B
HG5A (+HA5s FN,FM,GF,JI,LN,MK, ML,OM,PP,WE,HA7RY)
1,776,978-3235-136- D
HA4KYN (HA4s XH,XI,ZZ, oprs.)
1,182,736-2492-116- D

Switzerland

HB9AGH 39,970- 239- 60- B
HB9DX 38,480- 206- 52- B

Italy

I2VXJ 556,400-1365-104- B
IØZMQP 232,737- 805- 69- C
I8NOA 95,227- 379- 66- C
IV3IQE 46,066- 338- 31- C
I4CSP 60,812- 306- 38- C
IØKHY 35,776- 180- 52- C
I1XHV (+I1s BUY,BPF,CCL)
253,435-1085- 65- D

Bulgaria

LZ1KWS 249,927-1480- 67- A
LZ2KRR (LZ2AP, opr.)
13,860- 144- 22- A
LZ2SO 1364- 58- 11- A
LZ2JE 73,236- 639- 51- B
LZ2BR 67,896- 395- 46- B
LZ1IA 62,440- 351- 56- B
LZ1EP 21,570- 222- 34- B
LZ2AG 6463- 103- 15- B
LZ1KDP (LZ2CJ, opr.)
1,224,868-2071-139- C
LZ2AB 776,852-1856-102- C
LZ2RR 175,851- 604- 81- C
LZ1KSN (LZ1s QD,QV,XS,ZL, oprs.)
803,850-1995-115- D

Austria

OE6MBG 975,295-1714-131- C

Czechoslovakia

OK2BLG 647,829-1408-117- A
OK1IN 311,185- 948- 85- A
OK1PQ 148,038- 593- 66- A
OK1AJN 135,539- 480- 83- A
OK1KZ 84,042- 433- 58- A
OK1MIZ 28,000- 279- 35- A
OK3KAP (OK3CWU, opr.)
26,013- 275- 29- A
OK1AJY 15,620- 199- 22- A
OK1IST 6888- 88- 21- A
OK1VMA 3560- 110- 20- A
OK1IW 3808- 58- 17- A
OK1DLD 2496- 91- 12- A
OK2BHV 589,038-1519-114- B
OK1AVD 438,060-1146- 98- B
OK2QX 71,556- 289- 67- B
OK2PFQ 65,892- 334- 51- B
OK1AXB 55,900- 294- 50- B
OK1MKU 51,015- 226- 57- B
OK1BA 49,160- 327- 40- B
OK3TAY 42,240- 302- 40- B
OK1AXA 25,529- 233- 37- B
OK1CDN 20,708- 196- 31- B
OK1BB 15,650- 168- 25- B
OK1KRQ 12,900- 158- 25- B
OK1MWN 11,820- 110- 30- B
OK2BBQ 10,951- 179- 17- B
OK1MZO 9477- 101- 27- B
OK3CCB 6216- 144- 14- B
OK3CEL 4770- 110- 9- B
OK1DLF 3648- 58- 16- B
OK1AOU 1584- 36- 12- B
OK1MAA 1225- 79- 7- B
OK1DZD 1061- 27- 11- B
OL2VAG/P 624- 46- 6- B
OK1JDX 539- 61- 7- B
OK2KVI/P 402- 29- 6- B
OL2VAH 144- 22- 4- B
OK3CFA 337,155- 915-105- C
OK2BOL 74,240- 373- 58- C
OK1YK 52,210- 353- 46- C
OK2PDE 47,560- 347- 29- C
OK3CRH 16,370- 177- 32- C
OK1KSO (Multiop)
1,448,658-2437-139- D
OK3KCM (Multiop)
1,046,100-2360-110- D
OK1KCU (OK1s AGN,OCP,JHR,JIM, JST, oprs.)
538,361-1482- 89- D
OK3KFO (OK3s CHZ,CUM,CZM, oprs.)
385,366-1241- 86- D
OK3KEE (OK3s CGG,IKA,TEC, oprs.)
340,200-1156- 81- D
OK3KEX (OK3ZAS + 2 oprs.)
135,104- 652- 74- D
OK1KPX (Multiop)
105,264- 527- 68- D
OK2KLK (Multiop)
16,880- 147- 40- D
OK1KKL (Multiop)
6666- 89- 22- D

Greece

SVØAN 36,448- 294- 36- C
SVØAU 27,850- 330- 25- C
W4MAI/SV1 11,394- 131- 27- C

Crete

SVØBG/9 29,540- 262- 35- B

Rumania

YO6KAF (YO6VZ, opr.)
222,625-1118- 65- A
YO9HP 109,058- 510- 62- A
YO7AOT 70,952- 466- 49- A
YO3CR 31,311- 197- 49- A
YO8OD 15,022- 174- 29- B
YO6EZ 10,469- 169- 19- B
YO3BAP 8300- 132- 20- B
YO3JG 7035- 75- 21- B
YO6HQ 3626- 141- 14- B
YO8BDA 2674- 77- 14- B
YO8BOI 2226- 50- 14- B
YO6BMG 1792- 100- 8- B
YO6BTY 90- 25- 2- B
YO3KWJ 48,368- 506- 64- C
YO4HT 28,750- 177- 46- C
YO6AFP 18,067- 199- 29- C
YO4BXX 2024- 56- 11- C
YO9BSF 1920- 52- 16- C
YO2ALV 1199- 35- 11- C

Yugoslavia

YU2OG 574,500-1490-100- A
YU1NZW 129,430- 481- 70- A
YU2FF 14- 5- 2- A
YU4YA 180,257- 667- 77- B
YU7SF 155,040- 694- 68- B
YU3EO 105,035- 783- 35- B
YU7ORQ 46,540- 265- 52- B
YU7AF 31,837- 284- 31- B
YU7FN 24,030- 341- 18- B
YU7QDY 3944- 66- 17- B
YU3TSR 216,084-1521- 33- C
YU4EBL (YU4s VFF,WCW,WEU,WGD, WRR,WST, oprs.)
1,361,355-2503-141- D

German Democratic Republic

Y22OM/A 1,054,625-2118-125- A
Y37UF 230,802- 912- 78- A
Y32KE 201,520- 779- 80- A
Y33UO 45,828- 196- 57- A
Y21XC 45,816- 276- 46- A
Y47XN 43,050- 240- 50- A
Y56YF 41,856- 259- 48- A
Y24JJ 39,120- 330- 40- A
Y48DJ 30,100- 170- 43- A
Y41ZF 19,760- 248- 28- A
Y47ZF 19,362- 146- 42- A
Y44XF 18,200- 121- 40- A
Y31WO 11,550- 118- 30- A
Y49XN 7581- 101- 21- A
Y31PA 7412- 106- 17- A
Y27YF 3553- 82- 17- A
Y27CL 3402- 45- 18- A
Y23GB 1326- 29- 13- A
Y51VB 183,236- 681- 76- B
Y25TG 180,708- 814- 66- B
Y51IA 117,469- 712- 59- B
Y23CM 20,650- 146- 35- B
Y35RK 17,577- 194- 31- B
Y22UB 17,316- 134- 39- B
Y37ZE 17,272- 158- 34- B
Y39YD 15,402- 121- 34- B
Y26MC 12,826- 171- 22- B
Y37RL 9126- 147- 18- B
Y53XM 8766- 149- 18- B
Y22UK 4380- 114- 15- B
Y25KL 3600- 57- 20- B
Y25CL 3610- 55- 19- B
Y27IL 781- 25- 9- B
Y27HR 978- 55- 6- B
Y34YH 637- 41- 7- B
Y26FL 469- 21- 7- B
Y23HB 360- 20- 4- B
Y33XB 740,620-1905- 95- C
Y38YR 90,883- 402- 57- C
Y19XN 28,688- 247- 44- C
Y54ZL 26,410- 220- 38- C
Y23YK 14,112- 114- 36- C
Y26EL 10,536- 127- 24- C
Y26HO/P 10,730- 100- 29- C
Y57TH 7774- 103- 23- C
Y23RO 3300- 102- 11- C
Y25VJ 2210- 46- 17- C
Y53WL 1638- 60- 9- C
Y43ZL (+Y43VL)
599,254-1457- 89- D
Y36ZM (+Y36VM)
98,226- 697- 50- D
Y39ZH (+Y71OH)
45,120- 255- 48- D

ZONE 29

European R.S.F.S.R.

UA6LFX 460,130-1277- 94- A
UA3DCG 343,890-1158- 90- A
UA3SBW 337,689-1110- 99- A
UA6JAD 302,908-1126- 82- A
UA1AWO 255,944-1023- 81- A
UA1CAT 113,575- 758- 59- A
UA3QAQ 88,300- 526- 50- A
UA6ARA 61,104- 683- 38- A
UA6HKN 60,156- 549- 36- A
UA6LCN 41,625- 412- 37- A
UA6AJG 41,430- 233- 50- A
UA1WBZ 33,718- 259- 46- A
UA6LGJ 32,150- 348- 25- A
UA3TES 25,976- 276- 34- A
UA3VEF 24,531- 252- 37- A
UA6LBF 21,204- 276- 31- A
UA1CGE 19,539- 153- 39- A
UA4LM 13,671- 257- 21- A
UA6ADV 12,000- 115- 30- A
UW4NP 11,390- 190- 17- A
UA3VAS 8904- 109- 24- A
UA3DCX 8140- 126- 22- A
UA3DTD 4356- 94- 18- A
UA3HDV 2196- 122- 9- A
UA6AKT 1905- 31- 15- A
UW3HV 574,947-1482-107- B
UA4FAZ 432,006-1430- 89- B
UW3QQ 356,811-1760- 97- B
UA3DCY 339,357-1206- 93- B
UA3VDO 183,742- 802- 74- B
UA6HNJ 101,790- 601- 58- B
UA3ALS 99,354- 524- 58- B
UA3RDH 67,237- 320- 81- B
UA3DRI 71,984- 491- 44- B
UV3AP 70,450- 521- 50- B
UZ3RV 64,168- 398- 52- B
UA6LGG 57,654- 370- 46- B
UA3EDF 56,662- 411- 61- B
UA3AFX 55,650- 312- 53- B
UA1QBE 54,097- 381- 47- B
UA4CDY 53,956- 538- 36- B
UW3GL 42,705- 307- 45- B
UA3GO 42,483- 268- 51- B
UA3LAR 40,807- 250- 43- B
UA3ECF 33,550- 334- 25- B
UA3WBU 33,335- 229- 61- B
UA3QBC 28,560- 335- 30- B
UA3QEE 27,306- 300- 37- B
UA3MAR 24,252- 282- 34- B
UA4CLB 24,472- 329- 23- B
UA4CDL 20,068- 268- 29- B
UA4NBU 19,942- 295- 26- B
UA3AEZ 19,521- 276- 27- B
UA3LOZ 19,448- 268- 22- B
UA3YAO 18,816- 145- 32- B
UA3XN 18,576- 170- 36- B
UA6HLP 15,548- 269- 26- B
UA3ICF 13,566- 246- 17- B
UA4NCB 9488- 275- 16- B
UA6LJE 8109- 269- 17- B
UA1ANA 5652- 200- 11- B
UA4ALI 2893- 141- 11- B
UA1RCT 2850- 82- 15- B
UA1DF 1700- 34- 10- B
UA3IAR 192- 24- 6- B
UA6ALL 778,092-1701-118- C
UA6LBG 576,124-1087-101- C
UW1AE 243,268- 895- 84- C
UA3QDW 193,510- 828- 74- C
UA6AHI 87,000- 487- 60- C
UA4CO 64,638- 358- 54- C
UW4CF 60,300- 380- 60- C
UA4NAA 46,960- 284- 60- C
UA3TN 46,972- 263- 58- C
UA4LZ 45,000- 252- 50- C
UA4ACP 35,139- 297- 39- C
UA3AIO 33,088- 254- 47- C
UA3DRT 29,350- 317- 27- C
UA6UDB 22,270- 269- 34- C
UW3ZH 13,228- 74- 52- C
UW4NN 2280- 70- 24- C
R6L (UA6s LHR,LIG,LO + 2 oprs.)
2,795,156-4046-182- D
UK6LAA (13 oprs.)
1,363,600-2787-140- D
UK4ABZ (UA4AAW +2 oprs.)
950,956-2197-124- D
UK4LAZ (UA4s LBE,LCH, + 1 opr.)
346,704-1292- 93- D
UK3DAH (3 oprs.)
329,017-1150- 88- D
UK6LIG (6 oprs.)
283,611-1040- 83- D
UK1AAW (3 oprs.)
219,450-1147- 75- D
UK6HCZ (EZ6HDM,UA6HJU,UW6FG, oprs.)
214,536- 824- 84- D
UK6AGQ (3 oprs.)
209,415- 667- 69- D
UK3AAR (EZ3ABS + 4 oprs.)
179,056- 775- 66- D
UK3EAZ/P (UA3s EAL,ECM, oprs.)
178,530- 869- 66- D
UK3AAA (UA3AJP + 2 oprs.)
175,752- 867- 72- D
UK3XAB (RA3XBS + 3 oprs.)
167,178- 959- 51- D
UK3OBW (3 oprs.)
148,428-1016- 52- D
UK3OAM (UA3s QLJ,QPA,QPW, oprs.)
68,416- 390- 32- D
UK3DBV (UA3DFO + 2 oprs.)
54,570- 422- 51- D
UK6LBN (UA6LAG + 1 opr.)
40,677- 387- 39- D
UK3MAE (UA3s MCH,MCM, oprs.)
39,938- 625- 38- D
UK3EAO (UA3EDK + 4 oprs.)
39,270- 473- 34- D
UK1CIC (EZ1CAH,UA1s CID,CJV, oprs.)
33,542- 629- 31- D
UK3DDE (UA3DNZ + 2 oprs.)
25,216- 297- 32- D
UK3UAO (UA3s UBG,UBY,UCT, oprs.)
24,704- 316- 37- D
UK3DCV (7 oprs.)
22,194- 315- 27- D
UK3AAC (UA3AMW + 2 oprs.)
16,830- 379- 18- D
UK3WAF (6 oprs.)
12,034- 540- 62- D
UK6QAA (UF6QAN + 2 oprs.)
1482- 94- 6- D

Kaliningradsk

UA2FCB 61,100- 298- 65- B
UA2DC 8136- 187- 18- B
UA2FC 170,868- 708- 76- C
UK2FAA (RA2FDE,UA2s FCW,FCZ,FFW, oprs.)
665,990-1929- 94- D
UK2FBV (3 oprs.)
41,405- 434- 35- D

Ukraine

UB5AAF 1,077,743-1981-143- A
UB5XCM 387,830-1259-101- A
UB5GBD 165,372-1336-108- A
UB5UGU 76,880- 403- 62- A
UY5TE 72,325- 497- 55- A
UB5JJA 56,661- 378- 33- A
UB5IPJ 52,560- 370- 48- A
UB5IET 44,998- 605- 39- A
UB5IMD 31,430- 340- 39- A
UB5ILG 16,560- 322- 24- A
UB5ILN 15,364- 332- 23- A
UB5ZAL 376,686-1719-102- B
UB5UKW 335,585-1126- 95- B
UB5FOG 247,764- 962- 79- B
UB5BAT 234,421- 761-101- B
UB5GAY 228,512- 896- 76- B
UB5VAA 116,886- 673- 69- B
UB5CBA 102,900- 710- 50- B
UB5TN 91,130- 942- 65- B
UB5IFX 87,267- 479- 57- B
UB5SG 76,744- 622- 53- B
UB5UBG 70,431- 403- 51- B
UB5BBO 66,060- 305- 60- B

UB5RS	54,800	368	54	B
UB5IPF	58,368	386	57	B
UB5DW	56,800	280	50	B
UB5FF	53,040	408	48	B
UB5VK	46,488	507	39	B
UB5JNW	46,150	386	26	B
UB5KBE	44,385	447	33	B
UB5TR	42,871	466	43	B
UB5AAS	41,181	362	33	B
UB5IAN	38,792	476	26	B
UB5ZFR	36,192	308	44	B
UB5SP	35,917	271	49	B
UB5INO	29,029	456	29	B
UB5ZA	28,860	266	30	B
UB5FEP	26,107	372	27	B
UB5GBC	23,400	269	30	B
UB5QKN	22,176	220	33	B
UB5AAL	21,910	256	35	B
UB5QBF	21,350	317	25	B
UB5IGA	21,276	377	27	B
UB5ENI	20,410	299	26	B
UB5LLE	19,860	296	30	B
UB5NAD	12,030	288	15	B
UB5UWM	12,064	108	26	B
UB5WBI	11,800	290	20	B
UB5KBV	8250	130	22	B
UB5WCQ	6316	252	12	B
UY5XT	5280	98	16	B
UT5HP	2620	47	20	B
UB5VAW	413	19	7	B
UB5FDF	927,384	1760	136	C
UB5EDU	333,648	1024	88	C
UB5VAZ	287,760	1067	80	C
UY5XE	123,900	560	75	C
UB5MLP	117,453	553	65	C
UB5KAN	110,400	500	75	C
UB5WAD	29,070	262	38	C
UB5JR	6409	93	17	C
UK5MAF (UB5s LA,MEL,MJX,MLX,MMM,MNX,MNY,MOA,MOV,UY5LK, oprs.)	1,927,354	3502	143	D
UK5MAG (UB5s LNR,MBP,MDG,MDP,MRO,UT5HP, oprs.)	1,294,245	2738	135	D
UK5QAA (UB5s QAF,QAP,QAV,QCL,QOH,QRC,UY5YB, oprs.)	635,154	1708	102	D
UK5WBG (3 oprs.)	489,446	1439	101	D
UK5QBE (2 oprs.)	485,971	1463	101	D
UK5AAA (3 oprs.)	257,382	1153	74	D
UK5GCV (5 oprs.)	216,918	837	78	D
UK5IAI (EZ5IUK,UB5INT, oprs.)	162,840	982	59	D
UK5IGZ (3 oprs.)	134,406	883	57	D
UK5GBJ (UB5s LNS,LNU,LPZ, oprs.)	115,639	689	53	D
UK5WBF (UB5WBJ,UO5OBK, oprs.)	108,192	854	56	D
UK5FAA (EZ5FAI,UB5s FCG,FFP, oprs.)	105,468	697	51	D
UK5JAR (3 oprs.)	91,902	562	53	D
UK5HAB (EZ5HBD + 1 opr.)	70,392	391	56	D
UK5MCF (UB5s MPM,MRI,MRS, oprs.)	66,576	810	38	D
UK5IUX (3 oprs.)	55,477	601	41	D
UK5EAE (3 oprs.)	42,840	355	40	D
UK5TFS (3 oprs.)	31,290	410	35	D
UK5IAZ (3 oprs.)	15,372	300	21	D
UK5VAV (3 oprs.)	12,288	300	16	D
UK5LCX (3 oprs.)	7950	225	15	D
UK5ECT (3 oprs.)	5293	187	14	D
UK5IZZ (UB5ILN + 2 oprs.)	931	55	7	D

White R.S.S.R.

UC2WAZ	61,074	232	58	A
UC2OBD	31,239	305	39	A
UC2ACL	3580	137	18	A
UC2OCS	90,909	461	63	B
UC2SE	84,060	447	60	B
UC2AIA	9336	149	24	B
UC2AFI	4092	114	12	B
UC2AW	1302	41	9	B
UK2ABM (UC2s AAF,AID, oprs.)	130,724	614	64	D
UK2AAW (UC2s AGF,ACU,AFE, oprs.)	134,190	668	55	D
UK2OAM (3 oprs.)	77,000	676	40	D
UK2OAA (UC2s OBI,OOA, oprs.)	36,153	359	39	D
UK2LAN (2 oprs.)	6052	142	17	D

Azerbaijan

UD6DGX	13,368	159	24	A
UD6DFY	112,504	609	56	B
UD6DHC	110,250	373	90	B
UD6DKW	107,553	365	61	B
UD6DIB	89,000	555	50	B
UD6BW	1980	42	15	B
UD6DER	4497	89	19	C
UK6DAD (UD6s BQ,CD,DLF, oprs.)	234,910	1057	65	D

Georgia

UF6CR	710,737	2786	101	A
UF6VAA	167,535	938	45	A

Armenia

UG6GDS	18,387	181	27	A
UG6JJ	1582	32	14	C

Moldavia

UO5OWN	43,780	398	44	A
UO5OEK	29,812	400	29	A
UO5OWC	148,005	752	65	B
UO5SA	8008	266	13	B
UO5OCL	54,378	370	53	C
UO5OFU	13,908	304	19	C
UK5OAA (UO5s OCO,OHD,OHH,OHM, oprs.)	206,978	920	73	D

Lithuania

UP2BIM	244,000	944	80	A
UP2BDX	77,231	460	59	A
UP2BAS	290,521	1286	77	B
UP2BEX	95,400	700	50	B
UP2BCG	76,313	359	67	B
UP2BIC	58,560	564	40	B
UP2PBZ	38,910	439	30	B
UP2BFU	28,768	417	31	B
UP2BK	24,128	319	26	B
UP2BKM	13,338	321	19	B
UP2BAK	2880	57	16	B
UP2NO	6128	109	16	C
UK2PCR (UP2s BBI,BCR,BCT,BDF,BFI,BFL,BFN,BIO,PAV,PCI)	2,358,156	3549	164	D
UK2BAS (UP2s BIC,BKJ,PAJ, oprs.)	2,005,348	3599	131	D
UK2BBB (UP2s BBB,BIJ,BKW,MB,PX, oprs.)	1,269,440	2499	160	D
UK2PRC (UP2s BBM,BIL, oprs.)	304,920	1010	92	D
UK2BAU (3 oprs.)	560	60	5	D

Latvia

UQ2GDQ	1,026,201	2304	121	A
UQ2GLW	49,736	446	38	A
UQ2GKM	40,386	280	53	A
UQ2PM	94,922	520	62	B
UQ2GCQ	66,134	551	43	B
UQ2PP	45,840	258	60	B
UQ2DZ	40,995	313	45	B
UQ2GBJ	27,912	320	24	B
UQ2GFI	5880	204	14	B
UK2GCF (UQ2s GFD,GGB,GGZ, oprs.)	683,712	1952	96	D
UK2GIL (UQ2GFI + 1 opr.)	201,946	828	74	D
UK2GAY (3 oprs.)	31,161	193	51	D
UK2GJT (UQ2GFB + 1 opr.)	5031	93	13	D
UK2GAB (2 oprs.)	2321	83	11	D

Estonia

UR2OI	19,809	248	31	A
UR2BB	5380	133	20	A
UR2RNA	2352	96	6	A
UR2REE	219,800	1096	56	B
UR2FU	46,528	336	48	B
UR2RNC	17,532	461	18	B
UR2ZN	7406	151	14	B
UR2RMI	13,302	267	18	C
UK2RAQ (2 oprs.)	116,022	616	61	D
UK2RAX (UR2RKF + 1 opr.)	3960	54	24	D

ZONE 30

European R.S.F.S.R.

UA4HFK	152,660	677	68	B
UA4HBW	23,790	98	65	C
UK4HAL (3 oprs.)	280,592	1067	71	D

Asiatic R.S.F.S.R.

UA9ACZ	89,955	449	45	A
UA9FGD	78,053	447	37	A
UV9AX	593,586	1293	98	B
UA9AFG	160,580	549	62	B
UA9AEH	137,311	500	61	B
UA9CBR	122,742	509	54	B
UA9FGJ	60,920	331	40	B
UA9WFJ	36,344	287	28	B
UA9SHU	26,772	268	23	B
UA9CPC	13,700	260	15	B
UA9FRM	11,167	189	13	B
UW9WK	443,957	914	109	C
UA9AKU	127,735	489	59	C
UA9FDL	96,044	399	57	C
UA9CBO	57,690	281	43	C
UV9DD	10,064	179	24	C
UK9AAN (UA9s AIS,AKI,ALP,AOA, oprs.)	1,601,046	2155	162	D
UK9ALP (UA9s AAP,ADE,ADY,AGY,AKW,ANI, oprs.)	480,216	1645	66	D
UK9F (5 oprs.)	430,080	1514	60	D
UK9MAR (UA9MOH + 2 oprs.)	224,658	844	53	D
UK9AEC (3 oprs.)	203,211	663	57	D
UK9FER (RA9FEG,UA9s FAI,FAL, oprs.)	180,496	669	58	D
UK9SBI (UA9SCG,UV9SN, oprs.)	56,656	368	37	D
UK9FFF (UA9FDL + 1 opr.)	43,136	310	32	D

Kazakh

UL7BAZ	217,216	767	64	A
UL7LBM	7380	175	10	A
UL7IBU	236,400	878	60	B
UL7LAH	41,920	256	40	B
UL7LEZ	35,361	185	43	C
UK7PAL (UL7s PAE,PCZ, oprs.)	1,300,480	2496	127	D

Uzbek

UI8BI	466,155	1385	81	B

ZONE 31

Asiatic R.S.F.S.R.

UA9UUN	63,466	341	41	B
UA9OCI	61,600	362	40	B
UA9UCA	54,982	323	37	B
UA9HBJ	6314	101	14	B
UA9HDT	4788	91	12	B
UA9YCO	250,901	836	73	C
RA9AUD	624	30	8	C
UK9OAZ (3 oprs.)	343,828	888	86	D
UK9UDD (RA9UMD,UA9s UEL,UNM, oprs.)	241,626	398	77	D
UK9OAX (UA9s OEB,OO, oprs.)	128,193	519	57	D

Kirghiz

UM8MDX	344,652	1180	66	A
UM8PAC	204,000	690	68	B
UM8MCY	34,704	230	36	B

Kazakh

UL7QF	164,358	553	69	A

ZONE 32

Mongolia

JT1BM	10,360	262	10	B
JT1BG	25,792	286	26	C
JT1KAI	19,278	259	21	C

Asiatic R.S.F.S.R.

UAØSAU	521,518	1228	107	A
UAØSGL	311,376	1112	78	A
UAØYAW	115,668	531	51	B
UAØAYL	89,556	394	51	B
UAØAG	24,211	181	31	B
UAØSIN	31,140	138	20	B
UAØSKF	10,620	178	15	B
UAØWAY	407,225	1114	91	C
UKØAMM (UA9LAS,UAØs AAA,AAK,AGO,ADR,AMA, oprs.)	1,344,323	3354	171	D
UKØSAV (UAØs SDI,SMA, oprs.)	191,646	949	54	D
UKØABJ (RAØs AFW,AGH,UAØAJR, oprs.)	7905	111	17	D

ZONE 33

Asiatic R.S.F.S.R.

UAØJDX	45,090	371	30	B
UAØJAD	8712	110	22	B

ZONE 34

Asiatic R.S.F.S.R.

UAØLCZ	130,420	615	69	A
UAØFAY	155,356	591	59	B
UAØLDI	14,539	125	31	B
UAØFCL	43,989	288	43	C
UAØCCW	828	15	12	C
UKØLBC (UAØs LDF,LDP, oprs.)	29,816	491	44	D

ZONE 35

Asiatic R.S.F.S.R.

UAØZBP	54,750	339	50	A
UAØZCR	129,608	498	64	B
UKØZAB (UAØs ZBF,ZBW, oprs.)	390,870	942	101	D

ZONE 37

Portugal

CT1BWY	43,741	313	31	C
CT1BKE	20,272	277	26	C

Spain

AM2CR	31,100	294	50	B
EA3BOW	25,690	251	35	B
EA4AKW	16,551	170	27	B
AMØ/AIN	14,040	222	18	B
DK7TU/EA	9460	135	20	B
DJ3XD/EA	9052	84	31	B
EC1ADW	1072	42	8	B
EA5QR	810	17	10	B
EA3ALN	54,396	431	36	C
EA2SN	39,960	269	45	C
EA3AAY	38,794	308	34	C
AM5BZS	28,728	236	38	C
EA4HD	20,104	95	56	C
AM7CYD	4864	78	16	C
EA7CEC (+EA7s CEW,DIR,IH)	1,058,640	2309	110	D

Balearic Islands

EA6OC	18,336	219	32	C
EA6HN	16,032	282	16	C
EA6GP	3392	119	12	C

Melilla

EA9KN	66,608	293	46	C

ZONE 39

Oman

A4XIU	269,202	851	68	C

Bahrain

A92P	12,470	117	29	C

Israel

4X6BZ	19,323	290	19	C
4Z4TR	15,080	145	26	C

Kuwait

9K2BE (G4BWP, opr.)	515,105	1699	71	A

ZONE 44

Korea

HL1SR	68,013	719	27	C
HL1AZK	56,870	853	22	C
HLØK (HL1s AHN,AIO, oprs.)	213,864	1152	57	D

ZONE 45

Japan

JG1ILF	543,692	1150	109	A
JR2BNF	196,416	502	99	A
JH7DNO	164,791	604	71	A
JA6BIF	148,746	578	78	A
JA1BWA	115,997	343	73	A
JA7UFZ	65,018	458	38	A
JE3DYW	47,775	251	49	A
JH1MTR	28,763	165	49	A
JAØBMS/1	27,840	253	40	A
JF3PLF	21,050	358	25	A
JH7NAB	15,532	254	22	A
JA6IP	13,195	175	29	A
JI1EEA	12,730	256	19	A
JG2LGM	4500	70	15	A
JA6KFB/1	1989	35	17	A
JR2AQP	1040	21	11	A
JA7YAI (JR1CYV, opr.)	231,768	733	88	B
JG1RVR	203,915	567	85	B
JG1IMM	200,030	624	85	B
JA9CWJ	127,700	544	50	B
JAØDAI	127,636	423	68	B
JH9DCJ	84,854	255	77	B
JA7FCJ	73,414	341	47	B
JA9FAI	66,861	265	57	B
JH1CXL	64,664	327	59	B
JA1BSU	47,736	254	54	B
JH7WKO	46,550	257	50	B
JE1CKA	44,116	298	41	B
JM1RFT	42,594	302	31	B
JL1BOB	40,232	272	47	B
JJ1LBJ	29,556	251	36	B
JK1LUY	27,560	229	26	B
JA9YE	26,416	118	52	B
JA1OP	25,500	156	51	B
JA2FXV	20,160	224	30	B
JR4ISK	17,612	138	37	B
JH4DRB	14,434	144	22	B
JAØJCJ	12,116	57	52	B
JA7KM	8150	70	25	B
JA1BDI	7412	90	34	B
JG1WRN	4930	74	17	B
JH7BDS	3936	54	16	B
JA2SAP/1	2964	56	13	B
JA3BGI	1859	31	13	B
JA2KPV	1397	29	11	B
JR1AHH	658	20	7	B
JA9RYL	225	12	5	B
JN1TNL	108	15	4	B
JI1QQI	242,250	725	85	C
JR6OJD	215,232	1006	76	C
JH7YJF (JH7LRS, opr.)	105,222	484	57	C
JA4GOB	39,644	257	52	C
JH3DPB	36,990	290	27	C
JM1NKT	34,110	363	30	C
JH8NYK	26,941	197	29	C
JF1EEK	23,896	260	29	C
JR4FGH/1	19,052	302	22	C
JR7OKK/1	18,200	298	25	C
JG1ERB	16,762	406	29	C
JH1PMH	16,000	160	25	C
JA1OCO	15,929	197	19	C
JM1NGS	13,604	282	19	C
JE6JVJ	12,673	333	23	C
JH1DUT	11,868	217	23	C
JI1QLB	10,563	109	21	C
JHØGOC	9324	94	21	C
JF1JLW	7500	286	15	C
JF6GAS	6276	254	14	C
JRØACF	5018	98	13	C
JA6QDU	4072	71	16	C
JH5IRT	3040	256	10	C
JF3GTT	2790	54	15	C
JA2TKD	2608	39	16	C
JA1JGP	2106	64	13	C
JF1OJC	1764	49	12	C
JG1EJO	1728	72	12	C
JR7XKN	1716	34	13	C
JA1IT	1672	32	11	C
JHØQIC	1230	52	10	C
JR3KAH	810	23	10	C
JH5OXF	756	36	9	C
JA3BBG	637	51	7	C
JA7YFB (JJ1GXY, opr.)	574	42	7	C
JH7BNC	546	30	7	C
JN1OWG	434	15	7	C
JE7MLU/7	12	6	2	C
JA9YBA (JK1APO,JA9s LJI,LNJ,OTX,QGB,THR,UAD,VBW,JHØs CAZ,HHU, oprs.)	779,700	1881	113	D
JA1YAD (JM1TEU,JE7QTZ,JR6JOF,JA7RHJ,JA9UFS,JHØORT, oprs.)	352,800	1160	84	D
JA2YKA (JJ1BTC,JE2s RQT,SRB,VYM,JF2DQI,JG2GFR,JH2QXG,JR2GMC,JE6GTX,JA9SSY, oprs.)	171,402	1019	77	D
JA6YDH (JE6s PSL,VFJ,JR6s GHN,PKJ,QHK,QPH, oprs.)	69,212	607	44	D
JA6YAI (JE6UWI,JR6s ATZ,EZE, oprs.)	43,252	481	44	D
JH6YTX (JE2OUY,JH6SOR, oprs.)	21,675	440	25	D

ZONE 46

Benin

TY4AII (K4YT, opr.)	646,300	2022	93	C

ZONE 50

Republic of the Philippines

DU1CPL	53,748	599	18	C

ZONE 51

Solomon Islands

H44SB	506,276	1148	92	C

ZONE 54

Indonesia

YB2CR	546,480	1020	108	C
YBØACL	177,280	570	64	C

Singapore

9V1TL	218,041	723	71	B

ZONE 57

Lesotho

7P8CG	7348	68	22	B

ZONE 58

Australia

VK6NSD	1476	27	12	C

ZONE 59

Australia

VK2AYD	308,415	719	87	B
VK3AEW	91,854	306	63	B
VK2DIO	11,501	106	31	B

ZONE 60

New Zealand

ZL2RY	126,996	351	76	B
ZL3AGI	23,500	214	25	B
ZL1AIZ	4122	49	18	B

ZONE 61

Hawaii

KH6CP	53,520	210	60	A
KH6JWK	12,090	93	26	B

ZONE 63

Easter Island

CEØAE	6375	85	15	C

ZONE 64

Mariana Islands

N5RM/NHØ	732,807	1369	109	B

ZONE 67

Antarctica

4K1D (UA1s AEM,AFM, oprs.)	37,674	194	19	D

Checklogs

4N4NF, AA1M, AMØAVX, EA2AQJ, EA6MR, G4MVA, HAØG, HP1AC, JW5VAA, K7DU, KA1EVH, KA2GGB, KA4BMU, KE6A, KRØU, LA5TBA, LA7GL, LA9GY, LZ1NP, LZ2KS, N1BTW, OH1PY, OK1AD, OK1DKW, OK1KPA, OK1HS, OK2BNK, OK3COD, OL7BEO, OZ1NF, OZ4RT, OZ4ZT, PAØLRK, PAØNVE, PR7ABJ, PY1MGH/4, RB5ADF, SIØFRO, SM5BDV, SM5KQS, SM6AYM, SM7KNW, UAØBL, UAØLAF, UAØNH, UAØSKL, UAØWAM, UA1CAQ, UA1ZZ, UA3ABL, UA3AGF, UA3AGL, UA3AGW, UA3AKS, UA3DEV, UA3DIN, UA3DIW, UA3DJN, UA3DKE, UA3DNV, UA3DQS/U6A, UA3LCC, UA3MDX, UA3PBY, UA3TAG, UA3TDK, UA3VA, AU3VFT, UA3XBB, UA3XCM, UA4AGA, UA4ADL, UA4CGS, UA4FDD, UA4RF, UA4YAZ, UA6AKB, UA6ARP, UA6BKP, UA6LGO, UA6LGP, UA9AIB, UA9CHQ, UA9COT, UA9MBK, UA9OEO, UA9QBT, UA9SBM, UA9SIO, UA9SJL, UA9WFU, UA9XS, UB5ABY, UB5EU, UB5GKN, UB5GS, UB5JAR, UB5JDI, UB5JM, UB5KAD, UB5KBY, UB5LEE, UB5UJC, UB5MLV, UB5QFJ, UB5UCF, UB5UEG, UB5URJ, UB5VAL, UB5WAB, UB5WDV, UB5XBU, UC2AHG, UC2LBE, UH8DC, UK1ZBB, UK2FAH, UK2RAR, UK4CBL, UK4NBM, UK5JDF, UK5IDO, UK5OAH, UK5UBL, UK7FAP, UK7GAL, UL7JCK, UL7PFH, UM8MAZ, UM8MCR, UM8MDB, UO5ODA, UP2BET, UP2BV, UQ2GBR, UQ2OP, UR2RND, UT5CF, UV3DN, UW3RK, UW1TR, WØSG, W5PWG, W5VGX, W6KRO, W6YVK, W8VSK, WA6CWA, WA4PGM, WB4BRH, Y22WF, Y23MA, Y23OB, Y23ZF, Y24WL, Y24KD, Y25KH, Y26JD, Y26SO, Y26WN, Y32LL, Y33VL, Y37VK, Y38ZF, Y41WM, Y41ZH, Y41ZM, Y42TC, Y43VA, Y43WK, Y54UA, Y57ZL, Y59YM, Y78WN, YO6AOW, YU1AST, OH2BA1

ARRL International DX Contest Awards Program

The list below shows all of the plaques that will be awarded in the 1983 ARRL International DX Contest (see December 1982 *QST*, page 88, for the complete rules). The sponsors as of January 1 are shown next to the plaque name. Several plaques still need sponsors, so if you are interested in sponsoring one of these awards, contact the Contest Branch at ARRL Hq. for details. The list of sponsored plaques may change before you read this because of *QST* lead time, so please call or write for a list of what is available before sending any money. We salute those clubs and individuals who have helped to make the DX Contest awards program a success for the past four years!

W/VE Phone

Single Operator

All Bands	Frankford Radio Club
1.8 MHz	
3.5 MHz	Lance Johnson Engineering — KØCS
7 MHz	Dave Thompson, K4JRB/K5MDX
14 MHz	Mark Michel, W9OP and Richard Loehning, N9ACP
21 MHz	John Allyn, W7XR
28 MHz	Larry Emery, K1UO
QRP	Rochester DX Assn. — AJ7S

Multioperator

Single Transmitter	The VP2E Contest Operators
Two Transmitter	George Taft, W8UVZ and Donald Lenard, WB8LDH
Unlimited	Buffalo Area DX Club — W2RR

W/VE CW

Single Operator

All Bands	Frankford Radio Club
1.8 MHz	W1TX Memorial Trophy
3.5 MHz	Northern Illinois DX Assn.
7 MHz	Chuck Cullian, KØRF and George Schultz, WØUA
14 MHz	Neenah-Menasha ARC
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	Mike Badolato, W5MYA
QRP	Hollywood ARC

Multioperator

Single Transmitter	The VP2E Contest Operators
Two Transmitter	George Taft, W8UVZ
Unlimited	Colorado Contest Conspiracy

DX Phone

Single Operator

World	North Jersey DX Assn.
Africa	
Asia	Acadiana DX Assn.
Europe	Murphy's Marauders
North America	Chod Harris, VP2ML
Oceania	Ray Stone, W5RBO
South America	
1.8 MHz	Dana Atchley,W1CF
3.5 MHz	Robert Peterson, W3YY
7 MHz	Alfredo H. Cavledes Vega, HC1HC
14 MHz	Don C. Wallace, W6AM
21 MHz	
28 MHz	Mike Badolato, W5MYA
QRP	

Multiop-Single Transmitter

World	Delta DX Assn.
Africa	David Vogel, NL7P
Asia	
Europe	Metro DX Club
North America	Nick Lash, K9KLR and Phil Buzolitz, W9SC
Oceania	Carl L. Smith, WØBWJ
South America	Hamfesters RC

Multiop-Two Transmitter

World	

Multiop-Unlimited

World	Gloucester County ARC
Africa	Dan Robbins, KL7Y
Asia	
Europe	Tom and Joy Middleton, WB4CKY
North America	Megahertz Manor Maniacs
Oceania	Dale Meyers, W4BIM/3D2BM
South America	

DX CW

Single Operator

World	North Jersey DX Assn.
Africa	San Diego DX Club
Asia	Alamo DX Amigos
Europe	Clarke Greene, K1JX
North America	Peter Grillo, KNØE
Oceania	Ray Stone, W5RBO
South America	Herb Twitchell, W6BL
1.8 MHz	Jim Dionne, K1MEM and Bill Poellmitz, K1MM
3.5 MHz	
7 MHz	Kansas DX Assn.
14 MHz	Bencher, Inc.
21 MHz	Southern New England DX Assn.
28 MHz	
QRP	

Multiop-Single Transmitter

World	George Schultz, WØUA and John Brosnahan, WØUN
Africa	Red Stick DX Assn.
Asia	Red Stick DX Assn.
Europe	Mile Hi DX Assn.
North America	Tom Taormina, K5RC
Oceania	
South America	

Multiop-Two Transmitter

World	Tom Frenaye, K1KI

Multiop-Unlimited

World	*QRZ DX*
Africa	
Asia	Dr. and Mrs. Charles J. Ellis
Europe	W2PV Memorial — Schenectady ARA
North America	
Oceania	
South America	

Special

Single Operator

World Combined Score	Yankee Clipper Contest Club
W/VE Highest Combined Total Multiplier (both modes)	*The DX Bulletin*
Japan Combined Score	Northern California Contest Club
W/VE Operater (combined)	*National Contest Journal*
W/VE Low Power (cw)	Wireless Institute of the Northeast
W/VE Low Power (phone)	Rochester DX Assn.
Great Lakes Division (cw)	Livonia ARC
Great Lakes Division (phone)	Livonia ARC
Fifth Call Area (cw)	W5GO Memorial — Red Stick DX Assn.
California (phone)	Dave Bell, W6AQ
Texas (cw)	Dennis Motschenbacher, KZ5M
Texas (phone)	North Texas Contest Club
Caribbean Resident (phone)	Arturo Gigante, HI8GB
Australia (cw)	Jay Carr, W6FAY
Japan (cw)	Tom Morrison, K5TM and Randy Thompson, K5ZD
Japan (phone)	Western Washington DX Club
Israel (cw)	Martin Hartstein, N6WW
Israel (phone)	Martin Hartstein, N6WW
Scandinavia (either mode)	John Lindholm, W1XX

Multioperator

Caribbean Multi-Single (cw)	The YASME Foundation
Caribbean Multi-Single (phone)	Mike Badolato, W5MYA
West Coast Unlimited Multi-Multi (phone)	Morris J. Young, KN6M
California Two-Transmitter Multi-Multi (cw)	Southern California Contest Club

W/VE Club

Unlimited (50 + entries)	ARRL
Medium (fewer than 50 entries)	ARRL
Local (3-10 entries; live within 20 miles)	ARRL
Most Improved Club (points per entry)	Steve Place, WB1EYI

Public Service

Conducted By Robert J. Halprin,* K1XA

Operation Watchdog

The 1981 Oklahoma State Fair ended on a tragic note. Two teenage girls disappeared from the fairgrounds shortly after one of them called home to ask permission to stay late. Neither girl has been heard from since.

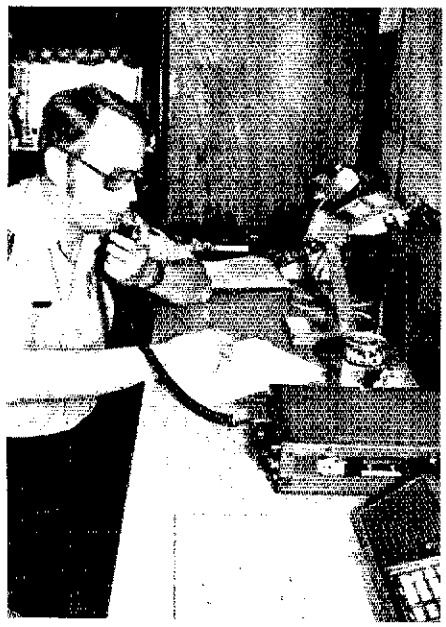
The 1982 state fair ended its 10-day run (September 24-October 3) in relative safety, thanks largely to the teaming of amateur and citizens radio organizations and local police departments. Just weeks prior to the opening of the annual fair, Oklahoma City police officials contacted area volunteer radio organizations with an idea to organize a giant communications network during the fair's run. City and fairground police command posts would be the hub of the network.

Invitations went out to the Central Oklahoma Radio Amateurs organization (CORA), the local citizens band REACT team, the area AWARE organization (Associates for Weather and Related Emergencies), and the police department's own Explorer Scout troop. Police requested that they be allowed to meet with these groups to organize and map out strategy. Art Roberts, W1GOM/5, was one of the CORA members who met with city officials at one of the preliminary meetings. He proceeded to dazzle city fathers with the capabilities of his 440-MHz HT, including its autopatch operation and fact that his radio had 2000 possible frequencies versus the police department's five!

After learning how each of the volunteer organizations could assist, police next met at a mass meeting of all interested volunteers. Rob Runyon, AAØO/5, hosted the meeting and outlined the basic concepts of operation. Police requested that the REACT team use CB channel 14, but amateurs selected their own 2-meter and 70-cm frequencies, both simplex and repeater duplex. Volunteers were told of procedures to gain free entrance to the fairgrounds, things to watch for at the fair and ways to communicate with the police. A special map, which divided the fairgrounds into specific patrol sectors, was used by the volunteers.

Police Lieutenant Adam Edwards and two detectives from his office also attended the meeting. They distributed photographs and descriptions of the girls reported missing from the previous fair, asking that the volunteers try to provide more clues to the girls' whereabouts. The police also asked that volunteers keep an eye open for safety hazards, midway con operations, accidents, suspect or criminal activity, and other unexpected problems.

Amateurs and REACT and AWARE members were permitted to use the city fire department's mobile command post for their net control stations. An interphone connected net control with the police command post. A closed telephone line also connected the command posts with state fair police offices, an ambulance service and the American Red Cross services office. REACT team members also used their own command post, placed on a hill overlooking the fairgrounds. Guest amateurs provided a 2-meter link between the REACT van and the rest of the fair.



W1GOM/5 coordinates Amateur Radio and REACT searches from the fire deparment's mobile command post. W1GOM, the newly appointed ARRL emergency coordinator for Oklahoma County, was a major planner for "Operation Watchdog." *(KD5DL photos)*

WB5GSZ patrols near the fair's grandstand as TV cameras record "Operation Watchdog" for the nightly news.

Typically, problems discovered in the field were relayed to either command post, and from there to the appropriate agency (police, fire or medical). Missing persons reports were initiated by the police or the Red Cross and were relayed to the volunteers in the field, who then began searching. As expected, most missing persons reports involved children.

According to the police logs, 119 people were reported missing at one time or another during the fair; all 119 were located, usually within several hours after their descriptions were broadcast. Nighttime searches took the longest because of darkness and the increased crowds at that time of day.

