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THE RADIO AMATEUR'S JOURNAL

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MFJ-16010 ST Super Antenna Tuner

This NEW MFJ Super Antenna Tuner matches everything from 160 thru 10 Meters: dipoles, inverted vees, long wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF OUTPUT. Built-in balun, too!

• Operate all bands with one antenna • Works with all solid state and tube rigs • Ultra compact: 5 x 2 x 6 inches • Uses toroid cores

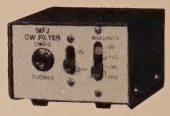


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MFJ-16010 Antenna Tuner

Now you can operate all bands — 160 thru 10 Meters — with a single random wire and run your full transceiver power output — up to 200 watts RF power OUTPUT.

• Small enough to carry in your hip pocket, 2-3/16 x 3-1/4 x 4 inches • Matches low and high impedance by interchanging input and output • SO-239 coaxial connectors • 12 position tapped inductor. Stacked toroid cores • At 1.8 MHz tuner matches 25 to 200 ohms.



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CWF-2BX Super CW Filter

This MFJ Super CW Filter gives you 80 Hz bandwidth, and extremely steep skirts with no ringing for razor sharp selectivity that lets you pull signals out of heavy QRM. Plugs between receiver and phones or connect between audio stage for speaker operation.

• Selectable BW: 80, 110, 180 Hz • 60 dB down one octave from center frequency of 750 Hz for 80 Hz BW • Reduces noises 15 dB • 9 V battery • 2-3/16 x 3-1/4 x 4 inches • CWF-2PC, wired PC board, $19.95.

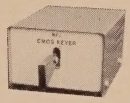


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This NEW MFJ Deluxe Keyer gives you more features per dollar than any other keyer available.

• Uses Curtis-8043 keyer chip • Sends iambic, automatic, semi-automatic, manual • Use squeeze, single lever, or straight key • Dot memory, self-completing dots and dashes, jam proof spacing, instant start • RF proof • Solid state keying ±300 V max • Weight, tone, volume, speed controls • Uses 4 C-cells; external power jack • 6 x 6 x 2 inches • Sidetone and speaker • Optional squeeze key: $29.95



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State of the art design uses CURTIS-8043 Keyer-on-a-chip.

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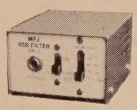


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Up to 400% more RF power. Plugs between your microphone and transmitter.

• Gives your audio punch power to slice through QRM • 30 dB IC log amp and 3 active filters • RF protected • 9 V battery • Two Mic jacks: ¼" phone jacks, uncommitted 4 pin jack • Output cable • 2-1/8 x 3-5/8 x 5-9/16 inches • LSP-520BX, in standard MFJ enclosure, electronically identical, $49.95.

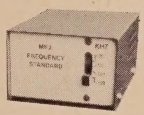


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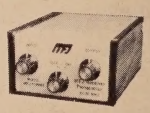


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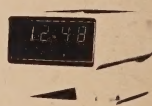
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For the Old Timer to polish his fist.
For the Code Instructor to teach his classes.

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TK-555, Optional Telegraph Key $1.95



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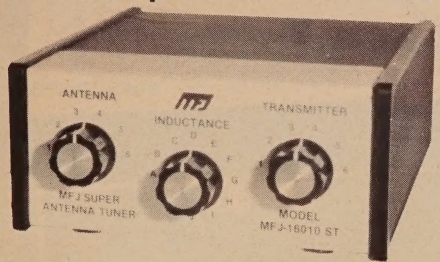
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This NEW MFJ Super Antenna Tuner . . .

matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF OUTPUT. Built-in balun, too!



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This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balance line inputs (2), random wire input (1), and ground (1).

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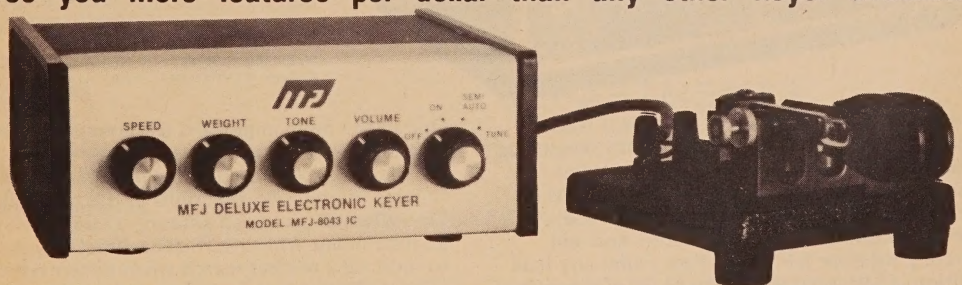
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This NEW MFJ Deluxe Keyer at $69.95 . . .

gives you more features per dollar than any other keyer available.



Based on the Curtis 8043 IC keyer-on-a-chip, the new MFJ Deluxe Keyer gives you more features per dollar than any other keyer available.

Sends iambic, automatic, semi-automatic, manual. Use squeeze, single lever or straight key.

Iambic squeeze key operation with dot and dash insertion lets you form characters with minimal wrist movement for comfortable, fatique-free sending.

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Beautiful Ten Tec enclosure. Eggshell white, walnut sides. Compact 6x6x2 inches.

Three conductor quarter-inch phone jack for key, phono jacks for keying outputs.

Optional squeeze key. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". $29.95 plus $2.00 for shipping and handling.

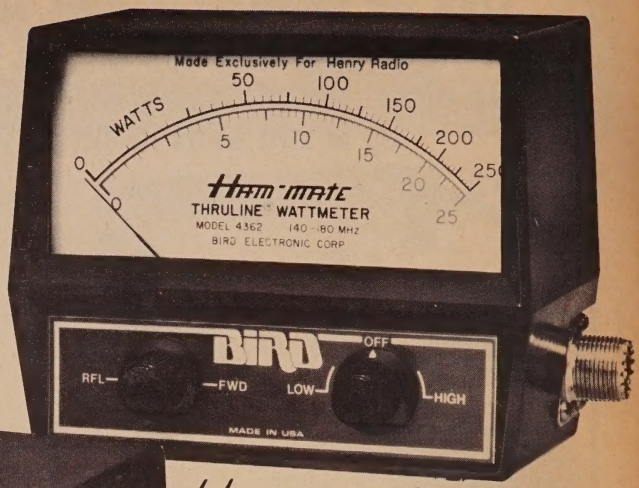
Try it—no obligation. If not delighted, return it within 30 days for a refund (less shipping). This keyer is unconditionally guaranteed for one year.

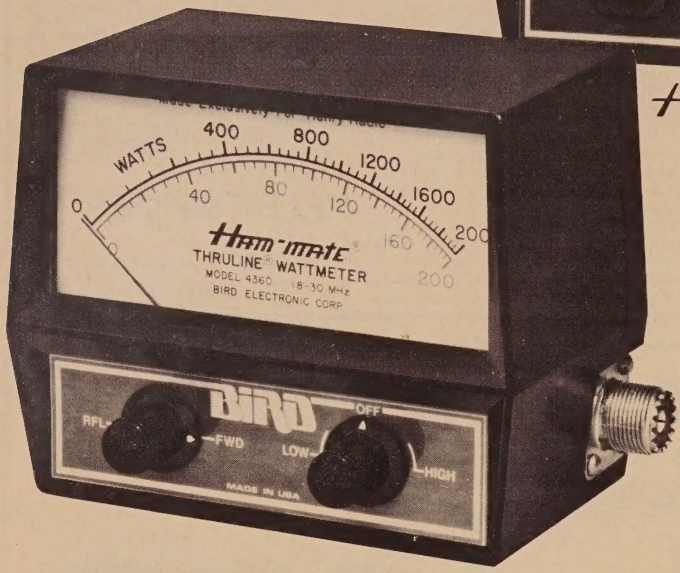
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Model 1525 Drake 1525 EM Encoding Mike	**$ 49.95**
Model 1330 Drake UMK-3 Remote Trunk-Mount Kit	**$ 69.95**

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A Message From The Publisher

The editorial on page 9 of September QST, is must reading for every amateur. The title of this editorial reads: "IN SEARCH OF ETHICS." It deals with those manufacturers, distributors and rotailers who have promulgated illegal operation on the citizens band, the amateur bands, and other adjacent frequencies. In no uncertain terms, QST and ARRL go on record as opposing illegal operation, What's more, they encourage members and readers to censure companies whose products can be used illegally. They encourage a boycott of dealers who sell such products, if I interpret the comments correctly. Lastly, they seek suggestions from members and readers that will help the league to establish a strong code of ethics by which they and other members of the amateur industry might live with a clear conscience.