The logs also show that 100 amateurs volunteered more than 3000 hours of their time to patrolling the fairgrounds. The hams found numerous safety violations and discovered several incidents of criminal activity. And although they were not actively involved, hams helped stop several fights, resolved domestic problems and alerted authorities to an attempted theft of the fair's giant American flag. Burglaries from automobiles and felonious arrests were down from the previous year.

At a follow-up meeting after the fair, the Oklahoma City Chief of Police gave his personal thanks to the volunteers for their efforts during the fair, and passed on the accolades of the city council. Lieutenant Edwards added that the volunteer radio operators were a bigger deterrent to crime than they could realize. "It was a super thing," he said. "It went better than you'd expect for the first time." Lieutenant Edwards said he would like to see this kind of cooperation at future events, and suggested several possibilities from civil use to natural disasters. He said volunteer radio operators would definitely be invited to return to help with next year's state fair.

The fair also demonstrated that the various radio services could work together to accomplish a common goal. Several REACT members were, in fact, amateurs, and were helping the citizens band enthusiasts study for amateur licenses. Other amateurs discussed communications techniques with the AWARE group, including the use of remote receivers for their local net. All three groups discussed the ramifications of Public Law 97-259, the Goldwater Bill, which became law just prior to the fair.

Epilogue: Just two weeks after the fair, amateurs were again called into service after a chemical fire in nearby Midwest City, Oklahoma, forced the evacuation of a 10-block residential area. Amateurs maintained radio communication between the site of the disaster, the Civil Defense headquarters, the Red Cross and the two evacuation sites. The subsequent chemical cleanup lasted nearly a week. — *C. H. Stewart, KD5DL*

*Deputy Communications Manager, ARRL

MARS

The Military Affiliate Radio System (MARS) is a three-pronged network organized primarily for handling messages to and from American service personnel stationed overseas. Because of third-party-traffic restrictions in many countries, MARS provides a service that is usually not permitted on the amateur frequencies. Thousands of amateurs participate in MARS (a separate license and authorization is required) on numerous nets, all of which are outside the amateur bands on military frequencies.

Many amateur messages find their way into MARS circuits, and MARS messages find their way into amateur (usually National Traffic System) nets, as a result of those amateurs who provide liaison between the two circuits. Traffic for points overseas at which U.S. military personnel are stationed can be introduced into NTS and ultimately handled via MARS, provided a complete *military address* is given. Third-party traffic coming from the MARS network into NTS nets for delivery by Amateur Radio is converted from MARS to amateur message format and handled as any other message. When the traffic originates overseas, the name of the country from which it originates, followed by "via MARS," appears as the place of origin in the message preamble.

Information concerning MARS can be obtained directly from the individual branches at these addresses:

Air Force MARS
Chief, Air Force MARS
AFCC/XOP
Scott AFB, IL 62225

Navy-Marine Corps MARS
Chief, Navy-Marine Corps MARS
NAVTELCOM
Washington, DC 20390

Army MARS
Director, CONUS Army MARS
C COM 7th SIG Command
Ft. Ritchie, MD 21719

HAMS NEEDED TO AID IN CROSS-COUNTRY BICYCLE RACE

Organizers of Race Across America (RAAM), formerly the Great American Bike Race, are asking volunteer ham radio operators to accompany each of 12 riders as they attempt to set a new coast-to-coast bicycle speed record. The current record of nine days 20 hours was set last August during GABR by Lon Haldeman; in that race, riders averaged less than two hours sleep per night. Because of the vast distances involved, it is felt that Amateur Radio capabilities will be vital to rider safety and will also help reduce crowd control problems as riders move through populated areas. This year's race is again scheduled for August and will start from the Los Angeles area. If you would like more information, send an s.a.s.e. to: Ed Goss, N3CW, 9754 Whiskey Run, Laurel, MD 20707. General information about Race Across America is available from: Bob Hustwit, Suite 152, 358 S. Main St., Orange, CA 92668. — *Ed Goss, N3CW*

SLIDE SHOW

Carl Weaks, N4DMA, SEC Alabama, is putting together a slide show that will be shown to state government officials to explain the emergency communications capabilities of Amateur Radio. If you have any "action" slides showing hams providing emergency communications and you would like to share them with Carl, please send them directly to N4DMA, 1341 West Navajo Dr., Alabaster, AL 35007.

PUBLIC SERVICE DIARY

☐ Coffs Harbor, New South Wales, Australia — August 4. During a circumnavigation trip, DL3SAM lost his yacht *Pepina* when it sank off the eastern Australia coast. The yacht had struck an unidentified object near Coffs Harbor. DL3SAM's distress calls on 40 meters were answered by VK2DFH, who contacted the coastal authorities. After 10 hours stranded at sea, DL3SAM was rescued by a merchant vessel. (VK2DFH)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Mt. Baker, Washington — June 20-21. W7FCH received a call from the Whatcom County Sheriff's Department for communications support in a search for two missing climbers. A station was set up to link with the Whatcom County Court House, and was manned by KC7TV and WA7YOK. The court house station was operated in shifts by W7FCH, WA7TWE, N7CUI, N7CCF, W7ILR and WA7RUB. The operation concluded after 20 hours, when the searchers found the climbers, who had fallen during their expedition, killing one member and injuring the other. (WA7RUB, AEC Whatcom Co.)

☐ Portsmouth, Virginia — October 16. The telephone system of the Portsmouth General Hospital failed, resulting in the inability to call into or from the building and leaving the hospital without its internal paging operation. Portsmouth ARES members were alerted, and set up a 2-meter station inside so hospital personnel could be summoned when needed. Fortunately, during the 2-1/2 hours the telephone lines were down only one notification was placed using the improvised system. (N4FTN, EC Portsmouth)

COMMUNICATIONS SERVICE OF THE MONTH

Nearly 8000 runners depended on Boston-area hams at the world's largest women's sporting event. Like most public service communications efforts, hams participate primarily to provide health, welfare and safety-related communications. But at the 6th Annual Bonne Bell 10K National Championship Race, held in Boston on Columbus Day, hams did much more and helped the race activities go as smoothly and trouble-free as possible. This year, the Bonne Bell race had more registered runners than the well-known Boston Marathon and featured runners ranging in age from 6 to 80, as well as entrants from 32 states and four countries.

For the fifth consecutive year, race director Dusty Rhodes called on K1HLZ to coordinate race communications. Preparations began a month before the race, as K1HLZ met with race officials to discuss route plans, security and liaison with medical, police and press representatives.

On race day, K1HLZ distributed a detailed communications packet with maps and race information so that the hams were fully aware of all facets of the race events and could field questions from the public intelligently, in addition to facilitating their ham activities. Identified by official race ribbons, hams with hand held radios were assigned to communicate from various areas, including the registration station, medical facilities, press booths, information tables, the pre-race sweep car, the pace car and the press truck, while others kept key race officials advised of up-to-the-minute status and situations.

Shortly after area roads were closed off for race preparation, fire equipment had to be driven through the start/finish area for access to a fire on the race route only a quarter mile from the starting line. Hams not only forewarned race officials, they also helped move aside the ropes and the people who had lined up for the race.

Operators observed race course conditions, relayed road closing information, followed race progress and passed other information. K1HLZ set up and operated net control on the officials' platform at the start/finish line, five hours before the starting gun. Three stations (two of which were for backup) were available, along with power supplies and antennas. A headset with a noise-cancelling boom mike was used at net control, and additional receive audio was supplied to a local speaker and individual spare earphones.

All stations were busy four hours before the race began, communicating setup information and answering questions from the public, race participants and race officials. Operators included KA1CAZ, WB1FVK, WA1ZLQ, WA1RIY, WA1TTV, WA1VMG, WB1EWS, W1MJ, WA1NUY, WB1BUM, N1BVR and WA1RIY.

Some hams even found time to help a 10-year-old girl from out-of-state, heartbroken because she couldn't be an official entry owing to an inadvertent and undetected registration number mix-up. Amateurs located a blank registration card, acquired a new number and bar-code strip used in calculating the official race times, and arranged to have her new registration included in the official scoring. No one person could have helped the little girl in the very limited time available. But hams, as a group and with the help of radio, initiated and coordinated efforts quickly and effectively to help her fulfill her dream. Hams even verified a report of an elephant (a stray from the Columbus Day parade setting up on an adjacent street) walking on the course.

Once the race was under way, everyone shifted into high gear. Sometimes, two nets were necessary to handle the traffic — one for race progress and other related items from mobile stations, the other for safety and medical communications from around the congested finish-line area. More than 40,000 people congregated at Boston Common, site of the start/finish line and location of other race-related activities, and, as the first of the almost 8000 runners neared the finish line, the crowds swelled, creating a potentially hazardous situation. The thousands of finishing runners needed air, water and rest, not people closing in on them. Hams, while watching for any situation that needed attention, assisted race officials with their efforts at crowd control and helped direct finishing runners to the appropriate chutes for scoring, and with medically related communications.

At one point a runner collapsed on the course, inches from the finish line. WA1RIY, an emergency medical technician, called for assistance and pulled the downed runner from out of the path of the oncoming runners, and was joined by a doctor. A request for an ambulance was made for the unconscious runner, but the density of the crowd made it impossible for any vehicle to get within a quarter mile of her. Net control was prepared for the situation and, based on WA1RIY's report, had already alerted the nearest ambulance attendants, who eventually were able to get medical aid to the runner.

The Bonne Bell race was a great exercise for hams, who had to communicate under unusual and sometimes chaotic conditions. It was also an excellent opportunity to promote Amateur Radio public relations. Media attention was focused on the race, with the broadcast and print media everywhere.

Amateur Radio was credited for communications in the race program, frequently by the public address announcer and in several mentions by a Boston radio station broadcasting from the Common. — *Linda Gomes, KA1CAZ, and Alan Carp, K1HLZ*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For October, 44 SEC reports were received, denoting a total ARES membership of 24,012. Sections reporting were: AL, AK, AB, AZ, AR, CO, DE, ENY, IL, IN, IA, KS, KY, LA, ME, MI, MN, MO, NE, NH, NLI, NFL, NTX, OH, OK, ON, ORG, PAC, RI, SV SDG, SJV, SCV, SC, SD, SFL, STX, TN, VA, WA, WV, WMA, WNY and WPA.

☐ For November, 40 SEC reports were received, denoting a total ARES membership of 21,302. Sections reporting were: AL, AK, AB, AZ, CO, DE, ENY, IN, IA, KS, KY, ME, MI, MN, NE, NH, FLI, NFL, NTX, OH, OK, ON, ORG, PAC, RI, SV, SDG, SJV, SCV, SC, SD, SFL, STX, TN, VA, WV, WMA, WNY, WPA and WI.

NATIONAL TRAFFIC SYSTEM

This seems to have been quite the month for region-level manager changes. N4MD has stepped down as RN5/c4 manager, and KB5W (who is also Mississippi STM) has taken over. WD8MIO has picked up the reins of 8RN/c2 from KB8MX. Also, KA4MZY has handed over command of 9RN/c2 to WA4JTE. A hearty welcome to the new managers, and a big thank you to the former honchos. Certificates for 2RN/c4 were awarded to: N2BC N2CER AK2E AG2X W2GLH KC2PB KK2Y (first annual); KA2CTU K2UL (third annual); K2NY (sixth annual). RN6/c4 certificates were issued to AD0A and KA7DXU.

November Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	1311	42.7	.867	91.1	
CAN	30	991	33.0	.664	100.0	
PAN*	60	929	15.5	.439	100.0	
Region Nets						
1RN	54	386	7.1	.352	83.6	100.0
2RN	60	515	8.6	.377	97.7	100.0
3RN	30	215	7.2	.471	96.7	96.7
4RN	60	949	15.8	.496	79.7	100.0
RN5	30	480	16.0	.420	98.6	100.0
RN6	56	891	15.9	.415	93.7	100.0
RN7	90	693	7.7	.656	86.0	100.0
8RN	60	429	7.1	.436	90.5	100.0
9RN						100.0
TEN	30	378	12.6	.351	93.0	100.0
ECN						50.0
TWN	60	299	5.0	.349	67.0	100.0
TCC						
TCC Eastern	104[1]	741				
TCC Central	84[1]	574				
TCC Pacific	110[1]	735				
Cycle Four						
Area Nets						
EAN	30	2025	67.5	1.556	98.3	
CAN	30	1272	42.4	1.240	100.0	
PAN	30	1690	56.3	1.394	100.0	
Region Nets						
1RN						93.3
2RN	90	758	8.4	.541	96.7	100.0
3RN						100.0
4RN						100.0
RN5						100.0
RN6	60	1117	18.6	.645	100.0	100.0
RN7	60	775	12.9	.793	96.4	100.0

8RN	58	509	8.8	.487	91.0	96.7
9RN	60	673	11.2	.464	99.0	100.0
TEN	60	392	6.5	.424	73.1	100.0
ECN	60	254	4.2	.441	88.3	100.0
TWN	60	635	10.6	.470	97.0	100.0
TCC						
TCC Eastern	134[1]	933				
TCC Central	55[1]	528				
TCC Pacific	112[1]	1162				
Sections[2]	6920	35,445	5.1			
Summary	8300	56,700	6.8			
Record	8258	66,257	18.4			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (242): APSN ATN (AB), AENB AEND AENH AENI AENJ AENK AENW AENY AENZ ATNM ECAR (AL), ATEN HARC TEN (AZ), SWN (AZ/NM), BCEN (BC), NCTN NCN SCN/V (CA), CN CPN NVTN RTN WCN (CT), DEPN DTN NCC2MN SEN (DE), MDD (DE/MD), FAST FMSN FMTN FPON FPTN GN LCEN MCEN NFPN QFN QFNS SVTN SWFTN TPTN (FL), GCN GSN GSSBN GTN (GA), GTEN I75MN ICN IPMN ITEN TLCN (IA), ICN ITN QIN (IN), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 4ARES 11ARES BARES CARN CCEN KEN KNTN KRN KSN KTN KYN KYPON LCARES MKPN PAEWTN PAWN SEKEN TSTMN WTEN (KY), LAN LTN (LA), CI2MN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN (MA/RI), MEPN MMN MTN WRIN (MB), AEN CMEN MPSN PTN RACES SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MNWX MSN MPSN MSSN PICO (MN), MTN (MS), CN CSN (NC/SC), NCHN NE40 NE75 NE160 NMPN NSN PV2MN SA2MN WNN (NE), GSFM GSPN MCEN NHN RCARES (NH), JSARS MCN/SJVN NJN NJPN NJSN NJVN OBTTN SOCTN TCETN (NJ), NSN (NV), CDN CNYTN EPN HVN NCVHFTN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN SDN STAR WDN (NY), BARF BRTN COARES LCNWOARES MCTN NCTW NEON O6MN OSSBN OSSN (OH), OFON OLN STN (OK), KTN KLN OPN OSN OSN2 OSND (ON), BSN LBLARES OARES OSN PTTN SOFM WGN (OR), CCARES CCARS D3ARES D5ESN D6ARES EPA EPEPTN NWPAPTN PFN PTTN WARCVTN WPA (PA), PTN (PAC), WQVUARESN (PQ), PWXN RARA SATN SKTN2 SPN (SK), A2MN BR2MN GPD2MN LC2MN SCNTN SCSSBN YC2MN (SC), SDEMN SDN SDNJQN SNEPN (SD), TNCW TNPN TNVN TSRN (TN), DFW TEX TSN TTN (TX), BUN DCEN UCN (UT), EWTN NTN PSTS SCARES WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVARN WVMDN WVN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

Ted Wood, N2CER, has been appointed TCC-E/c2 Director, succeeding Linda Ferdinand, N2YL. Our thanks to Linda for the leadership she has shown in the advancement of NTS for the past seven years, both as 2RN manager and as TCC director.

1	2	3	4	5
Cycle Two				
TCC Eastern	113	92.0	1470	741
TCC Central	90	93.3	1148	574
TCC Pacific	120	91.7	1445	735
Summary	323	92.3	4063	2050
Cycle Four				
TCC Eastern	146	91.8	1872	933
TCC Central	60	91.7	1021	528
TCC Pacific	120	93.3	2298	1162
Summary	326	92.3	5191	2623

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November) *Cycle Two* — Eastern Area (N2CER, Director) — N1BHH WA4CCK N2CER KC3DW K1EIC VE3GOL WB3GZU KO2H WA2HEB WB1HIH VE3HTL WA4LJI WD8LRT AH2M WD8MIO W2MTA W8PMJ WB4PNY W1QYY AF8V K2VX AK1W N2XJ W1XX KK2Y W88YDZ. Central Area (W9JUJ, Director) — N5AMK K5BNH N5BT W5CTZ N5CRU N5DFO WØFRC W9JUJ K5KJN KD5KQ KA4MZY W9NXG KA4SAA KB5TC WB9WGD WF4X WB5YDD. Pacific Area (WØHXB, Director) — NI6A KT6A N6AED N7AFZ NØACW N7CSP VE6CHK NØCX! KU6D W7DZX KØDJ WØEJD KA7FKT W7GHT N6GIW WØHXB K6HAP KM6I W5JOV WA7LGN KBØMB WBØMTA K6OWA W9OBV WAØOYI KF7R WB7TQF KV5U W7VSE WA7WQE WB7WOW KM7Z. *Cycle Four* — Eastern Area (W2CS, Director) — VE3AWE W3BBN KI3C WA4CCK W2CS W1EFW W2FR W2GKZ VE3GOL WB3GZU N4KB K2KIR AH2M WB8MTD W1NJM W8PMJ WB4PNY W3PQ W1QYY WA2SPL WB4UHC W4UQ AF8V VE1WF KS6X W2XD N8XX N2YL K4ZK. Central Area (W5GHP, Director) — WØAM W9CXY KØEZ K5GM WØHI W5LQ W5RB N5TC W5TFB K5TL WB9UYU KB5W KB9X W4ZJY. Pacific Area (KØDJ, Director) — KT6A WDØAIT W7AK KN7B KØBN KCØD KØDJ W7DZX W6EOT W7EP W7GHT WA7GYQ K7HLR WØHXB K7KSA W7LCF W7LYA WB7NHR WØOGH W7VSE W6VZT VE7ZK.

Independent Nets (November 1982)

1	2	3	4
Central Gulf Coast Hurricane	30	202	2247
Clearing House	30	122	343
Early Bird	30	1003	411
Empire Slow Speed	29	64	396
Golden Bear	30	217	1666
IMRA	26	759	1419
Midwest RTTY	30	54	298
Mission Trail	30	257	936
North American SSB Traffic		250	307
West Coast Slow Speed	30	149	498
20-Meter ISSB	26	1127	735
75-Meter ISSB	30	567	1222
7290 Traffic	46	1201	3216

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll November 1982

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 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. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points each, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

4327
N4EDQ
340
WØZWL
291
WØMZI
192
K5CXP
169
W2AHV
164
KA1GBS
156
WD8LRT
153
K2ZM
144
KM9B
140
WB3GZU
136
K4SCL
133
NG4J
132
WD4COL
WF4X
127
WØOYH
125
WA4QXT
KA2KVZ
124
N8BQK
123
WB2MCO
119
WB2EAG
116
KC9CJ
KB5W
KA5CXW
115
KS6T
114
WA7GQO
AF8V
113
KT6A
112
W6VOM
W1EOF
111
W9JUJ
W9YCV
AG2R
WA1TBY
110
WB1HIH
KT6D
KB3XO
WB8WKQ
109
WD4ALY
WA5RVT
K4ZK
WA4PFK
WB1GXZ
W2YJR
108
KV5X
K8KQJ
K2VX
WA3EHD
107
WA4JDH
106
K8OZ
WB4WYG
WD9ESZ
KAØJQG
W2MTA
WA2FJJ
105
W2XD
KA3DLY
K1JHC
104
W7GHT
WB4TZR
W5DTR
WD9FRI
WB2ZCM
103
WA2HEB
WA4EIC
N8DSW
KA4SAA
102
K4JST
KA5KRI
W9DM
N5AMK
K2ZVI
WD4CNQ
101
KB5EK
KA8GHF
W4CKS
N3CKQ
K3ZJJ
WA4FKY
100
KI1M
KJ3E
WD4AWN
N2XJ
WD8RHU
WB8MTD
99
WB2ZJF
NI6A
N9DIH
N8AUH
W6NTN
AK1W
98
WB2PKG
KC2QQ
W7VSE
W2AET
97
WA4CCK
K9MX
KA4GFU
N7AKX
WA7LGN
96
K3RZR
WA3WIY
KA4AUR
W7LNE
95
KB4WT
N6AWH
KA4ASZ
N2AKZ
N8EES
94
N8DSU
WA7MEL
KB2HM
93
K4VWK
NØBDG
KA9IKR
N5BT
K6UYK
KA8CPS
92
KB4PW
K6YD
W4ANK
K3JL
NW4X
VE3DPO
91
WD8MIO
NT4U
WAØTFC
W5CTZ
N5TC
KA4MTX
WA4YPO
WB4WII
90
VE5HG
KB4OZ
KB3UD
89
WB8SYA
KUØG
KB5UL
89
VE3GOL
W9NXG
88
W1TN
N2CER
KC3DW
KA1EHR
KA5HOT
N4PL
K2GCE
87
KD5FR
WA1YNZ
W2BIW
N8DSU
N6GIW
86
KE4DA
KA6BNW
KA1AVU
85
KD5P
AB5X
WB3KUZ
84
KBØMB
KF4GZ
VE3GT
83
NN4I
KA9HPQ
KD4PJ
KE5SF
82
WD5GKH
WØKJZ
WA4LXP
KE1U
KA1DB
WB4AID
W5WZ
W9TLU
81
N1ARI
KAØARP
80
VE3WM
N1BJW
W5KMF
79
KX2L
WA4EYU
KF4U
K5OAF
W6RNL
WØHXB
WA2ARC
W2TZO
78
NT4S
WA8HGH
KC2SW
W1RWG
77
KB3LF
KCØOO
VE3BDM
KA8GJV
W5KLV
76
WD4HBP
KB4LB
WB5YDD
KØSI
N8DTZ
75
K4ZN
W2ZOJ
KA2GSX
K7LCA
KA5AZK
W7EP
WB6QBZ
AG9G
KE1L
AE1T
74
KA4GUS
W3VA
W3DKX
K3CR
N7BGW
WB9WGD
WL7H
73
KM6I
WB7OEX
N9BYK
KA3EJG
KØDJ
W8GGX
72
W4LXB
WØOGH
AA4AT
WA6OCM
71
N9ATP
AC3N
KD9K
VE3HTL
WB5LAT
70
KA4IUM
AC5R
KA1T
WB2IDS
N4FQD
KF8J
69
KF4HA
KD4QZ
WA8GMT
KA4BCM
WØFRC
K4IWW
68
WB2OWO
N2BDW
67
W6IPL
KTØU
WA5QFD
N6AUB
66
N2BOP
N5AMH
W6JTA
65
W4SME
N3ADU
KA7ELI
K1OSM
WB5LBR
AI6E
KA5LLT
K8JDI
64
WA6QCA
KA2LEB
VE2EDO
WB8SIQ
KC6NN
N5EZM
WB4NTW
63
KAØNLI
N5FDL
WB9IHH
WA2KOJ
62
WB2QMP
N2BLX
KE6NO
WA4JTE
WA8DHB
61
KY4U
KA2LEB
W9YT
WA3DUM
K6AGD
KØJCF
N5DKW
WD4BSC
W7LBK
N4UF
KF7R
KD5MA
WA3BZM
60
VE5AAT
KD4TY
WB3FKP
N3CJP
W4HON
W6CPB
KA8MEB
W9UMH
KK9N
58
WB2TWQ/T
53
KA4BBN/T
51
N5EMJ/T
KA8GGZ/T
47
N5FCZ/T
N6EPG/T
42
WB2ANK/T
N2DPV/T
KA9GBG/N
41
N6FYV/T
40
KA1BIV/T

Brass Pounders League November 1982

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.

1	2	3	4	5	6
N4EDQ	844	4780	1447	4244	11,315
W3CUL	710	1097	1384	82	3273
NØBQP	36	1114	311	535	1997
W5SHN	333	480	814	11	1638
WAØHJZ	25	892	66	509	1494
WØACD	3	707	19	426	1155
W9JUJ	5	553	570	10	1138
NI6A	60	467	500	12	1039
WA4JDH	1	499	482	6	988
W1EOF	1	374	499	11	885
K8NCV	29	405	430	4	868
W7DZX	10	401	382	3	796
KS6T	20	387	325	62	794
N7AKX	138	291	332	11	782
WØZWL	0	449	0	309	758
KT6A	4	425	304	24	757
W3VR	271	123	346	15	755
WØACH	26	335	360	1	722
W6NL	27	317	338	2	684
WF4X	4	305	27	36	672
N4PL	55	251	318	29	655
W5TFB	14	314	304	21	653
N5DFO	210	183	234	8	635
K6UYK	111	285	220	16	632
WØMZI	0	335	32	262	629
W7VSE	0	263	337	9	609
N2CER	0	310	281	4	595
WB2EAG	6	290	277	18	591
VE3BSY	34	279	257	12	582
N6GIW	6	275	286	3	570
KS7I	76	184	265	34	559
WA4QXT	21	234	269	24	548
WB3GZU	18	238	230	39	545
AA4FG	227	42	260	10	539
KØJAN	4	330	23	181	538
WAØAUX	20	232	271	0	523
WB5YDD	4	260	237	17	518
WB7WOW	23	246	217	32	518
W4ZJY	0	94	419	4	517
WB7TQF	78	178	225	31	512
W4NFK	26	262	195	27	510
KL7LA	4	248	240	12	504
WD8MIO	112	186	179	27	504
AF8V	15	225	246	18	504
K4EUK	22	214	254	10	500

BPL for 100 or more originations plus deliveries:

WØBMA	181	K5CXP	110
WB4TZR	170	WA4TWD	105
KB1G	135		

Multioperator station:

WD4IIO 140

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

Volunteer-Monitoring Aspects of P.L. 97-259

For over 50 years, the League-sponsored Official Observer program has aided thousands of amateurs in maintaining their transmitting equipment and operating procedures in compliance with the regulations. It has been a half century of amateurs helping each other.

This highly touted program formed the basis for recognition of amateur volunteer efforts in the *Congressional Record* (August 19, 1982, p. H 6533): "The Amateur Radio Service has been praised for being self-regulated. The Commission has reported that less time has been devoted to monitoring and regulating the Amateur Service than to any other service because of *its self-policing and discipline*" (emphasis added). Further: "The amateurs have kept their bands in order with minimal enforcement activity by the Commission. . .amateurs must and do respond with efforts to bring any noncompliant action into full compliance with amateur rules. For example, one amateur operator might inform another that he was engaging in prohibited transmission. . .which should be discontinued. This has worked in an overwhelming number of cases."

The above is a matter of record in support of enactment of Public Law 97-259. The monitoring aspect of the law places the responsibility squarely on the shoulders of the volunteer amateur community. This legislation, which, of course, had widespread amateur support, has rescued previous volunteer efforts, such as the OO program, from legal quicksand. The U.S. District Court for the District of Columbia, in *Reston v. F.C.C.*, held in 1980 that Amateur Radio transmissions are not generally exempt from the secrecy provisions of Section 605 of the Communications Act of 1934. This overturned a long-held understanding of exemption. Thus, in drawing up the approved legislation, the Senate and House Conferees appropriately exempted the Amateur Service from this secrecy provision believing "that the self-enforcement efforts. . .should be encouraged, and that this (legislation) will promote such self-regulation without unduly infringing upon individuals' privacy rights." Right on!

The law gives the FCC the latitude to accept the services of volunteers in monitoring violations of the regulations, and says that the Commission "for purposes of screening, annotating, and summarizing violation reports. . .may accept and employ the voluntary and uncompensated services of any amateur station operator organization." Thus, the League's long-time effective OO program can indeed gain even greater recognition in performing its monitoring function with somewhat stronger "teeth." The law further describes the functions of the volunteer monitoring corps, to wit: "the detection of improper amateur radio transmissions; the conveyance to Commission personnel of information which is essential to. . .enforcement. . .; issuing advisory notices." However, volunteers are restricted from becoming vigilantes with: "Nothing in this clause shall be construed to grant individuals recruited and trained. . .any authority to issue sanctions to violators or to take any enforcement action other than any action which the Commission may prescribe by rule."

Thus, the League has a unique opportunity, nay responsibility, to develop an enhanced monitoring program in parallel with FCC expectations. Recent consultation with FCC staff indicates an approximate six-month developmental period. As the representative of organized amateur activity, it behooves the League to maintain close liaison with the FCC's Enforcement Division (of the Field Operations Bureau) to ensure that our program does indeed mesh with established guidelines. A well-defined procedure for the proper flow of information from the volunteer observer to the appropriate FCC official is already in the process of development.

The monitoring program consists of two elements. The traditional "maintenance" activity is your basic individual OO function. This involves daily cruising of the bands to assist in identifying on-the-air difficulties before they come to the attention of FCC. As it says in the OO guidelines: "The OO must not only be a well-qualified amateur himself, he must be capable of exercising good judgement, courtesy, tact, and diplomacy. There is no place in the OO roster for frustrated policemen, or amateurs with patronizing attitudes." The OO's role is a helping one. As it says on the OO advisory notice: "This observer thanks you for your courtesy and cooperation in improving the Amateur Radio Service." It is this conciliatory approach that resolves the vast majority of infractions, most of which are inadvertent.

The second aspect, amateur-to-amateur interference, involves the formation of a local interference committee for solutions. This activity addresses the problem of harassment and malicious interference that has resulted in the recent influx of inductees into the rogue's gallery of the FCC Censure-Y Club. A methodical course of action is required that incorporates radio direction-finding techniques, copious logging documentation and experience with rules of evidence. The operating instructions for this activity are detailed in the *Handbook for Local Interference Committees*, an educational product of the ARRL Interference Task Force. To respond effectively to P.L. 97-259, this activity must be conducted in close concert with the FCC Enforcement Division. Such investigations must be conducted with complete objectivity, to remove any hint that anyone may have an ax to grind.

This surge of legislative recognition could not have come at a more appropriate time. As the FCC is drawing up guidelines to avail itself of this volunteer effort, so the League is restructuring its vast field organization of volunteers to better meet the needs of today's ARRL. With the creation of the new section leadership appointment of OO/RFI Coordinator, the League stands in a good organizational position to meet the coming demand for volunteer monitors.

With the much-hailed enabling legislation, amateurs have the opportunity to put and keep their own house in order to an even higher degree. We can't stand on previous self-policing laureis. Nor can we stand scofflaws in our midst. In the coming months, as the League tailors its monitoring program to FCC requirements, more volunteers with proper credentials will be asked to step forward. Can we meet the challenge? Our very pleasure in the hobby and service will depend on it. Our very continued existence may even hang in the balance.

MIDNIGHT SPECIAL RESULTS

It was Top Band that got a little workout last October 23-24, during the Midnight Special contest. It just goes to show that you never know where one of these little gems will show up. The Special ran one hour on 160 cw, and then one hour on 160 phone. The exchange was transmitter input power and antenna type.

As you can see from the following top scores, activity was great; in fact, it was much greater than we had anticipated. We received a total of 58 entries, and each entrant sending an s.a.s.e. has received a complete copy of the results. The following scores list call, score, cw QSOs, phone QSOs and state. — *Bill Jennings, K1WJ*

W1OD	159-74-	85-CT
AA2Z	142-68-	74-CT
W1XX	120-64-	56-CT
WA2SPL	180-79-101-NY
K5NA	169-83-	86-NY
WA2SRQ	158-73-	85-NJ
W3TS	156-62-	94-PA
W3YOZ	155-56-	99-MD
K3PA	128-65-	63-PA
KX4V	111-56-	55-VA
K4UEE	110-48-	62-GA
N4XM	107-53-	54-KY
KB5UL	52-32-	20-TX
KM6S	8- 5-	3-CA
W7WG	14- 4-	10-WA

*Communications Manager, ARRL

KW8N	178-78-100-OH
W8CAR	111-58- 53-OH
K9IFO	115-45- 70-IL
WA9TZE	73-37- 36-WI
VE2QO	44-18- 26-PQ

OCTOBER CD PARTY

The following are the top scores from the October 1982 CD Parties. The listings read: call, score, QSOs, multipliers, hours operated, section.

Cw

K6LL/7	24,003-381-63-10-AZ
W2RQ	23,040-384-60-10-NNJ
N6TR	21,452-346-62- 9-SB
K1XA	20,400-340-60-10-CT
WA9EKA	20,100-335-60-10-IL
AG7M	18,054-306-59-10-WA
W8LNO	17,400-290-60- 7-OH
N6NF	17,141-281-61-10-SCV
KZ5D	16,240-280-58- 9-LA
W9NEC	16,080-268-60-10-IL
*W4UQ	14,268-246-58-10-VA
KB1W	13,500-250-54- 9-WMA
KB5UL	13,145-239-55-10-NTX
K9GDF	13,122-243-54- 8-WI
N4SA	11,169-219-51- 5-NFL
W9NA	11,144-199-56- 4-WI
K4BAI	10,065-183-55- 5-GA

Phone

WA4VWV	4715-115-41- 5-IA
WB8MZZ	3978-102-39- 8-OH
AE5B	3861- 99-39- 5-NTX
N6NF	3552- 96-37- 5-SCV

SCM ELECTION RESULTS

The following elections were conducted for a two-year term of office beginning January 1, 1983: Balloting Results: In the Missouri Section, Benton C. Smith, KØPCK, received 521 votes and Steven R. Mulford, WBØFKY, received 281 votes. Mr. Smith is declared elected.

In the Nebraska Section, Reynolds Davis, KØGND, received 287 votes and Shirley M. Rice, KAØBCB, received 143 votes. Mr. Davis is declared elected.

In the New York City-Long Island Section, John Smale, K2IZ, received 570 votes and Paul A. Lindgren, AH2M, received 403 votes. Mr. Smale is declared elected.

In the South Carolina Section, James G. Walker, Sr., WD4HLZ, received 302 votes and Richard H. Miller, W4OCX, received 135 votes. Mr. Walker is declared elected.

In the Vermont Section, Reed Garfield, WB1ABQ, received 72 votes and Ralph T. Stetson III, KD1R, received 58 votes. Mr. Garfield is declared elected.

SCM APPOINTMENT

In the Nevada Section, William J. Marshall-Gratrix, KA7Q, has been appointed to complete the term (June 30, 1983) of Ralph E. Covington, Sr., W7SK (resigned).

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 67. A W1AW schedule also is available on request from ARRL Headquarters. Please enclose an s.a.s.e. See the Contest Corral section of *QST* for times and dates of W1AW Code Proficiency Runs.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,* W9KDR

AMSAT BOARD MEETING

The AMSAT Board of Directors met at the NASA Goddard Space Flight Center in Greenbelt, Maryland, on the weekend of December 3-5. Dr. Thomas A. Clark, W3IWI, AMSAT President and a NASA employee, hosted the weekend meeting. The decisions rendered by the Board, AMSAT's top policy organ, will affect AMSAT direction for years to come. Major highlights: a new organizational structure effective April 1, 1983, and *ORBIT* will continue publication. Here are the details.

On Saturday morning, Chairman of the Board John Browning, W6SP, called the meeting to order. Present were all seven Directors, including JA1ANG, G3IOR, VE2VQ, W3GEY, W3IWI, K1HTV and W6SP. Other attendees throughout the session were K8OCL, KD2S, W4PUJ, KA4JFO, W1HDX, KO5I, W1XT, W6XN (alternate director), WA2LQQ, W2FPY, Martha Saragovitz, W2RS, W3XO, WØRPK, KA9Q and KA2PFD.

The first substantive issue was AMSAT's connection with AFCEA, the Armed Forces Communications and Electronics Association. W3IWI explained that the involvement was limited to accepting a free booth at the Washington, DC convention in a manner similar to other public service organizations. W6SP pointed out that AFCEA is composed of about 1/3 hams, and the exposure is an excellent opportunity to develop contacts that could be very helpful in obtaining rare launch opportunities. G3IOR and W6SP agreed to coauthor an article for *ASR* to clarify the AFCEA-AMSAT relationship and to underscore AMSAT's neutral political posture in the U.S. and elsewhere.

The discussion moved next to the need to involve new personnel in the decision and management processes in AMSAT. Much thought was given to the "hows" and "whys" individuals become leaders within AMSAT and, in particular, how to promote participation by motivated, talented new individuals. The oft-discussed Center of Excellence concept was elaborated again.

In a discussion on member services, the Board decided that management of member services should be recognized and staffed separately from functional engineering activities. Proposals for new structure within the engineering and operations directorates were presented.

A discussion of W2RS's financial report followed. The Board allowed that the President be authorized to make changes in the profile of the investment portfolio with the concurrence of the Chairman of the Management and Finance Committee (W2RS). It was stated that about $70,000 was expended annually on member services, including salaries (Martha), office rental, utilities, *ORBIT* ($6000 to $7000 per issue), etc. The 2000 annual members, at $16/member, generate $32,000; and the interest of Life Member Reserves yields $8000; thus, the deficit is about $30,000 per year for member services. Tom suggested that about 25% of office time should be charged to project expenses rather than member services.

Many technical projects were discussed, including Phase IIIB (only a spin-balance test remains; Mode L transponder intermod products are reduced now to −35 dB); Phase IIIC (proposal submitted to USAF for DSCS 3 launch in mid-1984); PACSAT (possible university liaison; several launch opportunities; much interest in affiliated AMSAT Canada; rcvr and xmtr ongoing in the Project OSCAR California group; VE2VQ to give paper at conference in Ottawa in June 83); Shuttle, STS-9 (joint ARRL/AMSAT proposal submitted — AMSAT to be technical advisor, with ARRL in lead role for liaison with NASA; risk/benefit ratios discussed, with emphasis on "high visibility" project framework). Future funding levels were then discussed, followed by a discussion of various office expenses, including a proposed computer for processing membership records/activities.

The Board then approved a dues increase as follows: Effective April 1, 1983, the annual dues will be $24 (U.S., Canada and Mexico), $26 elsewhere. Life membership will be 25 times the annual rate. The Board allowed a nominal 25% discount for senior citizens on fixed/limited income and for students.

In discussing publications, the Board heard that *ASR* is a no-cost, self-funding enterprise now endorsed by ARRL. *ORBIT* has, since its inception, failed to pay for itself as planned. WA2LQQ explained that the root of the problem is inadequate readership levels. The *ORBIT* concept was based (three years ago) on having the magazine generate sufficient advertising revenues to offset fully the cost of publication so that no monies would need flow from the treasury to the magazine. Since the expected influx of new members attending the launch of Phase IIIA didn't happen, the per-reader-reached cost to a potential advertiser has been much higher than comparable magazines (e.g., *QST, 73, CQ, HR).*

Without advertising revenues, AMSAT's choice has been either to make up the difference from the treasury or to scrap the magazine until membership levels improve. The latter option would present an improved cost picture to the prospective advertiser. The Board decided that *ORBIT* should continue without interruption, because of keen member interest in the magazine, despite the additional costs involved and schedule/production delays. Six issues were budgeted for 1983. The Board then heard that the difficulties in maintaining the 1982 schedule were largely attributable to work overload of one or two key individuals. WA2LQQ then explained that there were three new editors coming on-line early next year to help relieve the tremendous workload. N1DM, W4OWA and KB2M will be "in training" over the next few months, with N1DM assuming the Editor's chair by *ORBIT* no. 15, scheduled for mid-1983.

The Board then turned to the election of officers, the establishment of new offices and the ratification of appointments. Reelected were: W6SP, Chairman of the Board; W3IWI, President; WA2LQQ, Executive Vice President; W3GEY, Vice President/Engineering; K1HTV, Vice President/Operations; K9LF, Vice President/Special Projects; K4YV, Treasurer. Elected were: KA9Q, Secretary to the Board, K8OCL, Senior Vice President (new position); KO5I, Assistant Vice President/Ops. for Spacecraft Operations (new position); WØRPK, Assistant Vice President/Ops. for User Services (new position); W2FPY, Assistant Vice President/Eng. for Research and Development (new position); KD2S, Assistant Vice President/Eng. for Spacecraft Engineering (new position); KA9Q, Assistant Vice President/Eng. for Systems Analysis (new position). Ratified were: KD2S, PACSAT Project Manager; W2RS, Chairman Management/Finance Committee; W1HDX, Manager of Ground Station Development.

The Board of Directors extended special recognition to KA5EIM, W4OWA, KD6DG, and W8GQW and the SRI (Stanford Research International) team. K1HTV will communicate the Board's appreciation. The meeting closed with the playing of an audio tape recording of greetings from AMSAT UK Secretary G3AAJ. (from *ASR* 48/49, Dec. 27, 1982)

Satellite Listening Post

The times and dates (Central North America Time Zone, not UTC) shown below are approximate. During these weekend periods, you can listen to amateur communication on the 10-meter downlinks between 29.300 and 29.500 MHz.

Feb. 5 - 6 — 5:25-6:30 A.M. and 6:45-8:00 P.M.
Feb. 12-13 — 5:00-6:00 A.M. and 6:15-7:30 P.M.
Feb. 19-20 — 4:30-5:30 A.M. and 5:00-7:00 P.M.
Feb. 26-27 — 4:00-5:00 A.M. and 5:30-7:30 P.M.

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $18 ($25 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ Project OSCAR 1983 Annual Orbital Predictions for every orbit of AMSAT-OSCAR 8 and RADIOs 5, 6, 7 and 8 are available for $10 postpaid in Canada, Mexico and the U.S.; $12 elsewhere. Send to Project OSCAR, Inc., P.O. Box 1136, Los Altos, CA 94022.

☐ ARRL members only: Send a 4- × 9-in. s.a.s.e. with your call sign to ARRL Hq. Club and Training Department for a complete, monthly orbit schedule for all operating amateur satellites.

☐ Further information on the Amateur Radio Satellite Program can be obtained free of charge from ARRL Hq. The OSCARlocator package (satellite plotters and details) is now available for $7 U.S., $8 elsewhere.

*OSCAR Program Manager, ARRL

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

FEBRUARY

1

West Coast Qualifying Run, 10-35 wpm, at 0500Z Feb. 2 (9 P.M. PST Feb. 1). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

5-6

Arizona QSO Party, Jan. *QST*, page 92.

QRP SSB Contest, Jan. *QST*, page 92.

New Hampshire QSO Party, Jan. *QST*, page 92.

South Carolina QSO Party, Jan. *QST*, page 92.

North American Sprint, cw, sponsored by the *National Contest Journal*, from 0100 to 0459Z Feb. 6 (phone contest 0100-0459Z Feb. 14). Contests are separate. 80, 40, 20 meters only. Suggested frequencies: cw — 3.530-3.550 7.030-7.050 14.030-14.050; phone — 3.870-3.910 7.210-7.240 14.260-14.290. For a valid QSO, you must send and receive *all* of the following information: other station's call, your call, serial number (consecutive starting with 001), your name and state (or province/country). An operator may use only one call sign during the contest. Multiply valid QSOs by sum of states, provinces and North American countries (not W/VE). KH6 is not counted as a state or as an NA country. VE mults. are Maritimes (VE1, VO1, VO2) and VE2 through VE8 (8 max.). Non-NA countries do not count as multipliers. Special QSY rule: Stations soliciting a call by sending CQ, QRZ, etc., are permitted to work only one station in response to that solicitation. They must thereafter move at least 1 kHz before working any other station, or at least 5 kHz before again soliciting calls. Team competition: Each team has a maximum of 10 members as a single-entry unit. Clubs having more than 10 members may submit more than one team entry. To qualify, the name and call sign of each operator (and station operated if a guest op) must be registered with W6OAT. The team information may be contained either in a letter received by W6OAT before the start of the Sprint or in a Western Union mailgram dated at least 24 hours before the start of the Sprint. There are no distance or meeting requirements for a team entry. Cw and phone teams are separate. Entries must be *received* no later than 30 days after the Sprint. Mail cw entries to Rusty Epps, W6OAT, 948-H Kiely Blvd., Santa Clara, CA 95051. Phone entries go to Rick Niswander, K7GM, 1914 W. Cortez Circle, Chandler, AZ 85224.

Vermont QSO Party, sponsored by the Central Vermont ARC, from 2100Z Feb. 5 until 0700Z Feb. 6, and 1100-2400Z Feb. 6. Work stations once per band and mode. Repeater QSOs do not count. Exchange serial number and QTH (county for VT stations; state, province or country for others). Suggested frequencies: phone — 3.930 3.960 7.230 7.260 14.280 14.320 21.360 28.570 50.110 144.200; cw — 3.530 7.030 14.080 21.060 28.070 144.100; Novice — 3.730 7.130 21.160. Count 1 point per QSO. VT stations multiply by total states/provinces/countries worked; others multiply by total VT counties worked. Mail logs by March 1 (include large s.a.s.e. for results) to D. Nevin, KK1U, W. Hill, Northfield, VT 05663.

7 MHz Contest, phone, sponsored by the Radio Society of Great Britain, from 1200Z Feb. 5 until 0900Z Feb. 6. Phone only (cw, Feb. 26-27). Single operator only. Exchange signal report and serial number starting with 001. Suggested frequencies: phone — 7.040-7.100; cw — 7.000-7.030. Non-European stations count 15 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of G prefixes worked. Mail by April 2 (April 23 for cw) to G3KDB, RSGB HF Contest Committee, P.O. Box 73, Lichfield, Staffs WS13 6UJ, England.

8

W1AW Qualifying Run, 10-40 wpm, at 0300Z Feb. 9 (10 P.M. EST Feb. 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Feb. 1 listing for more details.

12-13

North American Sprint, phone. See Feb. 5-6 listing.

QCWA QSO Party, cw.

PACC Contest, sponsored by VERON, from 1400Z Feb. 12 until 1700Z Feb. 13. Cw and phone, 160-10 meters. Work PA PE PI stations. Single and multioperator categories. Exchange signal report and serial number. Dutch stations will send report and province (GR FR DR GD UT OV YP NH ZH ZL NB LB). Work stations once per band, regardless of mode. Count one point per QSO and multiply by number of provinces worked per band for final score. Mail logs by March 31 to PACC Contest, F. Th. Oosthoek, PA0INA, Fred. Matstraat 36, 4614 EH Bergen op Zoom, The Netherlands.

Two-Land QSO Party, sponsored by the Gloucester Co. ARC, from 2100Z Feb. 12 until 0300Z Feb. 14. Single ops operate 24 hours max. Multiops may use entire 30 hours. Work stations once per band and mode. Work mobiles and portables as they change county. NY and NJ stations may work each other for credit. Exchange signal report and QTH (state and county for NY/NJ stations; state, province or country for others). Suggested frequencies: cw — 1.805 and 60 kHz up from lower band edges; phone — 3.900 7.230 14.280 21.355 28.600; Novice — 25 kHz up from lower band edge. Count 2 points per phone QSO and 3 points per cw QSO. NY/NJ stations multiply by total states/provinces/countries/NY/NJ counties worked per band; others multiply by total NY/NJ counties worked per band (83 max./band). Awards. Mail entries by March 20 (include large s.a.s.e. for results) to Dennis Sandole, WB2GES, 814 W. Kings Hwy., Mt. Ephraim, NJ 08059.