All of which, I find, indicate a high sense of moral indignation at the 'bad guys' who pollute the airwaves illegally. Fine moral leadership is being stimulated by a most honorable group of amateur radio leaders. All honorable men with the highest of ideals. I admire these men and I admire their ideals. They are setting the pace for a truly high sense of morality in our industry and the fraternity it serves.

And of course, I'm certain that the league and QST are going to be the pacesetters for this new morality with actions, not just strong editorials. I know deep down that QST is going to refuse to take advertising from all those 'bad guy' manufacturers who have had the gall to manufacture products that outsiders might use illegally. I know that QST is going to refuse advertising from all those retailers who have had the dastardly nerve to modify products for illegal operation, and then sell other products to legitimate amateurs. And I know that QST is going to withdraw its own advertising support from those CB hobby magazines that have permitted such products to be publicized.

I know that all these things are going to happen because I know that the people at the league are all honorable men with a high sense of decency and moral leadership. I know that the financial sacrifices the league is going to experience by offering this moral leadership will be more than offset by the satisfaction of knowing that they've helped clean up our airwaves.

I'm certain that no one will ever be able to point an accusing finger at the high-idealed QST staff and say, with justification, "Physician, heal thyself." For these are all honorable men.

Dick Cowan

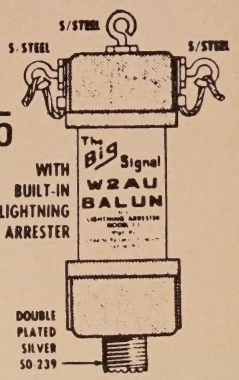
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Secretary: Claude "Red" Gambrell, W3UO, 17937 Archwood Way, Olney, MD 20832. (301) 774-7697 & 9537100 (work).
Treasurer: Jeffery Hartley, N8II, 416 S. Rosemont Ave., Martinsburg, W. VA 25401.
The Mailing address for the PVRC for correspondence is: Potomac Valley Radio Club, c/o Gambrell, W3UO, Sec'y, 17937 Archwood Way, Olney, MD 20832.

• The Society of Wireless Pioneers (SOWP) is planning a membership Christmas on-the-air CW QSO Party for the weekend of Dec. 17 and 18, 1977. The party will cover the full GMT period to allow members around the world to participate. This will be the second Christmas on-the-air Party held by the Society.

All members with amateur licenses are being encouraged to take part. The call will be CQ SOWP. While there will be no certificates or other awards given, everyone who takes part will be a winner by having an opportunity to renew old friendships, establish new one, and to continue a comaraderie developed over the years.

Suggested frequencies for the Party are 55 kHz up from the low end of each amateur band. Additional information about this Party and the Society can be obtained from the Party Coordinator, Bill Willmot, K4TF, Venus St., Merritt Island, FL 32952.

KENWOOD

...pacesetter in amateur radio

TS-520S

AND DG-5 DIGITAL FREQUENCY DISPLAY



The TS-520S combines all of the fine, field-proven characteristics of the original TS-520 together with many of the ideas and suggestions for improvement from amateurs worldwide.

FULL COVERAGE TRANSCEIVER

The TS-520S provides full coverage on all amateur bands from 1.8 to 29.7 MHz. Kenwood gives you 160 meter capability, WWV on 15.000 MHz., and an auxiliary band position for maximum flexibility. And with the addition of the TV-506 transverter, your TS-520S can cover 160 meters to 6 meters on SSB and CW.

DIGITAL DISPLAY DG-5 (option)

The Kenwood DG-5 provides easy, accurate readout of your operating frequency while transmitting *and* receiving.

OUTSTANDING RECEIVER SENSITIVITY AND MINIMUM CROSS MODULATION

The TS-520S incorporates a 3SK35 dual gate MOSFET for outstanding cross modulation and spurious response characteristics. The 3SK35 has a low noise figure (3.5 dB typ.) and high gain (18 dB typ.) for excellent sensitivity.

NEW IMPROVED SPEECH PROCESSOR

An audio compression amplifier gives you extra punch in the pile ups and when the going gets rough.

VERNIER TUNING FOR FINAL PLATE CONTROL

A vernier tuning mechanism allows easy and accurate adjustment of the plate control during tune-up.

FINAL AMPLIFIER

The TS-520S is completely solid state except for the driver (12B-Y7A) and the final tubes. Rather than subsitute TV sweep tubes as final amplifier tubes in a state of the art amateur transceiver,

Kenwood has employed two husky S-2001A (equivalent to 6146B) tubes. These rugged, time-proven tubes are known for their long life and superb linearity.

HIGHLY EFFECTIVE NOISE BLANKER

An effective noise blanking cricuit developed by Kenwood that virtually eliminates ignition noise is built into the TS-520S.

RF ATTENUATOR

The TS-520S has a built-in 20 dB attentuator that can be activated by a push button swich conveniently located on the front panel.

PROVISION FOR EXTERNAL RECEIVER

A special jack on the rear panel of the TS-520S provides receiver signals to an external receiver for increased station versitility. A switch on the rear panel determines the signal path . . . the receiver in the TS-820 or any external receiver.

VFO-520 — NEW REMOTE VFO

The VFO-520 remote VFO matches the styling of the TS-520S and provides maximum operating flexibility on the band selected on your TS-520S.

AC POWER SUPPLY

The TS-520S is completely self-contained with a rugged AC power supply built-in. The addition of the DS-1A DC-DC converter (optional) allows for mobile operation of the TS-520S.

EASY PHONE PATCH CONNECTION

The TS-520S has 2 convenient RCA phono jacks on the rear panel for PHONE PATCH IN and PHONE PATCH OUT.

CW-520 — CW FILTER (OPTION)

The CW-520-500 Hz filter can be easilly installed and will provide improved operation on CW.

AMPLIFIED TYPE AGC CIRCUIT

The AGC circuit has 3 positions (OFF, FAST, SLOW) to enable the TS-520S to be operated in the optimum condition at all times whether operating CW or SSB.

The TS-520S retains all of the features of the original TS-520 that made it tops in its class: RIT control • 8-pole crystal filter • Built-in 25 KHz calibrator • Front panel carrier level control • Semi-break-in CW with sidetone • VOX/PTT/MOX • TUNE position for low power tune up • Built-in speaker • Built-in Cooling Fan • Provisions for 4 fixed frequency channels • Heater switch.

TS-520 *Specifications*

Amateur Bands: 160-10 meters plus WWV (receive only)
Modes: USB, LSB, CW
Antenna Impedance: 50-75 Ohms
Frequency Stability: Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during any 30 minute period thereafter
Tubes & Semiconductors:
Tubes . . . . . 3 (S2001A x 2, 12BY7A)
Transistors 52
FETs 19
Diodes 101
Power Requirements: 120/220 V AC, 50/60 Hz, 13.8 V DC (with optional DS-1A)
Power Consumption: Transmit: 280 Watts Receive: 26 Watts (with heater off)
Dimension: 333(13¼) W x 153 (6-0) H x 335(13-(13-3/16) D mm(inch)
Weight: 16.0 kg(35.2 lbs)
TRANSMITTER
RF Input Power: SSB: 200 Watts PEP CW: 160 Watts DC
Carrier Suppression: Better than -40 dB
Sideband Suppression: Better than -50 dB
Spurious Radiation: Better than -40 dB
Microphone Impedance: 50k Ohms
AF Response: 400 to 2,600 Hz
RECEIVER
Sensitivity: 0.25 uV for 10 dB (S+N)/N
Selectivity: SSB:2.4 kHz/-6 dB, 4.4 kHz/-60 dB
Selectivity: CW: 0.5 kHz/-6 dB, 1.5 kHz/-60 dB (with optional CW-520 filter)
Image Ratio: Better than 50 dB
IF Rejection: Better than 50 dB
AF Output Power: 1.0 Watt (8 Ohm load, with less than 10% distortion)
AF Output Impedance: 4 to 16 Ohms

DG-5

SPECIFICATIONS
Measuring Range: 100 Hz to 40 MHz
Input Impedance: 5 k Ohms
Gate Time: 0.1 Sec.
Input Sensitivity: 100 Hz to 40 MHz . . . 200 mV rms or over, 10 kHz to 10 MHz . . 50 mV or over
Measuring Accuracy: Internal time base accuracy ±0.1 count
Time Base: 10 MHz
Operating Temperature: -10° to 50° C/14° 122° F
Power Requirement: Supplied from TS-520S or 12 to 16 VDC (nominal 13.8 VDC)
Dimensions: 167(6-9/16) W x 43(1-11/16) H x 268(10-9/16) D mm(inch)
Weight: 1.3 kg(2.9 lbs)





DG-5

The luxury of digital readout is available on the TS-520S by connecting the DG-5 readout (option). More than just the average readout circuit, this counter mixes the carrier, VFO, and heterodyne frequencies to give you your exact frequency. This handsomely-styled accessory can be set almost anyplace in your shack for easy to read operation . . . or set it on the dashboard during mobile operation for safety and convenience. Six bold digits display your operating frequency while you transmit and receive. Complete with DH (display hold) switch for frequency memory and 2 position intensity selector. The DG-5 can also be used as a normal frequency counter up to 40 MHz at the touch of a switch. (Input cable provided.)
NOTE: TS-520 owners can use the DG-5 with a DK-520 adapter kit.

KENWOOD

...pacesetter in amateur radio



TS-820S

WITH DIGITAL FREQUENCY DISPLAY

We told you that the TS-820 would be best. In little more than a year our promise has become a fact. Now, in response to hundreds of requests from amateurs, Kenwood offers the TS-820S*... the same superb transceiver, but with the digital readout factory installed. As an owner of this beautiful rig, you will have at your fingertips the combination of controls and features that even under the toughest operating conditions make the *TS-820S the Pacesetter that it is.*

Following are a few of the TS-820S' many exciting features.

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

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

SPEECH PROCESSOR • An RF circuit provides quick time constant compression using a true RF compressor as opposed to an AF clipper. Amount of compression is adjustable to the desired level by a convenient front panel control.

IF SHIFT • The IF SHIFT control varies the IF passband without changing the receive frequency. Enables the operator to eliminate unwanted signals by moving them out of the passband of the receiver. This feature alone makes the TS-820S a pacesetter.

*The TS-820 and DG-1 are still available separately.

TS-600



Experience the excitement of 6 meters. The TS-600 all mode transceiver lets you experience the fun of 6 meter band openings.

This 10 watt, solid state rig covers 50.0-54.0 MHz. The VFO tunes the band in 1 MHz segments. It also has provisions for fixed frequency operation on NETS or to listen for beacons. State of the art features such as an effective noise blanker and the RIT (Receiver Incremental Tuning) circuit make the TS-600 another Kenwood "Pacesetter".



TV-506

An easy way to get on the 6 meter band with your TS-520/520S, TS-820/820S and most other transceivers. Simply plug it in and you're on . . . full band coverage with 10 watts output on SSB and CW.



TR-8300

Experience the luxury of 450 MHz at an economical price.

The TR-8300 offers high quality and superb performance as a result of many years of improving VHF/UHF design techniques. The transceiver is capable of F3 emission on 23 crystal-controlled channels (3 supplied). The transmitter output is 10 watts.

The TR-8300 incorporates a 5 section helical resonator and a two-pole crystal filter in the IF section of the receiver for improved intermodulation characteristics. Receiver sensitivity, spurious response, and temperature characteristics are excellent.

KENWOOD

...pacesetter in amateur radio

TS-700S

WITH DIGITAL FREQUENCY DISPLAY



Check out the new "built-ins": digital readout, receiver pre-amp, VOX, semi-break in, and CW sidetone! Of course, it's still all mode, 144-148 MHz and VFO controlled.

Features: Digital readout with "Kenwood Blue" digits • High gain receiver pre-amp • 1 watt lower power switch • Built in VOX • Semi-break in on CW • CW sidetone • Operates all modes: SSB (upper & lower), FM, AM and CW • Completely solid state circuitry provides stable, long lasting, trouble-free operation • AC and DC capability (operate from your car, boat, or as a base station through its built-in power supply) • 4 MHz band coverage (144 to 148 MHz) • Automatically switches transmit frequency 600 KHz for repeater operation. Simply dial in your receive frequency and the radio does the rest . . . simplex, repeater, reverse • Or accomplish the same by plugging a single crystal into one of the 11 crystal positions for your favorite channel • Transmit/Receive capability on 44 channels with 11 crystals.



VFO-700S

Handsomely styled and a perfect companion to the TS-700S. This unit provides you with the extra versatility and the luxury of having a second VFO in your shack. Great for split frequency operation and for tuning off frequency to check the band. The function switch on the VFO-700S selects the VFO in use and the appropriate frequency is displayed on the digital readout in the TS-700S. In addition a momentary contact "frequency check" switch allows you to spot check the frequency of the VFO not in use.



TR-7400A

Features Kenwood's unique Continuous Tone Coded Squelch system, 4 MHz band coverage, 25 watt output and fully synthesized 800 channel operation. This compact package gives you the kind of performance specifications you've always wanted in a 2-meter amateur rig.

Outstanding sensitivity, large-sized helical resonators with High Q to minimize undesirable out-of-band interferance, and give a 2-pole 10.7 MHz monolithic crystal filter combine to give your TR-7400A outstanding receiver performance. Intermodulation characteristics (Better than 66dB), spurious (Better than −60dB), image rejection (Better than −70dB), and a versatile squelch system make the TR-7400A tops in its class.

Shown with the PS-8 power supply

(Active filters and Tone Burst Modules optional)



TR-7500

This 100 channel PLL synthesized 146-148 MHz transceiver comes with 88 pre-programmed channels for use on all standard repeater frequencies (as per ARRL Band Plan) and most simplex channels. For added flexibility, there are 6 diode-programmable switch positions. The 15 KHz shift function makes these 6 positions into 12 channels. 10 watt output, ±600 KHz offset and LED digital frequency display are just a few of the many fine features of the TR-7500.

The PS-6 is the handsomely styled, matching power supply for the TR-7500. Its 3.5 amp current capacity and built-in speaker make it the perfect companion for home use of the TR-7500.



TR-2200A

The high performance portable 2-meter FM transceiver. 146-148 MHz, 12 channels (6 supplied), 2 watts or 400 mW RF output. Everything you need is included: Ni-Cad battery pack, charger, carrying case and microphone.

KENWOOD

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Kenwood developed the T-599D transmitter and R-599D receiver for the most discriminating amateur.

The R-599D is the most complete receiver ever offered. It is entirely solid-state, superbly reliable and compact. It covers the full amateur band, 10 through 160 meters, CW, LSB, USB, AM and FM.

The T-599D is solid-state with the exception of only three tubes, has built-in power supply and full metering. It operates CW, LSB, USB and AM and, of course, is a perfect match to the R-599D receiver.

If you have never considered the advantages of operating a receiver/transmitter combination . . .maybe you should. Because of the larger number of controls and dual VFOs the combination offers flexibility impossible to duplicate with a transceiver.

Compare the specs of the R-599D and the T-599D with any other brand. Remember, the R-599D is all solid state (and includes four filters). Your choice will obviously be the Kenwood.

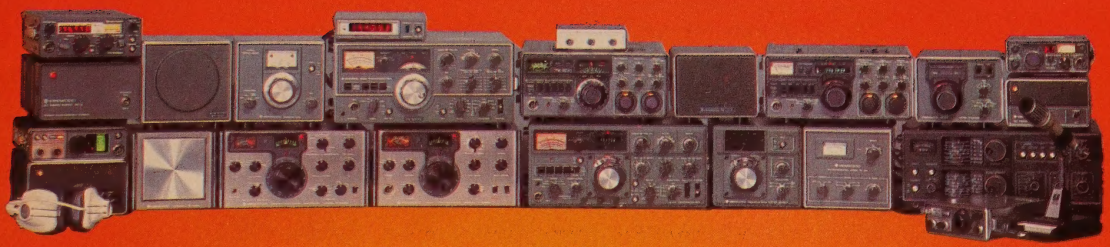


R-599D T-599D

R-300

Dependable operation, superior specifications and excellent features make the R-300 an unexcelled value for the shortwave listener. It offers full band coverage with a frequency range of 170 KHz to 30.0 MHz • Receives AM, SSB and CW • Features large, easy to read drum dials with fast smooth dial action • Band spread is calibrated for the 10 foreign broadcast bands, easily tuned with the use of a built-in 500 KHz calibrator • Automatic noise limiter • 3-way power supply system (AC/Batteries/External DC) . . . take it anyplace • Automatically switches to battery power in the event of AC power failure.