YU WW DX Contest, sponsored by the Savez Radio-Amatera Jugoslavije, from 2100Z Feb. 12 until 2100Z Feb. 13. No rules received for this year's contest, but here's what the rules have been for the past several years. Cw only, 3.5 and 7 MHz. Suggested frequencies 3.520-3.590 and 7.010-7.040. Exchange signal report and serial number. Count 5 points per YU QSO (10 points on 3.5 MHz), 2 points for other DX QSOs (5 points on 3.5 MHz) and 1 point for QSOs on your own continent (2 points on 3.5 MHz). Multiply by the number of DXCC countries plus YU prefixes worked per band. Single ops must remain on a band for at least 30 minutes; multiops at least 10 minutes. Band changes to work new multipliers may be made at any time. Mail logs by March 15 to Savez Radio-Amatera Jugoslavije, YUDXC, Box 48, 11001 Beograd, Yugoslavia.

19-20

ARRL International DX Contest, cw, Dec. *QST*, page 94.

YL ISSB QSO Party, phone, from 0001Z Feb. 19 until 2359Z Feb. 20 (cw, March 12-13). Contact Rick Connolly, K0RDJ, Star Rte. 1, Crocker, MO 65452, for logs, complete rules and further information.

UHF ATV QSO Party, sponsored by *A5 Magazine*. Contact Mike Stone, WB0QCD, P.O. Box H, Lowden, IA 52255-0408, for complete rules and further information.

23

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST) Feb. 23. See Feb. 8 listing for more details.

26-27

CQ WW 160-Meter Contest, phone, Jan. *QST*, page 92.

French Contest, phone, Jan. *QST*, page 92.

7 MHz Contest, cw. See Feb. 5-6 listing.

World RTTY Championship Contest, sponsored by *73 Magazine* and *The RTTY Journal*, from 0000-2400Z Feb. 26. Single ops work 16 hours max., and off-times must be at least 30 minutes long and noted in log. Multiops may use all 24 hours. Work stations once per band; no crossmode QSOs. Single and multioperator, single transmitter only. Single band and all band (10-80 m). W/VE stations send signal report and state, province or territory. Others (including KH6/KL7) send signal report and serial number. Count 1 point per QSO. Multiply by total states/provinces/countries worked per band. Awards. Mail entries by March 26 to *The RTTY Journal*, P.O. Box RY, Cardiff, CA 92007.

MARCH

2

West Coast Qualifying Run, 10-35 wpm, at 0500Z March 3 (9 P.M. PST March 2). See Feb. 1 listing for more details.

5-6

ARRL International DX Contest, phone, Dec. *QST*, page 94.

9

W1AW Qualifying Run, 10-35 wpm, at 0300Z March 10 (10 P.M. EST March 9). See Feb. 8 listing for more details.

12-13

YL ISSB QSO Party, cw. See Feb. 19-20 listing for more details.

QCWA QSO Party, phone.

Idaho QSO Party, sponsored by the Kootenai ARS, from 0000Z March 12 until 2359Z March 14. No net QSOs. Exchange signal report and QTH (county for ID stations; state, province or country for others). Suggested frequencies: cw — 50 kHz up from lower band edge; phone — 3.920 7.260 14.250 14.325 21.325 21.380 28.550; Novice — 25 kHz up from lower band edge. Count 1 point per QSO. ID stations multiply by total ID counties, states, VE provinces and countries worked; others multiply by total ID counties worked. Awards. Mail logs by April 16 (include large s.a.s.e. for results) to Vladimar Kalina, KN7K, South 1555 Signal Point Rd., Post Falls, ID 83854.

Virginia QSO Party, sponsored by the Sterling Park ARC, from 1800Z March 12 until 0200Z March 14. Work stations once per band and mode. VA-to-VA QSOs permitted. Work mobiles again as they change county. QRP stations must run 5-W input or less at all times. Exchange serial number and QTH (county for VA stations; state, province or country for others). Suggested frequencies: cw — 60 kHz up from lower band edge and anywhere in 160-m and Novice bands; phone — 3.930 7.230 14.285 21.375 28.575 and anywhere on 160 m. Count 1 point per QSO. VA stations multiply by total states, VE provinces, countries and VA counties worked. Others multiply by total VA counties worked (max. 95). Awards. Mail entry by April 15 (include large s.a.s.e. for results) to Barry Pybas, KW4I, 313 W. Derby Ave., Sterling Park, VA 22170.

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1700 to 2400Z March 13. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state, province or country for others). Suggested frequencies: cw — 3.560 7.050 14.060; phone — 3.990 7.290 14.290. Count 1 point per phone QSO, 2 points per cw QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max. 72). WI mobiles may add 500 points to their score for each county outside of their home county that they make 15 QSOs from. Mail logs by April 15 (include large s.a.s.e. for results) to WARAC, P.O. Box 1071, Milwaukee, WI 53201.

19-20

BARTG Spring RTTY Contest

Bermuda Contest

Spring QRP Activity Weekend

24

W1AW Qualifying Run

26-27

CQ WW WPX Contest, phone.

*Assistant Communications Manager, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADIAN DIVISION

ALBERTA: SCM: E. Roy Ellis, VE6XC — SCM/SEC: VE6XC. ASCM: VE6AMM. STM/NM (ATN & APSN): VE6ABC. EC: VE6AGH VE6AVV VE6AMM VE6AHC VE6FV VE6ABC VE6ASL VE6AFO. Some clubs are having difficulty in getting a magazine published owing to costs and lack of editors. Winter activities such as hockey will be keeping NARC busy supplying radio coverage. Plans to coordinate communications for the Universiade '83, the World University Games, is taking shape. Traffic: VE6CHK 195, VE6ABC 31, VE6AMM 8, VE6WN 6, VE6QN 6, VE6NA 4, VE6XC 4, VE6YW 4, VE6AW 1, VE6CFQ 1.

BRITISH COLUMBIA: SCM, H. Ernie Savage, VE7FB — B.C. Public Service Net, NM VE7QC, reports 4808 checkins, high 196, low 121. VE7CSI reports that BCEN attendance is improving with increase of traffic. Years absent VE7DE is back on with VE7FMH. Welcome. VE7CCJ has early Christmas IC-740 and IC-290. VE7US and VE7UR back from KH6-land even to an emergency call on 2 meters, inside the hotel, man stuck in elevator. Amateur Radio Communications Assn. held their annual Christmas party in Vancouver. VE7XQ saw that everyone received a gift from Santa Claus. Traffic: VE7ZK 118, VE7BNI 90, VE7FB 61, VE7CDF 12, VE7BZI 6. (Oct.) VE7COA 28, VE7EDN 10.

MANITOBA: SCM, Peter Guenther, VE4PG — ASCM: AJE. SEC: HK. STM: RO. NMs: VJ NM ACX TE HW. VE4JP was recently honored at a dinner Nov. 17th to show appreciation for the work he has done in the past. Some of the winter stations are now checking into nets. Must be a sign of summer behind us. VE4EF is back from treatments in Brandon. Hang in there, Brandon had a successful flea market with lots of goods available. MEPN QNI 1321, QTC 18, sess. 30. MTN QNI 238, QTC 56, sess. 29. WRIN QNI 202, QTC nil, sess. 8. MMN QNI 404, QTC 27, sess. 30. QTC QNI 128, QTC 24, sess. 29. Traffic: VE4AJE 53, VE4ACX 49, VE4PG 38, VE4TE 27, VE4RO 25, VE4FK 18, VE4AAD 14, VE4JA 13, VE4HK 9, VE4ID 8, VE4JK 8, VE4CF 7, VE4YE 6, VE4AAU 5, VE4LB 5, VE4TL 5, VE4MG 3, VE4AAF 2, VE4HA 2, VE4NE 2, VE4AAT 2, VE4AGT 1.

MARITIME/NEWFOUNDLAND: SCM, D. R. Welling, VE1WF — ASCM. VO1FG. SEC: VE1EI. NM: VO1JN VE1WF. STM: Open. VE1ASJ has been appointed CRRL Director for the Atlantic Provinces. Asst. dirs. now being appointed. Congrats. CRRL Incoming QSL Bureau has had a busy year. Exec of SONRA: VO1KR, pres.; VO1MP, v.p.; VO1IF, secy.; VO1KZ, treas. Humbars: VO1OK, pres.; VO1DO, v.p.; VO1RE, secy.; VO1AE, treas. ARCON: VO1DF, pres. Grand Falls, Nfld; VO1AT, pres. VO1BS, secy./treas. HOWL: VO2AG, pres. Congrats to all. VE1LZ and VE1YS with XYLs are vacationing in ZF1. VE1FD now in BC. VE1BBO elected Mayor of Dartmouth. APN: sess. 30, QNI 201, tfc 83, time 356 mins. Traffic: VE1WF 338, VE1XF 93, VE1BKM 21, VE1BXA 19, VO1AW 6, VE1BPM 5.

ONTARIO: SCM, Larry Thivierge, VE3GT — ASCM: VE3GOL. SEC: VE3GV. STM: VE3GFN. Several recent changes in the section's traffic nets has seen the Laurentian Net opting out of the NTS and operating more informally, such as the CJ Net. This leaves almost no formal traffic handling facilities in the northern portion of the section. VE3GNW has resigned as NM of the OPN and VE3BDM of Brockville has taken over the reins. Special thanks to VE3GNW for his efforts, who, by the way, now has a TRS-80 to keep him busy. New ECs are VE3WV, York Co., and VE3EUI for the "Soo." New League Life Members are VE3NMH and VE3JUZ. Congrats to VE3AWE who was presented with the Public Service Medal from NASA and the U.S. Government for his work with the Remote Manipulator System (RMS) developed by Canada for NASA's space shuttle flights. VE3AWE, a well known cw traffic handler, has been a popular speaker at several club meetings. Also congrats to VE3KF who won a Cover Plaque Award for his excellent article in the March *QST*, "A Digital Readout System for the Visually Impaired." VE3FZZ is off to the Far East on a teaching assignment. VE3MFE presented an interesting talk to the Welland Co. ARC on the effects of lightning. London ARC has installed an autopatch on the club rptr, VE3LAC. Hart House ARC of the Univ. of Toronto has become an affiliated club. Early 1983 should see a new rptr, VE3ERX, 146.13/73, on the air from just north of Wiarton on the Bruce Peninsula. VE3ADK is now VE3ACW. VE3BPS was presented with a Life Membership in the Algoma ARC, thus becoming their second life member. I would appreciate receiving bulletins from clubs, or individual news items from the following areas: Kenora, Lake of the Woods, Rainy River, Thunder Bay and North Bay. Traffic: VE3GOL 324, VE3HGJ 200, VE3HTL 190, VE3DPO 111, VE3GT 108, VE3GNW 92, VE3GFN 80, VE3WG 77, VE3BDM 61, VE3JSM 60, VE3FGU 57, VE3WM 51, VE3KXB 32, VE3AYZ 26, VE3AJN 25, VE3KCZ 21, VE3EWD 17, VE3DZH 9, VE3KLX 5, VE3EFX 4. (Oct.) VE3AWE 93

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2EDO VE2FSA. Congratulations to VE2GE for being a League member for fifty years. Every month in 1982, VE2EKC, XYL of VE2BP, has made *QST* available on a C-90 cassette tape to blind amateurs. 167 tapes were sent. This service will continue in 1983. Silent Keys: VE2TD, well known as editor of the *VE2TD NEWSLETTER*, as well as for his work with blind amateurs in the Montreal area; VE2AN, a well known friend of every one. Nouveaux en RTTY: VE2s BNE BMJ ADA ABO and BP. VE2FJR s'achemine vers le DXCC. VE2AJD, tres heureux avec son nouveau TS-130S. Traffic: VE2EDO 62, VE2BP 42, VE2EC 30, VE2EKC 26, VE2GAG 13.

SASKATCHEWAN: SCM, W. C. Munday, VE5WM — STM: VE5QY. SEC: VE5II. NMs: VE5DC VE5HG VE5OI VE5MP. The sunny climes of the southern states have beckoned to many of the VE5-gang. Radio classes are in full swing, and a vote of thanks is extended to those instructors for their valuable work. The Regina and Moose Jaw clubs have been conducting monthly 2-meter transmitter hunts. Traffic: VE5ADZ 53, VE5BAF 23, VE5UX 22, VE5HG 18, VE5AAT 11, VE5WM 8.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY K3JL W3DKX WA3DUM. Officers Del. Rptr Assn 1983: KC3A, pres.; N3CLZ, v.p.; WB3LGC, treas.; N3ADT, corr. secy.; W3AHW, rec. secy. SARA officers for 1983: K3JL, pres.; W3WD, v.p.; N3DCK, secy. SARA has a newsletter now, edited by N3DCK. AWARE held their annual Xmas party with an organ concert by WA2MKI. It was very enjoyable. All club officers, do not forget to send your club news to AC3U, editor of the *Del. News Letter*. DTN: QNI 328, QTC 47, sess. 22. DEPN: QNI 60, QTC 11, sess. 4. SEN: QNI 49, QTC 2, sess. 5. Traffic: W3PQ 161, W3QQ 66, W3DKX 64, WB3DUG 50, WA3WIY 38, K3JL 32, WA3DUM 12, K3ZXP 12, N3AXH 7, WA3PWT 7, KA5DIJ 6, W3WD 5, WA3RTX 2.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: KB3LF. DEC: AA3C K3QXC KB3QW KB3UD N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 P.M. Dy	505	226	30
EPA	3610	7/10 P.M. Dy	481	200	57
PTTN	3610	6:30 P.M. Dy	247	60	30
PFN	3958	5 P.M. Dy	322	254	30

Local and vhf nets reports (QNI/QTC/sess.): D3ARES 266/20/5; D5ESN 65/11/4; D6ARES 21/9/3; CCAREC 15/0/2; CCARS 63/11/5; WARCVTN 27/8/4. OO reports: W3FAF W3GOA W3KEK KB3XO. OBS reports: W3CL W3VA WA3ENE. PSHR: KA3DLY KA3EJG KB3LF KB3UD KB3XO KE1L N3CJP W3VA WA3EHD WB3FKP WB3KUZ WB3FYT. New appointments: KE1L to ORS; WB3FRL to OES. Congrats. EPA welcomes WA3SLN. EPAEPTN welcomes KA3JRO. KB3HV upgraded to Extra, and KA3FUL to Gen. K3BWE reports for first time. Welcome aboard. WB3KUZ all set for ttc work with Collins S-line, keyer and Bencher paddle. KB3XO completed 75M WAS. New gear: KB3HV IC2AT; KB3LF TR-9130; K3RLI FT102; N3AVZ triband beam; KA3ILE TS130S; KC3AK VIC20; W3CPR FT102; W3FM FT-One. New officers: Mobile Sixers RC-N3AHP, pres.; WB3BDP, v.p.; KA3GCY, secy.; KA3AFT, treas. Murgas ARC-K3SAE, pres.; WB3FYT, v.p.; K2OCD, secy.; K3JML, treas. York ARC-W3EDO, pres.; W3BUI, v.p.; WB3LJS, secy.; W3AMQ, asst. secy.; WA3SRE, treas.; K3BWB, trustee. JA1VOK gave an interesting talk on 6M and vhf activities in JA-land at recent Pack Rats meeting. WA3PZO, EPA SEC, has been nominated for the National Retail Merchants Service, Fred Lazarus, Jr. Memorial Award for Community Service on the basis of his involvement with disaster communication. WA3VIL, Asst Tech Editor *QST*, was guest speaker at recent Social Nite held in Tamaqua. This event was sponsored by the Schuylkill ARA and the Tamaqua ARA. A large crowd was on hand. Traffic: WA3WQP 191, W3IPX 180, KB3UD 146, KB3LF 118, W3DP 115, WA3EHD 113, KE1L 107, KA3DLY 96, WB3KUZ 87, KB3XO 81, W3VA 76, N3CD 62, KA3GJT 50, W3TWV 44, N3BFL 32, W3AQN 24, N3COY 22, W3CL 20, KA3EJG 19, N3CJP 13, WB3FYT 13, WB3FKP 11, W3ADE 9, W3PTM 5, W3FAF 4, N3BHF 3, AF3Z 3, W3KEK 2, W3HK 1.

MARYLAND-DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — STM: WB3GZU. SEC: WA3TAI. The Columbia ARS and the SMARC provided amateur coverage for the Vietnam parade, and a job well done says WA3TAI. Congrats to KC3DO, ex-KA3HLK, on his upgrade, and to AARS members N3CZP General, KA3BQF & KA3GUB Advanced and KK3O Extra for ex-KB3ME. New calls for N3CZC/ex-KA3JLK, KB3ZA/KA3EFK, N3CZX/KA3IVM. W3FZV has added 3RN liaison duties to his sked. KC3DW is thinking about a noontime net. Interested? WB3BFK keeps the PONs pretty much in line. W3LDD and W3HTB are almost neck and neck DXers. Winter hits KB3WL first! KB3NL has one eye on the TV news when he is NCS. W3UT does all the MDD jobs on Thursdays. W3CVE continues to send W3CUL all his traffic. WB3GZU now has the hobby and work getting along well together. W3ZNW is moving traffic on his RTTY skeds. W3CDQ has settled into the winter routine. After 45 years KJ3E tries electronic keyers. KA3R, our OO, says "Better me than the FCC!" The contesting bug bit KC3D. WB3KJT is trying antennas and QRP while the main rig gets overhauled. News bulletins from AARS, SMARC and FAR appreciated. W3IK, as District one Deputy Director for the KCs, is busier than before retirement. New gear necessitates some interfacing for easier quicker operation, and he still finds time to help the rest of us as OO. KA3CDQ is up to his ears with the seasonal workload. With the nets (Net/manager sessions/traffic/QNI average) WC 2-Mtr/KC3DW 5/1/17.2; MDC PON/W3OYY 4/8/18.3; WR PON/WB3BFK 24/45/18.5; MDD/W3PQ 60/262/7.8; MEPN/WB3GZU 31/134/30. Brass W3FA and W3QQ. W3DKX and KC3DW were 100%. Others were: KA3AMK (Fla), KA3ARH WB3BFK W3LDD and WA2YFM (NY). We can use more especially cw operators! Traffic: WB3GZU 545, W3FA 261, KC3DW 237, W3CVE 219, KJ3E 183, W3UT 65, KB3WL 52, W3FZV 40, WB3BFK 22, W3LDD 20, WB3KJT 17, W3ZNW 16, KC3D 10, KB3NL 2. (Oct.) W3CVE 208, KB3WL 8.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: N2CER. Continuing from last time, the search was resumed around 3 P.M., with the Civil Air Patrol participating. The area was now narrowed down to a small region of Hainesport township, where the signal was very, very strong. Included in this area was a New Jersey Bell Telephone maintenance garage, which had already been checked out by the CAP with no success. George and Boyd became convinced that the signal was originating from within the fenced-in enclosure, however, and were able to gain access since they are both telephone company employees. A thorough search of the inside area of the compound revealed nothing until Boyd hopped into the trailer-sized trash hopper and started routing around in the trash. What a surprise! There, buried under all kinds of electronic garbage, was an intact aircraft ELT transmitting a signal on 121.5 MHz!!! How did it get there??? No one knows for sure. George suggests that a telephone lineman probably came across it in his travels and, when he figured it was no good, threw it in the hopper. The impact of it landing in the hopper would have been plenty to set it off and, presto, instant search and rescue effort started . . . and wasted. An important point is proved, however, and that is that our DFing techniques did indeed work, and that we could certainly find a downed aircraft if it became necessary! We hope it doesn't. Traffic: N2CER 595, WA2HEB 248, WB2ZJF 215, WB2PKG 156, KM2E 75, KA2KTR 16.

WESTERN NEW YORK: SCM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZOJ. ASCM: W2GLH. DECs: WA2AIV KA2BHR WB3CUF WB2NAO W2GJ (acting). ARES nets: Central 1930 3rd Sn 40/00, Chemung 2100 Sn 10/70, Lewis 1815 Sn 43/03, Oneida 1930 Tu 34/94, Oswego 1900 Sn 75/15, SLVARES 1930 Sn 31/91.

Net	Freq.	Time/Day	Mgr.	QNI	QSP	QND
NARASEN	75/15	0930/Sn	KC2JO	65	0	4
NYS/1*	7077	1000/M-S	WB2EAG	186	114	25
NYSCN	3677	1000/Sn	W2MTA	42	25	4
THIN	3913	1600/Sn	WA2KOJ	59	—	4
NYPON*	3913	1700/Dy	K2KQC	714	370	30
NYSPTEN	3925	1800/Dy	KA2O	739	93	30
ESS	3590	1800/Dy	W2WSS	382	61	28
OCTEN*	34/94	1830/Dy	WB2HLY	598	61	30
Q Net	31/91	1830/Dy	KA2CMQ	456	2	30
STAR/E*	99/39	1830/Dy	N2BLX	54	10	22
WDN/E*	04/64	1830/Dy	KG2QQ	666	136	30
NYS/4*	3677	1900/Dy	N2APB	437	203	30
JCARCN	10/70	2000/Dy	WA2WAX	396	21	27
OARCN	25/85	2000/W	K2VTT	97	0	4
VHF THIN	04/64	2000/T	KC2QQ	83	—	5
WNYECN	3955	2000/3 Sn	W2BCH	(ARES)		
BRVRAN	055/655	2100/Dy	WB2OFU	329	1	30
CNTYN*	90/30	2115/Dy	WA2PUU	382	71	30
STAR/L*	325/925	2130/Dy	N2BLX	59	38	20
WDN/L*	04/64	2130/Dy	KC2QQ	764	167	30
NYS/5*	3677	2200/Dy	N2APB	333	311	30

*NTS net. PSHR: W2AET N2BLX WA2FJJ WB2IDS WA2KOJ W2MTA WB2OWO KC2QQ KC2SW W2ZOJ. Appts: KU2N WB2RBA-ORS. Novice Classes Fulton ARC-WB2LBE W2TQF. GRAM has formed a Computer Group-WB3JSU. Club Officers: W2TQF KA2AON WA2LBG WB2LBE-Fulton ARC; WA2IVD KA2HJG N2CSG WA2KUT-SVARA. RARA has the STEEL up at 111 Westfall. Western New York needs an Affiliated Club Coordinator; contact W2MTA for info. Reports: (OES) KA2LHO K2OC; (OO) W2AET active support on 10 MHz. Hamfests: WB2OWS chairing 1983 Ham-O-Rama; Southern Tier Hamfest at Owego May 7; NY State and Atlantic Division Convention at Rochester May 20-21; Finger Lakes at Trumansburg Aug. 27; more to come. If you read this column, send a message to W2MTA. Western New York needs more appointees-ORS OES OBS OO EC-as well as a Bulletin Manager, an Official Observer and RFI Coordinator, a Public Information Officer, a State Government Liaison, and a Technical Coordinator-express your interest(s) to W2MTA. Traffic: W2MTA 411, WA2FJJ 333, W2AET 300, WB2IDS 276, KO2H 259, WB2OWO 252, W2FR 187, WA2HSB 146, KC2SJ 124, WB2QIX 106, KC2SW 101, KG2D 95, WA2KOJ 80, W2ZOJ 79, N2BLX 65, KC2QQ 63, WB2RBA 55, W2HYM 47, AF2K 45, WA2PUU 43, KB3RG 39, N2ARD 31, KA2BCH 28, N2ABA 27, KU2N 22, N2CBZ 17, K2IUT 16, WB2PID 16, WA2AIV 15, KA2DBD 14, KA2OKA 14, WA2SMZ 11, K2RN 10, WA2OEP 8, W2PHQ 8, KA2QCO 8, WB2NAO 7, KA2DQA 5, K2VR 2.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — STM: AC3N. NMs: WA3UNX N3ADU W3MML W3NEM. SEC: AB3Q. DECs: WB3JDI KB3OO KN3ZAN WB3EFQ WB3KJH WA3ZNP N3ADU.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	418	202	30	3585	7:00 P/D
WPAPTN	735	165	30	3983	6:15 P/D
WPA2MTN	565	165	30	146.28/88	8:00 P/D
NWPA2MTN	419	3	29	146.04/64	9:00 P/D

I would like to commend our operators on our traffic nets both section and the out-of-region for the fine job being done. We could use more, especially in areas that are sparsely populated. Try to check in and see if you can help. Upgrades: Tech-KA3JVX KA3HPU; General-KA3JKO N3BQI; Advanced-WA3UFI; Extra-WB3GPR. Congrats. New officers for 1983: Indiana Co. ARC-KC3BR, pres.; KA3JGN, v.p.; W3FVU, secy./treas.; W3AEN W3ELZ, board; K3VC(, trustee. Two Rivers ARC W3OFM, pres.; WB3CWR, v.p.; WB3ICC, secy.; KA3HPU, treas.; WB3JWJ, act.; KA3BLJ W3SYR WA3IZH, trustees. Steel City ARC-WB3BRY, pres.; AK3J, v.p.; WB3EML, rec. secy., WA3FWA, treas.; W3UUH, corres. secy. The members of the PI THETA PHI from Thiel College made their annual walk from Greenville to Pittsburgh for the Childrens Hosp. here. Amateur Radio was the main means of communication for them and kept them in touch with their home base. The boys collected about $30,000. More next month when we get a full report. Traffic: N3ADU 328, K3CR 236, N3CKQ 203, AC3N 146, W3OKN 145, WA3QNT 80, W3EGK 60, W3IQD 59, K3SMB 58, WA3UNX 54, N3FM 52, KB3UO 52, KB3DT 42, W3SMV 36, W3KUN 32, W3MML 30, K3LTV 27, WB3HWB 25, K3NPW 23, W3RUL 23, KB3NV 22, KB3BG 19, N3BKU 19, W3NGO 19, K3VQV 18, KA3ETC 16, WA3HJC 16, WB3GUK 12, W3SN 12, W3TTN 11, KI3C 10, K3HCT 9, K3TUA 7, W3KMZ 6, KA3CDV 5, N3KB 5, WB3JCW 3, W3LOD 1. (Oct.) KF3V 19, N3KB 3.

CENTRAL DIVISION

ILLINOIS: SCM, David E. Lattan, WD9EBQ — SEC: W9QBH. ASCM: K9ORP.

Net	Freq.	Time/Day	Sess.	QNI	QTC
ILN	3960	0030/0430 Dy	—	—	—

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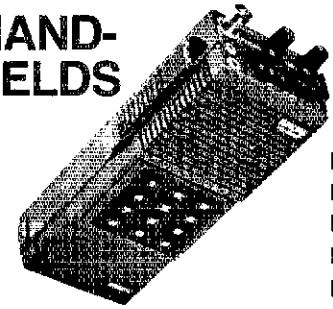

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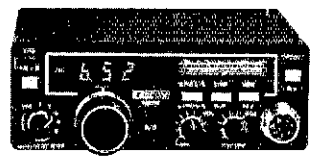

IC-290H 2 METER FM/SSB/CW TRANSCEIVER

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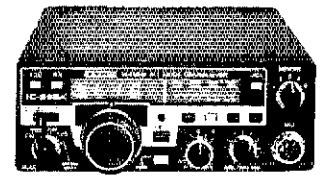

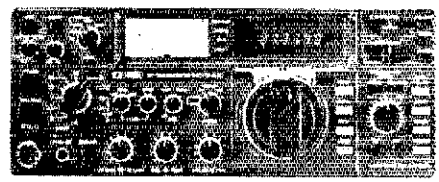

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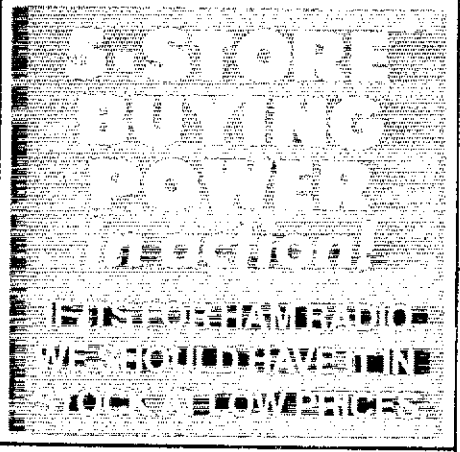

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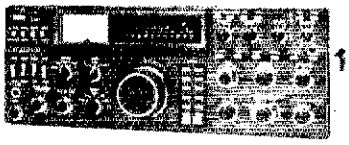

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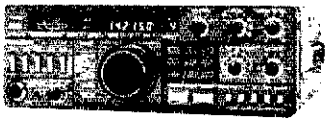

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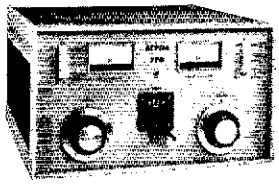

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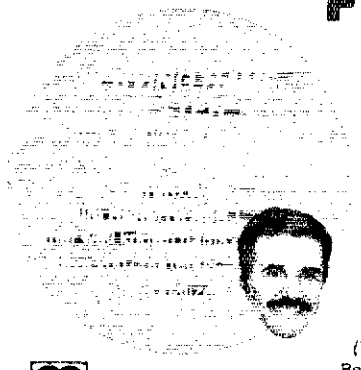

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W9VEY Memorial Net reports 68 QNI and 10 QTC in 5 sess. IL 100% D9RN: W9HOT W9NXG WB9ODN WB9WGD K9EHP K9AZS N9DFD. IL 100% CAND: W9HOT W9NXG WB9WGD. Special thanks to the Hq. Editorial Staff for putting up with a hand-written report this month. As of this writing, I am on assignment with another VOAD organization (ARRL is a VOAD member organization), the American Red Cross. I am stationed in Cape Girardeau, MO, functioning as Chief of Communications and Engineering for the MO and IL tornadus and floods. The support of the Red Cross disaster relief effort has been superb by both SE MO and So. IL hams. The amateurs here have consistently provided communications for Red Cross operations throughout the 11-county disaster district. Hams working this disaster include: WØQMF WAØDOV WB2FOH NØEBB KAØLBE KI9P N7EFA WBØRLO KØDQA KAØGCG KØQCS WDØHDI WØECA WBØLGY WØRMS NØDEB. N9DMK and N9DBB have been assisting Red Cross as damage assessment surveyors in addition to their ham radio capacities. Other hams involved by virtue of wearing more than one hat include: WAØZUD, dir. of emerg. services for Bulter Co. MO: WAØWIV, dir. of emerg services for Cape Girardeau Co., MO: NØAKR, dispatcher for Cape Girardeau Co. emerg. services; WAØVED, who is in the two-way industry and has been helping keep all the radio equipment going. Special thanks to WAØZNI for relaying the teletype weather information sent by N9CNQ from Makanda, IL. This column shows that state lines don't get in the way of hams helping out in a disaster. In other news, WA9EKA reports the 1983 officers of Hamfesters RC to be: K9UVN, pres.; KB9KD, 1st v.p.; N9BVT, 2nd v.p.; N9BRV, treas.; KA9HDB, secy.; KA9BOK, sgt-at-arms: WA9EKA, trustee; KB9ZL, "Hamfester of the Year." KB9X reports that KA9NWO will be taking over the on-air responsibilities as ITN NM. As I write I have just been informed that the river has crested and has begun to recede. This is good news, but the job is far from over as Red Cross involvement will continue throughout the cleanup and reconstruction. Thanks to all hams on both sides of the river who have made the operation run more smoothly, resulting in more and better service to the disaster victims. 73 de WD9EBQ. Traffic: W9NXG 359, W9HOT 282, K9MX 208, W9JIJ 200, K9AZS 188, W9OK 161, KD9K 113, WB9WGD 112, W9TLU 104, KN9BAM 91, KA9NWO 72, W9HLX 64, N9DIX 60, K9EHP 37, WA9SHE 28, W9LNQ 26, KA9NBH 26, WD9IBH 21, W9KR 18, WA9RUM 8, W9HBI 7, AA9D 4, KA9GJN 3, WD9CJB 2.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. SOOC: KJ9G. SGLC: WA9BVS. SRC: N9WB. SACC: K9TUS. SCC: W9OBF. STC: WD9ADB. SPRC: K9DIY. SDXC: N9MM. SOBC: KC9TA. NMs: ITN-W9QYY; QIN-KJ9J; ICN-KA9CZD: VHF-W9PMT; IWN-N9BHT; IPN-KO9F; I6SSB-WD9HQJ.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2300	2249	334	1709	60
QIN	3656	1430/0100/0400	918	350	2656	90
ICN	3708	0100	164	90	1041	30
IPN	3910	2130	1158	115	866	30
IWN	3910	1310	4370	—	515	30
I6SSB	50150	0100	252	5	1803	30

Hoosier vhf Nets: QNI 3957, QTC 202, QTR 5586, bulletins 60 for 24 nets. D9RN 100% 443 messages in 1840 minutes., for 60 sess. IN stns W9URQ W9JUJ K9CGS KB9NR KJ9J WD9BKT. 9RN 632 messages in 1255 minutes in 60 sess. IN 100% stns K9WWJ W9EI N9HZ WD9GXW W9JUJ W9QLW WB9UYU WA9QCF N9AEI KJ9J K9FW. CAND 991 messages in 30 sess. D9RN 100% IN stns W9JUJ W9URQ. Appts: Section DX Coordinator-N9MM; Section Official Bulletin Coordinator-KC9TA; OO-K9FVN AK9G WB9DFD KB9EZ KC9IT; OBS-N9COS; EC-WB9EBI Huntington Co., WB9WAZ Vermillion Co., WD9EVK Monroe Co.; NM-ICN KA9CZD, Porter Co. ARES Net KK9N. I, WB9ZQE and W9JUJ enjoyed the Fort Wayne Hamfest. Thanks to W9FC for the dinner arrangements, to WB9PXT and WD9HII for the tour of their EOC, and to KA9GWE for the forum arrangements and an A1 hamfest. The Randolph Co. hamfest will be March 13. Their new president is WB9UZZ. The new president of the Hoosier Lakes ARC is WB9JUV. If you have elected new officers to your club or have changed newsletter editors please let me, WB9ZQE or K9TUS know. We are planning to establish a much closer relationship with all Indiana clubs. We sure hate to spin our wheels because we are not getting to the right people. The new Tri-State *SPARKS* editor is KA9LQN. KA9FFO had a full-page article on him in the *Carroll Co. Comet.* KA9FFO is an important part of the Indiana Wet Net and SKYWARN program. WB9ZQE and I spoke at the Laughery Valley ARC annual Banquet. I would like to thank WA9JNC, WA9BLA and WB9TFD for their hospitality. Traffic: W9JUJ 1138, W9FC 367, KJ9J 304, WB9UYU 247, KM9B 160, W9QLW 146, W9URQ 126, W9QYY 120, W9UMH 76, W9EI 73, K9FZX 70, WA9QCF 64, W9WKM 55, KB9HH 47, N9AEI 41, W9UEM 40, WB9JUV 35, K9WWJ 33, W9JZV 28, KK9N 27, WB9MIK 23, K9DCX 22, W9PMT 20, KB9NR 18, KA9FFO 17, KI9R 17, WB9OZZ 14, W9RTH 14, WD9CIV 12, K9DIY 12, WD9DWD 11, K9FVN 11, N9AST 10, W8LKU 10, WB9AWI 9, N9COS 9, KK9D 9, W9DKP 9, WD9ART 8, W9ZGC 8, N9DHX 7, K9KTB 7, K9OUP 6, WA9OKK 5, W9YEW 5, W9BDP 5, KB9DE 4, WA9JNC 4, W9UPI 3, W9XD 3, WB9AJY 2, N9DER 1, K9SBW 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1215Z QNI 1200, QTC 1306 WB9YPY. BEN 3985 1800Z QNI 717, QTC 227 WB9ESM. WSBN 3985 2300Z QNI 1129, QTC 388 WD9ESZ. WNN 3723 0000Z QNI 196, QTC 46 KA9HPQ. WSSN 3645 0030Z QNI 208, QTC 78 N9BYK. WIN-E 3662 0100Z QNI 364, QTC 176 W9YCV. WIN-L 3662 0400Z QNI 312, QTC 113 K9LGU. XPO 3925 1831Z QNI 438, QTC 25 WA9GYF. NWTN .34/.94 0030Z QNI 460, QTC 40 WB9YPY. Gr. Bay .72/.12 0245Z Wed. QNI 31, QTC 10 WB9NRK. WCWTN .31/.91 0030Z QNI 390, QTC 40 N9AUG. AD9X gave a great slide show on Russia to FLARC meeting. KA9MHA has General. New Novice Madison area KA9OME. WB9BPS has RTTY rptr on 6.10/6.70 near North Freedom, 10 miles west of Baraboo. New officers Mancorad club are: K9DIN, pres.; K9LWI, v.p.; WB9OQD, secy.; W9NPX, treas.; WB9OBX K9HAG WB9CYC N9BCX, board. New officers Green Fox ARC: N9AOZ, pres.; KB9WC, v.p.; N9CXX, secy.; N9ALZ, treas. HK3NBB/K3ZO had a good article in *Smoke Signals* (Dec. Issue) about hams and licensing in Colombia. You know, we really have it pretty good here. Starting next month, he will have a series on Badger ARS station W9YT. BPL to KA9CPA. OES to W9FBC. W9CBE re-

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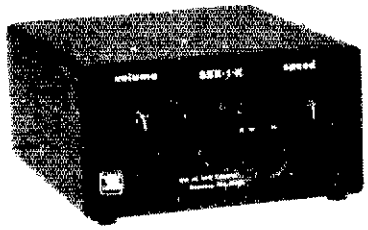
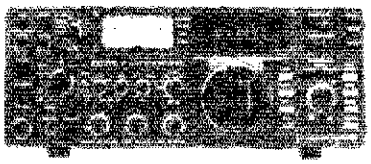


NYE VIKING



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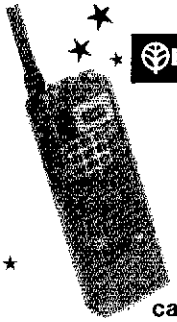

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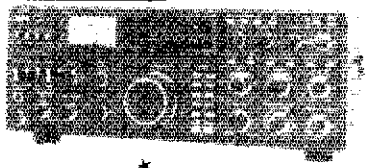
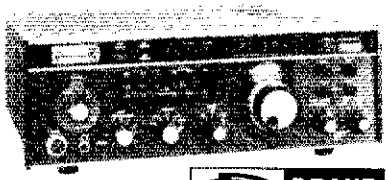


Henry Radio



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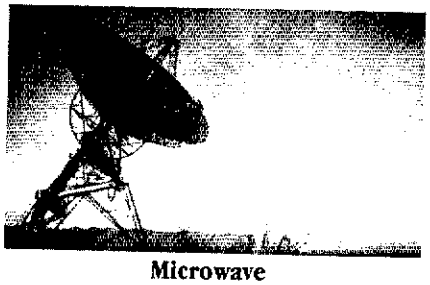

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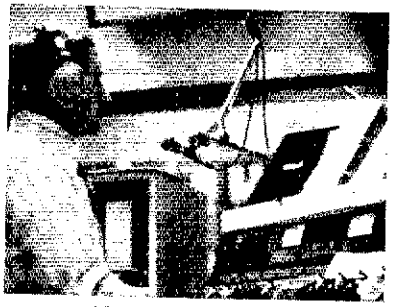

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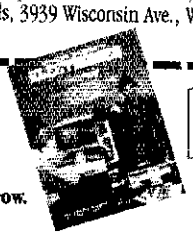

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ceived award for 45 w.p.m. Congrats. Sorry to see K9EN lose the election of Vice-Director, but congrats to W9PRN and K9KM as Director and Vice-Director. Three 8th graders 13-years-old from Shawano area upgraded: one Extra, one Advance, and one General. Congrats. Traffic: KA9CPA 2417, WD9ESZ 319, W9CXY 317, WB9YPY 214, W9YCV 218, K9FHI 200, KC9CJ 180, K9GDF 176, W9UCL 149, W9DND 138, N9BYK 94, N9DIH 91, WD9FRI 84, W9IEM 77, KA9IKR 77, WB9NRK 77, K9AKG 73, WB9ICH 68, KA9BHL 64, W9LDO 58, N9ATP 56, KA9OBP 48, WB9JSW 47, W9SO 47, AG9G 46, W9IHW 44, N9AUG 43, K9JPS 40, KA9KLZ 38, WB9JGA 36, KB9NG 34, W9CBE 32, W9YT 31, K9UTQ 30, K9HDF 28, N9BCX 27, KB9GO 27, WA9WYS 27, WD9BKT 26, KC9GW 26, N9DCF 25, WA9GYF 24, W9FDY 22, KA9GYD 21, W9UW 21, KG9B 20, WA9DXW 20, N9BDL 19, WB9WNA 19, WD9IMZ 18, KA9MFV 18, K9ANV 15, KB9FM 11. (Oct.) KC9KO 149, KA9HPA 73, N9CP 7, WA9BZW 6, W9RTP 5, KA9BHK 5.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — STM: ADØS. SEC: KNØJ. Congrats: to WRØCZZ who is the Asst. EC for Crow Wing Co.; to KAØEPY who is the new net manager for MSN/2; to NØDUQ who is an alternate net control for MSPN/E. A big THANKS to KØJCF for the fine job on MSN/2. The section works because of your help. Our best to the family of WØEF who became a Silent Key. WØMGI was honored for his outstanding service as a board & commission member for the Recreation & Parks Assn. He is also editor for the *Ground Wave* for the St. Paul RC. MSN 1 & 2 are combining to put out a joint newsletter for all regular checkins. ADØS is the ZERO rep in the IARS No. American Council. I hope you all had a nice holiday and Santa left ham gear. Hi. Send any items for this column to STM ADØS by the 5th of each month. 73.

Net	Mgr.	Freq.	Time	QNI	QTC
PICO	WØHZU	3925	8:00 A	3108	245
MSPN/E	KCØT	3929	5:30 P	1206	345
MSPN/N	KAØJUX	3945	12:10 P	588	61
MNWX	WAØONE	3929	6:15 P	576	418
MSN/1	W9DM	3685	6:30 P	339	145
MSN/2	KAØEPY	3585	10:00 P	176	51
MSSN	WBØWXU	3710	7:00 P	—	—

Traffic: WAØTFC 392, KBØMB 305, WØHZU 231, KAØJUX 197, KAØEPY 172, W9DM 160, WAØONE 157, KAØIAQ 128, NØCLS 123, WØDFX 100, KAØARP 73, WDØCGM 61, KCØT 55, KTØR 54, ADØS 52, NØDFR 38, KØCSE 38, WØMFW 33, NØDUQ 30, WDØAHO 27, KBØRW 22, KØOGI 15, KCØYG 11, WDØBGS 11, NØJP 9, KAØMZJ 7, KAØNRU 5.

NORTH DAKOTA: SCM, Dean R. Summers, KQØC — Congrats to new upgrades KVØR NØEGN & KAØOXN. Try the 30M band, 10.100-10.109 and 10.115-10.150. Hope all had a good time during the ND QSO Party. All the nets listed below are looking for checkins. You might also try your hand at being a net control. Contact the net manager for each net listed. Send me any information for this column at least three months in advance for all major events. FCC coming to Bismarck in Sept. and to Fargo in April. Contact me for more info.

NDSN	7.145	2300Z S	KD4PS/KOØL
DATA	3.9965	2330Z Dy	KAØFSM
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Goose River	1.990	1400Z Sn.	WØCDO

NDYLWX QNI 194, QTC 181; G.R. QNI 72, QTC 2; DATA QNI 256, QTC 24. Traffic: WØCDO 57, KAØFSM 41.

SOUTH DAKOTA: SCM, Fredric Stephan, KCØOO — Mobridge Area ARC newly elected officers are as follows: WØYMB, pres.; KAØKXG, v.p.; W. Aman, secy/treas. Elected by Hot Springs ARC were: KCØOO, pres.; WØHOJ, v.p.; NØEDF, secy/treas. Black Hills ARC members helped out Stratobowl Jules Verne balloon launch. SD Traffic Information Net meets on 3960 at 1500 UTC. Please join us soon. The NTS liaison were KØFRE WØKJZ WBØKWX WAØAOY and KCØOO. Tnx. SD WX net 816 QTC, 1009 QNI; SD Eve Phone net 91 QTC, 1294 QNI; SD Eve CW Net 41 QTC, 105 QNI; SD NJQ Net 16 QTC, 547 QNI; SD Emg Net 8 QTC, 105 QNI. BPL: WØZWL WØMZI. PSHR: WØZWL WØMZI WØKJZ. Traffic: WØZWL 758, WØMZI 629, WØHOJ 139, WAØVRE 130, KØAIE 108, WØKJZ 86, KCØOO 85, WAØUEN 69, WØDVB 62, KØFRE 59, WBØYQT 34, WBØOMF 30, WØRWE 28, W7UDB 27, WBØHTT 25, KAØANF 24, WAØBZD 22, WBØRXF 22, WBØPAI 21, KØRVD 20, WAØAOY 17, NØDCM 16, KØZBJ 15, NØCDX 12, WBØLTV 8.

DELTA DIVISION

ARKANSAS: SCM, Dale Temple, W5RXU — SEC: WB5IGF. Never before in the history of ham radio in Arkansas have so many been involved in emergency, health & welfare traffic for so long as Arkansas hams have these past four days. Tornados (20) and floods over approximately one-half the state have had more hams involved for a longer period of time than at any other. A full report hopefully will be available next month. As of this writing the health & welfare traffic continues. An estimated 200 hams have so far been involved in Arkadelphia, Malvern, Bryant, Benton, Little Rock, North Little Rock, Conway, Searcy, Newport, Jonesboro, Horseshoe Bend, Hardy, Mt. View, Clinton, Batesville, Walnut Ridge, Melbourne, Tuckerman, and I'm sure others. As far as I am concerned it was, ARKANSAS HAMS FINEST HOUR.

LOUISIANA: SCM, John Meyer, N5JM — ASCM: KC5SF. STM: W5GHP. SEC: AC5R. February's frosty winds find busy times in Baton Rouge. BRARC's new officers are: KD5SL, pres.; WD5CQG, v.p.; KD5FH, secy.; W5HMU, treas.; WB5CIQ W5KYC WD5ELJ KB5OI KB5AS KB5AQ KB5YK, board members. N5ADF is looking for help with comms this summer when thousands of handicapped folks participate in the Special Olympics at B.R. Why not volunteer and meet these visitors to our state? Down in N.O. recent retiree K5KX now has more time for DXing and is polishing his standing on the Honor Roll. W5LDH has discovered the wonderful world of slow-scan. Never one with idle time, W5GHP is now publishing the *Delta Division Tfc. Bulletin*, a quarterly array of info from four states; contact him for a copy. KC5SF says he's been getting TVI "love-letters"; seems his 2-meter rig is not compatable with the local cable system.