Fine equipment that belongs in every well equipped station

HF LINES

820 Series

TS-820S . . . TS-820 with Digital Installed
TS-820 . . . . 10-160 M Deluxe Transceiver
DG-1 . . . . . Digital Frequency Display for TS-820
VFO-820 . . . Deluxe Remote VFO for for TS-820/820S
CW-820 . . . 500 Hz CW Filter for TS-820/820S
DS-1A . . . . DC-DC Converter for 520/820 Series

520 Series

TS-520S . . . 160-10 M Transceiver
DG-5 . . . . . Digital Frequency Display for TS-520 Series
VFO-520 . . . Remote VFO for TS-520 and TS-520S
SP-520 . . . External Speaker for 520/820 Series
CW-520 . . . 500 Hz CW Filter for TS-520/520S
DK-520 . . . Digital Adaptor Kit for TS-520

599D Series

R-599D . . . 160-10 M Solid State Receiver
T-599D . . . . 80-10 M Matching Transmitter
S-599 . . . . External Speaker for 599D Series
CC-29A . . . . 2 Meter Converter for R-599D
CC-69 . . . . . 6 Meter Converter for R-599D
FM-599A . . FM Filter for R-599D

SHORT WAVE LISTENING

R-300 General Coverage SWL Receiver

VHF LINES

TS-600 . . . . 6 M All Mode Transceiver
TS-700S . . . 2 M All Mode Digital Transceiver
VFO-700S . Remote VFO for TS-700S
SP-70 . . . . . Matching Speaker for TS-600/700 Series
TR-2200A . 2 M Portable FM Transceiver
TR-7400A . 2 M Synthesized Deluxe FM Transceiver
TR-7500 . . . 100 Channel Synthesized 2 M FM Transceiver
TR-8300 . . . 70 CM FM Transceiver (450 MHz)
TV-506 . . . . 6 M Transverter for 520/820/599 Series

POPULAR STATION ACCESSORIES

HS-4 . . . . . Headphone Set
MB-1A . . . . Mounting Bracket for TR-2200A
MC-50 . . . . Desk Microphone
PS-5 . . . . . Power Supply for TR-8300
PS-6 . . . . . Power Supply for TR-7500
PS-8 . . . . . Power Supply for TR-7400A
VOX-3 . . . . VOX for TS-600/700A

Trio-Kenwood stocks a complete line of replacement parts, accessories, and manuals for all Kenwood models.

MORE ACCESSORIES:

Description	Model #	For use with
Rubber Helical Antenna	RA-1	TR-2200A
Telescoping Whip Antenna	T90-0082-05	TR-2200A
Ni-Cad Battery Pack (set)	PB-15	TR-2200A
4 Pin Mic. Connector	E07-0403-05	All Models
Active Filter Elements	See Service Manual	TR-7400A
Tone Burst Modules	See Service Manual	TS-700A; TR-7400A
AC Cables	Specify Model	All Models
DC Cables	Specify Model	All Models



The Kenwood HS-4 headphone set adds versatility to any Kenwood station. For extended periods of wear, the HS-4 is comfortably padded and is completely adjustable. The frequency response of the HS-4 is tailored specifically for amateur communication use. (300 to 3000 Hz, 8 ohms).



The MC-50 dynamic microphone has been designed expressly for amateur radio operation as a splendid addition to any Kenwood shack. Complete with PTT and LOCK switches, and a microphone plug for instant hook-up to any Kenwood rig. Easily converted to high or low impedance. (600 or 50k ohm).

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220

KENWOOD
...paceseller in amateur radio

Now there are two MLA amplifiers.
DenTron announces the NEW! MLA-1200

The MLA-1200 linear amplifier was designed to give you a choice. We know that not all amateurs want to run 2000 watts PEP, but we also feel the demand for a luxury styled amplifier. Hence the MLA-1200.

Basically it's built on success. The MLA-1200 incorporates the same sleek styling of the famous MLA-2500, but employs a single Eimac 8875 triode, yielding 1200 watts PEP SSB and 1000 watts DC CW with as little as 70 watts of drive.

There are many features common to both MLA's, like forced air cooling, and a plug-in PC board containing ALC and metering circuitry. The MLA-1200 covers 10-80 and MARS frequencies. Be assured that all DenTron amplifiers far exceed the FCC harmonic emissions standards.

It's a different kind of luxury. The MLA-1200 is a compact dynamo only 10"W x 6¼"H x 10"D and weighs only 10 pounds! Twin outboard power supplies are available for AC or DC mobile operation. Picture that on your home, boat or car!

MLA-1200 $399.50. AC-1200 $159.50. DC-1200 $199.50.
I'll bet you knew DenTron would give you a choice.

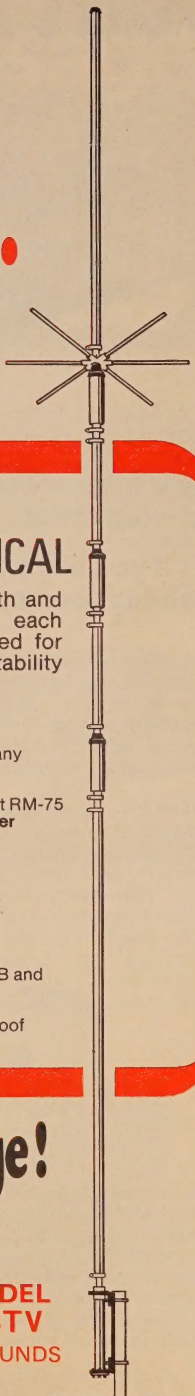
DenTron
Radio Co., Inc.



arma
amateur radio manufacturers association

2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216)425-3173

if the 4-BTV weighs 39% more... what do others leave out?



HUSTLER FIXED STATION FOUR BAND VERTICAL

The 4-BTV is longer for greater aperature, larger in diameter for strength and bandwidth, heavier traps for precision and safety factor. Individually, each subassembly weighs more to collectively give you an antenna designed for convenience of assembly and installation, a wide margin in mechanical stability and far superior electrical performance.

- **Lowest SWR**—PLUS!
- Bandwidth at its **broadest!** SWR 1.6 to 1 or better at band edges.
- Hustler exclusive trap covers **"Spritz" extruded** to otherwise unattainable close tolerances assuring accurate and permanent trap resonance.
- Solid one inch **fiberglass trap forms** for optimum electrical and mechanical stability.
- Extra heavy duty aluminum mounting bracket with **low loss—high strength** insulators.
- All sections **1¼" heavy wall,** high strength aluminum. Length 21'5".
- **Stainless steel clamps** permitting adjustment without damage to the aluminum tubing.
- Guaranteed to be **easiest assembly** of any multi-band vertical.
- Antenna has ⅜"-24 stud at top to accept RM-75 or RM-75-S Hustler resonator for **75 meter operation** when desired.
- Top loading on 75 meters for broader bandwidth and **higher radiation efficiency!**
- Feed with **any length** 50 ohm coax.
- Power capability—**full legal limit** on SSB and CW.
- Ground mount with or without radials; roof mount with radials.

one setting for total band coverage!
40 THROUGH 10 METERS

HUSTLER ANTENNA PRODUCTS—for sixteen years—original designs—created and manufactured by American ingenuity, labor and materials—used by communicators throughout the world.

Hustler designs are patented under one or more of the following assigned to New-Tronics Corporation: 3287732, 3513472, 3419869, 3873985, 3327311, 3599214, 3582951

HUSTLER®

Available from all distributors who recognize the best!

MODEL 4-BTV
15 POUNDS

new-tronics corporation

15800 commerce park drive,
brook park, ohio 44142

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

Don't Buy an Amplifier on Toothpaste Claims



Buy a tube of toothpaste on the basis of outrageous exaggerations as to what it'll do for your social life and it still may clean your teeth.

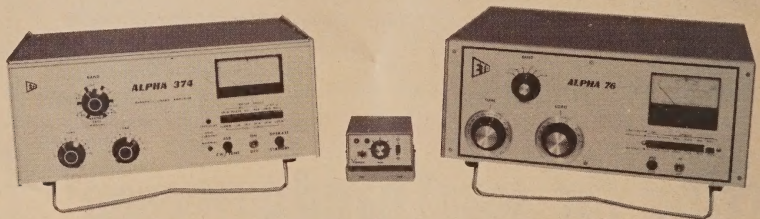
BUT if you buy a linear amplifier on the basis of toothpaste claims — or ambiguous specifications — you may end up with a real turkey!

Large differences in quality and performance exist among so-called "2 KW PEP" amplifiers. Thinking of buying another model that's "just as good" as an ALPHA? Better thoroughly investigate the manufacturer's reputation. . . and what, exactly, is promised in his specifications and warranty. Unless, of course, you like surprises.

EXAMPLE — Power Output & Efficiency:
An ALPHA 76 running key-down at one kilowatt DC input delivers well over 600 watts rf output, averaged over the 160 thru 10 meter amateur bands. Another current model "deluxe" linear managed less than 400 watts average output in identical tests using the same instrumentation. You'd never suspect it from reading the manufacturer's claims and specs — and the deficiency was largely concealed by gross errors in the internal metering circuits!

EXAMPLE — Duty Cycle:
Ratings are sometimes ambiguous and can be misleading. One prominent amplifier manufacturer rates his desk model for full power in "intermittent amateur service." (Just how intermittent he doesn't say.) Another manufacturer hedges his "continuous" rating with time limits for one model, but not for a second model.

ALPHA specs say clearly, "No Time Limit." And every ALPHA is backed by a factory warranty that extends 18 months — six times as long as other amplifier warranties!



It's understandable why certain of our competitors hedge: the ALPHA 76's forty-five pound transformer alone weighs as much as some of the complete linears for which they claim capability equal to the 76's. And every ALPHA power transformer is efficiently cooled by ETO's exclusive ducted air system. You owe it to yourself, before buying, to check how (if at all) the smaller transformers in those other desk-top linears are cooled.

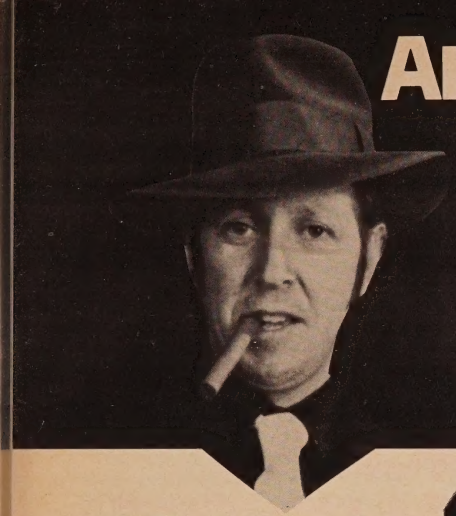
To get the facts about what an ALPHA linear amplifier can do in your station, call or write your dealer or ETO direct for detailed literature. And ask for a free copy of our newly-updated guide to comparing linears.

ALPHA: Sure you can buy a cheaper linear. . . But is that *really* what you want?

ETO Ehrhorn Technological Operations, Inc.

P.O. Box 708 · Cañon City, Colorado 81212 · (303) 275-1613

And Now . . . A Message From The Boss!

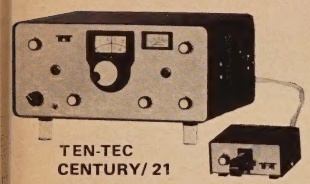




VFO 3855

Speaker 3854

HY-GAIN SSB/CW Transceiver 3750



TEN-TEC CENTURY/ 21

What we have here is Big John Capone. He's the head honcho at CW Electronics. As you can see, John keeps pretty busy guarding the tremendous stock of beautiful ham gear that CW is famous for.

John carries just about every major brand a ham could ask for. That includes Yaesu, Kenwood, Swan, Drake, Icom, Dentron, Atlas, Ten-Tec, Regency, Hy-Gain, and many others. You see, old John's got a pretty good rapport with the manufacturers, 'cause he orders so many radios. They see to it that he gets what he needs. In healthy quantities.

That's why the service at CW is so great. And why the prices are so fantastic. You never heard of a better combination from any other ham dealer anywhere.

So, when you're ready to add that next little goody to your shack, pick up the phone and call CW. Ask for John or Allan. Either way you're gonna come away with an offer you won't want to refuse.



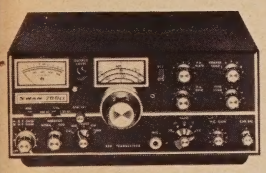
YAESU FT-101E



ATLAS 350-XL



DENTRON MLA 2500



SWAN 700-CX



DRAKE TR-4CW



KENWOOD TS-820S

REGENCY HR-312



CW ELECTRONIC SALES COMPANY

1401 Blake Street Denver, Colorado 80202 (303) 893-5525

When it comes to watts per dollar in full performance transceivers you can't top the new 350A, 350D and 750CW from Swan.

They're part of Swan's new emphasis on solid value equipment that gets out and does the job better than gear costing a lot more.

THESE NEW TRANSCEIVERS GIVE YOU GLOBE-SPANNING PERFORMANCE AT DOWN-TO-EARTH PRICES.



750CW. $679.95. PSU-3 AC Power Supply $173.95.

750CW

If you're ready for 700 loud-talking watts, you're ready for the new 750CW.

- 700 watts P.E.P. input on SSB
- 400 watts DC input on CW
- CW audio filter selectable 80 or 100 Hz.
- CW sidetone monitor with adjustable pitch and volume control
- 80 through 10 meters, USB, LSB, CW
- Selectable 25 or 100 KHz crystal calibrator
- Standard 5.5 Mhz, 2.7 Hz bandwidth crystal filter or optional accessory 16 pole filter available with 140 Db ultimate rejection.

Accessories

- VX-2 Vox
- MK-II Linear amplifier
- DD-76 Digital Dial

The 750CW is a CW man's dream come true. What's more there's a long list of accessories you can add later for increased performance.

350A

- 300 watts P.E.P. input SSB
- 200 watts DC input on CW
- 80 through 10 meters, USB, LSB, CW
- 5.5 Mhz, 2.7 KHz bandwidth crystal filter
- Oscillators are solid state and IC regulated for stability
- CW sidetone monitor with adjustable pitch and volume
- CW audio filter 80 and 100 Hz selectable
- Built in 117 VAC power supply and speaker. (220 VAC power supply available on special request)

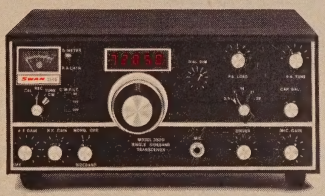
Accessories

- VX-2 Vox
- 14A DC Converter
- 1200X linear amplifier

- Crystal Calibrator (350A only)

350D

- Same basic features as 350A except added feature of:
- 6 Digit LED frequency display with readout to 100 Hz



350D. $699.95 with built-in A.C. power supply.

Both the 350A and the 350D are compatible with the same line of Swan accessories that has built a reputation for reliability and performance that's second to none. Including linear amplifiers to boost your power to the legal limit.

So they're perfect for novices or anyone else because you can build capability as you need it.