Net	Freq.	Time	Mgr.
LAN	3610	7 & 10 P.M. Dy	KC5SF
LTN	3910	6:30 P.M. Dy	N5ANH
LSN	3703	7:30 P.M. M-F	WD5FWK
LRN	3587.5	6:30 P.M. Sn	W5GHP
CCTN	146.01/61	6:45 P.M. M-F	GNOARC

Traffic: W5LQ 302, KC5SF 253, K5TL 240, W5GHP 224, AC5R 123, KA5HDT 94, WD5JFY 73, KA5NYT 59, WB5LBR 48, WA5TQA 29, N5ANH 24, KD5MA 21, W5TVW 18, N5BFV 16, WD5CWK 13, W5WJZ 9.

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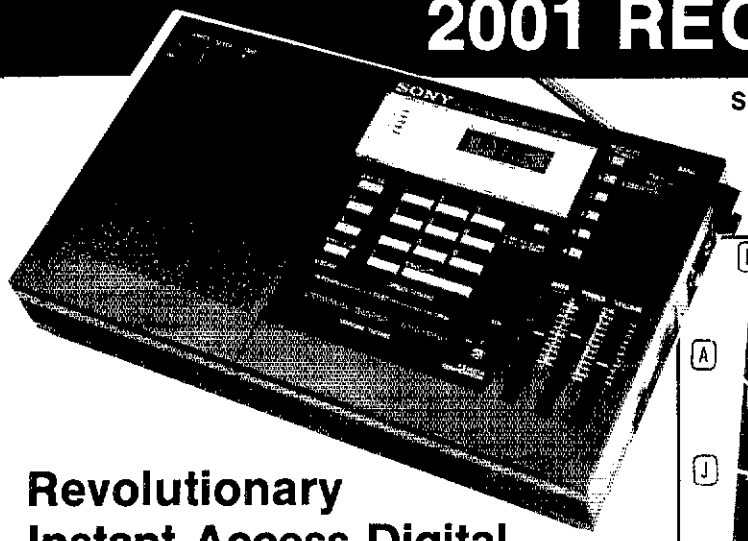

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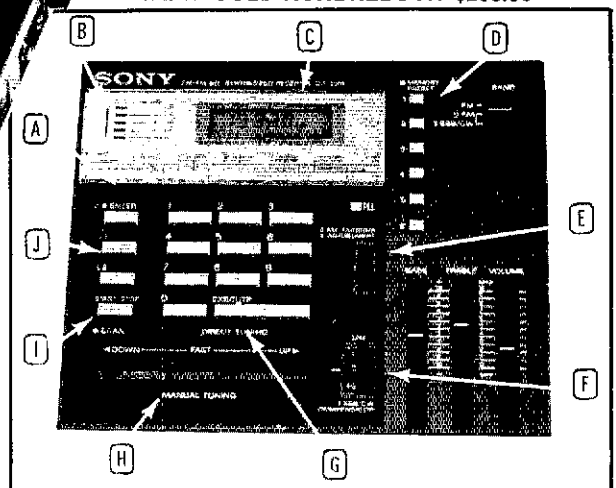
A WHOLE NEW BREED OF RADIO IS HERE NOW! No other short wave receiver combines so many advanced features for both operating convenience and high performance as does the new Sony ICF-2001. Once you have operated this exciting new radio, you'll be spoiled forever! Direct access tuning eliminates conventional tuning knobs and dials with a convenient digital keyboard and Liquid Crystal Display (LCD) for accurate frequency readout to within 1 KHz. Instant fingertip tuning, up to 8 memory presets, and continuous scanning features make the ICF-2001 the ultimate in convenience

Compare the following features against any receiver currently available and you will have to agree that the Sony ICF 2001 is the best value in shortwave receivers today:

DUAL PLL SYNTHESIZER CIRCUITRY covers entire 150 KHz to 29.999 MHz band. PLL_1 circuit has 100 KHz step while PLL_2 handles 1 KHz step, both of which are controlled by separate quartz crystal oscillators for precise, no-drift tuning. **DUAL CONVERSION SUPERHETERODYNE** circuitry assures superior AM reception and high image rejection characteristics. The 10.7 MHz IF of the FM band is utilized as the 2nd IF of the AM band. A new type of crystal filter made especially for this purpose realizes clearer reception than commonly used ceramic filters. **ALL FET FRONT END** for high sensitivity and interference rejection. Intermodulation, cross modulation, and spurious interference are effectively rejected. **FET RF AMP** contributes to superior image rejection, high sensitivity, and good signal to noise ratio. Both strong and weak stations are received with minimal distortion

EXTENDED SPECTRUM CONTINUOUS TUNING



A Enter Button
B Signal Strength Indicator
C Liquid Crystal Display
D Memory Preset Buttons
E Antenna Adjustment Dial
F SSB/CW Compensator
G Execute Bar
H Manual Tuning Buttons
I Scan Button
J High/Low Limit Buttons

OPERATIONAL FEATURES

INSTANT FINGERTIP TUNING with the calculator-type key board enables the operator to have instant access to any frequency in the LW, MW, SW, and FM bands. And the LCD digital frequency display confirms the exact, drift-free signal being received. **AUTOMATIC SCANNING** of the above bands. Continuous scanning of any desired portion of the band is achieved by setting the "L_1" and "L_2" keys to define the range to be scanned. The scanner can stop automatically on strong signals, or it can be done manually. **MANUAL SEARCH** is similar to the manual scan mode and is useful for quick signal searching. The "UP" and "DOWN" keys let the tuner search for you. The "FAST" key increases the search rate for faster signal detection. **MEMORY PRESETS.** Six memory keys hold desired stations for instant one-key tuning in any mode (AM, SSB/CW, and FM), and also, the "L_1" and "L_2" keys can give you two more memory slots when not used for scanning. **OTHER FEATURES:** Local, normal, DX sensitivity selector for AM; SSB/CW compensator; 90 min. sleep timer; AM Ant. Adjust.

SPECIFICATIONS

CIRCUIT SYSTEM: Fm Superheterodyne; AM Dual conversion superheterodyne. **SIGNAL CIRCUITRY:** 4 IC's, 11 FET's, 23 Transistors, 16 Diodes. **AUXILIARY CIRCUITRY:** 5 IC's, 1 LSI, 5 LED's, 25 Transistors, 9 Diodes. **FREQUENCY RANGE:** FM 76-108 MHz; AM 150-29,999 KHz. **INTERMEDIATE FREQUENCY:** FM 10.7 MHz.; AM 1st 66.35 MHz., 2nd 10.7 MHz. **ANTENNAS:** FM telescopic, ext. ant. terminal; AM telescopic, built-in ferrite bar, ext. ant. terminal. **POWER:** 4.5 VDC/120 VAC **DIMENSIONS:** 12¼ (W) X 2¾ (H) X 6¾ (D). **WEIGHT:** 3 lb. 15 oz. (1.8 kg)

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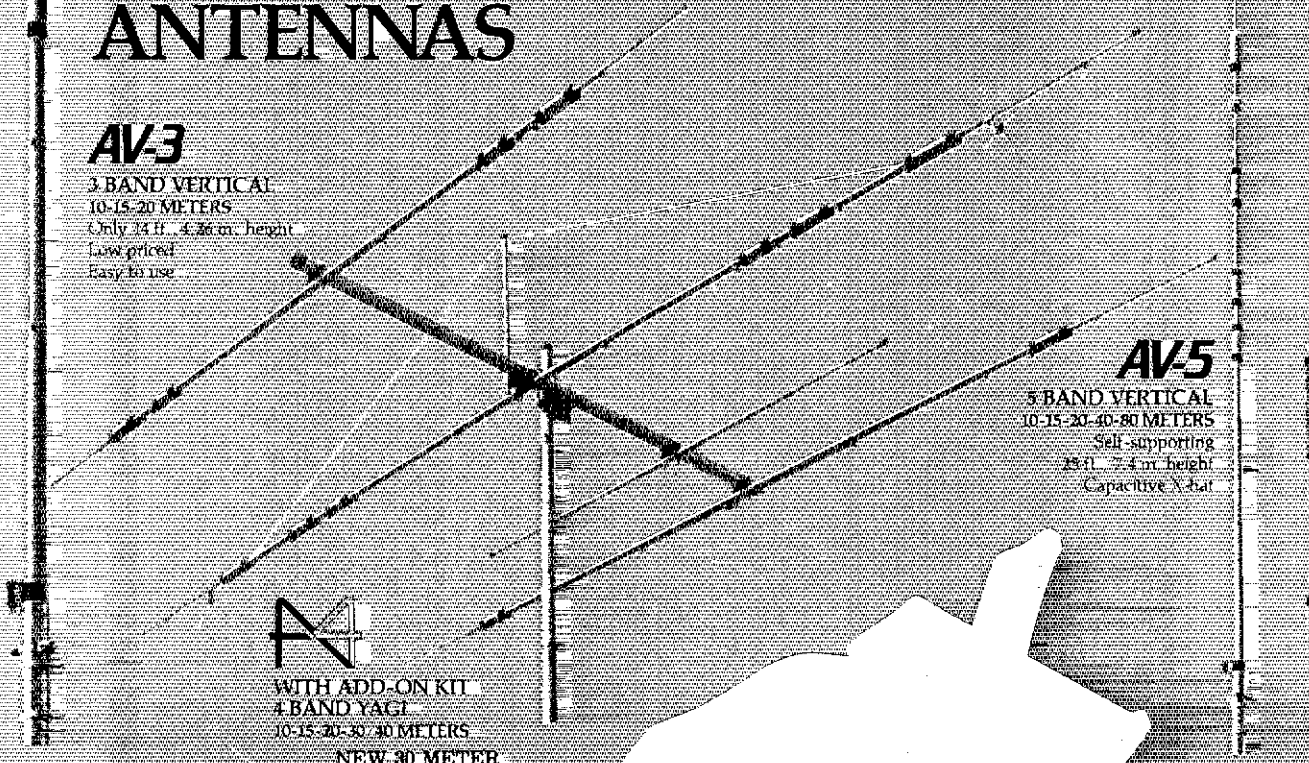

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10-15-20 METERS
Only 14 ft., 4.26 m. height
Low priced
Easy to use

AV-5

5 BAND VERTICAL
10-15-20-40-80 METERS
Self-supporting
151 ft., 7.4 m. height
Capacitive X-hat

A4

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10-15-20-30/40 METERS
NEW 30 METER WARC BAND WITH A3 OR A4

R3

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22 ft., 6.7 m. height

A3

3 BAND YAGI
10-15-20 METERS

The world renowned Cushcraft HF Multiband antennas are chosen time after time for DX-peditions to far corners of the globe. Their excellent gain, outstanding radiation pattern, 2kw power rating, easy assembly, and high strength-clean profile aluminum construction enable the adventurous DX-er to travel further and make more contacts.
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A3
Broadband, excellent gain and f/b ratio, 2 kw power rating direct 50 Ω feed. Boom 14 ft., 4.26 m., longest element 28 ft., 8.5 m., weight 27 lbs., 12.9 kg., turn radius 15.5 ft., 4.7 m., mast dia. 1¼ in. to 2 in., 3.18 cm. to 5.08 cm., material 6063-T832 seamless aluminum.

A4
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 32 ft., 9.7m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1¼" to 2 in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

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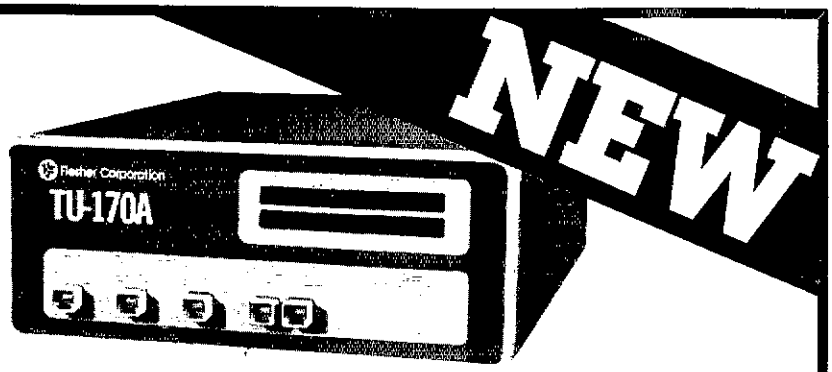


TU-17OA

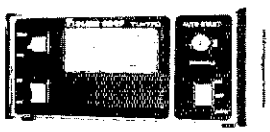
This single shift TU-17OA is designed for standard RTTY communications and modern high-speed rates to 300 baud ASCII. Comes standard with crystal controlled AFSK, RS-232C and TTL compatible I/O for computers, 2125Hz and 2295Hz filters. Options include LO-tones, CW demodulator, and loop power supply for TTY machines.

$189.95 kit
$289.95 wired

TU-300

The TU-300 offers all of the features of the TU-17OA and more with the capability of three shifts selectable on the front panel. The TU-300 comes standard with crystal controlled AFSK, 2125Hz, 2295Hz, 2550Hz, and 2975Hz filters. (LO-tones, CW demodulator and Loop supply optional.)

$289.95 kit
$399.95 wired



TU-17O

This single shift TU-17O is compact, economical and ideal for HF or VHF applications up to 110 baud ASCII. Single board construction with AFSK and loop supply included. TTL compatible I/O, active filters and AFSK tuned for 2125Hz, 2295Hz.

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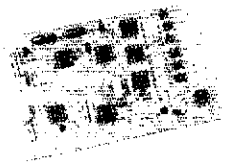

DM-17O

The DM-17O demodulator is truly state-of-the-art, with active filters used throughout. The DM-17O includes anti-space circuitry, autostart output with adjustable threshold, scope outputs, meter output and loop keyer output. Requires additional ± 12VDC power supply.

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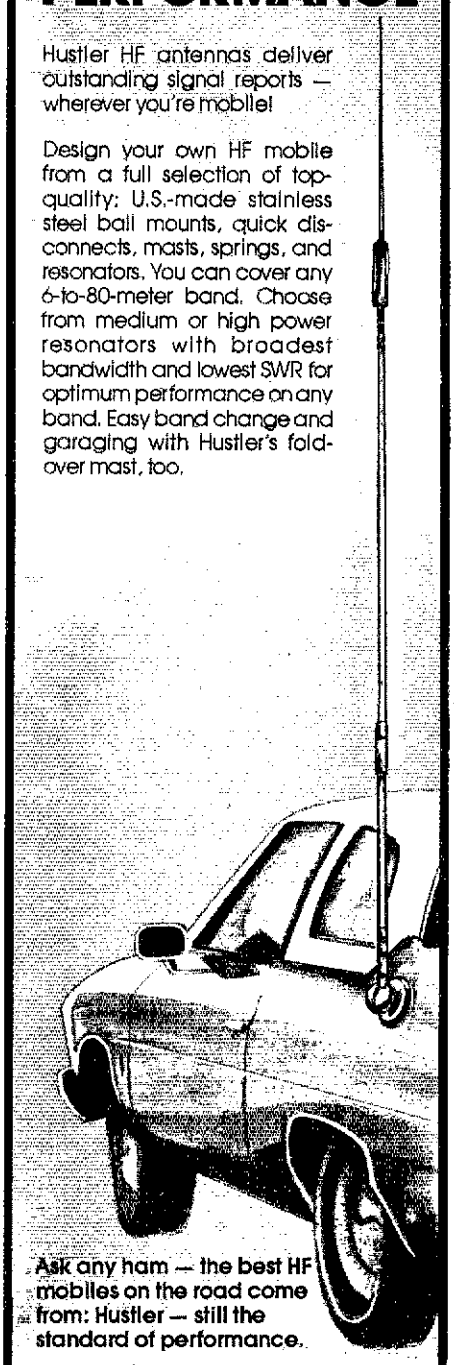

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MISSISSIPPI: SCM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. Freq. Coord.: KB9TN. Congrats to KB5W who has been elected to be mgr. of Region Five Net. He will remain STM. The second edition of the *Delta Traffic Bulletin* provided much info about activities in our tfc nets. Tnx to W5GHP for fine job in putting this together. Congrats to upgrades: Adv — N5EZO; Novice, KA5POC. K5OAF granddaddy again. WB5SQL is back home after unscheduled stay in hospital. Good work by OBS AE5H on relaying 45 bulletins this month. CAND (W5KLV) sess. 30 QTC 991. DRN5 (WB5YDD) sess. 30. QTC 480 new reps. KC5OB, WD5DCI. MTN (K5OAF) sess. 30, QNI 201, QTC 138. MSBN (N5DSK) sess. 30. QNI 2357, QTC 82. MN (WB5RMW) sess. 30, QNI 550, QTC 17. MSN (N5ERX) sess. 22 QNI 116, QTC 31. GSEN (KB5W) sess. 22, QNI 403, QTC 18. CAEN (KA5AGD) sess. 4, QNI 118, QTC 3. RACES/ARES (N5AMK) sess. 5, QNI 86, QTC 2. Traffic: KB5W 538, N5AMK 527, K5OAF 188, N5RN 159, KD5P 96, KT5Z 75, W5LSG 37, W5WZ 26, N5EZO 24.

TENNESSEE: SM, John C. Brown, NO4Q — SGL: W4WHN. STM: K4YOL. ACC: WA4GLS. SEC: K4TKQ. I am sure by this time a lot or hopefully most of you are beginning to have a better feeling and understanding of the new Section Manager concept initiated as of the first of the year for the section. It will take some time for all or most to get changed over and feel easy with the operation under this concept. The section did not have to begin operating with the Section Manager until the end of the present SCM term (end 1983). There were many advantages to beginning the early time. As a scan is made on the cw portion only of the various bands, one can see at a glance that many of the amateurs are just not familiar with what RTTY sounds like, or what could be thought when so many signals on cw are on top of the RTTY signal sending QRZ? Fellows and gals, that is the desired portion of the band for them to operate as on cw. Hope that isn't deliberate. Talking about cw, W4DDK has been named as assistant Net Manager by K4VM. Also W4VQE is doing a fine job pinch hitting as assistant on the TN RTTY net which now meets at 0130 UTC on 3625 daily. Reports indicate business is picking up. Better give the new mode a try what with all the new computers in operation in the amateur bands. By the way, DX isn't so bad using RTTY with the computer. Get your programs refined enough, and you can tell very quickly if that station you hear is really all that rare and if you have worked him before. How about giving it a try and see how much more fun Amateur Radio can become. Traffic for the month: LF-sess 91, QNI 3429, QTC 350; VHF-sess 94, QNI 2215, QTC 556; CW-sess 63, QNI 464, QTC 469; RTTY-sess 26, QNI 98, QTC 7. We will have new DRN5 slots for those who are around the shack in the mornings. Check with the STM or SM. Watch that winter ice on the antennas. Traffic: W4ZJY 517, NG4J 274, W4MRD 154, W4DDK 102, K4WWQ 102, KA4BSG 47, K4VM 41, K4WOP 40, WD4SIG 32, NM4W 27, KA4USF 24, K4AMC 23, W4PFP 21, KE4OL 13, WD4GYT 11, W4TYV 11, W4RUW 10, NQ4Y 9, KI4V 8, KE4LS 7, W4PSN 6, W4EWR 4, K4UMW 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Dave Vest, KZ4G — STM: KA4GFU. SEC: KA4MIC. NTS Nets

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
KRN	3960	0630 M-F	563	42	22	WA4IUW
MKPN	3960	0830 Dy	1266	118	30	KA4SAA
KTN	3960	1900 Dy	1325	133	30	WD4BSC
KNTN	3727	1900 Dy	391	111	36	KB4OZ
KYN	3600	2000 Dy	274	114	30	WD4IYI
KSN	3600	2230 Dy	223	118	30	KC4WN

Twelve public service nets reported QNI 1586, QTC 160. D9RN 100%. PSHR: KA4SAA KA4GFU WA4YPQ KB4OZ KA4MTX KA4BCM WA4JTE KD4TY WD4BSC. New appt.: DEC-#9 KD4SN; #13 WA4GHQ; ORS-WD4IXS. Woodford ARS received club charter in Christmas party Dec. 21. Congrats. KD4TY qualified this month for PSHR award. Congrats. Don't forget upcoming test, Glasgow and Etown. Traffic: KA4SAA 169, WA4JTE 154, KA4GFU 141, KA4MZY 120, WD4IYI 116, KC4WN 97, KZ4G 76, K4MHL 57, W4WQV 56, WD4BSC 54, KB4OZ 50, WA4EBN 48, WB4APC 47, KA4MTX 47, N4GD 46, K4HOE 45, KA4BCM 35, KS4V 27, WD4BSC 24, KA4SKV 24, WD4CJQ 24, NZ4L 21, WA4AGH 19, WA4YPQ 19, WD4CQF 18, WA4AVV 16, WA4JAV 16, WD4IYH 14, KA4AXE 12, KD4TY 12, KA4GBZ 9, KA4MAP 9, KA4MBF 4, K4AVX 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB, SEC: WA8EFK. STM: WD8RHU. DECs: K8BTH N8CUH WD8IXZ WD8MBB W8VWY. NMs: WA8DHB N8DSW K8LNE K8KMQ W8QHB W8SCW KV8U W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	QTC	Sess.	Mgr.
QMN*	3663	1800 Dy**	1293	370	90	KV8U
MITN*	3953	1900 Dy	745	355	30	K8KQJ
MNN*	3722	1730 Dy**	393	132	60	N8DSW
MACS*	3953	1100 Dy**	584	118	30	K8LNE
GLETN	3932	2100 Dy	1239	112	30	WD8IBY
UPN*	3922	1700 Dy	684	103	34	WA8DHB
WSSBN	3935	1900 Dy	625	36	30	WB8SUR
TASYL	3922	1900 M	19	5	5	KM8E
BR	3930	1730 M/S	—	—	—	WB8ZGP
MEN	3930	0900 Sn	—	—	—	WB8ZGP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300. Vhf nets 8 rpts, QNI 518, QTC 14, sess. 36, WD8RHU mgr. ARES net Sn, 3932, 1730. Traffic Workshop Sn, 3953, 1600. 3932 is MI emer. freq. Upgrades: to Adv-N8DXO KA8PIZ; to General-KA8OUK; to Extra-W8NKR (47 years a ham, age 77. Great going!) Silent Key, with deep regret: WD8JFF. MCRC's 50th anniversary banquet was memorable. They have the most completely documented history of any club I know of, all on slides and tapes and in numerous scrapbooks. I wonder what they'll come up with for their 100-year bash? The U.P. Hamfest is definitely set for July 30 (one day only) in Ishpeming, at the Armory. W8GP is new president of the Au Sable Valley ARC. BPL: AF8V. Traffic: AF8V 504, WB8WKQ 436, WD8LRT 343, KA8CPS 285, WB8MTD 212, N8DSW 185, WD8RHU 136, W8QHB 135, K8KQJ 114, K8KMQ 109, WA8DHB 107, N8BNC 105, W8IHX 98, WD8EIB 82, W8RNQ 66, N8DNC 64, K8GXV 64, WD8MJB 63, KE8X 63, N8BBY 61, KA8NCR 60, W8VPW 56, N8DTZ 52, WB8SYA 49, W8SCW 47, K8LNE 35, WB8ITT 34, W8YIQ 30, K8UPE 26, WB8YDZ 23, KT8G 20, WB8HPZ 20, W8JXJ 20, W8VIZ 20, KU8H 19, WB8DJS 16, K8OCP 16, KI8Q 16, W8URM 15, KB8GT 14, KS8P 13, WD8JRT 12, N8EGK 11, KA9JFM 11, WB8TTA 11, N8CNY 10, WD8IXZ 10, WB8POL 9, W8CUP 8, KV8U 8, K8ZJU 8, W8LDS 7, WD8OEP 7, W8BEZ 6, WA8EFK 6, WB8HSN 6, W8YY 6, WB8YRY 5, WB8YWA 5, WB8ZJL 5, K8DD 3, WB8SIW 2, KF8M 1. (Oct.) K8ZJU 14.

OHIO: SCM, Allan L. Severson, AB8P — ASCM: W8MOK.

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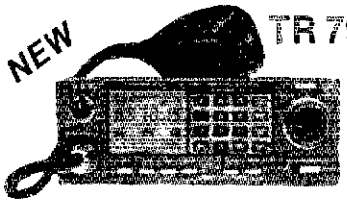

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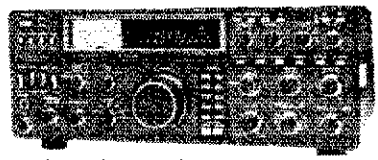

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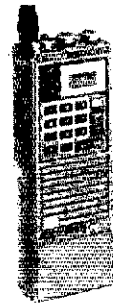

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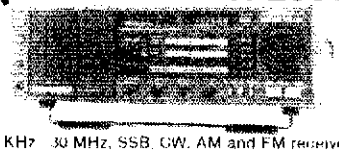

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PB-25	Batt Pack.	34.95
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SMC25	Speaker Mic. . .	34.95
TU-1	Sub Audible. . .	34.95

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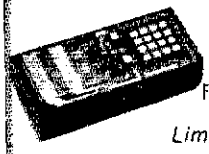

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More features than any other keyer on the market such as: automatic serial number generator, automatic beacon mode, and an automatic speed increasing Morse trainer mode.

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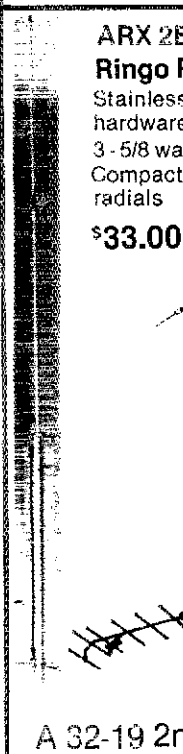

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Stainless steel hardware.
3 - 5/8 wave sections
Compact designed radials
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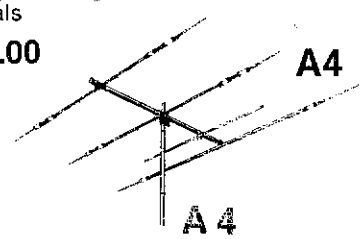
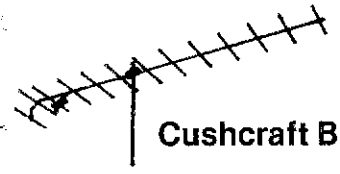


A4

Tri Band HF Beam
$229.00



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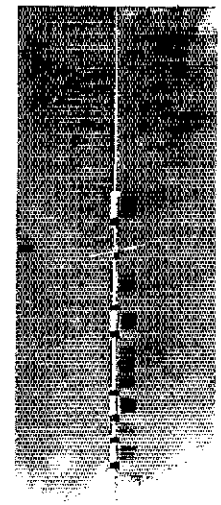

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10-40m
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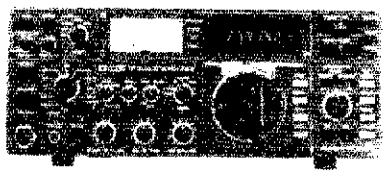

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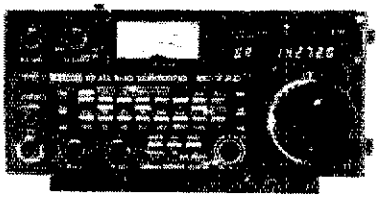

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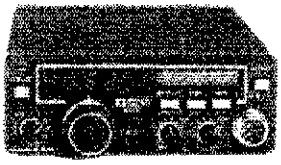
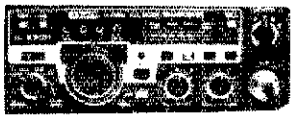
General coverage receiver, HF band ham transceiver. Pass-band tuning, dual VFO'S. Fully synthesized.

IC-25A



VERY COMPACT, 25 watt, 5 memories with scanning, priority channel, 2 meter mobile transceiver with encoding microphone.

NEW IC-290-H



All Mode, 5 memories, squelch on FM and SSB, RIT, NB, Green Display, 25 W, with encoding microphone.

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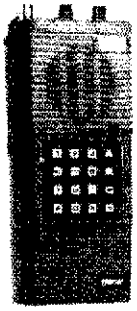

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SEC: K8AN. STM: K8OZ. NMs: WA8BUW WA8DYX W8EK WA8GMT KF8J WD8KFN WB8YTD.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	463	309	60	6:45/10 P.M.	3.577
BNR	222	116	30	6:00 P.M.	3.605
ONN	216	51	29	6:30 P.M.	3.708
OSN	265	137	30	6:10 P.M.	3.577
(Oct.)	291	157	31		
OSSBN	2428	889	90	10:30 A.M. 4:15 & 5:45 P.M.	3.9725
OSSN	200	102	30	6:45 A.M.	3.577
O6MN	591	20	30	9:00 P.M.	50.160

This is my last opportunity to remind you that the third annual Ohio State ARRL Convention will be held in Cincinnati on Feb. 26 & 27, and, judging from the first two, will be a no-miss affair. Let's give the hard-working Cincy crew another record-breaking crowd! Thanks to Findlay RC for its recent hospitality and for allowing me to talk on one of my favorite subjects — the League and its many services. Also thanks to TSRAC for its hospitality to my wife and me. TSRAC's annual awards banquet allowed me to talk with some of my favorite people, including KA8NXV, now 10 years old, who is working on her Tech ticket. K8AN announced that she is probably the world's youngest net manager. Tomorrow the world, huh. Club elections: Westpark Radiops-W8IO, pres.; KC8F, v p.; W8IMF, treas.; WD8BJL, secy.; AC8X, trustee. Greater Toledo ARA-WA8WZK, pres.; WA8JNT, v.p.; W8CBA, secy., KA8FKB, treas. Columbus ARA-WA3EKH, pres.; KA8IIC, v p.; AJ8J, secy.; N8DFO, treas.; WB8BTW N8BHL W8LNO, directors.

Local Nets	QNI	QTC	Sess.
BARF	235	37	27
BRTN	237	176	30
IE Net	68	7	5
LCNWOARES	376	25	44
MASER	99	7	4
Medina Co.	246	46	30
NCTW	42	28	18
NEON	197	74	29
RARA	77	233	4
TSRAC	927	84	32
VWCEN	28	2	3

Traffic: KA8IUK 36, KV8Q 36, KB8VE 35, KA8ICB 31, K3RC 31, W8BHL 27, WD8DOS 26, W8FUP 26, WB8HHZ 26, WD8JAW 25, W8GXM 24, W8RG 24, WA8TWM 23, N8AEH 21, WB8MRL 21, KA8GGZ 18, WB8KQJ 18, N8CW 16, WA8HED 16, WD8RZG 16, KA8GMF 15, WA8ZID 15, N8CGM 14, KA8IAF 14, WD8AYI 13, WD9HDZ 13, KC8JI 12, K8NJO 12, WD8DSC 11, WB8NHV 11, WD8RGS 11, KA8DGO 10, WD8EMS 10, KA8NXV 10, K8CKY 9, WD8JAJ 9, W8ZM 9, WD8AYH 8, N8CJS 8, WD8IQJ 8, WD8NED 8, W8QQL 7, KA8LNA 6, K8VOY 6, WD8EKI 5, WB8KWD 5, KA8PHB 4, K8CMR 3, W8LZE 3. (Oct.) WA8GMT 219, KF8J 80, W8SKP 72, WB8AWM 4, WB8NTR 4, W8ZM 4.

HUDSON DIVISION

EASTERN NEW YORK: SM: Paul S. Vydareny, WB2VUK — SEC: KB2KW STM: WA2SPL. NM: (CW)-W2WSS N2APB WB2EAG; (HF phone)-WB2MCO KA2Q; (RTTY)-W2ODC. (VHF)-WB2ZCM N2BDW K2ZVI KV2U. CLUB NEWS: Rip Van Winkle ARC, under the direction of AA2Y, is planning a spring ham auction. Orange Co. ARC has new officers for 83: K2MI, pres.; N2AUB, v p.; N2CGN, treas.; N2AWI, secy.; N2CF, activities chairman. COVERS has new officers; WB2SON, comm officer; KC2HV, plans and opns; KA2MSL, trng; N3BAY, admin. ARES/COVERS members observed, judged and reported performance of 12 Indian Point sirens for Orange Co. CD. N2BFG of WECA is working on pilot program of "Hams on the Road" as an outreach program to recruit new hams. Contact him at his home address for further info. A word on accuracy! Let's not forget accuracy is paramount, speed second! During heavy traffic times, accuracy too often suffers! SM plan has been implemented. Can still use some volunteers for some of the positions. As of January 1, category 9 of PSHR has *NO* limit! Each public service activity during month counts 5 points. Let's see others on the PSHR! As we get into New Year, all appointment certificates will be renewed so all records can be updated. Don't forget PD in March??? BPL: WB2EAG. PSHR: K2ZM KA2KVZ WB2MCO WB2EAG W2YJR WB2ZCM K2ZVI W2BIW N2BDW WB2TWQ. Traffic: WB2EAG 591, K2ZM 353, WB2MCO 314, KA2KVZ 312, WA2JBO 199, WA2SPL 199, WA2JOL 194, W2YJR 127, K2ZVI 119, W2BIW 103, WB2ZCM 77, N2BDW 58, K2MI 43, WB2TWQ 30, N2CPX 23, W2SWA 20, AA2Y 20, WB2OHR 18, WB2SON 14, N2BFG 11, N2CSX 11, K2HNW 5.

NEW YORK CITY-LONG ISLAND: SCM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE.

NLI CW*	3630	1900/2200	W2LWB
NLIPN	3928	1815	KS2G
NLS	3720	1930	WB2EUF
NCVHF	6.04/64	2100 MWTh	N2BZL
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
LIMARC	6.25/85	2100 F	N2BZL
ESS	3590	1800	W2WSS
NYS	3577	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

*Denotes section net, all times are local, please try and help out by checking in whenever you can. I got my new A3 up in the air. First contact was WA2DHF/TI5. Many thanks to W2MFW who helped me get it up right the first time. As a result of the election for SCM, I will continue on for another 2 years. The title has changed to SM (Section Manager), and I will be following the changes as they were spelled out in *QST*. Please help me make it work. It's your ARRL. The Babylon town ARES is now the only official emergency comm. link between Babylon town and the U.S. Coast Guard. WA2COO is pres. of GT South Bay ARC; WA2SUB is v.p. Suffolk Co. ARC will hold an indoor flea market at the Republic Lodge, Rt 110, Melville. Radio Central ARC had a packed house at their indoor flea mkt on Nov. 28th. WA2PMW worked K4CAW in North Carolina for state #10 on 432 MHz. Grumman ARC is now back on 80 and 40 with new dipoles up at their Bethpage site, thanks to K2DOD W2INJ N2CAX W2BII and KB2UB. WA2YBG is now Extra. N2RQ reports that the Brooklyn Tech ARC, W2CXN, had its Kenwood 520S stolen. The club is looking for any donations to help replace the rig. Contact N2RQ for info. Congrats to KK2T on the birth of his son. Hall of Science ARC holds cw practice on Mondays at 2000 local, Novice (7 wpm) followed by General (22 wpm), on 21.130 kHz. There is also a low-band net run by WB2KVY on Mondays at 2100 local on 21.365. N2DAL is now KC2SK. WA2NIC W2NXZ and WA2MDR of LIMARC provided communication support while Telco cut over to

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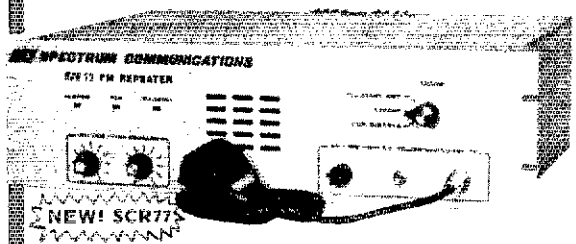

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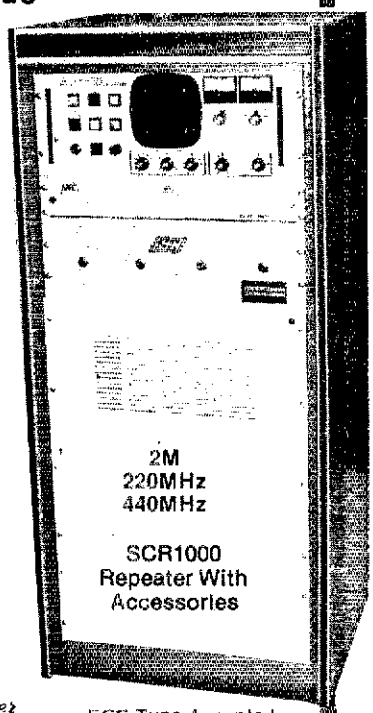

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BD-6	Planetary Ball Drive for variable caps 6:1 ratio ¼ shaft	$ 4.25

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Tubes

3-500Z EIMAC	$94.50
811A	$14.50
572B	$46.50
3-1000Z EIMAC	$360.00
8877 EIMAC	$455.00
813	$40.00

Coils

TIC-1	Toroidal tuned input coils specify frequency	$ 2.00
FTC-1	Final Tank Coil for 3-500's, 4-400's, 8877, 572B etc. 2KW 160-40 MTR	$16.50
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VARIABLE CAPACITORS

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A-250-75	250pf 3.5 - KV	$21.50
A-225-120	225pf 4.5 - KV	$23.50
A-232-45	250pf 2.2 - KV	$19.25

Loading

A-1100-53	1100pf 3 section 1.2KW	$12.25
A-1000-32	1000pf 2.5KW	$35.50
A-800-32	800pf 2.5KW	$26.00

Plate Chokes

PC-811-1A	Use with 4x811A or Sweep tubes	$ 5.25
PC-500-2A	Use with 3-500, 4-400 etc.	$ 8.25
PC-1000-2A	Use with 3-1000, 4-1000, 8777 etc.	$10.00

Filiment Choke

FC-30-A	30 amp choke on Ferrite Core	$ 8.50

Plate Caps

PC-500-1	Aluminum Heat Sink use with 3-500 etc.	$ 5.50
PC-811-1	Use with 811A, 572B	$ 1.50
PC-8877-1	Aluminum Heat Snk For 8874, 8875, 8877	$7.50

Sockets

SC-500-1	Johnson 122-0275-001 use with 3-500, 4-400 etc.	$10.50
SC-811-1	Socket for 811A, 572B	$ 1.00
SC-1000-1	Socket 3-1000, 4-1000	$35.00

Antenna change over relay 2KW

RL-2P-1	2PDT 12VDC	$ 5.25
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M-1000-P	Dual scale 0-3000VDC, 0-1 amp w/shunt & voltage resistors	$17.95
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M-5000-VDC	5000 VDC Meter	$19.95

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CC-1000	1000pf 5KV	$ 5.95
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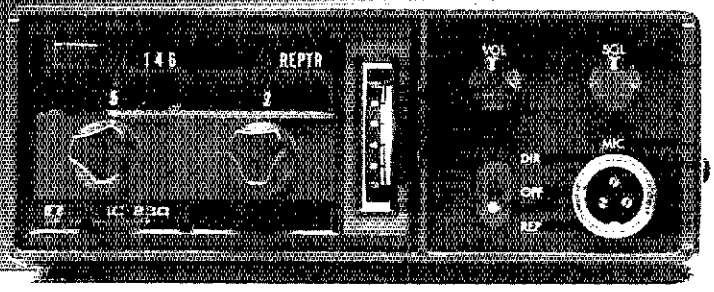

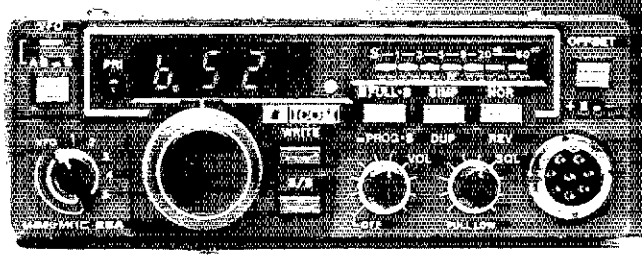

IC-230

- 67 Channels
- 10 Watts
- Crystal Synthesized

In 1975, ICOM came out with the IC-230 — the first synthesized 67 channel, 2 meter mobile in history. It became one of the most popular mobiles ever.

Now, eight years later, ICOM reverses inflation with another potential blockbuster, the IC-25A ....and look at the price!

$489 (In 1975 dollars)

IC-25A

- 800 Channels
- 25 Watt Hi/1 Watt Lo
- PLL Synthesized
- Touchtone Microphone
- 5 Memories
- Priority Channel
- Programmable Band Scan
- Full Bandscan
- Dual VFO's
- Memory Scan
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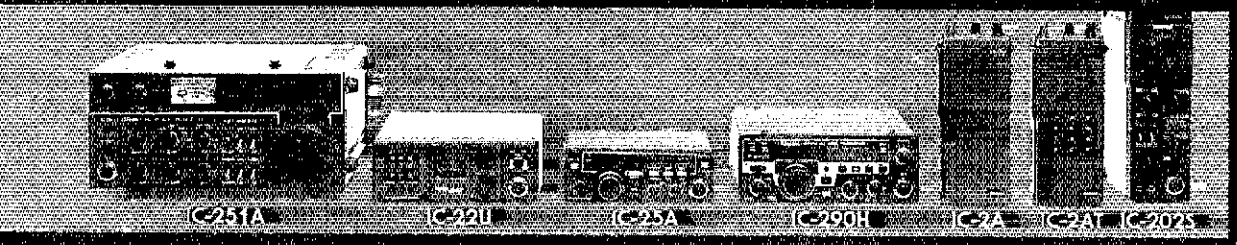
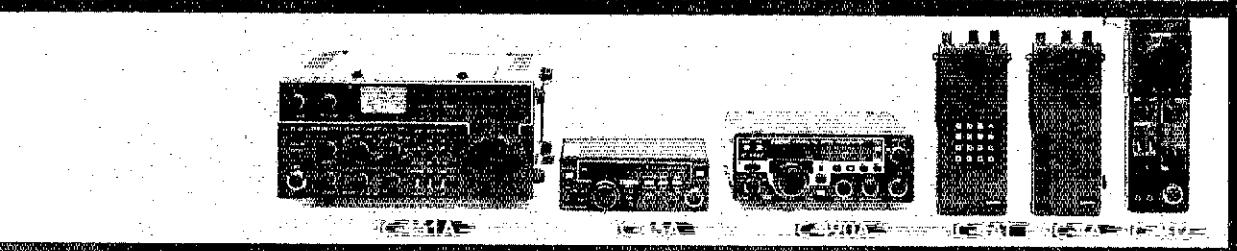
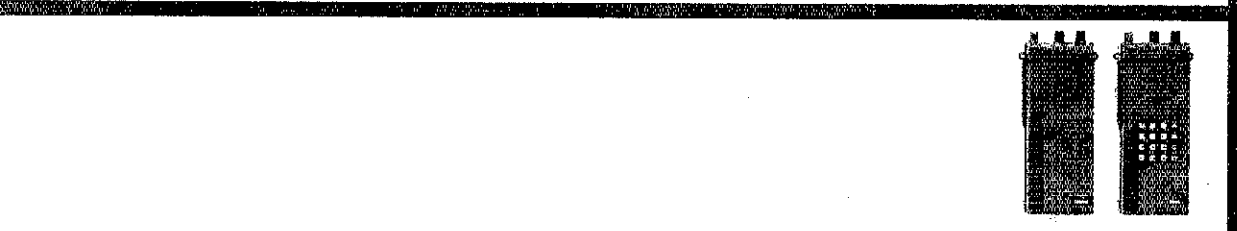
HF



VHF



UHF



6M

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The Dynamic Duo

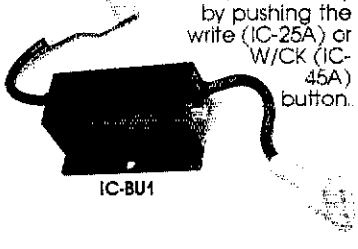
ICOM's 2 Meter and 440 MHz FM

25 watt/5 memories/2 scanning systems in a 2"H x 5½W x 7"D package is what has made the easy-to-use IC-25A the most popular 2 meter FM mobile transceiver ever. Now ICOM presents the second half of its mobile duo...IC-45A. The IC-45A covers 440-449.995 MHz. Both transceivers are supplied with touchtone™ microphones standard.

Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

	VFO A	VFO B
IC-25A	5 KHz	15 KHz
IC-45A	5 KHz	25 KHz

5 Memories. Instant access to most used frequencies. VFO A information is transferred to the selected memory by pushing the write (IC-25A) or W/CK (IC-45A) button.



Priority Channel. Any memory channel may be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

LED Bar Meter. Shows strength of received signal as well as relative transmitter output from the fully protected final RF amplifier. APC (automatic power control) is used to detect SWR and adjust the power output to a safe level.

Simplex/Duplex Operation. Standard 600 KHz offset initializes into radio at turn on. Offset may be changed by pressing the priority button while in VFO operation. Rotating the main tuning knob will now change the offset up or down and the offset will be displayed on the frequency readout.

Adjustable Power Levels.

	Hi Pwr	Lo Pwr
IC-25A	25 W	1 W
IC-45A	10 W	1 W

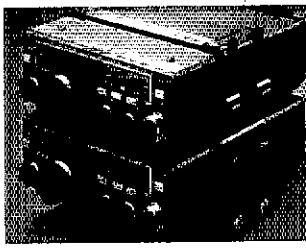
Pulling the squelch knob out places the unit into low power. Both the high and low power may be independently set to accomodate your simplex/repeater requirements or amplifier input characteristics.

Nor/Rev Capability. Use of this button on the IC-25A or the W/CK button on the IC-45A, in the duplex mode, allows one touch monitoring of the repeater input frequency. If simplex operation is possible you will know instantly.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies.

With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2. Full band scan or program band scan is selected from the front panel in the IC-25A, internally on the IC-45A.

Both units have internally switched scanning choices of adjustable delay period after a carrier is received then resume scan, or resume on carrier drop.



The Most Compact FM Mobiles on the Market. Fits in the smallest of places. Stackin matching Mobile Mounts for complete mobile communications for your car.

Memory Backup. When t optional IC-BU1 backup powe unit is installed on the back o the IC-25A or IC-45A, memory will be maintained while transferring the unit from powe source to power source. If the unit is not removed from powe it will maintain memory even when turned off with or withou the IC-BU1.

ICOM

The World Systen

ICOM America, Inc., 2112-116th Ave IE, Bellevue, WA 98004 (206)454-8155/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-27

IC-720A + IC-R70

The "plus" is the New IC-7072 Transceiver Unit

Now you can add ICOM's most versatile HF general coverage receiver to your IC-720(A). Combine the portability and operating convenience of the IC-720(A), with its long list of standard features...and the IC-R70, ICOM's latest general coverage receiver, into one transceiver by using the new IC-7072 transceiver unit.

Check ths list of features that will be added to your IC-720(A) receiving system:

Audio Monitor. Monitor your own transmitted audio and check SSB audio quality/CW keying characteristics.

Selectable AGC With Off Position. Perfect for use with transverters.

2 Position Noise Blanker. Very effective, virtually eliminates impulse noise.

500Hz CW Filter Standard. 250Hz (FL63) optional 8-pole filter

3 Stage Preamp/Off (Direct)/Attenuator Control. Controls input to ICOM's Direct Feed Mixer receiving system.

Squelch Control. Effective in all modes allowing only signals above a certain strength to be heard.

Audio Tone Control. For easier listening/less fatigue.

Record Jack. Allows connection of a tape recorder to record both sides of a QSO. Unaffected by the volume or monitor control. Also may be used to drive an RTTY decoder.

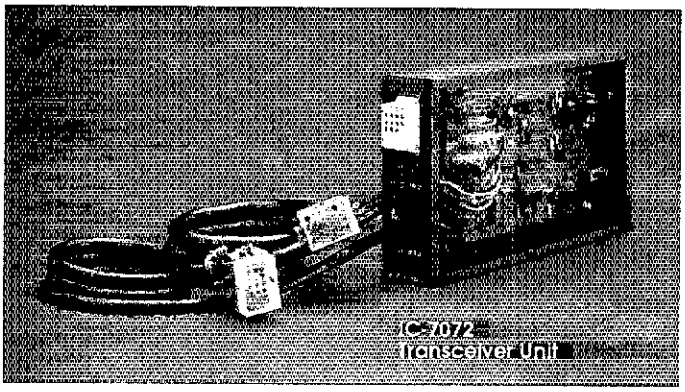
Notch Filter. Deep IF notch eliminates annoying hetrodynes from interfering adjacent signals.

Large Front Mount Speaker. Full 3 watts of audio.

Expanded Range Pass Band Tuning. For greater adjacent signal rejection in the AM mode.

Option for FM Reception. Useful for 10 meter FM.

Excellent, Clear Reception. With the R70's advance receiving system with the first IF at 70MHz. and with the lowest synthesizer noise level available — better than receivers costing much more.



IC-7072 transceiver unit

Bring all of these advanced features to your IC-720(A) shack with the R70 and the IC-7072 transceiver unit. The plug-in IC-7072 transceiver unit slaves the CPU of the IC-720(A) to the IC-R70 microprocessor. This allows the tuning knob and selector buttons of the IC-R70 to control the IC-720(A).

Included with the IC-7072 are cables for the mute line control on the IC-R70 and a coax line to patch the IC-720(A) antenna into the IC-R70. An accessory connector on the IC-7072 is provided for attachment of "ICOM System" accessories such as the IC-2KL linear amplifier or IC-AT500 automatic antenna tuner or both.

Now your base station can have the most advanced ham/general coverage receiver available and the crisp transmitted audio of the IC-720(A) with RF speech processor. And yet, the 12 volt operated IC-720(A) may be taken mobile or portable for the ultimate in a ham band transceiver...and you still have general coverage reception...at both places!

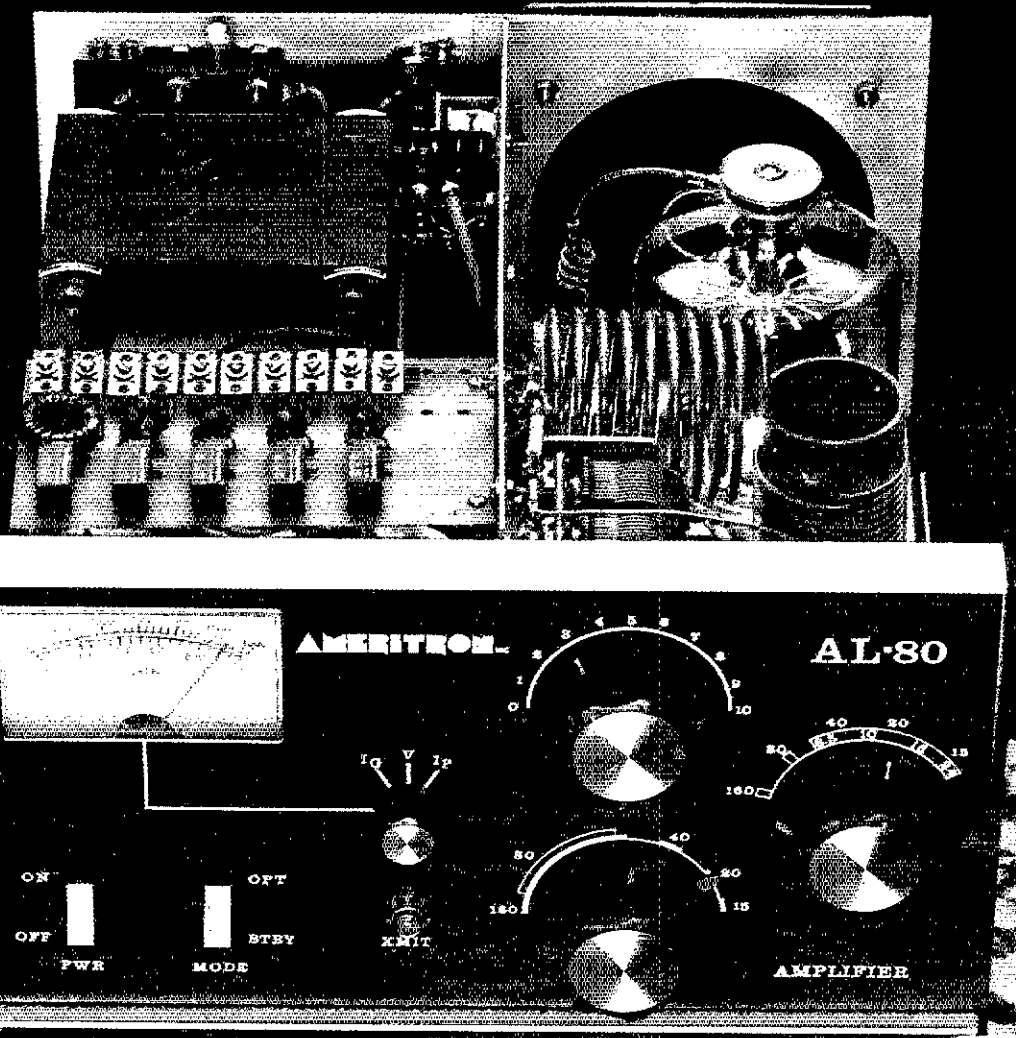
ICOM

The World System

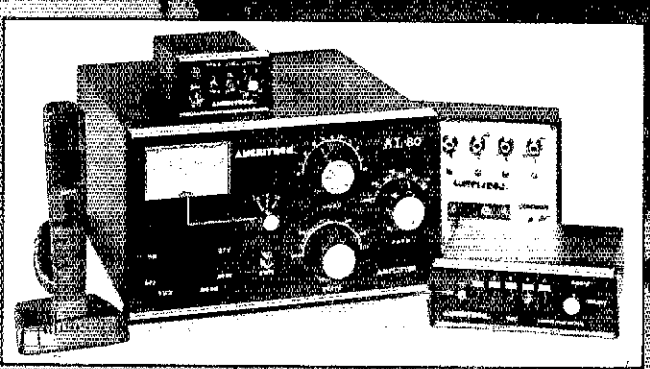
ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155**/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780.**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

Ameritron's AL-80 is so Affordable it's Indispensable!



Performance is what an amplifier is all about, and at less than 80¢ per watt, how can you afford *not* to own an AL-80? The AL-80 delivers 1200 + watts PEP SSB, 1000 watts, CW, RTTY and SSTV input and includes FULL BREAK-IN on 160 - 10 meters.*



because of its durability, power output and years of proven reliability. It's a workhorse, and we know whether you are competing in a contest or rag chewing, your station's dependability is essential.

At Ameritron we build reliability into all our products. The SPR-8 Studio Processor gives you studio-quality sound in a natural way. The RCS-8 Remote Coax Switch allows you to *instantly* switch up to 5 different antennas, using a single coax, without leaving the comfort of your shack.

Shouldn't your equipment give you performance and economy? Shouldn't it be built by Ameritron?

Buy the Ameritron Line from Dealers across the country, write us for a catalog.

*10 meters included on export models or may be modified by licensed amateurs.

There is no other 1200 watt linear on the market today selling for $699.50 to offer full break-in and all WARC bands and a one (1) year limited warranty.

We designed the AL-80 [illegible]

AMERITRON INC.
2071 Midway Drive
Twinsburg, Ohio 44087

new phone service at Good Samaritan Hosp. Traffic: W2AHV 271, N2AKZ 141, W2TZO 139, WA2ARC 117, W2DBQ 48, K2GCE 45, K2IZ 26, KV2O 6.

NORTHERN NEW JERSEY: SCM, Curtis R. Williams, W5DTR. SEC: WB2VUF. STM: W2XD. NMs: W2CC AG2R N2BNB KA2GSX KA2HNQ WB2IQJ WA8ZNH W2PSU.

Net	Mgr.	Freq.	Time	Sess.	QNI	QSP
NJPN	W2CC	3950	6 P.M. Dy 9 A.M. Sn	34	553	231
NJN/E	AG2R	3695	7 P.M. Dy	30	426	169
NJN/L	AG2R	3695	10 P.M. Dy	30	340	141
NJSN	WB2IQJ	3735	6:30 P.M. Dy	30	261	101
OBTTN	WA8ZNH	72/12	8 P.M. Dy	29	505	122
TCETN	KA2GSX	855/255	7:30 P.M. Dy	28	228	61
NJVN	KA2HNQ	49/49	10:30 P.M. Dy			
NJRTTY	W2PSU	147.51	Autostart			

Congrats to KB2WI on being selected for the W2SWE Memorial Award. NJ Public Service Confab was held recently at Holmdel. W2XD and N2CER received Certificates of Merit for their outstanding public service work. WB1GXZ received special recognition for outstanding support of the New Jersey Slow Net in recruiting and sending training messages. WA8ZNH replaces N2BOP as Net Manager for OBTTN. An OBTTN Net Certificate was earned by KX2G. TCETN provided communications for a Boy Scout victory hike. N2DPN is looking for donations of radio equipment for a newly formed high school radio club. Welcome to KA2QWK to North Brunswick. Congrats to WB2QMP on upgrading to General. The Neptune ARC was recently formed and Pres. KC2V can be contacted for information. W5DTR presented plans for the new Section Manager structure in NNJ at a recent NARC meeting. Your local and state nets need your support. Can you spare a few minutes to be NCS or a liaison once a week? PSHR: AG2R K2VX W2XD W5DTR N2XJ KB2HM KX2L KA2GSX N2BOP KA2LEB WB2QMP WB2ANK N2DPV. Traffic: N2XJ 375, AG2R 251, K2VX 200, N2BOP 199, W2XD 147, KB2HM 137, KA2LEB 107, WB2KLF 84, KX2L 82, W2RQ 60, WA2NPP 55, WB2ANK 52, W5DTR 52, N2DPV 46, N2BNB 45, KA2GSX 38, N2DPN 35, WB2QMP 27, W2CC 20, KA2FXB 20, W2ZEP 13, N2BC 9, KC2MM 8, W2KB 4, W2ODV 1. (Oct.) KA2LEB 64, W2COB 46, N2BC 12.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K∅CY — ASCM: W∅RPK. SEC: WA4VWV. STM: K∅GP. NMs: W∅YLS WB∅AVW WA∅AUX KQ0I. Still accepting nominations for Iowa ARRL "Amateur of the Year" Award. Mark your calendar for the Davenport Hamfest this month and the Midwest Convention in April in Soo Cy. Packet switching in DSM. Congrats to all the Upgrades: to Extra — KC∅HK KA∅EFU KA∅KUJ KU∅Y KC∅YN; to Adv. — N∅EEN KA∅CQT N∅OFF WD∅BBE KA∅BGP; to General — KA∅LES; to tech. — KA∅DGE KA∅NXL KA∅OBV KA∅ALN. New officers for NIARC: WA∅SPF WB∅YTO KA∅AIP. W∅RPK has been appointed asst. v.p. for AMSAT. Fifty-year affiliation award presented to DSM by Director Grauer. I appreciate receiving "Win Mager Award." Encourage new and old to support the ICN. Keep it going.

Net	Freq	UTC	Dy	QNI	QTC	Sess.
Tallcorn	3560	0030-0400	Dy	322	154	60
75MPhone	3970	1830-2330	M-S	1955	238	52
ITEN	3970	2230	Sn	66	10	4

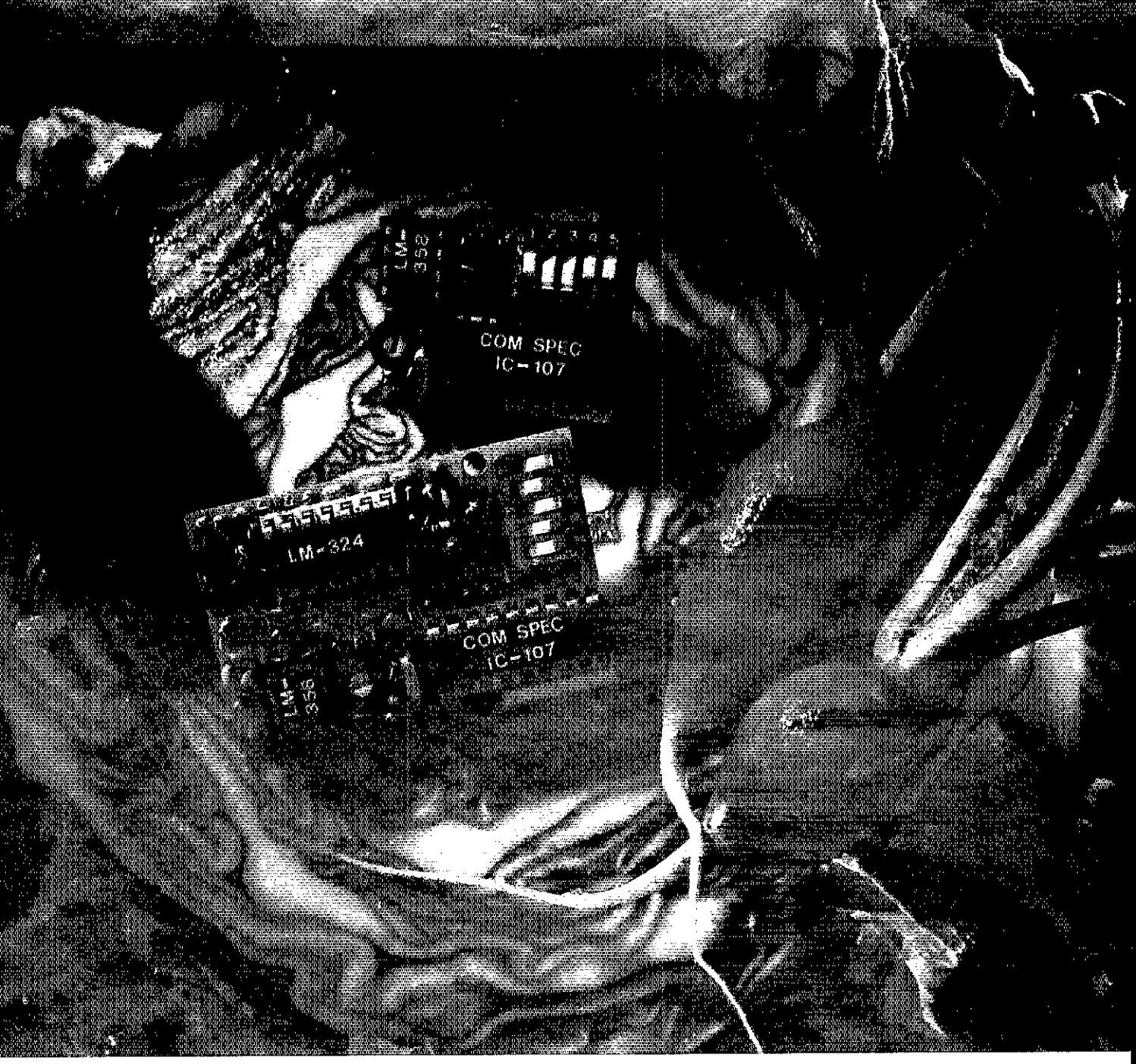
WA∅AUX wins BPL this month, KA∅JQG and KA9GBG have obtained PSHR. Section reorganization is almost complete. Thanks for all comments. The 33rd Annual Operation Santa Claus in DSM was a very big success. I wish to thank all who have done such a great job in supporting the ARRL section. Keep The Reports coming. Spring is almost here. Traffic: WA∅AUX 523, W∅SS 170, W∅YLS 160, K∅GP 119, WD∅HND 113, KA∅JQJ 111, WD∅FWB 105, WB∅JFF 49, KA∅ADF 44, W∅BW 42, KB∅OZ 39, K∅CY 37, KA9GBG 33, WB∅AVW 32, WB∅CPR 31, KQ0I 30, W4JL 29, KC∅SC 28, N∅EHV 19, WA4VWV 18, K∅RJV 14, W∅FQ 8, K∅ZQ 6.

KANSAS: SM, Robert M. Summers, K∅BXF — SEC: W∅KL. STM: W∅OYH. Was sorry to hear of an ex-SCM of Kansas being in the hospital this past month. W∅ICV, get well!! W∅IEU, a faithful check in of the Kansas Weather net, was recently awarded a Public Service Award from the National Weather Service for 21 years of reporting local weather conditions to the Colo. Amateur Radio Network. Yours truly, K∅BXF, also has received an award for participating in the first National Communications System-sponsored National Level Emergency communications test. Net reports: KSBN QNI 1295, QTC 177, KPN QNI 411, QTC 43, KWN QNI 918 with 612 reports, CSTN 1722 QNI, QTC 172, QKS 378 QNI, QTC 92, QKS-SS QNI 44, QTC 9. The new morning session of Weather Net reports 336 QNI and 304 reports. Effective January 1, Kansas joined the League in the new IIIe program. Only time will tell if good or bad will result. Let us all put forth our best and give it a good start. A number of changes will be taking place. Keep a good ear to 3920 kHz as development happens. IF YOU OPERATE in the new cw band, 9 out of 10 will be within the allocated band and the other 1 will be out. Let's make sure the one out of the band is not you. Traffic: W∅FRC 487, W∅OYH 167, WB∅ZEN 159, W∅KL 114, W∅HI 103, W∅FDJ 50, W∅QMT 48, K∅BXF 38, N∅BDG 35, W∅CHJ 23, W∅PB 13, W∅RT 13, W∅RBO 10, WA∅OWH 7, W∅NYG 5, KA∅E 3, AC∅E 2.

MISSOURI: SCM, L. G. Wilson, K∅RWL — It's that time of year again. New officers are being elected. Here are the results so far. HARC: WB∅YBC, pres.; K∅UAA, v.p.; KG∅Y, secy.; WB∅RAF, treas. KCDXC: KB∅X, pres.; W∅JLC, v.p.; AB∅X, secy.; K∅VBU, treas. Mo. Valley ARC: KB∅DE, pres.; WD∅BCX, v.p.; KC∅GB, secy.; WB∅HNO, treas. There are several new nets now operating in the state: WCAN, West Central ARES Net; SLAN, St. Louis ARES Net; NARA, Northland ARA Net. Congrats to KA∅CUU and KA∅NGU on recent upgrade to Advanced.

Net	QNI	QTC
MON	153	121
SLAN	274	0
MON2	108	54
CMEN	80	4
WCAN	95	2
NARA	16	54
MEOW	516	88
HBN	416	60

Congrats to K∅GUG on a score of 597 out of a possible 600 during the recent State Pistol competition. Several good scores were turned in by Missouri stations after the recent contests. Our deepest sympathy to the families and friends of W∅GBV WA∅DWX and W∅GFN, who recently joined the ranks of Silent Keys. I would like to take this opportunity to thank all of you who have been so supportive during my years of SCM. Thanks, also, to those of you who have served in appointed positions. It has been a pleasure to me to have worked with you and I have enjoyed it. Your new SCM is K∅PCK. He



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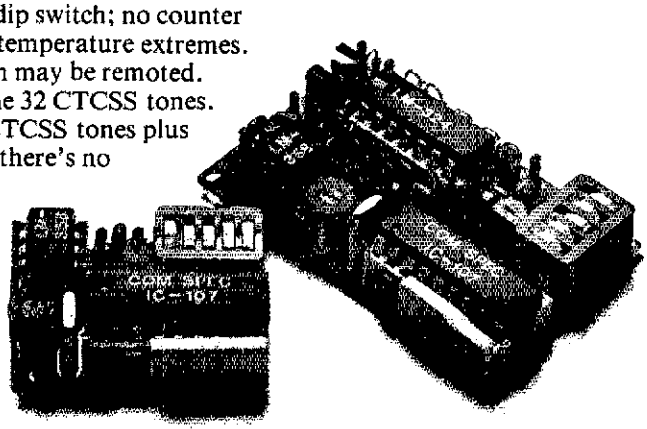
Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.



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- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
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- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies, no matter what the offset.
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- **DIGITAL S/RF METER:** Shows incoming signal strength and relative output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting.
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All 9 HF bands—160-10M. All bands ready to go.

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Triple Conversion Receiver with switchable RF Preamp. for sensitivity of 0.25 μV on all bands with dynamic range of 90 dB or better. 3rd order intercept +15 dBm.

Variable Bandwidth *plus* Passband Tuning. Narrow the bandwidth or move the passband anywhere in 2.4 kHz bandwidth. Standard 12 pole filter; optional filter converts to 16 pole performance.

Dual-range, triple-mode, Offset Tuning receiver, transmitter, or both—±1 kHz or ±4 kHz.

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Speech Processor—clipper/compressor design with up to 10 dB processing.

Fast/Slow AGC to suit conditions.

Adjustable ALC for maximum power without distortion.

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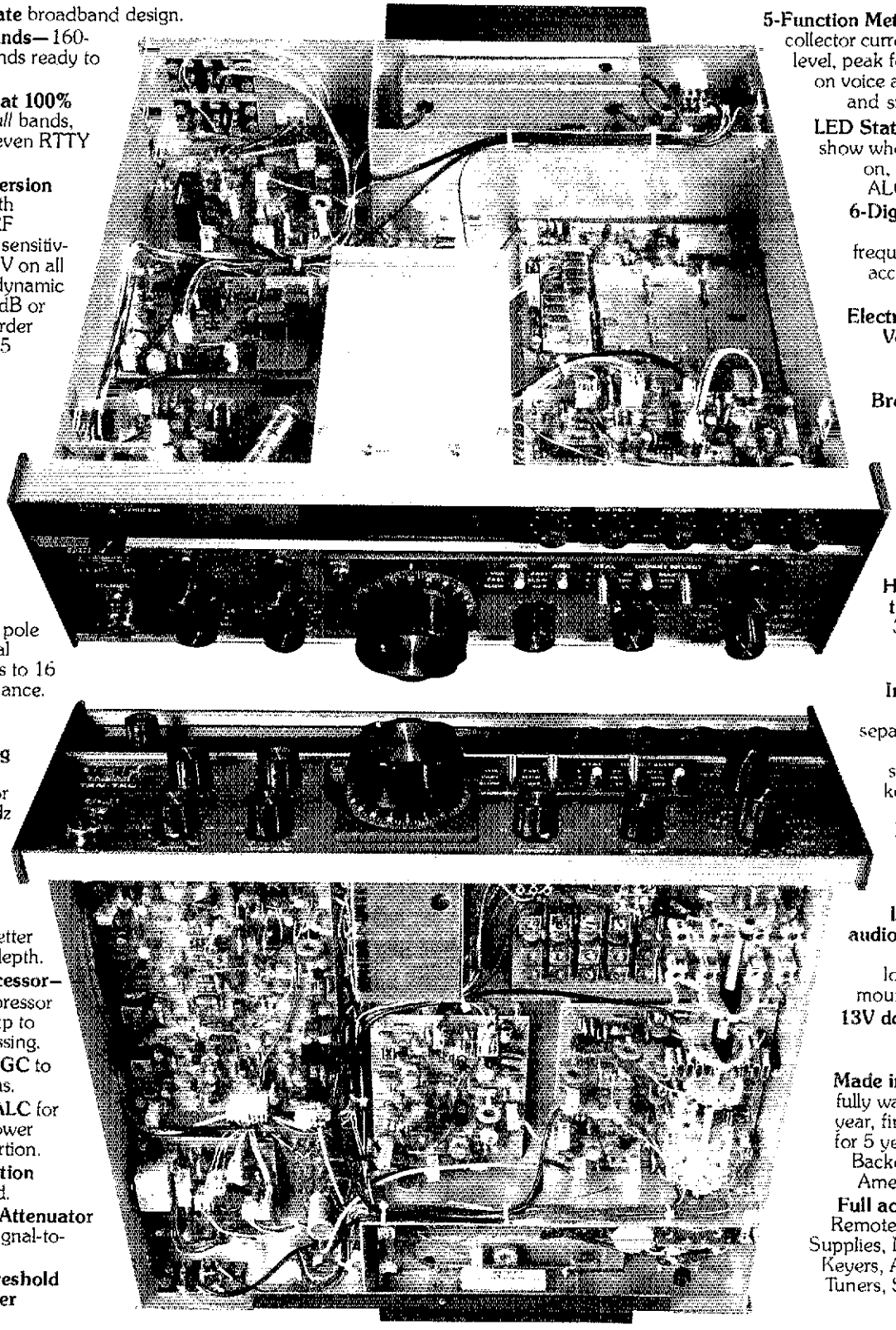
Headphone Attenuator to enhance signal-to-noise ratio.

Variable Threshold Noise Blanker



5-Function Meter—monitors collector current, processor level, peak forward power on voice and cw, SWR, and signal strength.

LED Status Indicators show when RF amp. is on, Processor on, ALC, and Offset.

6-Digit Readout—with LSI true frequency counter, accurate on both sidebands.

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Full or Semi Break-in for cw.

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Less than 2% audio distortion—compression loaded bottom mounted speaker.

13V dc design—for easy mobile operation.

Made in the USA—fully warranted for 1 year, final transistors for 5 years, pro rata. Backed by reliable American service.

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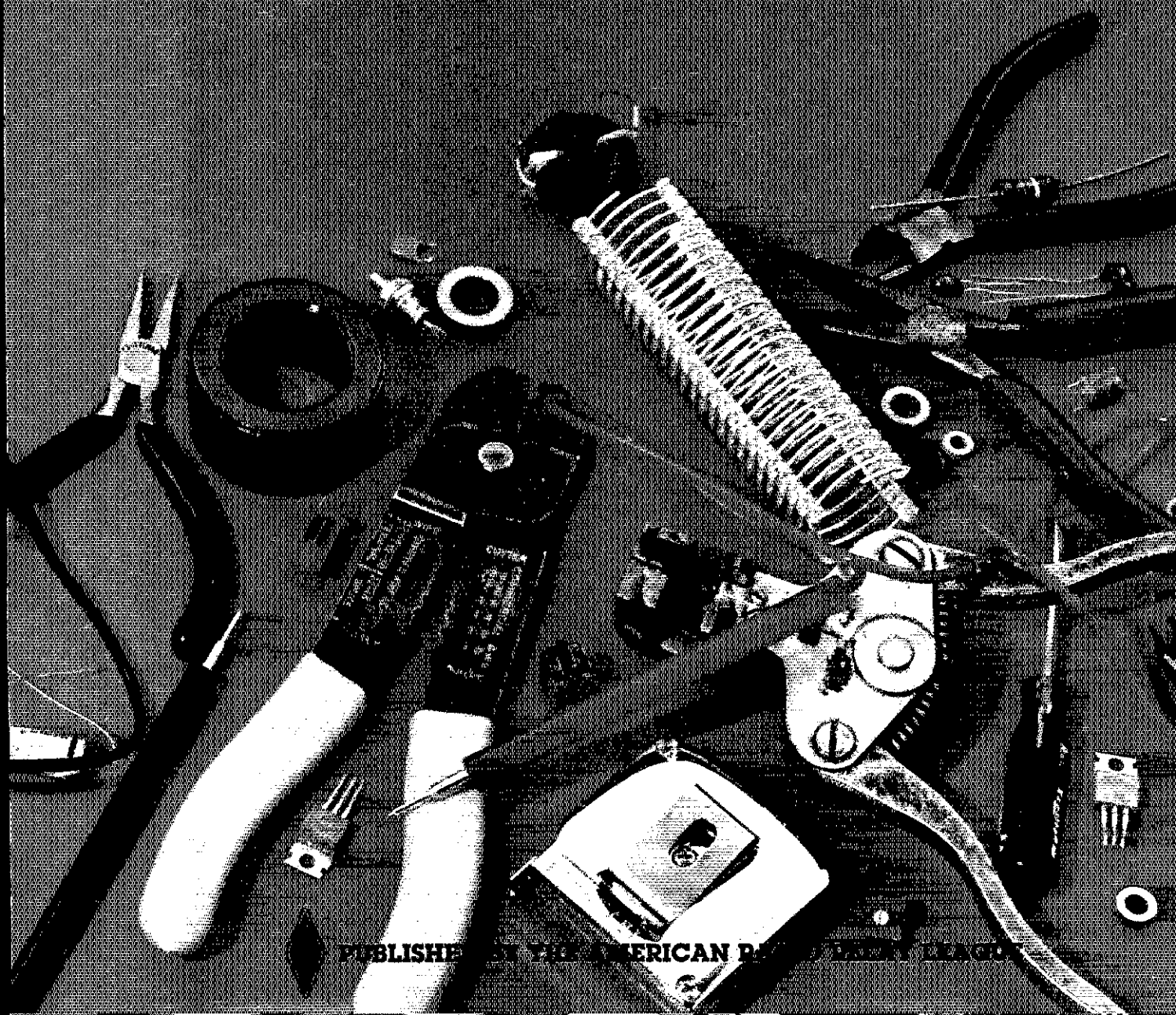
Hints and Kinks

for the Radio Amateur

A compendium of practical ideas gleaned from the pages of *QST* and the *H&K* mailbox



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The ultimate team...the new Drake "Twins"

The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard, plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! The very effective NB7 Noise Blanker is now standard.

New! Built in lightning protection avoids damage to solid-state components from lightning induced transients.

New! Mic audio available on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! NB7A Noise Blanker supplied as standard.

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! Standard ultimate selectivity choices include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

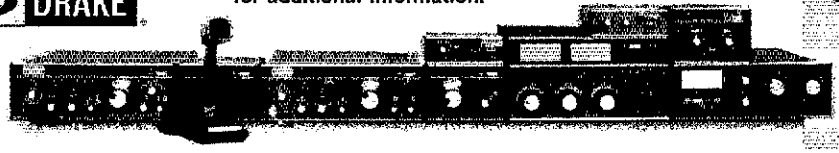
• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

Specifications, availability and prices subject to change without notice or obligation.

DRAKE

See your Drake dealer or write for additional information.



COMING SOON: New RV75 Synthesized VFO Compatible with TR5 and 7-Line Xcvrs/Rcvrs

• Frequency Synthesized for crystal-controlled stability • VRTO (Variable Rate Tuning Oscillator*) adjusts tuning rate as function of tuning speed. • Resolution to 10 Hz • Three programmable fixed frequencies for MARS, etc. • Split or Transceive operation with main transceiver PTO or RV75

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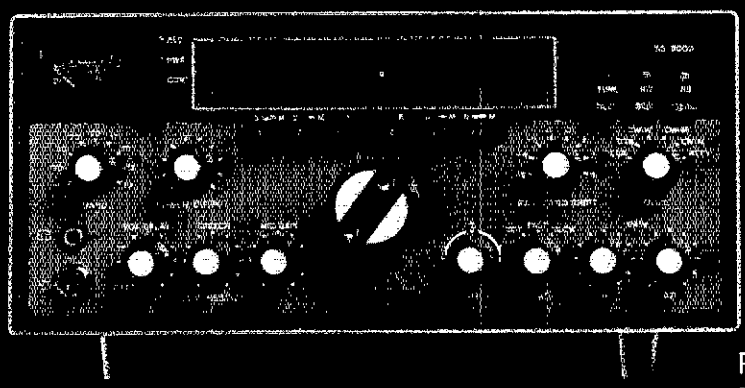
* Patent pending

More Transceiver

Contest or rare DX – the world is waiting to hear from a new breed of HF operators who'll have the power of a microcomputer at their instant command. The Heath SS-9000 signals a new era in Amateur Radio, full of exciting promise. Challenge. And opportunity...



MORE WORLD HORIZONS

In the SS-9000, we met a major design goal: *provide the highest-tech, most versatile transceiver possible.* Our objective? Nothing less than setting the pace for transceiver performance in the next decade. And transforming the state-of-the-art in amateur telecommunications potential.

As a microprocessor-based, fully-synthesized nine band Transceiver, your SS-9000 leads the new revolution in computer-enhanced hamshacks – with an array of applications yet to be discovered. At your command under direct or RS-232 control, it could break all known records for station performance.

MORE MICRO CONTROL

Harness the SS-9000 to a video terminal, ASCII teletype or home computer. Commands are available to select, display and change all 27 operating and memory frequencies, assign and toggle T/R/Tr status on the dual readout, and freely manipulate the three stored frequencies on each band, with full diagnostic error-prompting.

Keyboard command also allows you to set and switch the band, mode, passband shift, baud and scan rates, plus switch to one of five antennas *automatically.*

MORE POWER AS A PAIR

The PS-9000 AC Power Supply has an in-cabinet speaker and two digital 12 or 24-hour clocks. Both units benefit from thermal and over-current protection with high VSWR cutback. Test-prove the assembled System 9000. Get a hands-on tryout at your nearby Heathkit Electronic Center.*

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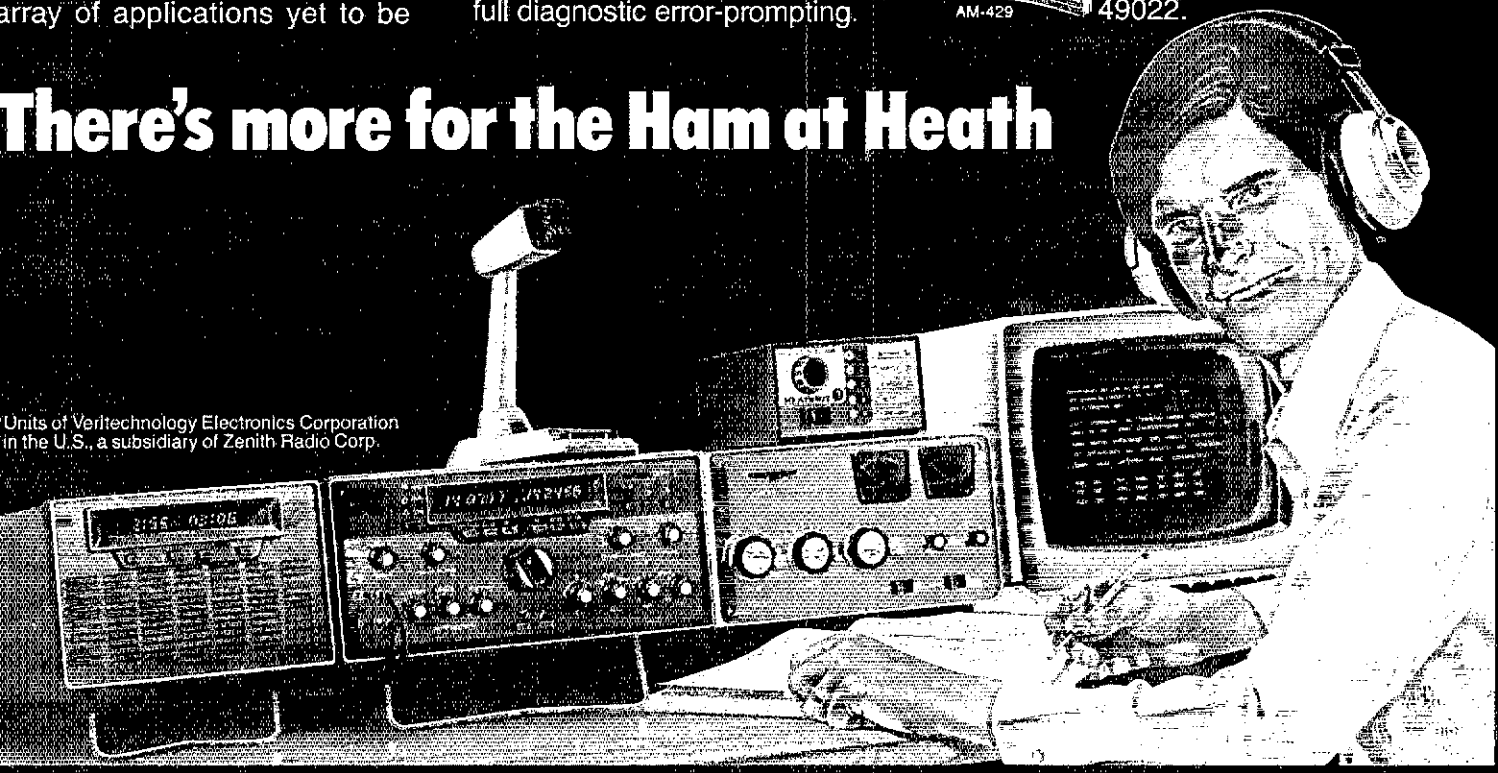

*Units of Veritechnology Electronics Corporation in the U.S., a subsidiary of Zenith Radio Corp.

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has been very active and is very experienced in the field of Amateur Radio. I'm sure he'll do a fine job for us. Please see that he gets all traffic, net reports and club newsletters. Look for me in the pile-ups trying for that elusive number 300 DXCC. Traffic: WØBMA 406, KØSI 195, NØAJI 171, NØDDZ 130, KUØG 97, WØOUD 62, KØPCK 62, KT5Y 37, KØRWL 10, KMØL 3.

NEBRASKA: SCM, Shirley M. Rice, KAØBCB — Our sympathy to family & friends of WØRIH & WØBOH who joined the ranks of Silent Keys. NØAIH received 25 applications for RACES stations. FB. New EC appointments: WBØGMQ Harlan Co.; NØDHP Hamilton Co.; KCØR Burt Co. KAØLAS is new pres. of Central NE ARC. WDØGKA upgraded to Gen. NE QCWA has 109 membership met at Grand Island. NE Chapter donated $2,500 to the National Scholarship Fund helping the National Goal of $25,000. Our WØGMQ of Omaha is National Fund Chairman. Listen for QCWA Net on 3980 at new time 14:00 UTC. Congrats to KØGND who was elected SCM for 1983-84. I'm sure he will be a very good leader. I would like to say thank you to all of the ECs, NMs & the rest of the Field Organization for your efforts during these last 2 years. My sincere gratitude to WDØBQG, my STM, chauffeur & "Box Carrier," and to NØAIH, "Big Jim," my SEC with a most active ARES program. I believe KØGND plans to go into new SM program, so when he asks for your help pse try. I LOVE you all! 88. Traffic: KØDKM 144, WØHOP 37, WØZNI 24, WBØGWR 23, KAØBCB 21, WAØPCC 12, WAØGMQ 11, WØNIK 10, WAØDXY 9, KØSFA 8, KAØBWN 6, KAØJLH 6, KØJFN 5, KØUDW 4, KØODF 2, WØERW 2, WAØBIE 2.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC; OO/RFI: KA1ML. SGL: K1AH. ACC: K1UQE. PIO: WB1AIU. OBS: WA1DWE.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	328	368	K1EIR
CPN	3965	1800 Dy/1000 Sn	100	229	W1OD
NVTN	28/88	2130	29	248	WB1ELA
WCN	78/18	2030	80	399	W1DPR
RTN	13/73	2100	37	308	WB1ESJ

Appts: OO/KM1L. Upgrades: Extra-W1GDZ; Adv-WB3LFG KA1BZS KA1JS N1CIT; Gen-N1CEU. Call changes: WB1HHW/KM1L; KA1QA/KM1E; N1BXO/KB1DW; KB1AM/KM1B; N1ARJ/KB1CW; N1CKC/KB1EI; KA1HYB/N1CLZ. Congrats to section OOs K1KI & KA1ML placing as two of the top ten OOs for the ARRL. Best wishes to K1PLR & KA1JNW on their recent marriage. Don't forget Valentine's Day. Effective immediately all section endorsements will occur annually in January. Please consult your respective coordinators. It is with regret that I inform the section that W1ICQ has become a Silent Key. An active amateur and Elmer, he will be missed by all who had the pleasure of knowing him. The .15 is now sporting a new call, W1TNS/R. W1QV off for the cold winter months to Calif. & Fla. TNX to WB1GXZ for her administrative assistance to WCN. The *Crossbander* publication from our sister section in EMASS has been expanded to include the entire New England Division, and is now called the *New England Report*. If you have info to contribute or wish to subscribe, contact K9HI. Pse remember to watch the "window" on 10 MHz. A BIG WELCOME to our section's recently affiliated clubs: Perkin-Elmer Amateur Radio Service & St. Mark School ARC. For those of you who like to plan ahead, the *1984* Boxboro NE Hamfest will be Sept. 29/30. Eleven new hams courtesy of FARA. CARA will hold its annual computer nite on Mar. 11th. Visitors welcome talk-in on 147.12. W1GNC-K1XA/6Y5 made over 4K QSOs in CW CQWW. Traffic: W1EFW 382, WB1GXZ 339, WB2PJU 272, KA1EGE 148, K1AQE 137, K1UQE 116, K2ZJJ 108, W1XX 90, WB9IHH 76, KA1BHT 62, W1BDN 48, KA1KD 38, K1EUW 25, W1CUH 13, W1QV 8, K1XA 1.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: K9HI.

Net	Mgr.	Freq.	Time(loc)Dy	QNI	QTC
EMRI	N1GQ	3.658	1900/2200/Dy	466	470
EMRIPN	KA1ON	3.949	1730/Dy	306	273
EM2MN	N1BNI	23/63	2000/Dy	364	144
NEEPN	K1BZD	3.945	0830/Sn	62	14
HHTN	K1BSO	04/64	2230/Dy	517	215
EMRISS	N1BHH	3.715	2030/Dy	155	69
CI2MN	N1BYS	045/645	1930/Dy	122	50

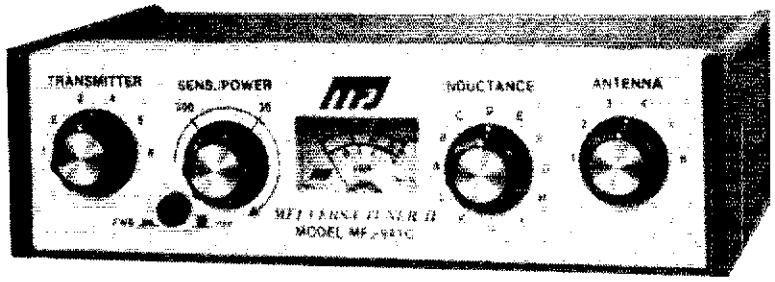
Some of you are aware of the problems our friends in West Mass are having in keeping the antennas of the 31/91 rptr on the tower which is on Mr. Greylock. By the time you read this it may all be resolved, but it does include some state legislation which would put the tower under civil defense authority in which case the antenna could stay. This repeater is vital to the emerg plan in West Mass and would be an important part of any real emergency. A number of hams in East Mass have been assisting by lobbying their reps and congressmen about the legislation, and that is as it should be. Bit I bet some of you are still asking yourself why the SCM of East Mass is taking up column space talking about a problem that is centered in West Mass. One answer is, of course, that we are closer to the state capitol and we should simply be helping fellow hams out of common courtesy. But there is a bigger issue. I'm sure you'll all agree that Amatuer Radio activities are becoming more political all the time what with local antenna zoning ordinances to fight, etc. Well, the League has recognized this, and as part of the new section organization that is being put in place I can appoint an individual to coordinate our activities with particular respect to state government. Ideally this person would have some knowledge of the workings of state government. But the hope is that by coordinating our efforts through one person we will present a more unified force in the political arena. The Mt. Greylock situation is just an example of why we need the new organization. If you know an individual who would be suited to this type of activity, please let me know asap. Al1H gave an interesting talk on a microprocessor he built into his 2-meter radio at a recent quannapowitt meeting. Greater Lawrence club is planning for Field Day already. K1BB gave a talk on antennas as the colonial club. Algonquin club participated in the scout jamboree by setting up a station. Honeywell 1200 club participated in a teleconference on the 72/12 repeater covering AMTOR. Traffic: KA1GBS 678, WA1TBY 519, N1BHH 248, KA1DB 239, W1AF 191, KE1U 158, WA4STO 147, K1BZD 116, N1BBT 102, N1CKM 100, K1BA 95, KA1MI 77, N1BYS 69, WA1LPM 64, KA1BBU 42, N1CDI 39, KA1AE 32, N8TM 29, WA1FNM 26, KA1KU 27, KA1DWX 25, W1DMH 24, WA1DXT 19, KA1KF 19, KA1ON 18, KA1BTV 14, WA1OEZ 14, W1CE 13, K1LCQ 9, W1XA 5, AE1X 2.

MAINE: SCM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. Many Maine hams participated in the

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



Ham Radio's most popular antenna tuner. Improved, too.

$89.95 (+ $4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

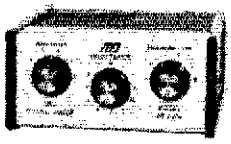
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900

$49.95 (+ $4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

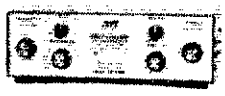
Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II



MFJ-949B

$139.95 (+ $4)

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962

$229.95 (+ $10)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

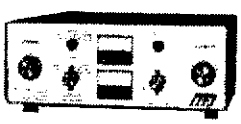
6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV



MFJ-984

$329.95 (+ $10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

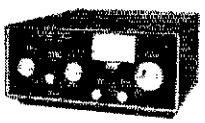
18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V



MFJ-989

$329.95 (+ $10)

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf-6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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Simulated Emergency of Maine Yankee Atomic Power Plant at Wiscasset involving evacuation plans. NCS for Red Cross of Kennebec Valley, KA1GCW, ass't EC and WB1EVI, EC, coordinated at BCEP hq. at Augusta. Seventy six hams checked in from CMEN, SPSN, MPSN and MidCoast, handling 4 pcs formal tfc, 10 pcs informal. W1WCI coordinated in accordance with energy operational plan from CMEN. Nets (sess./QNS/QTC/mgr): AEN/5/81/4/WA1YNZ; PTN/52/503/257/W1HDC and N1BJW; RACES/4/46/2/W1RWG; CMEN/9/142/26/W1WCI, SGN/26/1001/257/K1GUP. PSHR: AK1W N1BJW WA1YNZ KA1AVU W1RWG. Traffic: AK1W 375, W1ISO 140, N1BJW 122, KA1TJ 99, KL7IJG 79, KA1AVU 75, WB1BYR 75, W1RWG 64, W1HDC 57, W1JTH 34, W1BMX 30, WB1EIL 28, WA1YNZ 27, WA1ZJL 24, W1CTR 23, KA1ENL 19, K1PV 17, W1WCI 15, KA1GCW 14, W1KX 14, W1VEH 9, N1BME 6, K1BUC 6, KA1ENM 6, KA1ISO 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH — SEC: AK1E. STM: W1TN. NMs: N1NH K1OSM W1VTP. 1984 Boxboro Convention Sept. 29 & 30. Keene machine tower with 9 other services hit by gas truck. Tower being replaced. WA3BZM worked 3A2LF. Vhf DXer K1MNS spoke at Nashua club. K1OX timed out his rptr. WA1PEL has new Azden-4000. Your SCM and XYL have enjoyed attending the many clubs' ladies nights. Thanks to all our ladies for putting up with us. W1NH got YB5AES on 80. N1CBB and Cathy married by W1ALE. New 220 rptr on 223.62. W1FZ & N1CCF have new Azden 300s. Traffic: K1M 251, N1NH 224, W1TN 175, AK1E 167, K1OSM 105, KA1BJ 98, K1IR 84, W1MHX 69, K1YMH 64, WB1CFT 50, N1ALM 49, W1VTP 47, W1ALE 44, KA1FKM 42, N1AKS 33, W1CUE 33, KA1CJI 32, WA1YZN 31, WA3BZM 25, KB1A 24, K1ACL 13, KK1E 11, K6UXO 10, W1FYR 6, K1NH 2, WA1PEL 2. (Oct.) W1MHX 44. (Aug.) W1MHX 47.