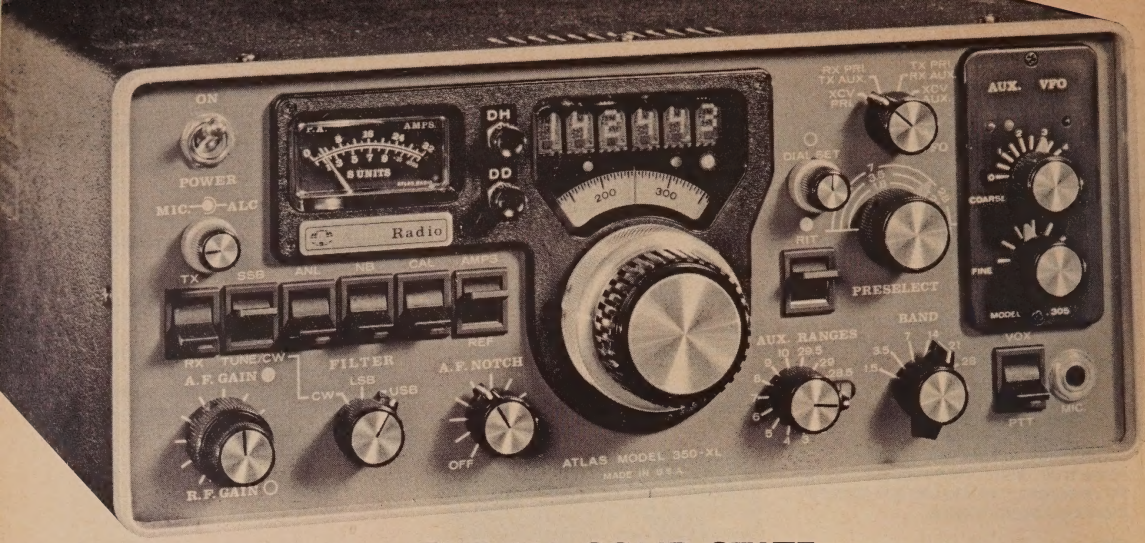
So put your money in a Swan transceiver. It buys a lot more rig now and later.

See the 350A, 350D or 750CW today at your Swan dealer, or contact the factory direct. Use your Swan credit card. Applications available at your dealer or write to us.
(Prices FOB Oceanside, CA)

SWAN® ELECTRONICS
A subsidiary of Cubic Corporation
305 Airport Road, Oceanside, CA 92054



350A. $599.95 with built-in A.C. power supply.



THE ALL SOLID STATE

ATLAS 350-XL

Its face has many interesting features:



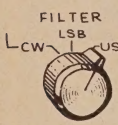
350 WATTS SOLID STATE POWER

P.E.P. and CW input.

SSB/CW TRANSCEIVER

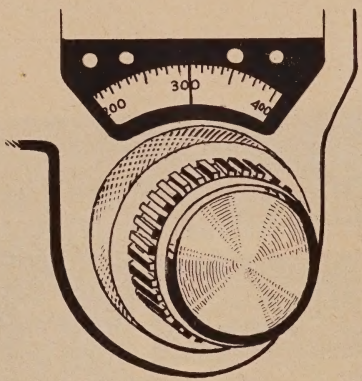
SSB with PTT or VOX operation and full break-in CW operation.





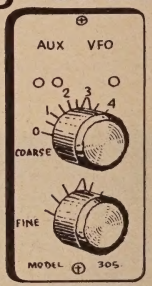
CW-LSB-USB FILTER

Selection of upper or lower sideband with 2700 Hz bandwidth, 1.6 to 1 shape factor, or 500 Hz CW bandwidth with 2.5 to 1 shape factor.



ANALOG DIAL SCALE

0 to 500 kHz dial scale in 5 kHz increments. Velvet smooth dual speed tuning, with 18 kHz per revolution of fine tuning control.



PLUG-IN AUXILIARY VFO (Optional)

Can be either a tunable VFO with the same 500 kHz tuning range as primary VFO or a crystal controlled fixed channel oscillator with choice of up to 12 crystal controlled channels.

10-160 METERS COVERAGE

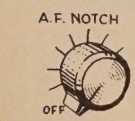
Provides a full coverage of all amateur bands in 500 kHz segments.





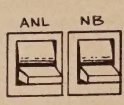
AUXILIARY RANGES

Up to 10 additional 500 kHz ranges between 2 and 23 mHz can be added by plugging in auxiliary crystals. (Will not operate between 23 and 28 mHz., or 5 to 6 Mhz.)



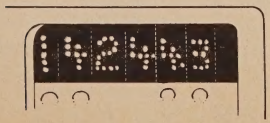
AF NOTCH FILTER

Provides better than 40 dB rejection of an audio frequency, adjustable from 300 to 3000 Hz.



ANL AND NOISE BLANKER

Automatic Noise Limiter reduces hash type noise interference which is not intermittent pulse type. Blanker effectively reduces or eliminates pulse type noises.



DIGITAL DIAL READOUT (Optional)

Provides precise frequency readout within 50 Hz. All L.E.D. Dot Matrix 6 digit display.



RECEIVER INCREMENTAL TUNING

Permits receiving up to 5 kHz above or below your transmitting frequency. Especially useful for CW operation or in a net of SSB stations that are on different frequencies.

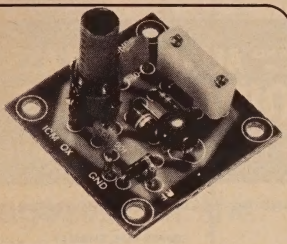
ATLAS 350-XL (less options) . . . . . $995.
Model DD6-XL Digital Dial Readout . . . $229.
Model 305 Plug-in Auxiliary VFO . . . . $155.
Model 311 Plug-in Auxiliary Crystal Oscillator . . . . . $135.
Model 350-PS Matching Power Supply $229.
Plug-in Mobile Mounting Bracket . . . . $ 65.

ATLAS RADIO INC.
417 Via Del Monte, Oceanside, CA 92054
Phone (714) 433-1983
Special Customer Service Direct Line
(714) 433-9591

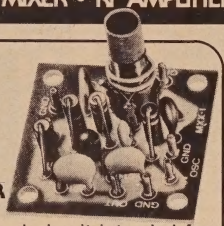
for the experimenter!

INTERNATIONAL CRYSTALS & KITS

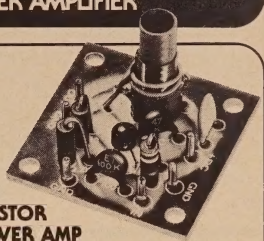
OSCILLATORS • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER



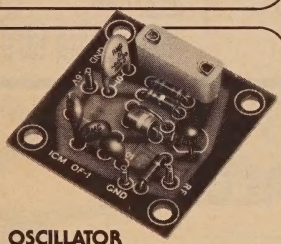
OX OSCILLATOR
Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101
Specify when ordering.
$3.95 ea.



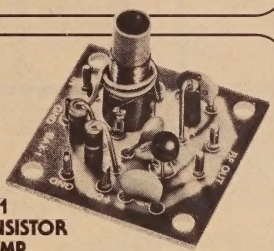
MXX-1
TRANSISTOR
RF MIXER
A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106
Specify when ordering.
$4.50 ea.



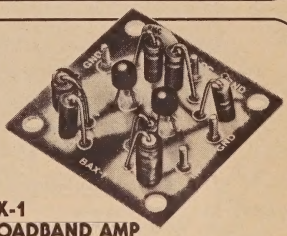
PAX-1
TRANSISTOR
RF POWER AMP
A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated. 3 to 30 MHz, Cat. No. 035104
Specify when ordering.
$4.75 ea.



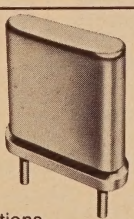
OF-1 OSCILLATOR
Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 HI, Cat. No. 035109
Specify when ordering.
$3.25 ea.



SAX-1
TRANSISTOR
RF AMP
A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 035102. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
Specify when ordering.
$4.50 ea.



BAX-1
BROADBAND AMP
General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat No. 035107
Specify when ordering
$4.75 ea.



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

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

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

ICM

International Crystal Mfg. Co., Inc.
10 North Lee
Oklahoma City, Oklahoma 73102



SUPER-QUAD FIBERGLASS ANTENNAS

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COMPLETE KITS INCLUDE HARDWARE, WIRE, ALL MOUNTS, BOOM

★

STRONGER AND LIGHTER THAN ALUMINUM

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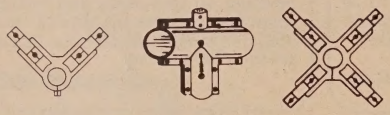
MAXIMUM GAIN

AVAILABLE IN A COMPLETE RANGE OF KITS

Special Instruction Manual on Kirk's "Super Quads" $2.00

- 2 3 4 ELEMENT TRI BAND
  10 15 20 METER . . . . . AMATEUR NET FROM $213.90
- 2 3 4 ELEMENT DUAL BAND
  10 15 OR 10 6 METER AMATEUR NET FROM $125.35
- 2 ELEMENT 40 METER AMATEUR NET $436.25
- UHF 4 ELEMENT 2 OR 6 METER
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COMPLETE PACKAGED KITS INCLUDING
SPIDERS OR V-SUPPORTS • BOOM TO MAST MOUNT
•ALL NECESSARY ASSEMBLY HARDWARE
•INSTRUCTION MANUAL
HEAVY DUTY CAST ALUMINUM

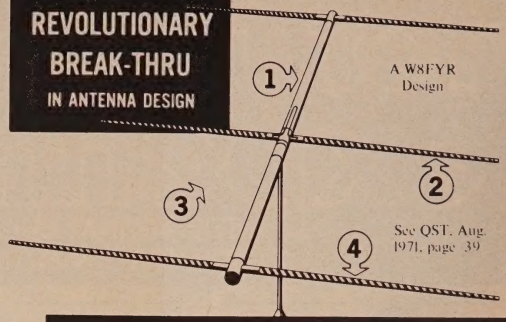
DELTA LOOP MOUNT KIT

DL-1	(2)	1½" Hub V-Supports	
	(1)	1½" Boom to 1½" Mast T-Mount	$16.10
DL-2	(2)	2" Hub V-Supports	
	(1)	2" Boom to 1½" Mast T-Mount	$24.69
DL-3	(2)	3" Hub V-Supports	
	(1)	3" Boom to 2" Mast T-Mount	$40.64

QUAD MOUNT KIT

QM-1	(2)	1¼" Hub Spiders (Small Spider for VHF)	
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	(1)	1¼" Boom to 1¼" Mast T-Mount	$15.12
QM-3	(2)	1½" Hub Spiders	
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A W8FYR Design

See QST, Aug. 1971, page 39

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AVAILABLE IN: 2 & 3 ELEMENT · 40 METER
2, 3, 4 & 5 ELEMENT · 10-15-20 METER

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AND EXCLUSIVE FEATURES:

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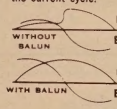
Example:

4 Element 40 M	46 Lbs.	$589.50
3 Element 20 M	17 Lbs.	$249.94
3 Element 15 M	9 Lbs.	$192.45
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WORLD'S FINEST BROAD BAND BALUNS 1:1 Or 1:4 RATIO

Kirk Bread Band Baluns are designed for matching an unbalanced line, such as coaxial cable, to a balanced antenna to produce a symmetrical wave form of equal intensity from the current cycle.



Kirk Baluns provide the greatest breakdown insurance by use of mylar insulation between the tough poly thermaleze winding and the Ferrite Core and a final dip coating of low dielectric impregnation. Handle peak power of 2000 watts provided ratio error is low.

Unique in design, Kirk Baluns are produced in two distinctive models. One for Dipoles and one for Beam Antennas.

NET PRICE **$14.25**

Application Frequency Coverage & Power Ratings For The Various Models Shown Below

MODEL	APPLICATION	F/MC.	POWER
5075-D	Dipole	3.4-52 mcs.	2K PEP
5075-B	Beam	3.4-52 mcs.	2K PEP
5075-LF	Dipole	1.7-10 mcs.	2K PEP



MODELS 5075-D & 5075-LF For Dipole Antennas Net Wt. 7 Oz.

MODEL 5075-B For Beam Antennas Net Wt. 7 Oz.

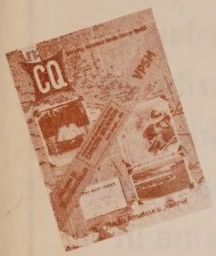
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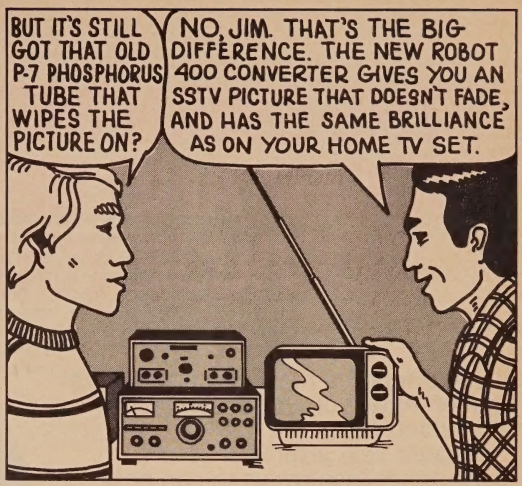
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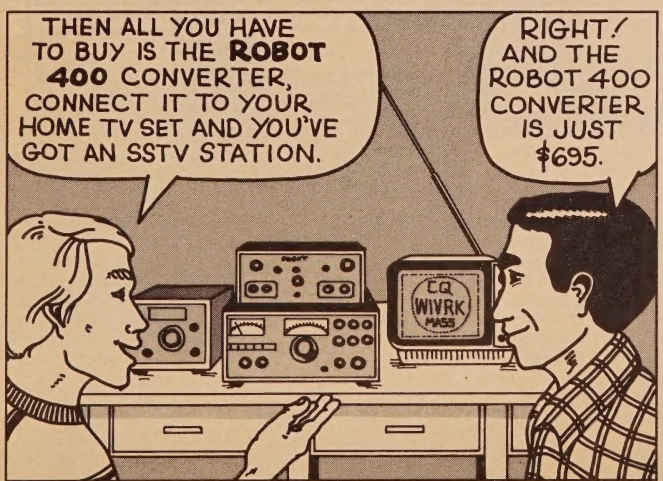
The NEW CQ

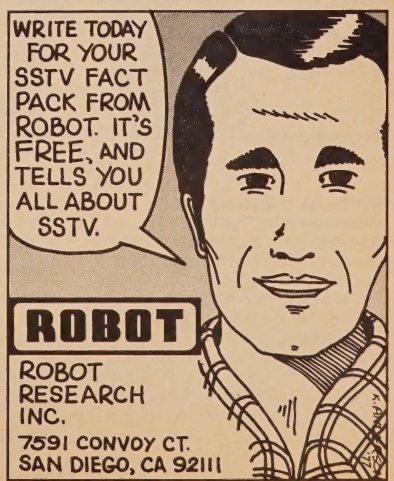
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* The Robot 400 Converter can be connected to the antenna terminal of a home TV set by means of the Robot RF Adapter Kit option for $25.



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*

COMPLETE KITS INCLUDE HARDWARE, WIRE, ALL MOUNTS, BOOM

*

STRONGER AND LIGHTER THAN ALUMINUM

*

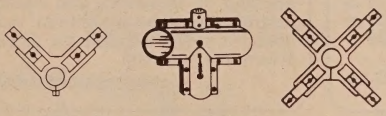
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REVOLUTION
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IN ANTENNA DE

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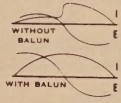
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   ELEMENTS
2. ELEMENT LI
   TO 35% SH
   METALLIC A
3. PRECISION
   MINIMUM A
   NO
   NO A



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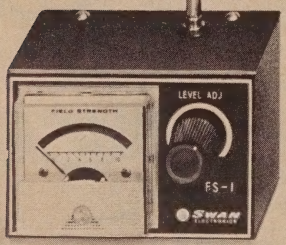
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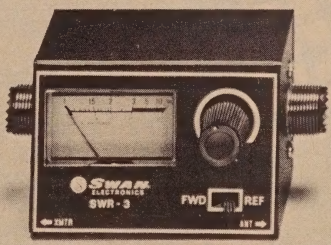
The meters you see here are only part of the Swan line. See them all at your Swan dealer today. Buy them with your Swan credit card. Applications at your dealer or write to us.