RHODE ISLAND: SCM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: KC1G. RIEM2MTN NM KC1G reports 22 sess., QNI 151, QTC 27. SEC reports 107 ARES members for Nov. and 7 nets with 28 drills for the month. EBAWA lost their balun in 160 contest to local "Berrington Hoodlebums," so says KA1EHR. Hard to believe. Prov. Co. ARES assisted in the Foxboro Marathon. Congrats to KA1HHM on upgrade. Join OSARG/ARES Message Fair was held at W. Warwick with KB1G AE1S W1YNE KA1EHR KA1EZH N1BXS KA1JGB WA1GCT W1EOF N1BAQ WB1DXQ and KA1GHF participating. Over 300 msgs handled. Look-out world-N1RI has a new Atari 400. Traffic: W1EOF 885, KB1G 284, W1YNE 221, KA1EHR 203, AE1S 34, KC1G 23, N1RI 22, K1AOS 21, KA1FPP 15, KA1HHM 11.

VERMONT: SCM, Bob Scott, W1RNA — SEC: WB1ABQ. STM: N1ARI. New Net Mgrs: (1) VSBN KA1XZ & KA1XG; (2) for the new CV FM net, which meets at 2000 hours Sundays, 146.625, W1BD rptr, is K1HKI; (3) VTN is W1KRV. Tnx WB1ABQ for FB job on VTN. Hope you have no more problems as SM! EC for W1BD rptr group is KK1U. Welcome aboard to the new mgrs and EC. All, repeat, ALL, amateur reports for Jan. 83 will go to WB1ABQ, who is your SM as of Jan 1st. VSB 30/533/138; VT FM 30/278/91; VTN 29/78/65; GMN 26/420/34; Carrier 26/373/29; RFD 4/71/18; VPN 4/79/6. By the time this gets into *QST*, hope all had a Merry Xmas & Happy New Year (and you were able to get the new gear into the house without incident!!!) Traffic: W1RNA 143, K1BQB 131, N1ARI 112, AE1T 107, WB1ABQ 86, KA1GID 72, W1KRV 59, KA1BSZ 8.

WESTERN MASSACHUSETTS: SM, William J. Hall, W1JP — I would like to pay special tribute to W1YI who has been so helpful in keeping me in touch with the affiliated clubs and providing much of the material which appears in this column. Over the past year he has put many, many hours into this effort. The big news this has the drive, spearheaded by WB1HIH to save the Mt. Greylock tower. Whatever happens there will ultimately affect other rptr sites located on state land. Kudos to WMFN which, owing to efforts of NM W1KK with help from WA1YYW, has achieved high representation status in FRN. The Mt. Tom rptr, K1ZJH/R significantly upgraded owing to $2,100 worth of equipment solicited free by WB1CJH. Some news from Worcester Co.! KA1TU W1UEO W1GLD and W1KC hopefully doing well after hospital stay. Condolences to family of WA1TFN who became Silent Key. Your SCM/SM very pleased to receive appointee reports from W1YI KA1T WA1YYW WB1HIH K1JHC W1UD W1ZPB and KA1CDC. Remember, to maintain your appointee status . . . PSHR: WB1HIH K1JHC KA1T. Traffic: KA1T 240, WB1HIH 183, W1UD 97, K1JHC 95, KB1W 54, WA1YYW 50, KA1CDC 49, W1JP 49, WA1OPN 32, K1IJV 30, W1ZPB 27, WB1HKN 11.

NORTHWESTERN DIVISION

ALASKA: SCM, Richard Henry, AL7O — ASCM: AL7AC. SEC: KL7LO. STM: WL7H. NMs: WL7APE WL7H KL7JDR KL7KV. Congrats to WL7H for achieving PSHR. The Southeast Alaska ARA meets 1st & 3rd Wednesdays 3892 kHz USB 0530Z. New officers for the Borealis ARC are: NL7O, pres.; KL7OE, v.p.; KL7RJ, secy.; KL7AJ, treas. All station appointees are reminded of the monthly reporting requirement.

Net	Freq.	Time (Z)	QNI	QTC	Mgr.
AMG	3932	0700	1016	92	KL7KV
ABN	7254	0430	225	11	WL7H

Traffic: KL7LA 504, KL7LO 59, WL7H 47, KL7VY 34, AL7AC 28, AL7O 8.

IDAHO: SCM, Dennis Hall, KK7X — The Nampa club is now forming a rptr group to purchase, install and operate a new solid-state unit to replace their present rptr in which the receiver has failed. Look for a sparkling new 2-meter rptr voice from Nampa soon. Best of the seasons greetings to all of you from Northern Idaho. New ideas on emergency communications are welcome and needed. The new Northern Idaho club, North Idaho ARA is now an ARRL Affiliated club. Congrats! Affiliated Clubs — Be sure and get your annual reports in to Headquarters as soon as possible. Clubs interested in becoming ARRL affiliated can contact KK7X or drop a line to ARRL Headquarters. 73 and thanks to W7JMH for his contribution to this month's column. Traffic: W7GHT 384, W7JMH 16. (Oct.) W7GHT 317, W7JMH 76. (Sept.) W7JMH 56.

MONTANA: SCM, Les Belyea, N7AIK — Club election results-Yellowstone ARC: N7ATT, pres.; N7CGC, v.p.; KA7NEA, secy/treas.; Gallatin ARC: W7JMX, pres.; WB7OIO, v.p.; W7OZH, secy/treas. Good luck to all. Upgrades reported: KA7ANR to General; KA7KXK to Advanced; KA7JGF to Extra. Congrats to all. KA7BFK is now KW7I. CORRECTION: It was reported last month that W7TGU has a county total of 2485; it should have been W7BKM. Sorry. KA7BNE received the "Earl Hedden Memorial Ham of the Year" Award from the Yellowstone

NEW TS830S for $150?

Yes indeed! Just add a Matched Pair of top-quality 2.1KHz BW (bandwidth) Fox Tango Filters. Here are a few quotes from users:

"... Makes a new rig out of my old TS830S! ..."
"...VBT now works the way I dreamed it should..."
"...Spectacular improvement in SSB selectivity..."
"...Completely eliminates my need for a CW filter..."
"...Simple installation - excellent instructions..."

The Fox Tango filters are notably superior to both original 2.7KHz BW units but especially the modest ceramic 2nd IF; our substitutes are 8-pole discrete-crystal construction. The comparative FT vs Kenwood results? VBT OFF — RX BW: 2.0 vs 2.4; Shape Factor: 1.19 vs 1.34; 80dB BW: 2.48 vs 3.41; Ultimate Rejection: 110dB vs 80. VBT SET FOR CW at 300Hz BW — SF 2.9 vs 3.33; Insertion Loss: 1dB vs 10dB.

AND NOW A *NEW* TS-930S.

Tests prove that the same filters improve the '930 even more than the '830. Don't buy CW filters—not even ours. Your probably won't need them.

INTRODUCTORY PRICE: (Complete Kit) . . . $150
Includes Matched Pair of Fox Tango Filters, All needed cables, parts, detailed instructions. Specify kit desired: FTK-830 or FTK-930. Shipping $3 (Air $5). FL Sale Tax 5%

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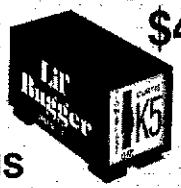

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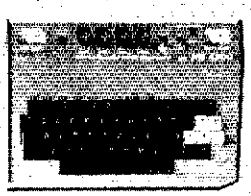
* Release squeeze during dah; dit follows, and vice versa. (Same as AEA, Ten-Tec, Nye, Heath, Accu-keyer and others)



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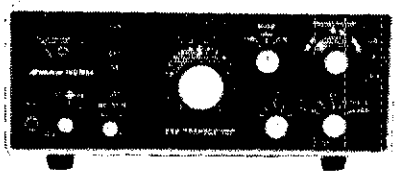

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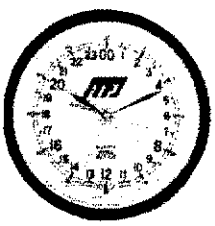

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ARC and it was well deserved. Many thanks go to WA7GVT from the Lower Yellowstone ARC for an excellent monthly newsletter with lots of information. K7LBK and K7MGM from Laurel conducted tests on two meters with ASCII. PSHR: WA7GQO W7LBK KF7R.

Net	Sess.	QNI	QTC	Mgr.
IMN	22	214	88	K7JV
BSN	13	226	9	WB7UTJ
MSN	4	46	0	KB7SE
MTN	22	811	98	K7TQM

Traffic: KF7R 140, WA7GQO 62, N7AIK 59, W7LBK 48, W7DB 3.

OREGON: SCM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA.

Net	Time/Day	Freq.	QNI	QTC	NM
OSN	0230/0600Z Dy	3587	647	503	KA7ELI
BSN	0145Z Dy	3908	983	36	W7FO
WCN	0300Z Dy	3702	498	149	WB7RKU
PTTN	0300Z Dy	147.24	470	35	W7LRB
SOFM	0330Z T	146.64	130	2	W7FDU
OARES	0115Z Dy	3993.5	498	149	W7HLF
LBLARES	0330Z Dy	146.79	988	14	K7ZQU

UPGRADES: WB7RQF (Tech); KA7KDX (Adv); KC7EY K7OYM (Extra). KA7MAA and KA7LZK both made Eagle Scout this month. McMinnville ARC is now officially ARRL affiliated. WA7UPP is new chapter head of "City of Roses" 10-10 chapter. Officers for Rogue Valley ARC: WA7IHS, pres.; N7DTX, v.p.; KO7S, secy./treas. Officers for Sunset Empire ARC: W7HJR, pres.; W7YLV, v.p.; KA7CXP, secy./treas. (all three on 2nd yr). Umpqua Valley ARC has new station set up in VA Hospital. Space and phone donated by the Hospital. Traffic in and out will be handled for resident vets. *EAGER BEAVER* (BSN newsletter) and editor K7WPC still doing outstanding job. We need *STATE* Official Observer/RFI and Official Bulletin coordinators; contact W7QMU if interested. Merry Christmas and Happy New Year to all!!!! Traffic: W7VSE 609, WA7LGN 275, K7NTS 215, WB7OEX 128, KA7ELI 124, W7ZB 109, W7LNE 80, N7BGW 50, W7HLF 18, KA7AID 10, W7LT 9, W7DAN 1. (Oct.) W7DAN 7.

WASHINGTON: SM, Joe Winter, WA7RWK — ASCM: KD7G. SEC: K7SH. STM: W7GB.

Net	Freq.	Time(Z)	QNI	QTC	Sess.	Mgr.
WSN	3590	0245/0545	678	293	60	W7GB
WARTS	3970	0200	2964	229	30	W7SFT
NTN	3970	2000	929	62	30	W7VL
EWTN	146.64	0130/0530	115	146	52	WA7CBN
PSTS	145.33	0130/0630	145	9	60	W7IEU
SCARES	147.18	0330(Wed.)	28	4	4	KA7AML
NWSSB	3945	0230	—	—	—	W7JGM

I welcome the opportunity to implement the new expanded Field Organization for our section. Please read June & Dec. *QST* explaining the new structure. The new org. will bring the League closer to every member in this section and will afford them a greater opportunity to contribute something to the League and to Amateur Radio. I urge you to join with me and help make our section the BEST. Here's your chance to fill a leadership position or recommend someone for OO/RFI Coor., Affiliated Club Coor., Pub. Info. Off'r., State Gov't. Liaison, Tech. Coor. or Bulletin Mgr. Pse contact me now for info on these or any other ARRL positions you may want. More later. WWARA elects '83 officers: W7FHZ, chmn.; WA7NAN, v. chmn.; K7CR, secy./treas.; W7KKN WA7FUS W7JPH WA7WKT, board members. Next mtg 2-19-83 at RCT bldg. Clallam Co. ARC YLs are forming women's section of the club. Congrats. CCARC elects '83 officers. KR7M, pres.; N7DHY, v.p.; Mary Tate (NC), secy.; N7BOE, treas. W7LG says EOC in Clallam Co. Ct. Hse. is on-the-air. Mt. Baker ARC has successful auction. Club buying 2-mtr rig. KA7EJO fills P.R. comm vacancy. MBARC plans interesting VIP (visit in person) contest strictly eyeball outside clb mtgs. Must have signed QSLs. Sounds good. Lower Col. ARA plans big Christmas potluck dinner mtg. with elect. of officers and auction. K7SH is auctioneer. KA7HWE has new tower and TET tribander installed and is getting thru the pileups. K7SH & K7ZVV rpt successful SET. Boeing Emp. ARS '83 officers are K7ZBF, pres.; K6DOW, v.p.; WB7DNS, treas.; WB7AZW, trustee. Radio Clb of Tacoma Novice class taught by KC7EO & WB7QCW. WB7CRR rpts 3rd wk of Nov. 6 mtrs was good; worked LUBs, Hawaii and into Mont., Ida. etc. Spokane Co. ARES/Red Cross EC WB7VSZ featured in Spokane press & TV RE: his tfc. hndlg during Hawaii hurricane. Good PR. W7LUP operated in simulated state exer's. OBS N7 N7CT in W3-land for a few weeks. W7ERH operated in support of Seattle Marathon. Want to see your call in print? Send me info on your activities. Traffic: W7DZX 796, KS7I 559, WB7WOW 518, WB7TQF 512, K7GXZ 258, N7CSP 243, N7DNG 198, W7LG 197, W7GB 185, K7CTP 150, N7ANE 134, W7HNA 122, N7AFY 92, N7AFZ 90, W7IEU 62, WA7BDD 61, N7DDP 59, KR7F 58, N7EPM 31, KD7G 28, W7APS 12, K7BFL 12, W7LUP 10, K7OXL 7, W7AIB 3, W7ERH 3, KA7CSP 6, WA7OJI 1. (Oct.) N7EPM 15. (Sept.) N7EPM 4.

PACIFIC DIVISION

EAST BAY: SCM: Bob Vallio, W6RGG — ASCMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. NM W6VOM reports that NCN/VHF tfc more than doubled October's total. STM NI6A reports the following stns active with Hawaiian emergency tfc: W6LKE K6AGD WA6BOB WA6ZFV WB6DOB W6RGG. NI6A made BPL again this month. Alameda Co. RACES was called out by the Sheriff's Dept. to participate in a search for a missing 8-year-old girl. Members who responded in the pouring rain at 11 P.M. were: K6JNW N6DHN N6FSV K6CSL WB6NMW KA6FIY WB3FCV WA6TPE W6RGG. I spoke on the League at the HARC regular meeting & to their Novice Class on our OO program. They provided comms for a run across the newly-opened Dumbarton Bridge and the Hayward PAL "Smokey & the Bandit Fun Run." MDARC has once again won the Pac Div "Club of the Year" award. Congrats to the entire membership! SBARA toured the RCA stn at Pt. Reyes. LARK had two "Klute-of-the-Month" award recipients, KD6DT & N6FWE! EBARC mourns the loss of long-time member WA6JGZ. Traffic: NI6A 1039, W6VOM 344, K6APW 129, K6AGD 108, WB6UZX 33, N6RD 2.

NEVADA: SM, Bill J. Marshall-Gratrix, KA7Q — STM: W7BS. On Dec. 7th, W7BS operated W5SC with other members of Pearl Harbor Survivors Assn. WADG working hard on preps for 1983 ARRL Pacific Div. Convention to be held in Reno. SNARS elected new officers: W7AAA KF7E WB7EIY WA7HVY N7RH K7GER WB7UXO, directors; WB7UXO, chmn.; KF7E, vice chmn.; WB7EIY, secy.; W7AAA, treas. Inter alia, congrats to October upgrades: KA7AKM N7CDH KA7CJL N7ENO WB7SUY N7EEU, Advanced; K4GXL KB7QY (now KW7W), Extra. Nevada Sagebrush Net meets weeknights 0730Z on 3906 kHz. Traffic: N7AKX 782, W7BS 229, W7BKQ 67.

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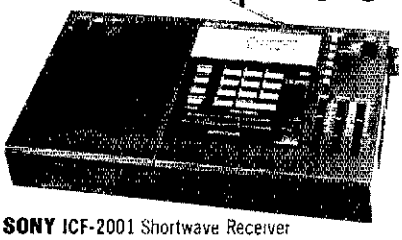

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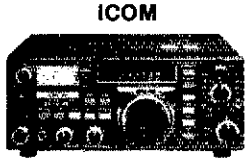

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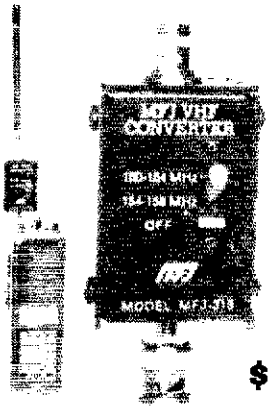

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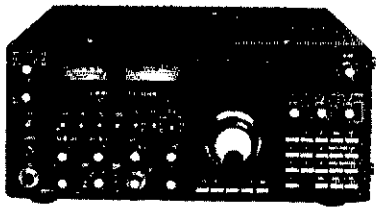

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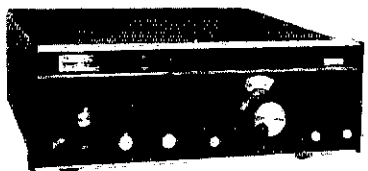

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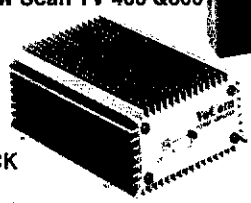

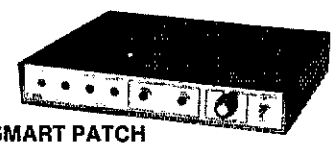

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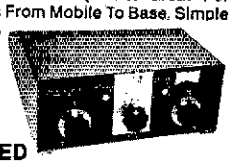
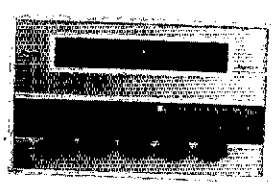


SANTEC ST-144/UP ST-440/UP



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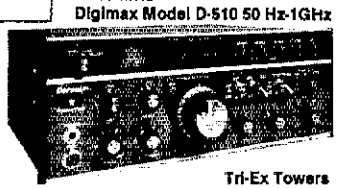

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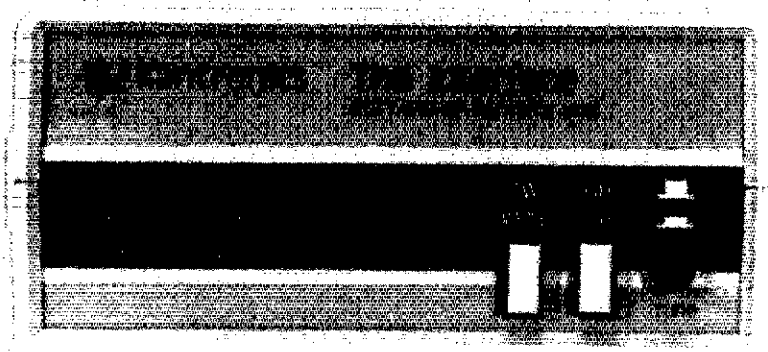

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Oil cooled. Includes high quality, industrial grade transformer oil (contains no PCB).

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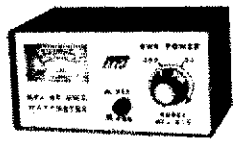

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SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — Sec: N6AUB. ASCM KI6T. W6AAQ and W6HMD have returned from a two month trip to the East Coast, including a visit to ARRL Hq and operating W1AW. W6GO and K6HHD operated from FO0JO and FO0OJ on their contest/DXpedition vacation. Congrats to N6AUB KE6NO and N6EPG on making PSHR. N6AUB also made BPL. KE6NO is now an ORS. We need a lot more. N6JV's quad was destroyed by a storm and KA6UME now has a 3-ele tribander up in Winters. Traffic: N6AUB 335, KE6NO 63.

SAN FRANCISCO: SM, Bob Smith, NA6T — STM: K6TP. SEC: N6BLN. NM: W6IPL. Welcome to 1983 and good DX to all this year. Humboldt Co. has a new EC, KE6LF. Tnx to WA6ICB for the work as EC in Humboldt and Del Norte Cos. for the past 6 years. Sonoma County's new EC is W6DTV. Del Norte County's new rptr is 146.18/78. SFRC is looking for qualified operators for the VA radio station to attend the meetings and get more information. SM attended the VOMARC Xmas party, their 10-6-2-220 computer mode base is taking shape real fine. REDXA club programs are FB, films from VQ9RS, ZL/C, and a visit from SM0AGD. This club is real active in the section when it comes to DX. Get out and try 10 MHz. It's a great place to sharpen your cw skills. Traffic: W6NL 684, W6IPL 320, WD6BIY 316, K6TWJ 208, K6TP 146, N6FYV 138, W6RNL 47, NA6T 20, WB6RTE 10.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. ASCMs: W6TRP K6YK NF6K. New officers of the Kings Co. ARC are: KV6W, pres.; N6EMU, v.p.; N6DUC, secy.; KC7GT, treas. The club meets the 3rd Thurs. in Armona. The Fresno Chapter of 10-10 meets Tuesdays at 2000 Pacific time on 28.845 MHz. WB6COT is Chapter Head, and W6KRO is certificate manager. The Chapter sponsors a basic certificate as well as the Golden Poppy award. Contact W6KRO for more information. Congrats to the following upgrades: Advanced — KA6ETD N6DXU KA6SKE; General-KA6LGL; Tech-KA6RUF KA6DOP KA6QVW KA6VTE KA6BEN. KA6UKF is N6HPA. KA6EME is active in the section. WA6JDB is getting an APPLE computer. The Fresno ARC has their 220 MHz rptr active on 222.34/223.94. The Fresno hamfest is May 20-22. Mark your calendar. Traffic: N6AWH 231, WA6YAB 23, W6DPD 18, WD6FRS 6, W6SX 6, WA6JDB 5.

SANTA CLARA VALLEY: SM, Ross Forbes, WB6GFJ — STM: W6ZRJ. SEC: KA6R. Owing to his many activities, W6ZRJ announces he would like to have someone else take over the STM position. Here's a chance for someone with a deep interest in traffic activities in the section to make a contribution. Contact SM for details. New OBS in Half Moon Bay is WA6EEP. Pacifica gave a rousing send off to former EC K6IIG for his many years of dedication. PARA heard from WB6ECE on how to improve their "tox hunt" techniques. KA6R doubles in duty, now that he has been elected SCCARA's new president for 1983. New president for SMRC is K6QE. NK6H and WB6TIJ were busy providing phone patches for WB6UES during sea-going research. Recent upgrades include KF6FC KA6WEV KF6AF and KA6RHJ. SPARK has been working on their emergency plans. New president for NPEC is WA6IZU. Don't forget the ARRL Board meeting coming up. Now is the time to get your thoughts and comments to our director, W6ZM. Make your opinions known! W6OII has been checking into the new American Legion net. Look for W6PRI back on NCN with his new cage vertical. A number of stations in the section were active passing traffic during the hurricane in KH6. Many stations are getting on the 30-meters band. The FCC cautions all to watch the four band edges very carefully! Lots of rumors now starting to fly about the next director election. It's not too early to start thinking about this year's Pacific Division Convention to be held in Reno later on this summer. Traffic: W6KZJ 218, WD6EKR 31, W6OII 28, W6ZRJ 20, WA6HAD 15, W6PRI 14, WB6GFJ 10, W6PHT 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ian C. Black, WD4CNR — STM: W4EAT. SEC: KU4W.

Net	Time	QNI	QTC	Sess.	Mgr.
CMN	1245Z	525	204	30	W4EAT
CN	0000Z	640	318	60	AB4S
JFKN	2330Z	1072	175	30	WB4WII
THEN	0030Z	1026	156	30	WA4OBR

If you have been observant, you have noticed the section has a new SEC. KU4W and his lovely wife, Cat, live in Fayetteville. Both are very active tfc handlers and run a team act which manages to work every traffic net in the section. He is one of those guys that every NCS is glad to hear QNI. He's always willing to make that little extra effort for the net, whether it's on cw or phone. He is also a DEC, so he is quite familiar with the emergency coordination efforts in the section and the problems thereof. By the time you read this, KU4W and NB4L will have had time to effect an orderly change-over, and by now KU4W should be firmly in the saddle. Poor poor old NB4L got his priorities mixed up. He thinks things like eating and paying his bills should take precedence over hamming. Congrats, though, on the new responsibilities. We'll miss you, but we understand. This change finds me with mixed emotions. While I'm sure KU4W will do a fine job as SEC, I hope it won't curtail his activities on the nets. North Carolina just ain't blessed with an oversupply of dual-mode ops. So the loss of one or part of one will be felt. If this sounds like a plea for help, you're right. The phone nets have shown a gratifying increase in checkins during the holiday rush season. Not so with the cw nets. If you'd like to try it, NC has two really good training nets. The CSN, 6:00 P.M. on 3715, and CN late, 10:00 P.M. on 3574. Join us. Traffic: WD4CNQ 455, WD4CNR 387, WA4FKY 351, WB4WII 315, KD4PJ 283, NJ4L 206, AB4S 140, KU4W 132, WA4SRD 82, K4IWW 72, NT4K 64, WA4OBR 60, KA4KJI 59, WD4LRG 56, KA4DHP 54, NE4J 53, KZ4A 52, WB4CYN 51, WB4N 49, N4CJJ 34, N4ESX 34, N4CYG 30, WD4HTE 26, KA4UBN 26, WD4CEB 25, WD4LOO 17, WB4HRR 16, WD4DCY 12, WA4CUD 10, W4WXZ 9, W4TWD 8, KA4ATK 7, W4RWV 6, K4SWN 6, K4SWN 5, W2JDB 4.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — W4NTO is number 2 OO out of 99 active in the ARRL program. He will receive a free subscription to 1983 *Callbook* to aid in his work. Congrats on job well done. KE4WC is saved by Amateur Radio. Story is, he was locked in his "shack" and gave a frantic call on 2 for help. The marvels of Amateur Radio. I gave a presentation to the South Carolina Management Meeting held by NOAA. The talk covered Amateur Preparedness Program in SC. Meteorologists from GA, NC, SC and Clemson attended. My *THANKS TO ALL* for the support and confidence during the past election. With your con-

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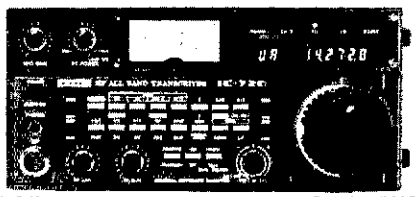

HF Transceivers:	Regular	SALE
IC-720A 9-band Xcvr/.1-30 MHz Rcvr	$1349.00	1099
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 KHz AM filter	49.50	
MB-5 Mobile mount	19.50	

IC-740 • $50 REBATE
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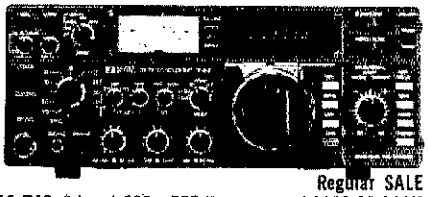

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IC-740 9-band 200w PEP Xcvr	$1099.00	949.95
EX-238 Internal power supply	159.00	149.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-44 455 KHz SSB filter	159.00	129.95
FL-45 9 MHz 500 Hz CW filter	59.50	
FL-54 9 MHz 270 Hz CW filter	47.50	
FL-52 455 KHz 500 Hz CW filter	96.50	89.95
FL-53 455 KHz 250 Hz CW filter	96.50	89.95
EX-254 Mobile mount	TBA	
HM-10 Mobile scan microphone	39.50	

	Regular	SALE
IC-730 8-band 200w PEP Xcvr w/mic	$829.00	699.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44 455 KHz SSB filter	159.00	129.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
HM-10 Mobile scan microphone	39.50	

Common accessories - 720/740/730	Regular	SALE
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EX-144 Adaptor; CF-1/PS-15	6.50	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adaptor; HF radio to PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
SM-5 8-pin electret desk mic	39.00	
SP-3 External speaker	49.50	
Speaker/phone patch (specify radio)	139.00	129.95
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile ant w/tuner	289.00	259.95

HF Linear Amplifier	Regular	SALE
IC-2KL 160-15m/WARC solid state linear	1795.00	1299

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IC-251A 2m FM/SSB/CW Xcvr/AC ps	$749.00	599.95
IC-551D 80w 6m Xcvr	699.00	599.95
PS-20 20A switching ps/spkr	229.00	199.95
CF-1 Cooling fan for PS-20	45.00	
EX-106 FM adaptor	125.00	112.95
IC-451A 430-440 SSB/FM/CW Xcvr/ps	899.00	769.95
IC-451A/High440-450 MHz Xcvr/ps	899.00	769.95
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IC-490A 10w 430-440 SSB/FM/CW Xcvr	649.00	579.95

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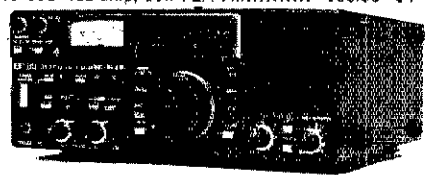
IC-25A Compact 25w 2m Xcvr/TTP mic	$349.00	299.95
IC-45A 10w 440 FM, TTP mic	399.00	359.95
EX-270 CTCSS encoder for IC-45A	TBA	
IC-22U 10w 2m FM non-digital Xcvr	$299.00	249.95
EX-199 Remote frequency selector	35.00	

VHF/UHF Portables:	Regular	SALE
IC-202S 2m port. SSB Xcvr, 3w PEP	$279.00	249.95
IC-505 3/10w 6m port. SSB/CW Xcvr	449.00	399.95
BP-10 Internal nicad battery pack	79.50	
BC-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
IC-402 432 port. SSB Xcvr, 3w PEP	389.00	349.95

Amplifiers for portables:	Regular	SALE
IC-20L 2m amp, 10w PEP or FM	98.00	89.95
IC-30L 432 amp, 10w PEP/FM	105.00	94.95



Shortwave receiver:	Regular	SALE
R-70 100KHz-30MHz digital receiver	$749.00	649.95
EX-257 FM unit	TBA	
EX-261 Transceive interface; 720A	TBA	
FL-44 455 KHz SSB filter	159.00	129.95
FL-63 9 MHz 250 Hz CW filter	TBA	
SP-3 External speaker	49.50	
EX-254 Mobile mount	TBA	

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2 meters:	Regular	SALE
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IC-2AT .15/1.5w 2m HT/batt/cgr/TTP	269.50	219.95
220 MHz:		
IC-220 HT/batt/wall cgr	269.95	229.95
IC-3AT .15/1.5w 220 HT/batt/cgr/TTP	299.95	239.95
440 MHz:		
IC-4A .15/1.5w 440 HT/batt/wall cgr	269.95	229.95
IC-4AT .15/1.5w 440 HT/batt/cgr/TTP	299.95	239.95

Hand-held Accessories:	Regular
BC-25U Extra 15-hour wall charger	$10.00
BC-30 1/15-hour drop-in charger for BP-2/3/5	69.00
BP-2* 450 ma, 7.2v 1w extended time battery	39.50
BP-3 Extra standard 250ma 8.4v 1.5w battery	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v 2.3w high power battery	49.50
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FA-2 Extra 2m flexible antenna	10.00
CA-2 Telescoping ¼-wave 2m antenna	10.00
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CP-1 Cigarette lighter receptacle charger for BP-3	9.50
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ML-1 2m 2.3/10w HT amplifier (Reg. $89)	SALE 79.95

Marine band:
IC-M12 12 ch Marine hand-held **SPECIAL $199.95**

Misc. accessories:	Regular
24-PP 24-pin accessory plug	$ 4.00
BC-10A Memory back-up; 551/720/730/740	8.50
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BU-1 Memory back-up; 25A/290A/490A	38.75
EX-2 Relay box w/marker; 720A/730/701	34.00
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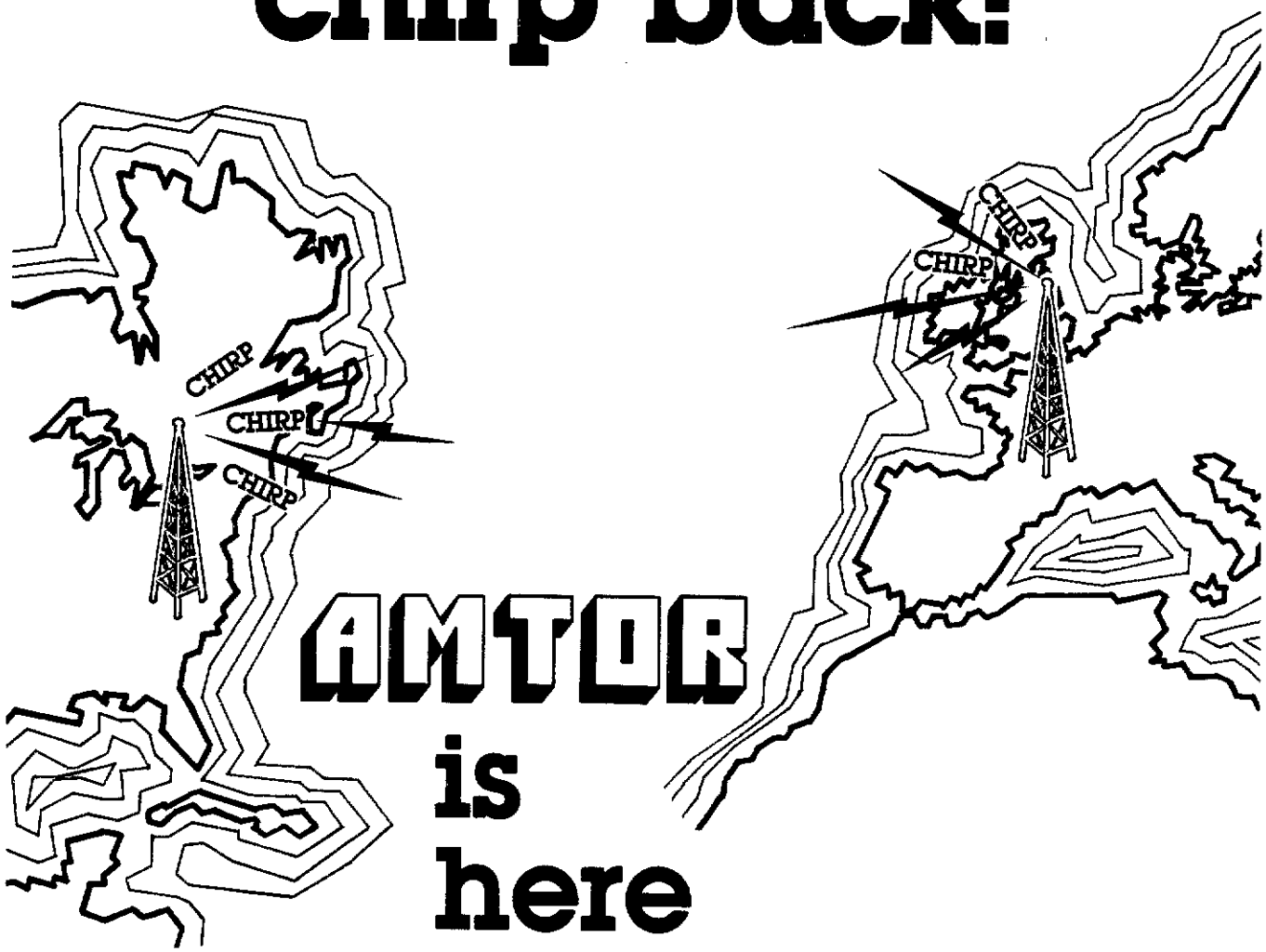
Now you can chirp back!



AMTOR is here

Been wondering what those "chirp-chirp" signals were around 14075? They're AMTOR, AMateur Teleprinting Over Radio. European hams have been enjoying the benefits of error free RTTY for sometime. (It's a must for commercial Maritime traffic.) Now, U.S. Amateurs are on the threshold of a new era of RTTY.

Old problems of QRM, QRN, & QSB are gone! If a propagation path exists, AMTOR will get the message thru — with no "hits" — "newspaper" perfect copy!

Two modes are available; AMTOR mode A transmits a three character block specially coded so that the receiving station can recognize an error. The three character block is repeated until the receiving station confirms reception by replying with the proper control code signal. Flawless print is possible with this "hand-shake" style operation.

Mode B, "FEC" or Forward Error Correction, is actually a time diversity mode where text is repeated and intermixed in the transmission. The receiving station unscrambles it and prints the clear text. This "broadcast" mode allows more than two stations to communicate. It's more effective than conventional Baudot or ASCII, but not as reliable as AMTOR mode A.

The actual DATA transfer in either AMTOR mode is nominally equivalent to conventional RTTY at 50 baud, or 66 WPM.

A receive only "Listen" mode is also available for reception of mode A data by a station not directly involved in the "hand-shake" communication.

Start with a new AMTOR ACT-1, ATR-6800, or update your present system.

Microlog is ready with AMTOR! Give us a "chirp" at Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879. TEL (301) 258-8400. TELEX 908153

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

tinued support, we can make SC section one of the best. Our section is moving to the expanded Field Organization in 1983. Under the new structure, there are eight section-level leadership positions. Full descriptions are in June and December 1982 *QST*. If you have a desire to serve and are qualified, please contact me for more information. NETS: 5896/485. Traffic: K4ZN 360, W4NTO 157, W4FMZ 154, K4WJR 139, W4ANK 107, KA4AUR 100, KA4LRM 91, W0IKT 84, WB4UDK 49, K4ZB 45, K4FRX 43, KE4WC 33, WA4MIY 28, WD4FJP 23, W4PAB 18, W4DRF 17, WA4JWS 15.

VIRGINIA: SCM, Phil Sager, WB4FDT — ASCM: K3RZR. STM: WD4ALY. SEC: WB4UHC, Chief OO: W4HU. Chief OBS: K3RZR.

VNTN	7260	1 P.M.	WD4FTK
VSBN	3947	6:00 P.M.	W4NWM
VSN	3680	6:30 P.M.	K4VWK
VN/E	3680	7:00 P.M.	K4JSTW3ATQ
VN/L	3680	10:00 P.M.	K4JSTW3ATQ
VLN	3947	10:15 P.M.	WD4ALY

WD4ALY is the new Section Traffic Manager (STM). All activity reports at the beginning of each month should be sent to him, and not to KY4K. KY4K was STM for nearly two years, and Virginia amateurs thank him for his hard work during that time. Please note that the VNTN is now meeting a 1 P.M., not at noon. Sorry to report that the Virginia RTTY net (VRN) has folded owing to lack of check-ins. Remember the Vienna "Winterfest" hamfest to be held Feb. 27 at the Vienna Community Center. K4TSJ is now working in Alaska. *The Virginia Ham* is now being edited by your SCM. It contains news of public service activities and general news of the Virginia section. If you wish to be on the mailing list, please write me via my address in front of *QST*. N4DR reports his new third harmonic is a girl. WA4PBG traveling with a new TS-930. The *Virginia QSO party* is now scheduled for the second weekend of March. See *QST* for further details. PSHR listings this month to WD4ALY K4JST WA4CCK K3RZR KB4WT KB4PW NT4U NN4I NT4S W4LXB AA4AT & KA4IUM. Our Chief OO, W4HU, was honored by ARRL for being one of the top ten OOs in the country. K4JM celebrates 50 years of hamming. W4MYI new president of the Richmond ARC. Has your club thought about subscribing to the new *ARRL Letter*? STARES net reports 31 QTC and 557 QNI. SVEN reports 47 QTC and 479 QNI. WB4DBK, a former Virginia PAM, is planning to move back to Virginia from the Boston area. Traffic: WB4PNY 470, W3ATQ 398, WD4FTK 307, WA4CCK 292, WD4ALY 289, K4JST 288, AA4AT 215, WA4LJI 215, K3RZR 180, K4KDJ 171, NT4U 140, W4UO 128, WB4FLT 118, KA3DTE 112, NN4I 107, W3BBN 105, KC4HN 100, K4JM 98, W4NWM 88, KA4IUM 80, KR4V 80, K4AET 81, KB4OG 77, N4YO 61, W3BBQ 56, WB4FDT 53, NW4O 52, NT4S 47, K4VWK 47, W4LXB 46, WD4CNG 45, KB4WT 43, N4EBU 29, KA4JXZ 28, KY4K 28, W4PVA 26, WB4ZNB 25, N4FNT 24, K0JH 24, KA4ZTB 23, KI4W 21, WB4ODZ 20, W4KFC 16, WB4UHC 16, W4CFV 13, WB4DQZ 13, WB4KIT 13, WB2OMZ 12, WB4RWY 11, WA4TVS 11, K4MLC 8, N4RYO 5, W4KXE 4, N4BJX 3, W4DM 3, W4TZC 3, N3RC 2, N4YE 2, KM4X 1.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — STM: KD8G. SEC: K8QEW. Rptr Coord: WD4KHL. K8LG is new pres of WV State AR Council, replacing WA8GYU who resigned. KB8ZM is new v. pres. W8HZA received his 60-year pin at a recent QCWA dinner. Congrats. KA8MAB and KJ8E worked BZ2AH on 20-mtr. cw on Nov. 21. New officers for KARC: KB8QX, pres.; KA8KVD, v.p.; WD4ALW, secy.; KA8RWF, treas.; KA8MLP, pub. chair.; KU8R, prog. chair.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3990	6:00	656	133	30	N8AJC
WVN	3567	7:00	132	43	26	W8LYV
WVMD	7234	Noon	550	31	30	W8FZP

Traffic: KA8GHF 144, W8JWX 130, KD8G 51, WA8KCJ 35, N8AJC 32, K8KT 32, W8FZP 27, WB8VAZ 26, K8QEW 24, W8HZA 21, WA8YLW 15, KC8CR 14, W8CAL 10, WB8BMX 9, K8JQ 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Lawrence E. Steimel, WØACD — SEC: K3PUR. STM: WDØAIT. NMs: WDØAIT WØHXB WØLAE WA8RYL. This could be a very interesting and eventful year for Amateur Radio. With all the deregulation by the FCC one wonders where it will end for us. Among the items being acted on: NO CODE licenses, testing of applicants, and deletion of most logging requirements. I feel that we as a group of technically-minded individuals we should consider what we think is best for Amateur Radio and let our feelings be known to the FCC when they ask for comments on different proposals. There is to the ever-growing field of cable television, and along with it is the possibility of interference to the 2-meter band. This is where at least one of their carrier frequencies are located. There have been some reports of interference with amateur communications, but in most cases the CATV companies have worked well with the amateur to correct the problem. If there are such problems I would be very interested in them. With the coming of spring I am sure a lot of us will be busy with all sorts of public service events. Nets: HNN-sess. 28, QNI 1827, QTC 137, QNF 1479. CWN: sess. 29, QNI 223, QTC 244, QNF 896. Colombine: sess. 26, QNI 1257, QTC 129, QNF 1102. Traffic: NØBQP 1997, WAØHJZ 1494, WØACD 1152, WØACH 722, KØJAN 534, KØDJ 326, WØHXB 236, WØNHA 200, WØWYX 195, WDØAIT 176, WØEJD 136, KBØZ 116, KAØNLI 91, KØTIV 79, WØLQ 54, WØNFW 46, ADØJ 26.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 297 msgs with 288 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC and handled 90 msgs with 1118 stations in. New Mexico Breakfast Club meets daily on 3939 at 0830 local and handled 94 msgs with 966 checkins. Yucca 2 Mtr Net 78/18 & 93/33 handled 22 msgs with 687 checkins. Caravan Club 2 Mtr. Net 66/06 handled 9 msgs with 90 checkins. Seven SAR missions going at once in central NM, with Silver City overloaded also with SAR missions. (One life lost, with many saved.) Mostly deer hunters lost in heavy snow. Traffic: W5DAD 210, W9OBV 204, N5SJ 203, K5DUV 154, W5ENI 108, KB5LI 29, WA5MIY 28.

UTAH: SCM, Leonard M. Norman, W7PBV — SEC: WB7BZJ. STM: W7OCX. KC7O conducting short class for upgrading to General class. K7QEQ, after a FB job of NCS on BUN, has been replaced by WA7MEL. New rptr near Logandale covers southern Utah on 31/91. N7BNC in charge of Novice class for UARC, assisted by KM7A KC7ZD KA7EVV KA7MUU KA7NBJ KA7JNF and KA7CNM. WA7WIB and WB7OEE new UCN members. WB7DPA WA7ARK and K7DOU meet with cable company reference Channel "E". N7DF reports Utah a better

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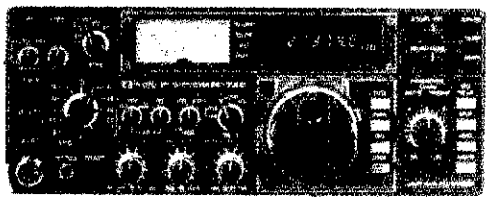
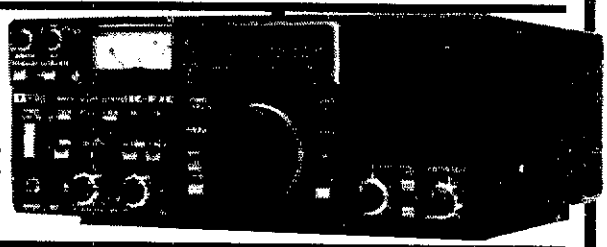


NEW IC-740

contains all of the most asked-for features, in the most advanced solidstate HF base station on the amateur market...performing to the delight of the most discerning operator. Study the front panel controls of the ICOM IC-740. You will see that it has all of the functions to give maximum versatility to tailor the receiver and transmitter performance to each individual operator's requirements.

NEW IC-R70

Features: squelch on sideband, adjustable width noise blanker, adjustable speed AGC, passband tuning as standard, and adjustable notch filter as standard. Other features are high stability, synthesized tuning and 3 tuning speeds, optional AM/FM mode, variable CW filter widths, dial lock, two VFO's with data transfer, plus many others. Also, the IC-R70 will operate transceive with the IC-720A.

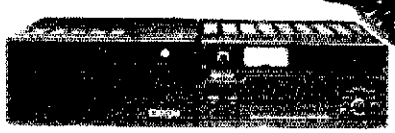


NEW IC-290H

The IC-290H features a powerful 25 watt output and a highly sunlight readable green readout, in the same compact package as the IC-290A. Other features and styling of the IC-290H are the same as the previous model - the IC-290A.

FEATURES

- 5 memories - store your most worked frequencies.
- Call channel - your favorite frequency instantly available.
- 5/KHz FM tuning or 1KHz/100Hz tuning on SSB.
- FM/USB/LSB/CW modes.
- Programmable offsets.
- Priority channel - monitors 2 frequencies.
- Scanning of memories or band.



IC-2KL 160 - 15 meter solid state linear amplifier. For use with the IC-701, IC-720A, or IC-730, 500 watt CW out. Includes matching power supply.

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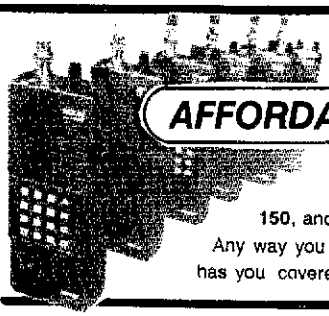

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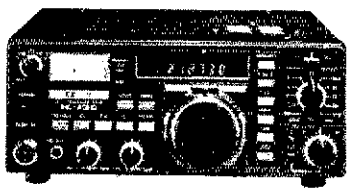

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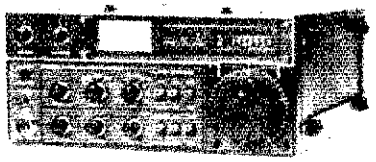
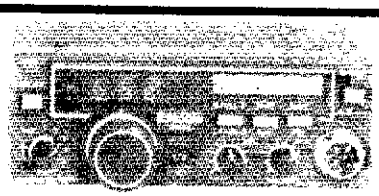


The **IC-251A** has excellent sensitivity and crystal filters having an exceptional shape factor giving good selectivity. Includes AC Power Supply.

ICOM's **IC-720A** is a superior quality HF transceiver. Whether you are a radio amateur, a shortwave listener, or a mariner, you will find the **IC-720A** has features that no other transceiver offers in such a small compact size.



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DX location than KS. W7ETR won first place in HB-contest, with N7CEU a winner in the beginner's spot. KE7G won for best techniques. Judges were W7NMK W7EU and WA7ZBO. W7DML was declared winner for originality. Traffic: K7HLR 224, WA7KHE 164, WA7MEL 141, WA7JJL 51, K7CKF 27, KN7U 25, WB7UJP 25, W7RO 15, W7OCX 11, W7PBV 10.

WYOMING: SCM, Dick Wunder, WA7WFC — Two great hamfests in Wyo. this summer. The Wyo. Hamfest will be at Meadow Lark Lake the third weekend in July sponsored by the Sheridan club. The WIMU Hamfest will be in Jackson, with the Rock Springs Club doing the honors as this is Wyoming's year to sponsor the event during the first part of August. Recent upgrades include: WA7LEA to Extra; N7DVQ KA7FKT to Advanced. Congrats to all. WB7NHR reports the Wyo. Cowboy Net held 22 sessions with 878 QNI & 28 QTC. WA@PFJ reports the Wyo. Jackalope Net held 25 sessions with 657 QNI & 3 QTC. Anyone interested in volunteering for any of the ARRL leadership positions, contact WA7WFC. Traffic: WB7NHR 371, W@OGH 180, K7SLM 66, KA7FKT 45.

SOUTHEASTERN DIVISION

ALABAMA: SCM, H. H. Wheeler, W4IBU — ASCMs: WA4RNP KA4WVU. SEC: N4DMA. STM: WA4PIZ. Big things in store for the ARES in Alabama! N4DMA is making arangements with the Civil Air Patrol and the FCC to assist the CAP in their emergencies with authorization to use CAP frequencies. The radio officer of the Alabama Civil Defense has big plans for a more effective use of the ARES. Both N4DMA and W4IBU are enthusiastic! If you are not yet a part of ARES get your order in early for membership! KA4IJT, recently re-elected as NM of the ATNM, is doing a fine job. Checkins on the cw nets have increased. Thanks to all who participate! For reasons expressed in the most recent *Newsletter*, the *Newsletter* has been, at least temporarily, discontinued. 1982 is now in the history books, but it did see some renewal of involvement of interest in Amateur Radio in our state. Things are looking up! WD4CPF has installed a most effective rptr on Sand Mountain. An article in *QST* about this rptr that talks would be most interesting. Alabama needs an RTTY net! Any volunteers to establish same? New officers for the Capital City ARA are: N4DLV, pres.; WD4BSU, v.p.; Phyllis Barrentine, secy.; WB4VSO, treas. (Could this be the old Twin Base Club?) The Enterprise ARS (EARS) assisted the sheriff's dept. in a successful search for a missing elderly woman. The search had started on Monday, but it wasn't till Friday that KA4AFI found the body in a fence row. Eight members of EARS participated. Hope everyone had a very merry Xmas and that the new year will being a fulfillment of your every desire. Keep those resolutions! Alabama represented 100% on DRN5 by W4CKS W4IBU WA4JDH KC4GS WB4IXA NW4X W4WJF N4FQD & WA4PIZ. Alabama represented on CAND 100% by W4CKS. Traffic: WA4JDH 988, W4CKS 155, WA4LXP 83, W4IBU 77, NW4X 74, WB4IXA 37, W4WJF 33, KA4IJT 30, WA4JPK 28, WA4HRV 14, KY4H 13, N4FQD 12, K4AOZ 8, W4DGH 7, WD4DHI 4, K4HJX 4, WB4TVY 4.

GEORGIA: SM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: WB4HXE. ASEC: K4SWJ. STM: W4WXA. Chief OBS: W4BIA. NWS: WA4PZD. Red Cross: NC4E. Listed below are the major traffic nets in the section. Won't you try and check in to at least one of them. Appreciate it.

Net	Freq.	Times all EST	Mgr.
GCN	3995	0700 Dy 0800 Sn	W4HON
GSN	3595	1900 & 2200 Dy	W4WXA
GTFCN	7243	1200 Dy 1300 Sn	WB4NTW
GSSBN	3975	1930 Dy	KP4EH
ARES	3975	1830 Sn	KO4V

Once again many thanks to K4VHC for operating for the kiddies from the North Pole. Atlanta Chapter 49 QCWA 1983 officers are: W4JWO, pres.; W4NET, v.p.; W4UVP, secy.; W4DXI K4IRD, directors. With the help of W4TYM KE4LY & NC4D, W4RA now has TH7DXS on the tower & is awaiting winter time DX. Oops forgot the QCWA net meets each Sat. morning on 3832 at 0900 local. All you ol' timers, come & join us. Am planning on having an ARRL information net starting sometime in March. Day & time will be announced on the nets. As of this writing I have appointed WA4ABY as the section Affiliated Club Coordinator, WA4PNY as Public Information Officer. (He is also the Division PIO). K4UDR is the Technical Coordinator. Under the new Section Manager program, the above will be part of my staff. Other appointments will be announced as soon as I get the volunteers. If any of you have any "in's" with a radio or television station that would be willing to run ARRL spots, please contact WA4PNY. He has a variety of spots that would be beneficial for the public to hear or see. These will help in un-confusing the public on many aspects of Amateur Radio. If any of you plan on becoming members of the Royal Order of the Wouff Hong at the Columbus Hamfest in March, please drop me a card so that the proper accommodations can be made. 73 Eddy. Traffic: W4WXA 122, WB4NTW 120, KL7FX 102, K4NM 58, K4JNL 52, KA4ATM 38, W4AAY 26, W4HON 24, W4BIA 18, W4NKL 17, N4BIM 14, AK4T 11, W4REI 10, N4DOM 9, K4PIK 4, K4BAI 1.

NORTHERN FLORIDA: SCM: Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. ASEC: KE8O. 1983 officers elected as follows: North Fla. ARS (Jax): WD4PFN, pres.; N4HKE, v.p.; N4HLS, secy.; WB4STB, treas.; WB4ANW, act. mgr. For Daytona Beach ARA: WB2KRR, pres.; WB4ESH, v.p.; KB4BAK, secy./treas.; WB4FKL WB2UKX KA8OHX KB4T, directors. Hernando Co. ARA: WB4EXA, pres., N4EBH, v.p.; WA4OEM, secy.; KB9LT, treas. Orange Park ARC elected: KD4CG, pres.; NX4F, v.p.; KF4EW, secy.; WD4NXY, treas. KE4OY now editor of newsletter. NU4Y busy operating contests new antenna installation. Good scores in CQWW and ARRL SS. He's also tech comm. chmn for 07/67 OPARC rptr. New ORS appointments to NQ4F NS4C WD4HBP NF4O and KA4RVQ. New ECs are WB4AOG (E. Pasco), KF4GY (Sumter), and WB4K (Beaches of Jax). OARC Board of Directors approved plans for Orange Co. Emergency Net to meet each Friday on the 16/76 rptr in Orlando. N4ADI and WA4OPA are prime movers. Silver Springs RC active in drills at "Big Sun Air Show." Participated with other emergency services there. Also provided comm for March of Dimes Bike-A-Thon. Gulf Coast ARC planning mall displays and traffic station. W4BE won OSCAR contest by predicting the fall from orbit of ISKRA 2. ARRL Awards of Merit presented to WA4SGF WB4EEK and WB4CGD. BARS and OPARC both turned down no-code license in voting at meetings. Again, virtually unanimous! Leon EC KC4N reports TARS participated in the Bike-A-Thon there over a 26-mile course. The SET there concentrated on hf communications with good results. Traffic: N4EDQ 11,315, WF4X 672. N4PL 655,

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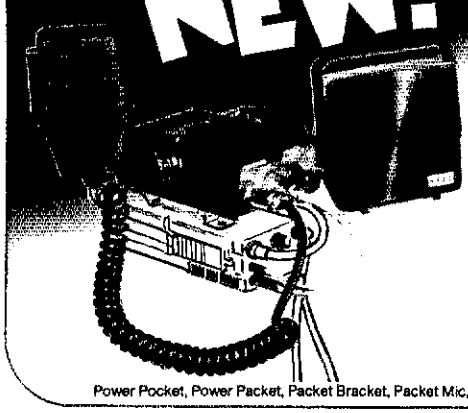

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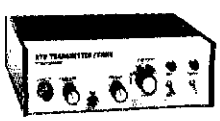

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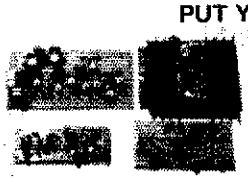

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WA4QXT 548, AA4FG 539, WB4TZR 392, WD4HBP 335, WB4ADL 293, WD4IIO 280, W4MGO 222, WA4EYU 214, NY4E 179, KB4LB 161, N4ADI 119, WD4RIQ 113, W4ILE 100, KF4GZ 90, NS4C 86, KD4QZ 85, WDYMLQ 81, N3BRT 76, W4KIX 75, KB9LT 64, KA4VXT 61, WD4HUZ 59, NF4O 54, NQ4P 49, WB4DTS 48, K3AQY 39, W4WGR 36, KA4RBY 35, W4GUJ 34, WB4EXA 32, K4RNG 31, NA4F 28, KF4EU 26, WB4OOS 21, WA4STZ 21, WD4ORO 20, WB4AWG 16, W3IDO 16, WB4YQP 16, KA4DCD 13, KA4ETX 12, WD4GUZ 12, WB4HMT 10, W4LUW 10, KF4GY 8, KD4KK 8, KA4RVQ 8, N4ESM 6, WA4PUP 5, KA4RMH 4. (Oct.) KF4GZ 67, WD4MLQ 48, KE4PO 20, KA4DCD 10, WB4YQP 3.

SOUTHERN FLORIDA: SCM, Richard D. Hill, WA4PFK — SEC: KB4OW. STM: K4ZK. The Fort Myers Radio Club held a Glades County DXpedition at the Ortona Locks Campgrounds on November 13th and 14th. The group was led by Dave Fox, KA8CXQ and assisted by Tim Philomento WD8ABP, Louie Bal WD9AEP and Leroy Kehrer, WD4CHO. Over four hundred stations in forty seven states and eight countries were contacted — over one hundred QSL cards have been received. Congrats to all for such a fine effort. There was a 30 kilometer run held November 21 in Coral Springs with over 1000 runners — communication was provided by a dozen hams using the WB4UFA Goldcoast FM Association repeater and the WA4LZR Motorola repeater. Steve Segal WA2NAV, was the net control station. Chuck Baer, W4ROA reports that the city of Sunrise has adopted as a city ordinance, the amateur radio emergency plan of Broward County. WB4ITH of Punta Gorda said that 14 mobile communication units were provided for the annual Christmas parade and that there was a RTTY demonstration at the Bounty of Sea Festival. 176 amateurs in Palm Beach County provided simulated emergency communication between disaster sites and various agencies and hospitals. W4ROA did some sleuthing to determine that WD4NLC/C6A was the ham who alerted the U.S. Coast Guard that a yacht was in distress off of Cape Hatteras. Jeff Beals, WB2OUK received a letter of commendation from the Hendry County Commission thanking him for his assistance in organizing ARES/RACES. Leroy Kehrer, WD4CHO, gave me one of his QSL cards — it is a picture of Leroy in the early 1920s with one of his father's homebrew radios — his father built and operated one of the first radios in Southern Indiana. Reference your PSHR — *Test* emergency messages do not count in category seven, and remember participation in SET does count as 5 points in category nine. W4LLA reported he handled 50 maritime mobile phone patches in November. 73 de WA4PFK. Traffic: W3CUL 3273, W3VR 755, VE3BSY 582, W4NFK 510, K4EUK 500, K4ZK 483, WA4PFK 477, WA4EIC 322, KE4O 297, WA4TWD 283, K4SCL 262, WB4AID 242, WB4WYG 220, WD4COL 218, K4IA 182, KA4GUS 181, NC4H 171, WD4AWN 140, W8BZY 137, WA4HXU 135, KE4DA 124, W4YCL 116, WD4CHO 110, W4DVO 109, KC4FL 103, KA4ASZ 101, W4DL 96, W1DLP 84, W4SME 84, KY4U 79, WD9AEP 75, K7LCA 70, WA4C 66, NJ4O 63, W4PKP 56, N4ET 55, KC4OT 50, KA4FZI 45, KM4Y 44, WB4MPJ 41, WF4E 39, W3IJC 36, W3TLV 36, KA4VAW 35, W4LLA 34, K5IHH 33, KA4AMC 31, WB4GCK 31, W4KLY 27, W4SMK 23, AA4BN 21, W4IRA 20, NW4R 19, W4HOA 18, K4IRT 16, KM4G 16, N4KB 16, WA4LQO 16, KA4TFD 16, K4FQU 15, KA4YHS 14, WA2UKE 12, KA4BBA 10, WA4NBE 10, WB2OUK 10, W4MPV 9, W8ARW 8, N4WYR 8, N4CMW 7, W4LVA 7, W3IJR 6, WB4HYT 5, KA4RWV 5, W4UIO 5, KA4CPS 4, WD4MCC 4, WD4PPA 4, N4GQR 3, W9FPO 3, NX4X 3, N8EL 2, N4FGG 2, KA4GDU 2, KF4JA 2, K4JLL 2, W4JM 2, W4MFD 2, WB8SNT 2, KA4AGI 1, KA8AIA 1, KA8CXQ 1, WD8DGH 1, K4DPX 1, KA4EBO 1, N4FNY 1, N4GCV 1, WB9NHV 1, K4OVC 1, WA4PIL 1, KA4UIO 1, KA4YHE 1. (Oct.) NC4H 138, WB4HZK 8.

WEST INDIES: SCM, Julio Negroni, KP4CV — Virgin Islands Amateur Radio Club has started new Novice classes with 9 enrolled. WP2AAP, now KP2I, upgraded to Extra Class, NP2AP informs. WP2ATC informs there are seven 2-mtr rptrs now in operation in the islands. St. Croix rptrs are on 146.64, 146.88 and and 146.91. St. Thomas repeaters are on 146.625, 146.805, 146.955. Tortola operates on 146.73. WINE reports QNI 25. Traffic 11 QNC 1. Traffic: KP4DJ 60, KP4ABK 58, NP2AP 11.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7FDN WA7KQE. November has flown by. I hope all had a pleasant Thanksgiving and wish all the best for the holiday season. Camp Wildcat Bike-A-Thon comm. exercise participants were: WB0OWL WB7PKP N7CMK WB7PKR N7DAX N7AFM WB3LQQ N4DZN K7AIY W7FBX AJ7C KA7JLE KA7DTS KA7DTT W7OPS W7KOY WA6III DV7D N9BD KV7B W5KMF K7OBR K7OMR WB7VOM W8BID N7CL N7EH K7CRN WB7TWM AF7M WB7CGQ K7KYW & WA7JCK. W7KAX reports that N7AML and WB7TIY have been appt'd asst ECs for Bullhead City. The Thunderbird Balloon Race communicators were: WB7OZR KA5EDU KA5EBM WB7BVS KA7FQO WB7BYK WA7ZCZ N7DOM N7EJJ W7TPW N7DFH KC7OE WB9VMP WA7ZZT KA7LBW W8AKH KA7FPK WA7FSG WA7VLW WB3LQQ N7AIY K7MPD & KA7DTT. Fountain Mountain Triathalon communicators were: WB7TPY WB7OMZ WB7NWW KB7UV WB7OEC WB7EMZ WB6TIX KA7DTT KB7KY KC7ND K7LKL W7OPS N7AFM & KA7FQO. The Superstition ARC reports they now have a solid state rptr to replace the one stolen earlier this year. Canyon Ranch AHA Fitness run communicators were: WB7VOM N7EKT WA0NNC AF7M WB7TWM WB7OBF KA7IZC K7KYW WB7ESQ KA7FTZ W8BID WB7CGQ KA7CCC KB7KZ KA7DYD WD4NGH & N7CLC. PSHR: W5KMF W7EP. ATEN: ONI 897. OTC 248. SWN: ONI 288, OTC 297. Traffic: W5KMF 210, W7EP 224, K7UXB 164, W7LVB 154, W7AMM 142, W0GMO 134, N7CQY 97, K6LL 59, WA7KQE 45, WA6ZVN 40, N7EH 25, WA7NXL 12, K7NMO 11, N7CVT 8, WA7YUL 8, W7LBW 7, KE7W 7, N7EAQ 3, KA7ZBZ 2, KA7CMJ 1, W7DQS 1. (Oct.) KE7W 39.

LOS ANGELES: SCM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. I made an error on the League Officials net time. It meets every Sunday at 1700 PST on 3907. All interested in meeting your local League Official please feel free to check in. The Section Level Public Information Net meets every Wed. at 1930 PST on K6QQN/R 147.705 (down 600). W6NAZ hosts this worthwhile net. N6AWF continues his battle with Cerritos after we all thought he had it won. I urge all local amateurs with an interest in antenna height restrictions to give N6AWF your encouragement and help. He can be reached at 213-865-4761. This past month has been busy with talks given at WARA and also to the Associated Amateurs of Long Beach. Also a rush trip to Santa Barbara to present

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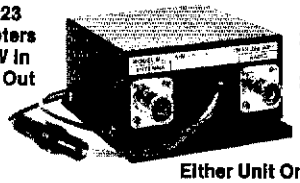

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B1016	2M	Yes	10W	160W	20A	$249
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C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
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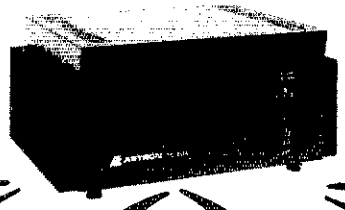
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199

MODEL RS-50A



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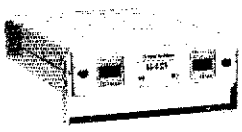

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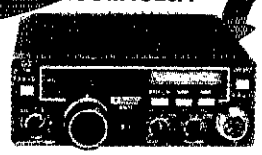

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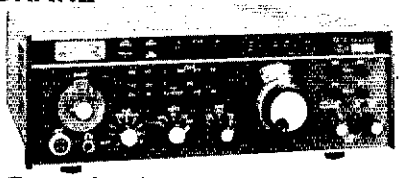

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496 Keyboard	299
525B RF Processor	109
524 Phone Patch	59
901 300W Tuner	54
940B Tuner w/Meter	72
941C Tuner w/Meter	79
949B Deluxe Tuner	129
989 Deluxe 2KW Tuner	289

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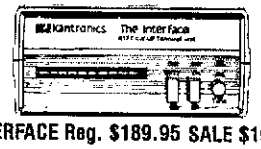

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that club with an interesting talk. It is interesting to meet so many amateurs and see what active clubs are around. Welcome to So. Cal. AD7G. Your help in NTS is great. We're looking forward to more reports in the future. OO activities: K6CL 4; KD6NL 4; K6KA 20. Traffic: K6UYK 632, KT6D 214, WA6OCM 151, W6INH 145, AD0A 47, W6NKE 28, N6DZQ 14.

ORANGE: SCM, Fred Heyn, WA6WZO — ASCM: WA6WZN. STM: WA6QCA. SEC: W6UBO. All clubs are encouraged to affiliate with ARRL and possibly gain special service status as well as join the LA and/or Orange Councils. Each club should have a PR person and should support the club-to-club net 7:30 P.M. Wed. 147.705 (−.6) MHz K6QON/R with W6NAZ as NM. New club officers for 1983 — Riverside ARC: KA6TUO, pres.; KN6U, v.p.; N6WS, secy.; WA6EBH, treas. Rio Hondo ARC: WA6GEV, pres.; KA6ETP, v.p.; WA6GCV, secy.; WB6ISR, treas. So. Calif. AR Computer Club: NI6R, pres.; WA6VSE, v.p.; VE7DLW/KA6WAH, secy.; KA6CFN, treas. Orange Co. ARC: W6IBR, pres.; KA6IIJ, v.p.; W6HHC, secy.; W6MIY, treas. OCWA So. Calif. Chapter: W6PHE, pres.; WA6HOQ, v.p.; W6CBA, secy./treas. Tri-County ARA: KF6E, pres.; K6TOS, v.p.; N6DTD, secy.; WA6CZZ, treas. West Coast ARC: KA6OMZ, pres.; KA6NOR, v.p.; KA6RRR, secy.; KA6TSA, treas. Western ARA: N6AWF, pres.; KE6JS, 1st v.p.; NC6H, 2nd v.p.; WB6BIM, secy.; N6DWR, treas. Downey ARC: WB6BFK, pres.; W6OWA, v.p.; WA6LVQ, secy./treas. Citrus Belt ARC: WB6OGL, pres.; N6CGG, v.p.; WA6YRF, secy.; WB6QFH, treas. Victorvally ARC: W6OUU, pres.; K4KUN, 1st v.p.; WA6JYA, 2nd v.p.; WB6QFU, secy.; WA6YBG, treas. Desert Waves (Blythe): WA6HRE, pres.; W6GUP, v.p.; KA6QAZ, secy.; N6ANL, treas. The Inyo Co. Administrator M.B. Hanford expressed his gratitude to DEC WB6YZY and the Inyo ARES organization for their assistance in the recent flooding problems where EC W6DQR, with the help of WCARS and NTS, handled all health and welfare traffic from Bishop. IDEC (Irvine) and MESAC (Costa Mesa) are working together on parades and other events, as well as developing message handling and OC Fire Dept. training.

Net	Freq.	Time	QNI	QTC	NM
SCN/1	3598	7 P.M. Dy	360	392	K6XI
SCN/2	3598	8:15 P.M.	205	180	K6HAP
SCN/V (FM)	146.045/645	9 P.M. Dy	513	431	WA6QCA

Traffic: KS6T 794, N6GIW 570, N6ANL 470, W6NTN 296, WA6QCA 222, WB6QBZ 213, AI6E 167, K6XI 82, W6RE 73, KA6HJK 71, KA6BNW 70, W6CPB 23, WB6LGL 16, W6TKV 8, WA6WZO 2. (Oct.) W6RE 33, WD6FEM 4.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. The City of San Diego needs Amateur Radio operators for its Emergency Management Volunteers program (formerly civil defense). Training is provided to promote proficiency in operating during disasters. Contact Bill Wolf at 236-6876 for info. November ARES activities included Red Flag Patrol, Mother Goose parade (coordinated by KM6S), Heart Assn Marathon (coordinated by W6THR), and, at request of City of San Diego, tornado watch with WB6TQF KM6S N6BUK and W6UZL participating. Upgraded: to Advanced-WA6AFS; to General-WD6CWZ; to Technician-KA6WLQ. W1LE reports antenna problem solved with radiating flagpole on 10, 15 & 20. North Shores ARC's club station license, K6HAI, will be used in the San Diego (city) Emergency Operating Center whenever it is activated. The EOC has 2M and 1-1/4M capability. KT6A made BPL again in November. Keep up the good record! North Country Traffic Net held 29 sessions and handled 167 messages. Traffic: KT6A 757, KM6I 343, K6HAP 291, KU6D 185, KB6AI 107, N6AT 33.

SANTA BARBARA: SCM, Robert N. Dyruff, W6POU — New ARRL sctn organ. opens new posts for members desiring to support Amateur Radio: membership svcs, tech. Advisors, legal/legis. Advisors, clubs & trng, publ info & news; bulletin mgr.; publications; QRM task force; rptr coord. and more. Will you help? KJ6R will. He assumes SEC (Sctn. Emerg. Coord.) post. Bkgnd includes Antarctica, Alaska-E.C., pilot, FAA Mgr., computers, cw, dx, RTTY, contesting. Welcome! New emerg. calling freqs set at 3952/7275 kHz by AE6N-(Ass't Dir.) after S.W. & Pacific Div. heads concur. SLO Diablo Canyon wildfire comms in support of Cal. Div. Forestry provided by EC WB6IIY, EC W6MSG, WA6ZBE WB6TXP W6HDQ and WB6RHR shown in *Telegraph-Tribune* story. Welcome CDF Capt. Gibson, now N6HMZ. Held CDF-VIP mtg. Arroyo Grande on year's work and plans. AB6S/W6FLL led 2 dozen ops in county-wide support for nite hospitals drill by SBar Co. OES Coord. Silva WA6HCX. Incl: Lompoc, S.M., S.Y., SBar on WB6RDV/R, N6ZF/R. Credit N6DJL with 911 rptr access instructions in *ORBIT*. W2KVA concludes good year as editor and pres. again. SCN-SB Tfc Net tops 1,000 count first year. Tnx KA6JWK/K6YD. Simi Settlers new rptr K3HZP/R 147.165/765. Sked Goldstone Trkg Stn for March meet. Holding Gen'l & Adv. classes now. Poinsettia ARC offering Novice & Gen'l. SBARC re-elects Board on term shift, added v.p. WD6BNH as ARRL liaison. K6TZ/R S.C. Island 222.32/223.92, back after lightning strike. Paso Robles ARC elected KJ6R pres. Meets 1st Mon. 1930PT at firehouse plus Sun. bkfst. ECs W6MSG/XE2MSG; KA6Q/XE2Q operated Baja 1,000 mi. race checkpoint comms. OO W6PN reports show many errant amateurs in unauthorized 10.109-10.115 in new band. Traffic: K6YD 178, W6JTA 63.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — ASCM: WA5QFD. SEC: W5GPO. STM: W5VMP. NMs: AA5J WD5JYI AE5I KA5LLT. The annual year-end purge of "deadwood" from the appointee file is complete and the following is our current list of appointees as of Jan. 1, 1983, with the exception of ECs, which will be covered in a special ARES column later. District Emergency Coordinators (DECs): W5TOC WB5DUQ WD5AFP WA5DTC N5OX K5SQA K5IID WA5KZA W5MVJ WB5LAT AE5I K5MWC WA5UTA N0AJP. Official Bulletin Stations (OBS): K5KQG W5GPO K5IID W5QXK W5GN W5PBN WB5LAT W5YK. Offical Observers (OO): K5FO K5PC KB5GU K2SCU W5ARV. Offical Relay Stations (ORS): KC5FX W5VMP K5SOR N5BT W5HMR N5DKW AA5J WA5QFD WB5LAT W5YK WD5JYI KB5UL AE5I. Official Emergency Stations (OES): K5HGX WD5JYI. Appointees must report at *least* four times per year to retain appointments and, of course, be a League member in good standing. If you are interested in an appointment, write me for an application. My address is at the bottom of page 8, this issue. New officers for KCARC (Abilene) are: AG5F, pres.; KA5NBW, newsletter; KA5OIG, secy.; K5MWN, trng.; N5ANO, treas. The Paris ARES group is sporting five new sirens for city-wide coverage, a new EOC, and EC-WB5JFL has updated the emergency plan

for Lamar Co. Too bad it takes a disaster to get the city fathers into gear, but this is an old fact of life. The Texins ARC (Texas Instruments) has renamed its club station, the Carroll E. Smith Memorial Station, in memory of the late K5DM. New NM for the Panhandle Tfc net is K5IKL. The net meets at 1800L daily on 3933 kHz. Let me take this opportunity to thank all the clubs and editors for sending me their newsletters each month. This column would be very short without all the fine input. Now's a good time of year to R&R those generators, power cords, and portable antennas, and get the quick response kit in order for spring. PSHR: KA5AZK N5FDL N5BT KB5UL WA5QFD N5EMJ KC5NN N5EZM N5DKW N5FCZ KD5FR WB5LAT KA5LLT. Traffic: N5BT 435, KB5UL 201, KA5AZK 161, KA5LLT 78, N5FDL 76, N5EMJ 53, KD5FR 48, KC5NN 46, WA5QFD 45, N5EZM 39, W5PBN 38, WB5LAT 36, N5DKW 34, W5ERT 34, K5HGX 25, N5FCZ 24, K5PC 13, K5SOR 5.

OKLAHOMA: ASCM, Ray Miller, W5REC — SEC: W5ZTN. NMs: KV5X WD5IFB WA5ZOO W5ZTN WA5OUV. These are the Net Managers of the OLZ, STN, OFON, OPEN and OTWN nets respectively. Thanks to each of them for the efforts they have expended daily to provide a service to the public and to the National Weather Service. The average messages handled per month, from August through November, is 1988. This represents a lot of hard work by all the operators. There has been an average of 308 weather reports per month — that takes a lot of thermometer tilting! W5ZWM and WD5EAA report that they and ten others attended the American Red Cross Disaster Services Training in Kay Co. They report that a lot of good information was gained. W5OFG reports that K5HUZ is mending nicely after suffering a tower raising accident. Remember "Safety First" if you plan any antenna work for the spring! Radar in Woodward is coming along great as reported by KB5XI. Traffic: K5CXP 253, W5AS 240, W5REC 226, KV5X 207, W5RB 188, WB5ELG 162, KA5CXW 154, KB5EK 139, W5VXU 94, WA5OUV 64, WB5EAY 52, WD5JCE 42, KB5XI 41, WD5IFB 39, W5SUG 36, W5VLW 25, WA5OGC 25, W5VOR 20, WA5ZOO 19, NØIN 10, K5CAY 9, KC5OU 6, WB5LSW 3.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — TM/ASCM: N5TC. SEC: WA5RVT. OO report: K5VRF. BPL: W5SHN W5TFB N5DFO WB5YYD. Congrats to upgraders: K5MBI to General; KA5PAK to Technician; WB5SHV to Advanced. ORS/OBS N5FN busy with seasonal activities and has new Yaesu FT-102 with accessories. EC AB5X is on RTTY and the new 30-mtr band; he likes both. ORS N5CRU also operational on RTTY, amateur and MARS. DRN5 mgr WB5YDD reports STX represented 100% by W5KLV K5KJN W5SHN WB5YDD N5DFO W5CTZ N5CRU W5URN K5WOB WA5RVT KD5KQ & N5AMH. CAND mgr W5KLV says DRN5 represented 100% by STX stations KD5KQ N5AMH W5SHN WB5YDD W5KLV N5DFO N5CRU W5URN WA5RVT. Texas Southmost ARC plans to send Christmas messages from area RV parks. OBS W5KLV made 113 readings of ARRL bulletins. That is "spreading the word." Traffic: W5SHN 1638, W5TFB 653, N5DFO 635, WB5YDD 518, W5CTZ 461, W5KLV 272, N5TC 180, N5CRU 104, N5AMH 102, AB5X 96, N5DAA 60, K5HZR 52, WD5GKH 45, KA5KRI 33, W5BGE 30, WA5RVT 29, W5KR 26, K5RVF 6.

Why I Love My Alpha 78.

It's just incredible.

I want lots of rugged, dependable power without sacrificing simple, no-tune-up operation. My ALPHA 78 gives me maximum legal power in any mode with a big margin of safety—and with no duty cycle or time limit. Even a rough 48-hour contest doesn't get it hot and bothered. Yet I can change bands instantly with just the flick of a switch. Nothing but an ALPHA can do that!

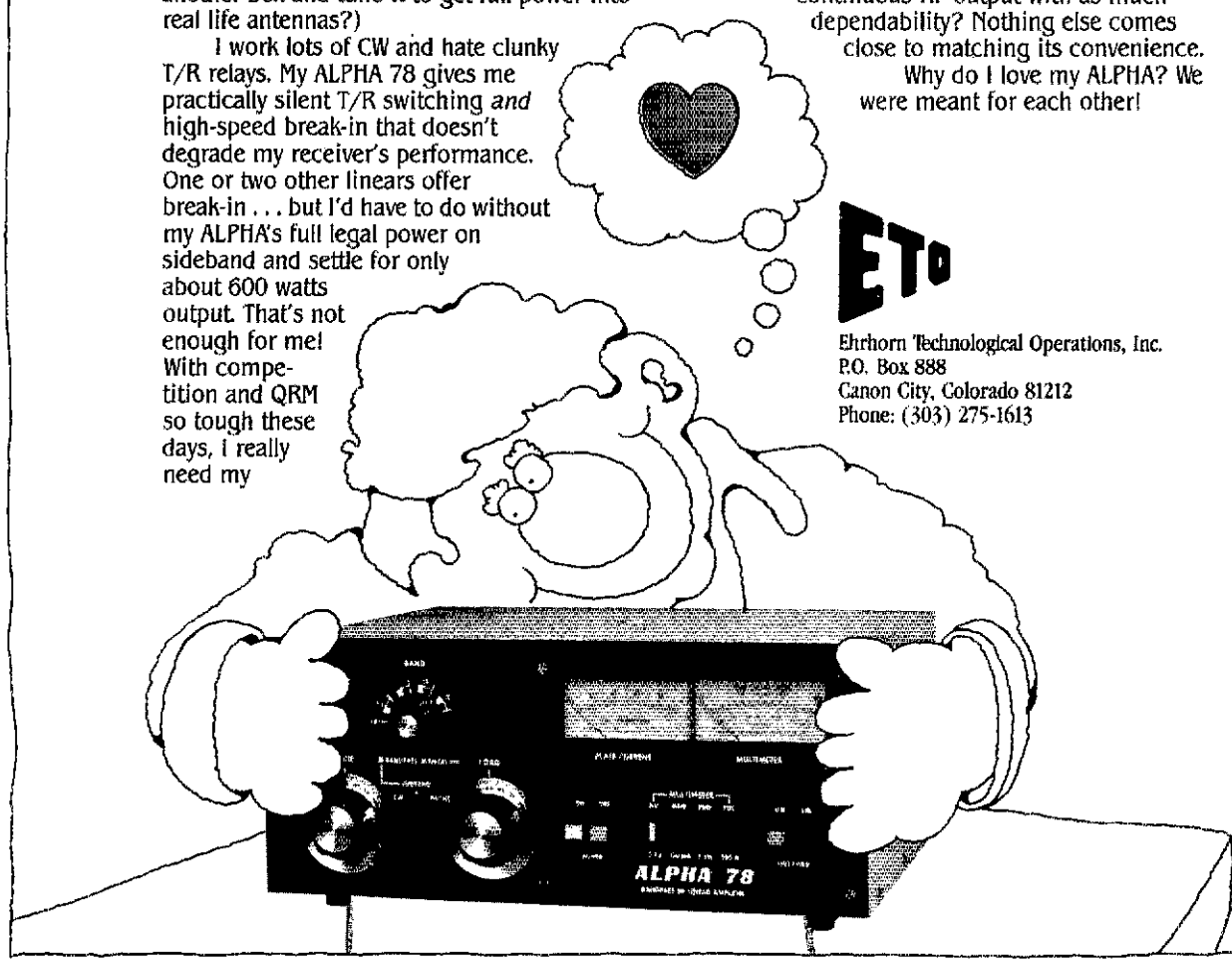
I insist on full power, even on a few favorite frequencies where my antenna SWR isn't too good. My ALPHA 78's auxiliary manual controls let me get full output even into a 2:1 SWR. I don't know of any other no-tune-up linear that has the ability to deliver full power into that kind of a mismatch. And with no antenna tuner! (After all, what's the point of having a "no-tune-up" linear if I have to clutter up my station with another box and tune *it* to get full power into real life antennas?)

I work lots of CW and hate clunky T/R relays. My ALPHA 78 gives me practically silent T/R switching *and* high-speed break-in that doesn't degrade my receiver's performance. One or two other linears offer break-in . . . but I'd have to do without my ALPHA's full legal power on sideband and settle for only about 600 watts output. That's not enough for me! With competition and QRM so tough these days, I really need my ALPHA's "full gallon" on all modes—*especially* sideband!

I'm not an electronics engineer, so I need an amplifier that works—and keeps on working. And if something should go wrong, I'd really hate to have a big hassle getting it fixed. My ALPHA's three year (limited) warranty protects me twelve times as long as the 90 days that's the industry standard. That says *everything* about how the ALPHA is built and how it stands up to hard use!

Finally, it'd be a real pain to have to collect a gang of gorillas with a hand truck whenever I want to move my linear. My ALPHA 78 takes up only about one cubic foot of space and I can easily handle its 50 pound weight. In fact, I never have to lift more than 35 pounds if I remove the plug-in transformer first. How many other amplifiers . . . even those weighing far more than my ALPHA . . . can deliver as much continuous RF output with as much dependability? Nothing else comes close to matching its convenience.

Why do I love my ALPHA? We were meant for each other!



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Phone: (303) 275-1613

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a Sunday, the Ham-ad deadline is the previous Friday.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc, is not permited in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, 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.

CQ and QST 1950-1982 also 73 and Ham Radio issues for sale. Two dollar minimum order. Cost 50 cents each 1976 and later issues, all other 30 cents each including USA shipping. Send SASE, chronological order and payment to W6LS, 2814 Empire Avenue, Burbank, CA 91504. Available issues and refund sent within one month.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

CINCINNATI ARRL '83 - Hamilton County ARPSC invites all hams to participate in the third annual Ohio State Convention. Two full days of amateur activities; forums, meetings, exhibits, Wouff Hong, flea market, and much more. This all-indoors activity will take place on Saturday & Sunday, February 26 & 27. For further information contact Cincinnati ARRL '83, Committee for Amateur Radio, P.O. Box 46311, Cincinnati, OH 45246. Dealer and exhibitor inquires invited. Registration $4, Flea Market $3.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

FOX-TANGO Club Newsletters for Yaesu Owners. Back issue (1980/1981) looseleaf sets $6 each, both for $10 while they last. Fox Tango Club, Box 15744, W. Palm Beach, FL 33416.

YAESU Owners — Join your International Fox-Tango Club — now ending its eleventh year. Calendar year dues still only $8 US, $9 Canada, $12 airmail elsewhere. Don't miss out — get top-rated FT Newsletters packed with modifications monthly, catalog of past modifications, free advertisements, technical consultation, FT Net (Saturdays, 17ØØZ, 14.325 MHz), more. 1982 or 1983 sets $8 each; both $15. Send dues to FT Club, Box 15944, W. Palm Beach, FL 33416.

W.A.R.A. Warren, Ohio Hamfest has been set for August 21, 1983.

NEW JERSEY: The Irvington RAC Hamfest is Sunday, March 13th, from 9 A.M. to 4 P.M. at the P.A.L. Building, 285 Union Avenue, Irvington, New Jersey. Take the Garden State Parkway to Exit 143 North or 143A South. Talkin on 34/94 and 52. Refreshments. Admission $1. Tables $3. Reservation: contact Ed WA2MYZ 2133 Stanley Terr., Union, N.J. 07083 — evenings 201-687-3240.

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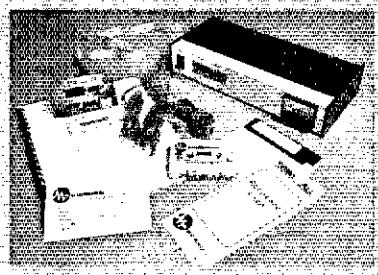

TERMINALL is a hardware and software system that converts your personal computer into a state of the art communications terminal. Terminall features simple connections to your computer and radio plus sophisticated and reliable software.

Simplicity

TERMINALL was designed from the outset to be easy to connect to your radio and easy to use. Plug into your receiver headphone jack and copy Morse Code or radioteletype (RTTY). Plug into your CW key jack and send Morse Code. Attach a microphone connector and send Baudot or ASCII RTTY using audio tones (AFSK). That's all there is to hooking it up.

The software is loaded into your computer from disk or cassette. Enter your callsign and the time and you will start receiving immediately. No settings or adjustments are necessary to receive Morse Code, it's fully automatic and it works! You may type your message while receiving or transmitting.

You will be on the air, receiving and transmitting in any mode, in minutes. As we said, TERMINALL is simple.

More for your money.

■ TERMINALL has the RTTY terminal unit - demod and AFSK - built in. This results in a lower total cost.

■ **Fantastic Morse reception.** Six stage active filter demodulator copies the weak ones. Auto adaptive Morse algorithm copies the sloppy ones. Received code speed displayed on status line.

■ **Outstanding documentation.** Professionally written, 90 page user manual contains step-by-step instructions.

■ **Built in, separate, multi-stage, active filter RTTY and CW demodulators.** No phase lock loops. RTTY demodulator has 170 and either 425 or 850 Hz shift- keyboard selectable - and uses either the panel meter or scope outputs for easy tuning. Copy the weak ones. Copy the noisy ones. Copy the fading ones.

■ **Built in crystal controlled AFSK.** Rock stable for even the most demanding VHF or HF applications. A must on many VHF RTTY repeaters.

■ **Built in 110 or 220** volt AC power supply.

■ **Built in parallel printer driver software.** Simply attach a parallel ASCII printer (e.g. the EPSON MX-80) to your printer port to obtain hardcopy in all modes.

■ **Multi level displays** - allows examining and editing of historical text.

■ **Word wrapping,** word mode editing, diddle, ignore carriage returns, user programmable end of line sequence, adjustable carriage width, multiple user defined WRU, transmit delay (fixed, none or auto adaptive), break mode and more!

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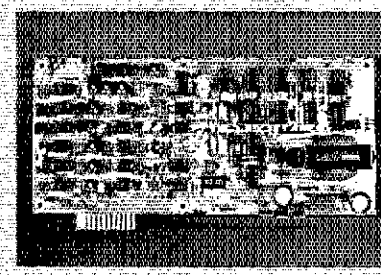

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TERMINALL T2 Communications terminal for the APPLE II. Requires an APPLE II or APPLE II PLus with 48K RAM and disk. Software is provided on disk in DOS 3.2 format. Use MUFFIN utility to convert to DOS 3.3 format. Includes software on disk, assembled and tested hardware and an extensive instruction manual. **$499.**

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DELUXE QSLs. Samples 25¢. Petty, W2HAZ, P.O. Box 5237, Trenton, NJ 08638.

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QSLs by W7HUL. Samples 50¢ 8511 19th Ave. N.W., Seattle, WA 98117.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

WOODGRAINED QSLs. Beautifully printed. You have to see them. Write for free samples. Ham Graphics, Box 244Q, Camden, NY 13316.

QSL samples — 25¢ Samcards · 48 Monte Carlo Dr., Pittsburgh, PA 15239.

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EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

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COLORFUL QSL's - including Day-Glows and Woodgrains. Samples 50¢. (Refundable with order.) Specialty Printing, Box 361, Duquesne, PA 15110.

QSLs, Catalog 50¢ N&S Print, 2523 West Orangewood Avenue, Phoenix, AZ 85021.

QSL Cards by reliable company with 17 years experience. Amateur QSL Cards (Standard Designs and Design-your-own). Also available are our own-designed State Cards. Top quality, reasonable prices. Free catalog and samples. Write: Mail Order Expess, Inc. P.O. Box 703, Lexington, NC 27292.

QSLs by W6BA "customized" $19.75 per 1000. Star Route 2, Box 241, 29 Palms, CA 92277.

LOW COST QSLs samples s.a.s.e. Koepke, 6 Katherine Road, Albany, NY 12205.

FINEST custom QSLs, large cut catalog and samples. $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

SELF-STICK labels with call, name, address 200 for $3., 500 for $5. N1BIC, 70 Florida Hill, Ridgefield, CT 06877. Free postage!

NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing, instructions included. Stamp appreciated.

PICTURE QSL cards of your shack etc. from your photograph or black ink art work. 500 $21, 1000 $29.50. Send stamp for illustrated literature. Generous sample pack $1; half pound of samples $2. Custom printed cards, send specifications for estimate. Raum's 4154 Fifth Street, Philadelphia, PA 19140. Phone: 1-215-228-5460.

WOOD Call Letter Desk Plaque, meticulously carved and handsomely finished. Makes a great gift! See our ad on page 185, Nov. 1982 QST. Free information. W9OB. 1625 Whittier Lane, New Castle, IN 47362 317-529-2149.

QSL samples 40¢. Pioneer Press, 3241 Normandy Lane, Green Bay, WI 54303.

QUALITY QSLs from $19.95/1000 ppd 48 states. All types. Discounts 5K or more. See ad-page 203-Nov. QST. Legal 40¢ SASE or 50¢ brings samples. DX-Print, N5CMI, Box 272, Plano, TX 75074.

RUBBER Stamps custom made to your satisfaction. Free literature. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

General

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SELLING collection QST's from 1922, CQ's 73's HR's, books, antique radios, antique tubes. Send $1 or SASE for list. Wanted: back issues VHF Communications Magazine, Atwater Kent breadboard series, antique televisions. VE3BVX 58 Albert North Lindsay Ontario Canada K9V 4J8.

TELETYPEWRITER parts, manuals, gears, tools, supplies. Toroids. S.a.s.e. list. Typetronics, Box 8873, Ft. Lauderdale FL 33310. Buy unused parts, cash or trade.

SERVICE by W9YKA. Professionnal grade lab, FCC 1st class license. Amateur and industrial ssb-fm equipment. Repairs, calibration, modifications, consultation. Reasonable rates. Write or call Robert J. Orwin, Communications Engineer, P. O. Box 1032, La Grange Park, IL 60525. 312-352-2333.

WANTED: Radios, parts, books, magazines before 1928. W6ME 4178 Chasin Street, Oceanside, CA 92054.

VERY Interesting! Next 5 issues $2. Ham Trader Yellow Sheets, POB356, Wheaton, IL 60187.

TEFLON, s.a.s.e. W9TFY, Alpha IL 61413.

COLLECTOR wants to buy battery radios made before 1929, pre 1940 TVs, wireless gear, crystal sets, early parts, tubes, magazines etc. Top price to buy battery radios made before 1929, pre 1940 TVs, wireless gear, crystal sets, early parts, tubes, magazines etc. Top prices paid. Jacobs, 1 Eighth Street, Pelham NY 10803.

VHF/UHF high power amplifiers. SASE. Fred Merry, W2GN, PO Box 546, 35 Highland Drive, East Greenbush, NY 12061. 518-477-4990.

COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin TX 78745.

MOBILE Ignition Shielding gives more range, no noise. Kits and custom systems. Literature. Estes Engineering. 930 Marine Dr., Port Angeles WA 98362.

HAMS for Christ. Amateur Radio bible tracts. New address — Dave Friar, AF8D, 4656 Krental Street, Holt, MI 48842. Nets 14300kHz at 2100Z; 7230kHz at 2200Z. Info: In South Pacific/Oceania write to - ZL1UE, in New England, - AC1Y.

MOTOROLA: Marine, SSB, FM. New, used, up to 75% off. Ralph Hicks, Tulsa. Phone 918-266-2525.

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WANTED — old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

WE Buy Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, 321 Pennsylvania Ave., Linden, NJ 07036. 201-486-3365.

MIRROR -in-the-lid, spinning disc, and other pre-1946 T.V. sets, parts, literature wanted for substantial cash. Finder's fee paid. Arnold Chase, WA1RYZ, 9 Rushleigh Road, West Hartford, CT 06117 203-521-5280 (collect o.k.).

MANUALS for most ham gear made 1937/70. Sorry no individual quotes given. Our current, 18 page, 'Manual Catalog' requied to order, $1 postpaid. HI-Manuals, Box C-802, Council Bluffs, IA 51502-0802.

KNOW FIRST! Ham radio fanatics. You need The W5YI Report,- twice-monthly award-winning Hot Insider Newsletter. Acclaimed best! Confidential facts, ideas, insights, nationwide news, technology, predictions, alerts! Quoted coast-to-coast! We print what you don't get elsewhere! $18. annually w/money back guarantee! Free sample - S.A.S.E. (two stamps) W5YI; Box #10101-Q, Dallas, TX 75207.

WANTED: McIntosh and Marantz tube type audio equipment. Marcus Frisch WA9IXP, P.O. Box 385, Elm Grove, WI 53122 414-475-5356.

CALL Toll-free 800-327-7798. Ask for Bob Hoffman. Jaro Electronics Corp. We buy all types of tubes. Top prices paid for Varian, Elmac, Amperex, RCA, Western Electric, Raytheon, in Florida Call toll free: 800-432-8524. Address 412 27th St., Orlando, FL 32802.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

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- ★ CW Proficiency Awards
- ★ Amateur of Year Award
- ★ Special Achievement Awards

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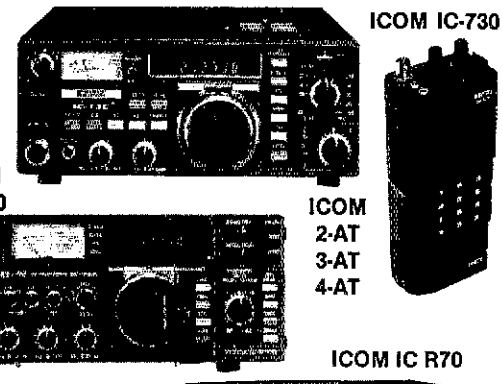

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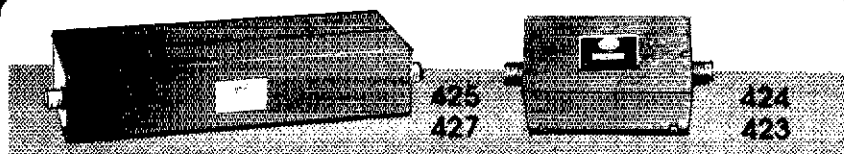

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WANTED: h.b. 811 linear as shown in 1964 ARRL Handbook, page 184, or someone to build this for me. Nothing fancy, just gud and tested out. Frank Lewis, K8GKR, RR5, Box 800, Lima, OH 45801.

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COLLINS 30S-1 linear, mint condition, $1395. Bill AA6S 209-732-7163.

KENWOOD TS-820 SSB transceiver. Includes: DG-1 digital display unit, YG-88C 500 Hz CW crystal filter, complete operating manual & service manual. Excellent condition, very little use, scratches. Even have original boxes & packing. I will ship within 48 continental states ppd & insured. $625 postal money order. Rick, KA8IGB, 3636 Plaza Drive., Bloomington, IN 47401. 812-825-2092 evenings.

FOR SALE: Collins S-51J-4 $250; HW-12A ac/dc $125; Drake T-4XB $350; Hallicrafters SR-46 ac/dc with HA-26 VFO $150; MOTRAC U63HHT-1130A 2mts. $200, New 4CX250's $48; Heath Vectorscope $50; HP-400C $50. W2IPI 609-784-8363, 10 Woodbridge, Gibbsboro, NJ 08026.

COLLINS KW-1, excellent condition, can arrange shipping. $3995 or best offer. Mansbach, 201-666-3460, evenings.

ALPHA 374A under warranty, 10 meters $1575, Icom IC-720, PS-15, SP-3 CW & AM filters $995, Drake MN-2700 $275, TET 3-element tribander $100. Harvey, AD2S, 212-263-3494 after 8 P.M. Sun-Thurs.

SALE: Drake TR3, operating, speaker, mike, power supply. Make offer. WA@WHZ. 515-332-1613.

HF TRANSCEIVER: Sell Yaesu FT-101ZD with 10 MHz. Mint condition. With FV-101Z VFO, 600 Hz filter and fan. Will ship in original cartons. $750. Lee Aurick, W1SE, Mon. and evenings 203-666-8048. Tues. through Fri., 7:30 to 5:30, 203-667-2494.

IF your Kenwood 820S is now backup rig, sell me the digital display. Need DG-1A. N7AVJ, 801-586-6015.

ANTIQUE Radios — Estate sale of old radios, keys, parts, and large collection of very old books — SASE for list. W3ZD, 520 Centennial Road, Warminster, PA 18974, 215-675-4539.

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HW-101, PS-23B power supply, CW filter, alligned by factory 10/80, excellent condition. $200 Ed WA7DAX 801-966-5077.

SELL: Kenwood TR-7850. Excellent condition $290. Heathkit HW101 and PS-23 excellent condition $370. Heathkit HR-1680 receiver $130. Brian Shiptuski, 228 Highland Avenue, Trucksville, PA 18708, 717-696-2555.

WANTED: Drake R4B, MS4, MN-2000. Write KX2B, 16 Clark St., Painted Post, NY 14870.

COMPUTER, TRS-80, Model III, 48K with cassette & Quick-Printer II for sale $890. Will trade for late model VHF Transceiver. Lots of software. Joe Schilling, 1409 S.W. 66th, Oklahoma City, OK 73159.

MINT cond: Complete Model 19 Teletype unit consisting of printer/perforator; transmitter/distributor; large table (factory standard); power supply unit; and typing reperforator. All units bagged, crated and palletized for frieght shipment. Sell at best offer. W. A. Stallings, K3NKL, 23 E. Marshall St., West Chester, PA 19380.

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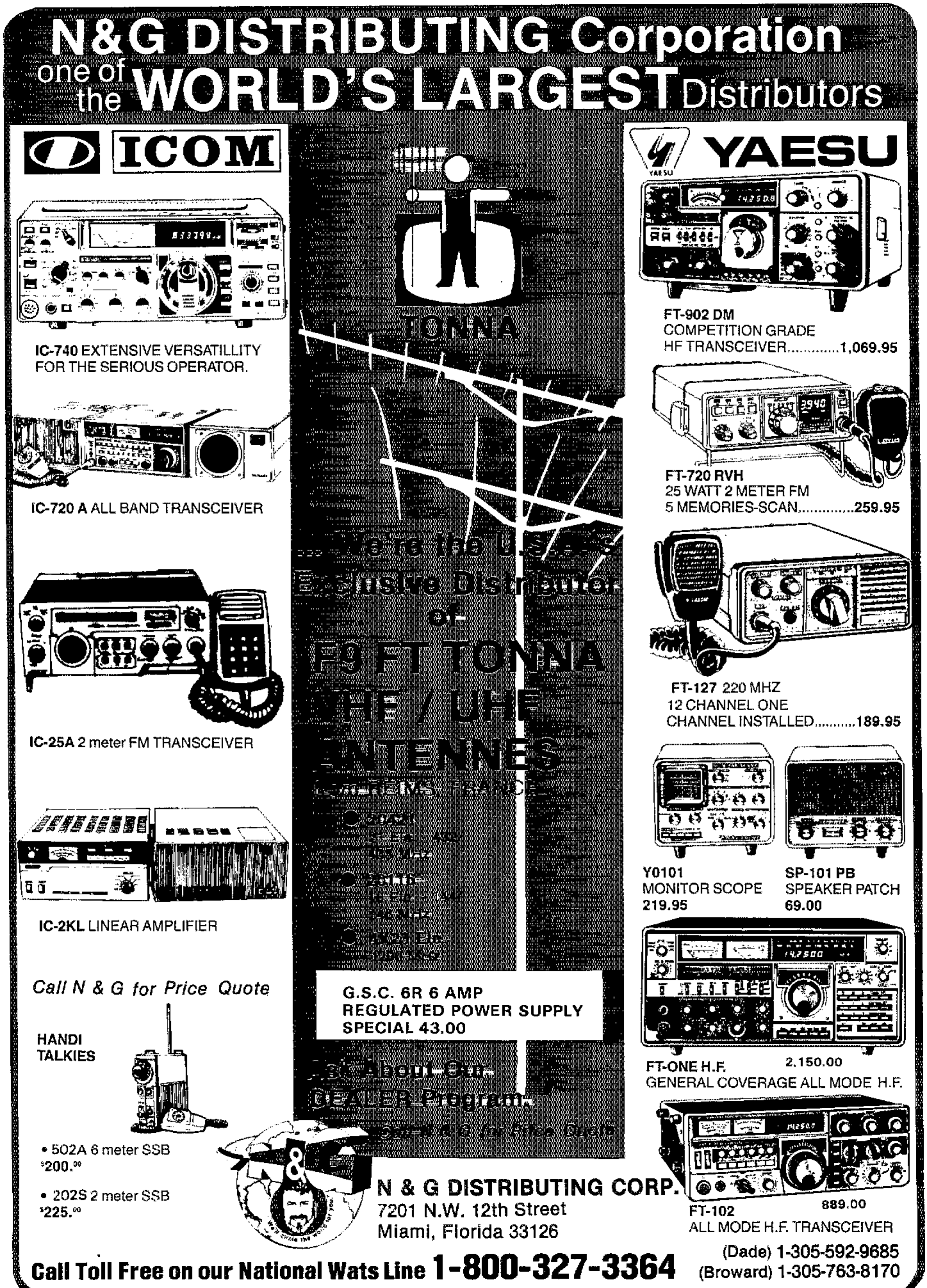
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ICOM M25D VHF/marine radio telephone. Unit is brand new, never used. $449. WB5IUU, 713-578-7357

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KENWOOD TS-180 in mint condition for sale, without power supply. $665 or best offer. Tel 702-852-1298. W7MRN.

KENWOOD: TS-520SE $490. Inquire WD6DUH, 114 2nd St., Livingston, CA 95334.

FOR SALE: Oldies or goodies: classics: Heath DX-60B xmtr $75. Heath HG-10 VFO $30. (Together: $95) SB-33 xcvr: $125. (All three: $195) Griffin, W8MEP/5, 6140 Pino Real, El Paso, TX 79912.

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DRAKE T4XB, R4B; mint unused since factory alignment, with manuals, AC-4 power supply, MS-4 speaker, microphone; $590 complete. KB3SY, Box 425, Bowie, MD 20715. 301-262-5083.

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IC22S mint condition w/ac supply $125. Tom Dornback, 2240 74th Court Elmwood Park IL 60635.

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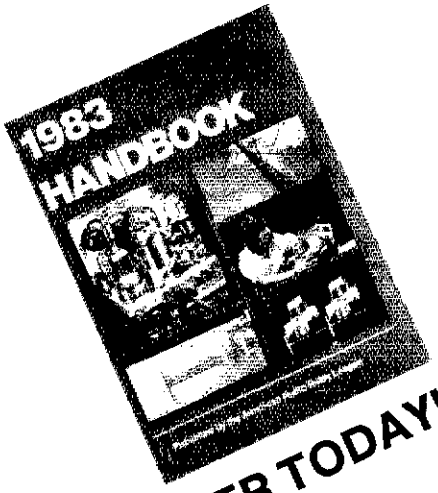

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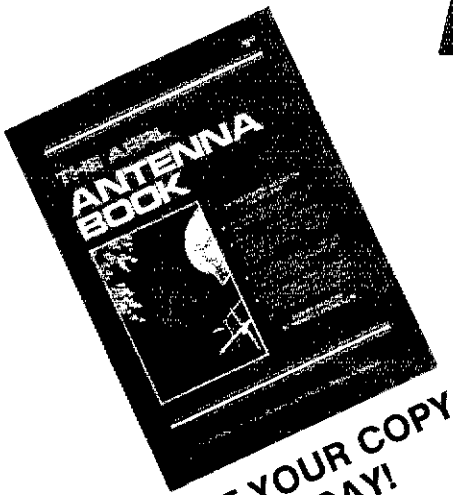

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WANTED - linear SB-221 or SB-201 Tom W2WCE 201-444-6605.

MUST SELL; Hal DS-2000KSR keyboard, ST-5000 demodulator, EHM-914 monitor. Together only. $475. Stan Gantz, WB5TGL 505-538-5091 evenings or 505-538-3941 days.

HEATH H88/H89 parts: H17-1 single sided disk drive, $195; H88-1 hard sectored disk controller, $90; H88-16K RAM Board, $75; All in excellent condition. Cost over $600 new, will sacrifice all for $350 and ship prepaid UPS. Barry Wright, KA7U, 322 NW 18th Street, Ontario, OR 97914 503-889-4546.

TEMPO1 (FT200) transceiver, p.s., manual original owner, mint, $300, Howard, W2HKE/3, 215-399-8977.

WANT FL-250 filter for R4C. Sell Ham-Key HK-1 lambic paddle $12. W1FJ 180 Denquarry Rd., Lynn MA 01904 617-598-3744.

HEATH SB101 transceiver, complete with HP23 power supply, speaker cabinet and CW filter, $325 or make offer, Cliff, WA8ZAZ, 432 Wallace, Chicago Heights, IL call after 6 PM 312-754-2751.

WANTED: Old bugs for my telegraph and radiotelegraph key collection. I am trying to find each make and model of bug manufactured before 1950. Vibroplex, Martin, McElroy, Bunnell, Mecograph, MacDonald, etc. Also looking for Spark keys, sideswipers, cooties and keys of historical significance. 73 de K5RW Neal McEwen 1128 Midway, Richardson, TX 75081.

TI99/4 Ext Basic tape programs: CW practice, SSTV keyboard. Write Sam Moore, Sr., AC5D, Box 388 Stigler, OK 74462.

SELL: 180-foot utility broadcast tower, $1000; Viking Ranger I, $75; HT30 linear, $75; HRO50TI, coils, $145; 1934 McElroy bug, $55; Viking I, WARC, VFO, $75; Viking II, WARC, VFO $85; CE-20A, VFO $55; mint Yaesu FT101E in box, $500; Collins 75A2, $125; Murch UT2000, $95; Mint Regency HR2B, mike, box, $100; 1948 Dumont 2M rig, $50; 1933 Silver-Marshall ham receiver, needs work, $75; 100-foot pop-up mast, trailer, 2.5 kW generator, rotor, compressor, KLM 80M dipole, 1966 International Communications Truck, guys, anchors, etc, $6,000. (F.O.B.) K8CCV 216-427-2303 weeknights 6-9 P.M. want to buy Eimac 1000T Teirex 80M.

TWO 12-Volt 50-watt AM transceivers, covers 160 and 80 meters. 50 each plus shipping. B&K 415B TV Sweep Marker Generator, $250. K7GFL/6 PH209-924-8566.

PRESIDENT Reagan supports the students at Junior High School 22 on Manhattan's Lower East Side. How about YOU? WB2JKJ via Callbook for details.

URGENT: Need manual and schem. For Delcon Corp lin amp T210 and power supply PS210. Will pay well for copy or loan and will make own copy and return. W6THZ/4, 120 Ridgefield Dr., Wetumpka, AL 36092.

ROBOT Model 70 SSTV, mint condition, I'll ship $170. CP5MD/W6 Marco, P.O. Box 265 Woodland Hills, CA 91365 213-344-2290.

TEKTRONIX 545 oscilloscope with CA plug-in. $175. Orville Wright, WD6CPN 5928 Sandwood St. Lakewood, CA 90713.

WANT rotator for parts: Roto-Brake 400 W6OR evenings 415-841-0148.

KENWOOD TS-120-S transceiver $435, and Kenwood R-300 general coverage receiver $165. Both units mint. Prices firm, you ship. A.C. 915-677-3875, W5SGT.

PACE Communicator I, 2MHT, TouchTone pad, 8 crystal pairs, mobile bracket-charger, desk charger, mint $125. KA9JYO 219-464-9207.

GONSET Communicator III. Two-meter band. Excellent condition $60. Pick-up only. W2MCD 212-383-6654.

ROBOT 400 — 2 yrs old - mint - no mods. $500. Fred, WA4JTJ, 502-622-6723.

DRAKE R7/DR7 #1074, 15 hours use, SL-300cw, SL-2300ssb, SL-4000am. Paid $1,399 - sell $899 firm - u ship. N7DNL, 307-325-9546, Hanna, WY.

ICOM IC-730 with CW and PBT filters. Perfect $675 or trade for Omni-D Series C. I ship. N9CDD/5. 617 Kimberly, Biloxi, MS 39532.

YAESU FT901D with 8 pole SSB filter. Excellent condition. $485 W7TF phone: 208-437-4146.

FOR SALE: Kenwood TS-120S, PS30 pwr supply, MC-50 mic. excellent condx. $550. Pickup preferred. WB1GOO 203-529-5577.

VFO-120 Super mint condition. About 2 months of use. can be used with TS-130, TS-830, TS-530. Prefer trade for 2-meter rig. S.a.s.e. for response. No collect calls. State condition of rig and terms. Please call before 10 Eastern time. Peter O'Dell, KB1N, 7 Brian Rd., South Windsor, CT 06074. DAys 203-666-1541, evenings 203-644-3543.

HEIGHTS aluminum tower, screw type layover base. John Dormois, Gravette, AR 72736.

MIRAGE B1016 2-meter power amplifier. 10 in 160 out, mint $195 W7BYG Box 1503 Chelan, WA 98816 509-682-2440.

SELL: Icom IC730 solid state xcvr with PS15 power supply, FL-30 passband filter, FL-45 cw 500 Hz filter, SM-5 electret desk mike, HM-7 mobile mike, all absolutely mint $500 firm WA1UOH 203-877-8521.

HEATH VL-1180 2-meter amplifier, mint $90. One 572-B, new $30. Panasonic RQ-102S reel portable/ac recorder $20. Ten 200µF/300V electrolytics w/mtg. clamps, surplus $10. SASE inquiries, you ship. Paul K. Pagel, N1FB, 4 Roberts Road, Enfield, CT 06082.

LOST interest in radio: Collins S/line - round emblem (32S-3, 75S-3B, 30L-1, power supply and speaker), station accessories $1500 - KA4MND 904-787-2091. Will Ship.

WANTED: Knight-Kit Ocean Hopper (wooden cabinet model) in good condition. WA9FBM 129 Taylor Street, Kaukanna, WI 54130.

DRAKE L4B, TR4C, RV4C, AC4, 444, $1300. Zachary Botwinick, 4721 Northwest 19th Court, Lauderhill, FL 33313.

RECEIVERS for sale: Drake SPR-4, $300, Hallicrafters SX-122A, $200. Both excellent. WA9FBM 129 Taylor Street Kankanna, WI 54130.

KENWOOD: YG-455C filter $85, two KB-1 flywheel knobs $30. W1BL. 727 Pine, Bristol, CT 06010.

SELL: FT221 $285 mint FT-101EX $350 mint R.G. Klausner, 492 Treeside, Akron, OH 44313. 216-836-4158.

COLLINS KWS-1, 75A4, SC101, complete late production, perfect physical and operating condition. $1995 or best offer. Can arrange shipping. Mansbach 201-666-3460.

SATELLITE station Icom: IC-211 2m FM/SSB/CW $350, IC-402 432/435 Oscar transceiver $290, IC-3PS/IC-30L 432 linear/speaker/p.s. $130, IC-280 2m FM with new small car remote cable $170; Microwave Modules 432/435-28S Oscar transverter for TS-520/820/FT101 etc. $220; ARR P432/435VD Oscar converter $55; VHF Engr. BLE10/40 432 linear $125; Diawa RF-660 RF processor for TS120/130/IC730 etc. $60; MM Electronics MSB-1 deluxe audio filter $60; Yaseau SP-101P speaker/patch $50; Bob, WA6ERB/O, 14311 W. Virginia Drive, Lakewood, CO 80228, 303-986-0189 (e).

COLLECTORS-early DeForest audion "X" grade, pig tail leads, screw base spare filament. Western Electric VT1, DeForest VT14. Best offer. Ken KA4UHW 6277 Skyline Ct., Spring Hill, FL 33526.

GORILLA Hooks secure climber to tower at all times when ascending, working, or descending. Forged steel 500 lb test. $73. ppd. Free specs. Safety belts, $30 & up. Avatar Mag. W9JVF, 1147 N. Emerson, Indianapolis, IN 46219.

COLLINS station, absolutely mint! 75S-3B, 32S-3, both we, 312B-4 re, 516F-2. Have all original cartons, cables, manuals. Sell as package only. K4HCA, 201-584-2547.

YAESU FT-101B, fan, CW filter, spare tubes and FV101B external VFO $500. I ship. Horace Goss, Crosstrees Hill, Essex, CT 06426, tel. 203-767-8485.

7.5VCT @ 21A, 120V in, transformers. #AV-377 $39. Ppd. Avatar Mag W9JVF 1147 N. Emerson Indianapolis, IN 46219.

WANTED: Drake R-4C noise blanker, FS-4, FR-4, C-4. Rick, K5UR, 501-988-2527.

FOR SALE: KWM-2 transceiver and AC power supply. Mint condition (no scratches or technical problems). Reconditioned. $925. Certified check. Will ship UPS. Gloria McDaniel, W9GHO, 6090 Fall Creek Road, Indianapolis, IN 46220. 317-257-0362.

SALE: Swan 350D excellent Novice or other transceiver $245; Datong FL-1 audio filter $85; E-tec FR-4tr $84; Dentron W-2 dual-SWR meter $90. All mint. John Bradley, Box 253, Cedargrove, NJ 07009.

HALLICRAFTER HT-37, needs work, $95. TenTec Argonaut 505, $190. You ship. NM6L, Rt. 2, Box 323 Aliso Circle, Bishop, CA 93514.

SLEP Specials, Jennings UCSL-1000 vacuum variable capacitors, 5000 kV, with gear drive train and mounting bracket $59.50; Collins 55G-1 VLF preselector console for 51S-1 or KWM-380, new boxed $375; HP608FR late model signal generator, 10 MHz thru 455 MHz, 19" panel with blue/gray cabinet, excellent for precision laboratory work $375; Tektronix 1L30 spectrum analyzer plug-in, 925 MHz thru 10.56 GHz $495; SG-1041/URM-191 late model solid-state military signal generator 10 kHz thru 50 MHz $375. All lab-tested excellent condition, we accept M/C, Visa or check. Phone 704-524-7519, Step Electronics Company, Highway 441, Otto, N.C. 28736.

HG-10VFO $25 Dentron Jr Tuner $49. Grid Dip Meter $45 Bearcat 20/20 scanner $189 Wilson System 4-el beam (pick up only) $133 HA201A-10 watt linear $29 Yaesu CW filter XF30C $25 Palomar noise bridge meter $39. Call Walt, N2WA, 201-742-9438.

SONY ICF-2001, portable digital receiver, AM/FM/SSB/CW - AC/DC, $195 + $5 (shipping). Limited quantities only for hams and SWLs. Send cashier's check or money order with your QSL card to KA2JZX, P.O. Box 17192, West Hartford, CT 06117.

SELL: Drake filters .5, 1.5, $46 each. Collins KWS-1 $425, Azden 15 foot remote control cable for PCS-3000, $25. Heath SB-630 $80, Heath SWR bridge $20. Rick, K5UR, 501-988-2527.

4CX100A, new Eimac $195. Collins 516F2 $125, 75S1 $225, 351R2 rack $35, F455FA21 $45, F455J31 - $25. Schaaf, 807 Sunbeam, Oneida, WI 54155. 414-434-2938.

SELL: Heathkit SB-200 amplifier w/10 meters, $300. I ship. Mark Wilson, AA2Z, 203-666-1541 days Mon.-Thurs.

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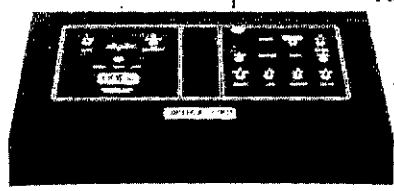

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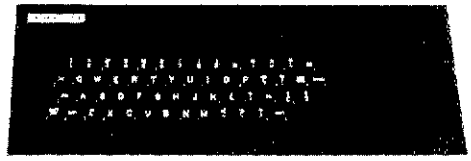

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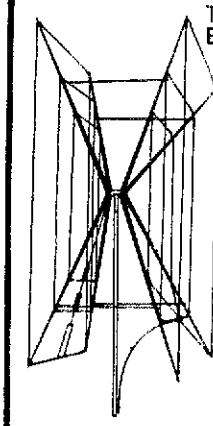

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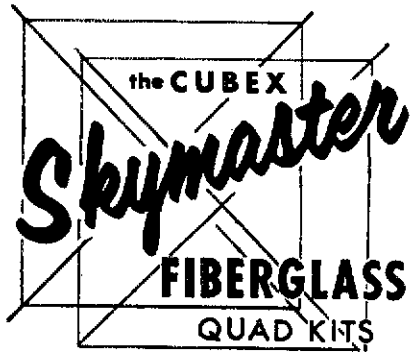

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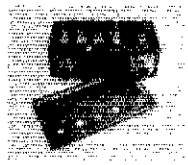

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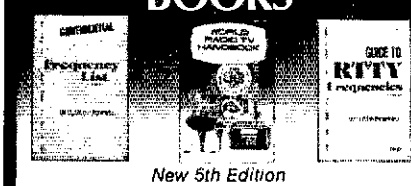

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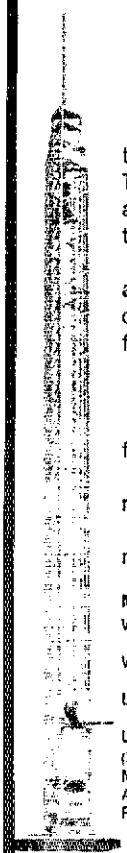
Index of Advertisers

ANTENNA SYSTEMS/TOWER HARDWARE



Tri-Ex® Tower Sale!

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

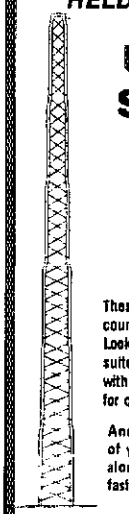
Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	$ 499
W-51	51 ft.	9 sq. ft., 50 mph	$ 799
LM-354	54 ft.	16 sq. ft., 60 mph	$1449
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2499

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

HELD OVER by Popular Demand



UNARCO-ROHN Self Supporting Towers — On Sale!

Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! Hows that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

BUTTERNUT

HF6V	80-10 mtr. Vertical	$129
TBR 160HD	160-mtr. Coil Kit	$ 49
RM KIT	Roof Mount w/Stub Tuned Radials	$ 39
STR KIT	Stub Tuned Radial Kit	$ 20

CUSHCRAFT

40-2CD	2-El. "Broad Band" 40 mtr. Beam	$279
A3	3-El. Triband Beam	$179
A4	4-El. Triband Beam	$229
A743/A744	40 mtr. Add-on Kit for A3/A4 Antenna	$ 69
R3	New Motor Tuned 20/15/10 mtr. Vertical	$229
AV5	80-10 mtr. Trap Vertical	$ 95
20-3CD	3-El. 20 mtr. Beam	$179
20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 99
15-4CD	4-El. 15 mtr. Beam	$109
10-3CD	3-El. 10 mtr. Beam	$ 75
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 65
424B	24-El. 432 MHz "Boomer"	$ 63
214B	14-El. 2 mtr. "Boomer"	$ 69
214FB	14-El. 2 mtr. FM "Boomer"	$ 69
228FB	28-El. 2 mtr. FM "Power Pack"	$189
32-19	19-El. 2 mtr. "Super Boomer"	$ 83
220B	17-El. 220 MHz "Boomer"	$ 75
ARX2B	2 mtr. "Ringo Ranger II"	$ 36
ARX450B	450 Mhz "Ringo Ranger II"	$ 38
A147-20T	2 mtr. Vert. & Horiz. 10-El. Beam	$ 63
A144-10T	10-El. 2 mtr. Satellite Antenna	$ 45
A144-20T	20-El. 2 mtr. Satellite Antenna	$ 69
A432-20T	20-El. 432 MHz Satellite Antenna	$ 45
A14T-MB	Dual Antenna Mounting Assembly	$ 25

MANY OTHER CUSHCRAFT ANTENNAS IN STOCK – CALL!

HYGAIN

V2S	New 2 mtr. Base Vertical	$ 39
TH5MK2S	New Broad Band 5-El. Triband Beam	$319
TH7DXS	New Broad Band 7-El. Triband Beam	$379
TH3MK3S	3-El. Triband Beam	$219
TH3JRS	3-El. Triband Beam	$159
TH2MK3S	2-El. Triband Beam	$139
HY-QUAD	2-El. Triband Quad	$279
402BAS	2-El. 40 mtr. Beam	$199
205BAS	5-El. 20 mtr. "Long John"	$299
155BAS	5-El. 15 mtr. "Long John"	$179
105BAS	5-El 10 mtr. "Long John"	$119
204BAS	4-El. 20 mtr. Beam	$229
203BAS	3-El. 20 mtr. Beam	$139
153BAS	3-El. 15 mtr. Beam	$ 79
103BAS	3-El. 10 mtr. Beam	$ 59
DB1015AS	3-El. 10/15 mtr. Beam	$159
64BS	4-El. 6 mtr. Beam	$ 55
66BS	6-El. 6 mtr. "Long John"	$109
18HTS	80-10 mtr. Hy-Tower Vertical	$339
18AVT/WBS	80-10 mtr. Trap Vertical	$ 95
214	14-El. 2 mtr. Beam	$ 35
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 99
BN86	80-10 mtr. KW Balun	$ 19

HUSTLER

3TBA	New 3-El. Triband Beam	$199
4BTV	40-10 mtr. Vertical	$ 79
5BTV	80-10 mtr. Vertical	$ 99
G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

HF Mobile Resonators (STD 400 Watt) Super 2 KW

10 & 15 mtrs.	$10	$15
20 mtrs.	$12	$18
40 mtrs.	$15	$21
75 mtrs.	$17	$32

BUMPER MOUNTS, SPRINGS, FOLDING MASTS IN STOCK

KLM

CALL!

KT34A	4-El. Tribander	$309
KT34XA	6-El. Tribander	$469
7.2-1	40 mtr. Rotatable Dipole	$159
7.2-2	2-El. 40 mtr. Beam	$299
7.2-3	3-El. 40 mtr. Beam	$449
7.0-7.3-4A	4-El. 40 mtr. Beam	$629
144-148-13LB	13-El. 2 mtr. Long Boomer	$ 79
432-16LB	16-El. 432 Mhz. Long Boomer	$ 69
144-150-16C	16-El. 2 mtr. Circular Pol. Beam	$ 99
420-450-18C	18-El. 435 MHz. Circular Pol. Beam	$ 59

CALL FOR OUR LOW PRICES ON OTHER KLM PRODUCTS!

MINI PRODUCTS

HQ-1 Mini-Quad Compact 20/15/10 mtr. Antenna $139

MOSLEY

CL-33	3-El. Triband Beam	$229
TA-33	3-El. Triband Beam	$199
TA-33 Jr.	3-El. Triband Beam	$149
S-402	2-El. 40 mtr. Beam	$279

ROTORS & CABLES

Alliance HD73 (10.7 sq. ft. Rating)	$ 99
Alliance U100 (For small beams & Oscar Elev. Rotor)	$ 45
Ham 4 (15 sq. ft. Rating)	$199
Tailtwister (20 sq. ft. Rating)	$249
HYGAIN HDR-300 (Most HD. Rotor for BIG Arrays)	$439
8 COND (2-#18 GA/6-#22 GA) Rotor Cable	$0.19/ft.
H.D. 8 COND (2-#16GA./6-#18GA.) Rotor Cable	$0.36/ft.

COAXIAL CABLE & CONNECTORS

RG213/U (95% shield - non-contaminating jacket)	$0.29/ft.
RG8X (95% shield-non contaminating jacket)	$0.18/ft.
RG11/U (75 OHM - 95% shield)	$0.35/ft.
½" Aluminum Hardline w/poly jacket	$0.69/ft.
½" Copper Hardline w/poly jacket	$1.10/ft.
½" Alum. H.L. Conn (UHF or N - Male or Female)	$15.00
½" Copper H.L. Conn (UHF or N - Male or Female)	$22.00
Amphenol Silver Plate PL259	$ 1.25
Amphenol Nickel Plate PL259	$ 0.90
Amphenol N Type Male Conn For RG213/U	$ 2.95

HYGAIN CRANKUPS

HG37SS	37 ft. Self Supporting	$569
HG52SS	52 ft. Self Supporting	$949
HG54HD	Heavy Duty 54 Ft. Self Supporting	$1499
HG70HD	Heavy Duty 70 Ft. Self Supporting	$2399
HG50MT2	50 ft. Side Supported	$779

ALL HYGAIN TOWERS FREIGHT PAID! CALL FOR PACKAGE QUOTE ON TOWER, ANTENNA & ROTOR—FREIGHT PAID.

ROHN TOWERS

20G-$32.00 25G-$41.50 45G-$93.50

HBX32	32 ft. Free Standing (rated 10 sq. ft.)	$169
HDBX32	32 ft. Free Standing (rated 18 sq. ft.)	$189
HBX40	40 ft. Free Standing (rated 10 sq. ft.)	$229
HDBX40	40 ft. Free Standing (rated 18 sq. ft.)	$259
HBX48	48 ft. Free Standing (rated 10 sq. ft.)	$289
HDBX48	48 ft. Free Standing (rated 18 sq. ft.)	$319
HBX56	56 ft. Free Standing (rated 10 sq. ft.)	$349
FK2548	48 ft. 25G Foldover Tower	$789
FK2558	58 ft. 25G Foldover Tower	$879
FK2568	68 ft. 25G Foldover Tower	$959
FK4544	44 ft. 45G Foldover Tower	$1099
FK4554	54 ft. 45G Foldover Tower	$1219
FK4564	64 ft. 45G Foldover Tower	$1329

Foldover Towers Freight Paid-10% Higher West of Rockies.
ALL ROHN ACCESSORIES IN STOCK – CALL!

GALVANIZED STEEL TWR. HARDWARE

3/16" EHS Guywire (3990 lbs.)	$12/100 ft. $111/1000 ft.
1/4" EHS Guywire (6000 lbs.)	$15/100 ft. $139/1000 ft.
5/32" 7 x 7 Aircraft Cable (2700 lbs.)	$11/100 ft.
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$0.30
1/4" CCM Cable Clamp (1/4" Cable)	$0.40
1/4" TH Thimble (fits all sizes)	$0.25
3/8 EE (3/8" Eye & Eye Turnbuckle)	$5.50
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$6.50
1/2 EE (1/2" Eye & Eye Turnbuckle)	$8.50
1/2 EJ (1/2" Eye & Jaw Turnbuckle)	$9.50
3/16" Preformed Guy Grip	$1.65
1/4" Preformed Guy Grip	$1.85
6" Diam - 4 ft. Long Earth Screw Anchor	$12.50
2" Diam - 10 ft. Long Heavy Duty Steel Mast	$39.00
500D Guy Insulator (5/32" or 3/16" Cable)	$0.95
502 Guy Insulator (1/4" Cable)	$1.95
5/8" Diam - 8 ft. Copper Clad Ground Rod w/clamp.	$11.00

ANTENNA WIRE & ACCESSORIES

12 Ga. Solid Copperweld	$.12/ft.
14 Ga. Solid Copperweld	$.10/ft.
14 Ga. Stranded Copper	$.10/ft.
14 Ga. Stranded Copper (70 ft. coil)	$ 7.00
14 Ga. Stranded Copper (140 ft. Coil)	$ 14.00
18 Ga. Copperweld (1/4 mile spool)	$30.00
Heavy Duty B&W End Insulator	$4/Pair
HYGAIN Model 155 Center Insulator	$ 5.95
HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$ 14/ft.

MasterCard

TEXAS TOWERS

A DIVISION OF TEXAS RF DISTRIBUTORS, INC.
1108 SUMMIT AVE., SUITE 4 — PLANO, TEXAS 75074

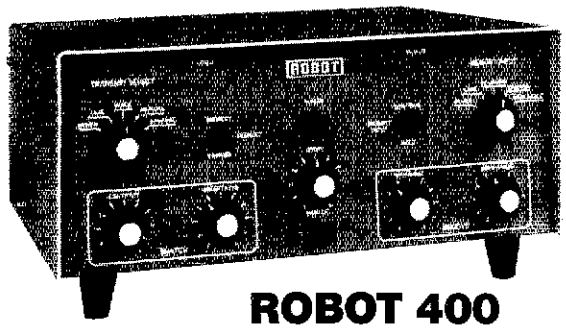
Mon.-Fri.: 8:30 a.m.-5:30 p.m. Saturday: 9:00 a.m.-1:00 p.m.
TELEPHONE: (214) 422-7306

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

VISA

ON ALL ROBOT 400 SSTV CONVERTERS AND ROBOT 800 SUPER TERMINALS

There has never been a better time to complete your station with SSTV, RTTY, and Machine Morse capabilities than right now. The recent FCC proposal opened up all amateur voice transmission frequencies for SSTV, more hams are operating specialty mode than ever before, and with this half-price sale you can complete your station at tremendous savings. But act now. See your participating dealer today. This half-price sale is limited to units in stock.



ROBOT 400 SSTV CONVERTER

Simple to operate, easy to add to your station. All connections to your transceiver are with ready made connecting cables. NO modifications required.

$397.50 *Reg. $795.00*

ROBOT 800 SUPER TERMINAL

For Baudot/ASCII, Morse and SSTV graphics. The Robot 800's built-in demodulator equals or exceeds the performance of those found only in expensive stand-alone terminal units.

$447.50 *Reg. $895.00*

ROBOT

ROBOT RESEARCH, INC. 7591 Convoy Court, San Diego, CA 92111 (619) 279-9430

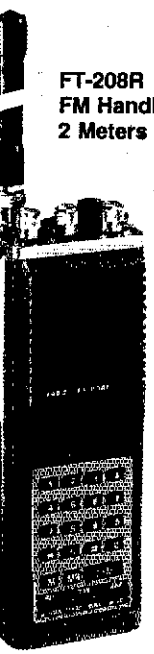
World Leaders in Slow Scan TV, Phone Line TV and Image Processing Systems.

FT-230R: QUITE A SIGHT! (AND EASY TO SEE, TOO!!)

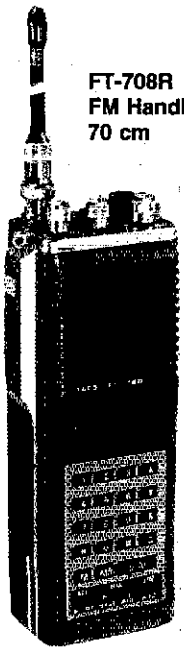
Sporting an all-new Liquid Crystal Display, the FT-230R is Yaesu's high-performance answer to your call for a very affordable 2 meter mobile rig with an easy-to-read frequency display! The FT-230R combines microprocessor convenience, a sensitive receiver, a powerful yet clean transmitter strip, and the new dimension of LCD frequency readout. See your Authorized Yaesu Dealer today — and go home with your new FT-230R!

- LCD five-digit frequency readout with night light for high visibility day or night.
- Two VFOs for quick QSY across the band.
- Ten memory slots for storage and recall of favorite channels.
- Selectable synthesizer steps (5 kHz or 10 kHz) in dial or scanning mode.
- Priority channel for checking a favorite frequency for activity while monitoring another.
- Unique VFO/Memory Split mode for covering unusual repeater splits.
- Up/Down band scan plus memory scan for busy or clear channel. Scanning microphone included in purchase price.
- Full 25 watts of RF power output from extremely compact package.
- Built-in automatic or manual tone burst.
- Optional synthesized CTCSS Encode and Encode/Decode boards available.
- Lithium memory backup battery with estimated lifetime of five years.
- Optional YM-49 Speaker/Microphone and YM-50 DTMF Encoding Microphone provide maximum operating versatility.

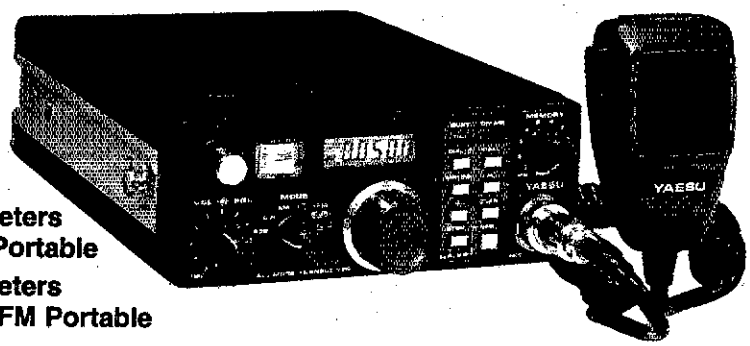
FT-208R
FM Handheld
2 Meters



FT-708R
FM Handheld
70 cm



And don't forget! Yaesu has a complete line of VHF and UHF handheld and battery portable transceivers using LCD display!!!



FT-290R - 2 Meters
SSB/CW/FM Portable

FT-690R - 6 Meters
USB/CW/AM/FM Portable

YAESU
The radio.

Price and Specifications Subject To Change Without Notice or Obligation

482

YAESU ELECTRONICS CORP. 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 • (513) 874-3100

NEW

Digital DX-terity...

General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

TS-430S

The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-30 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

TS-430S FEATURES:

- **160-10 meter operation, with general coverage receiver**
  With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.
- **USB, LSB, CW, AM, with optional FM**
  Operates on USB, LSB, CW, and AM, with optional FM, internally installed. AGC time constant automatically selected by mode.
- **Compact, lightweight design**
  Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14.3 lbs. (6.5 kg.).
- **Superior receiver dynamic range**
  Use of 2SK125 junction-type FET's in the Dyna-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.
- **10-Hz step dual digital VFO's**
  10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross-operation possible. Dial torque adjustable. STEP switch for tuning in 10-Hz or 100-Hz steps. A=B switch quickly shifts "B" VFO to the same frequency and mode as "A" VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.
- **Eight memories store frequency, mode, and band data**
  Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.
- **Lithium battery memory back-up**
  Estimated five-year life.
- **Memory scan**
  Scans memories in which data is stored.
- **Programmable automatic band scan**
  Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.
- **IF shift circuit for minimum QRM.**
  IF passband may be moved to place interferring signals outside the passband, for best interference rejection.
- **Tuneable notch filter built-in**
  Deep, sharp, tuneable, audio notch filter.
- **Narrow-wide filter selection**
  NAR-WIDE switch for IF filter selection on SSB, CW, or AM, when optional filters are installed. (2.4 kHz IF filter built-in.)
- **Speech processor built-in**
  Improves intelligibility, increases average "talk-power."
- **Fluorescent tube digital display**
  Indicates frequency to 100 Hz (10 Hz modifiable).
- **All solid-state technology**
  Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit final protection. Operates on 12 VDC, or 120 VAC, or 220-240 VAC with optional PS-430 AC power supply.
- **All-mode squelch circuit, built-in**
- **Noise blanker, built-in**
- **RF attenuator (20 dB)**
- **Vox circuit, plus semi break-in with side-tone**

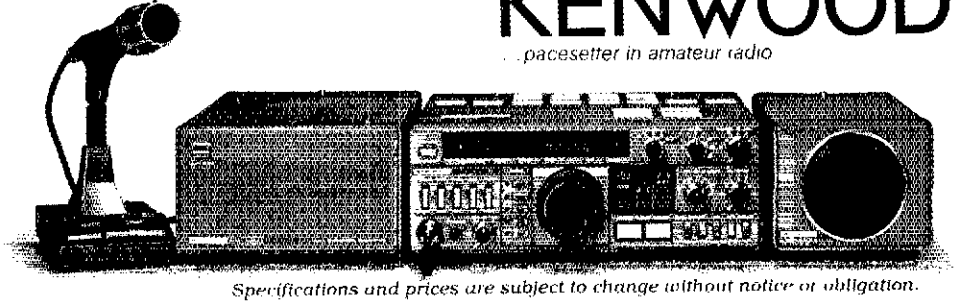
Optional accessories:

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- AT-230 base antenna tuner, 160-10 m incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-60A deluxe desk microphone, UP/DOWN switch.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

...pacesetter in amateur radio



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