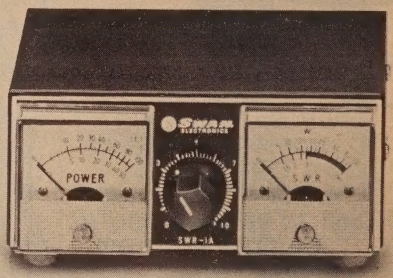
At last. A precision wattmeter for the 6 and 2-meter man. We design the WM-6200 for the upper-band man who needs to know with ± 7% accuracy. Reads power of 50 to 150 MHz signals on two scales to 200 watts plus SWR on expanded range scale from 1:1 to 3:1 with ± 3% accuracy. **WM-6200 In-Line Wattmeter** **$59.95**



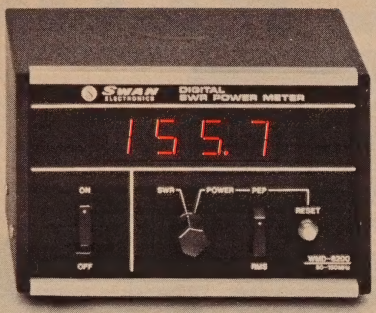
Sniffs out radiated power wherever it is. This little unit is so compact it could measure relative radiated power in your pocket. Telescoping antenna and a frequency range of 1.5 MHz all the way to 200 MHz. **FS-1 Field Strength Meter** **$10.95**



Easy-on-the-pocket pocket SWR. Mighty mite SWR meter with high accuracy, SWR-3 gives you 1:1 to 3:1 SWR at 50 ohms on frequencies from 1.7 to 55 MHz. Precision PC board directional coupler makes it a solid value at a rock-bottom price. **SWR-3 Pocket SWR Meter** **$12.95**



SWR bridge bridges the price barrier. This little jewel gives you relative forward power and SWR on two 100 microampere meters at a remarkably low price. Indicates 1:1 to infinity VSWR of up to 1000-watt signals on frequencies from 3.5 to 150 MHz. With low insertion loss, it's great for mobile operations, too. **SWR-1A Power Meter and SWR Bridge** **$25.95**



Put your power up in lights. The new WMD-6200 does everything our WM-6200 does and ends guesswork, interpolation errors and eyestrain besides with a 4-digit readout. 50 to 150 MHz, power to 200 watts with an accuracy of ± 10%. SWR from 1:1 to 19.99:1 with ± 3% accuracy. **WMD-6200 Digital SWR Power Meter** ..... **$199.95** (requires AC source)



Everything you need to know for $84.95. The new WM-200A does it all. As an in-line wattmeter it gives you power to 200 watts on two scales plus SWR from 1:1 to 3:1 for signals from 50 to 150 MHz. And as a peak reader it reads true peak envelope power of your voice modulated signal. Flat response forward or reflected power on scales to 200 watts in switch-selected RMS or peak. **WM-200A Peak Reading Wattmeter** **$84.95**



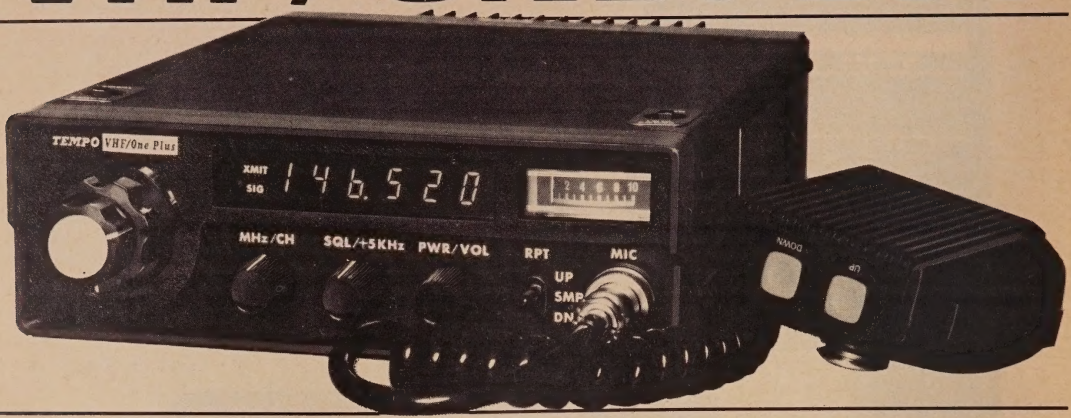
Nifty little meter just for VHF mobile. This brand new, easy-to-install swivel-mount unit is the perfect illuminated wattmeter for 2-meter mobile. Compact and capable, it gives you two scales, 0-20 watts and 0-200 watts at 10% accuracy. SWR from 1:1 to 3:1. Frequencies from 50 to 150 MHz. **WMM-200 SWR Power Meter** **$39.95**

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TEMPO

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MORE POWER / 25 OR 5* WATTS OUTPUT SELECTABLE

REMOTE TUNING / ON MICROPHONE

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

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

*Adjustable internally 3 to 15 watts



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

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

*Not furnished.

FCC Type accepted models available.

TEMPO VHF & UHF AMPLIFIERS

VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$199
10W	130W	130A10	$179
30W	130W	130A30	$189
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159

UHF (400 to 512 MHz)

Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
2W	40W	40D02	$180
10W	40W	40D10	$145
2W	10W	10D02	$125

FCC Type accepted models available.

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

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Henry Radio

TEN-TEC 544 DIGITAL. Another ahead-of-its-time achievement from the pioneers in solid-state HF amateur radio technology. The 544 Digital joins its successful companion, Triton IV, to chart new paths in engineering.

THE RECEIVER. Deserving of all superlatives. Range: 3.5-30 MHz (plus "160" with option). MOSFET RF Amplifier with Resonate Control for a sensitivity of 0.3 μV for 10 dB S+N/N. And overload minimized. Noise Blanker option: remarkably effective against impulse noise, functions in the IF, controls from the front panel. Hetrodyne crystal mixed VFO: steady as a rock. 8-pole 9 MHz Crystal-Lattice IF filter for a selectivity curve straight out of the text books: steep skirts, flat top, and narrow (2.5 kHz bandwidth, 1.8 shape factor at 6/60 dB points). Offset Tuning, with LED indicator, permits independent tuning of the receiver through a 10 kHz range (approx.). As one owner put it, "it makes SSB nets a breeze." And that beautiful Digital readout: six 0.43" LED digits, 5 in red and the least significant 6th in green, reading to 100 Hz with an accuracy of ± 50 Hz, settable to WWV. (Who needs a calibrator? And, indeed, it has none). WWV reception at 10 & 15 MHz. The sound? So beautifully clean and clear, it wins raves from all. Less than 2% distortion. Built-in speaker to clear the operating position. And External Speaker/Phone jack. CW Filter option, 2-position, 150 Hz width. Zero-Beat Switch for right-on CW. Whether you operate SSB or CW or both, you'll agree the 544 has a truly superior receiver section.

THE TRANSMITTER. 200 Watts Input – *all* bands, SSB or CW. Instant band change *without* tuneup! And no danger of off-resonance damage, even with the wrong antenna. 8-Pole SSB Filter. Automatic Sideband Selection, reversible. Push-Pull Output with the heat *outside* of the cabinet. 100% Duty Cycle so you can use it for RTTY and SSTV. Front panel ALC control with LED to show operation in the ALC region. Meter shows SWR when transmitting. VFO circuit is permeability tuned, has less than 15 Hz change per F° after 30 min. warmup, less than 10 Hz change from 105-125 VAC with accessory power supply. SSB speech quality is completely natural, CW signals clean, articulate. And *full* CW break-in! So right you wonder why it wasn't done before – turns monologs into conversations. Sidetone is adjustable in pitch and volume. Automatic CW offset of 750 Hz. P-T-T. Hi-Z mic. input. RF Output-Z 50-75 ohms, unbalanced.

THE CONSTRUCTION. Styled for today and tomorrow – etched aluminum front panel, black nomenclature, black top and sides. Ruggedized chassis stands up to the rough handling of mobile/portable use. Modular construction: 10 plug-in assemblies, 9 fixed circuit boards (65 transistors, 38 diodes, 14 ICs, 1 LSI, 6 LED displays). Snap-up front feet. Size: 4½ × 13-5/8 × 13. Net weight: 12 lbs.

THE ACCESSORIES. Model 242 Remote VFO for six-mode operation; 241 Crystal Oscillator for 6 spot freqs.; 240 Converter for 160 Meter operation at slightly reduced power level; 215P Microphone & Stand; 252G protected power supply; 262G power supply plus VOX plus 2 speakers; 207 Ammeter for supply monitoring; 249 Noise Blanker; 245 CW Filter; 212 Crystal for 29.0-29.5 MHz; 213 Crystal for 29.5-30.0 MHz. Plus various sized matching blank enclosures.

TEN-TEC 544 DIGITAL. So right, so advanced, it may well be the last rig you'll ever need to buy!

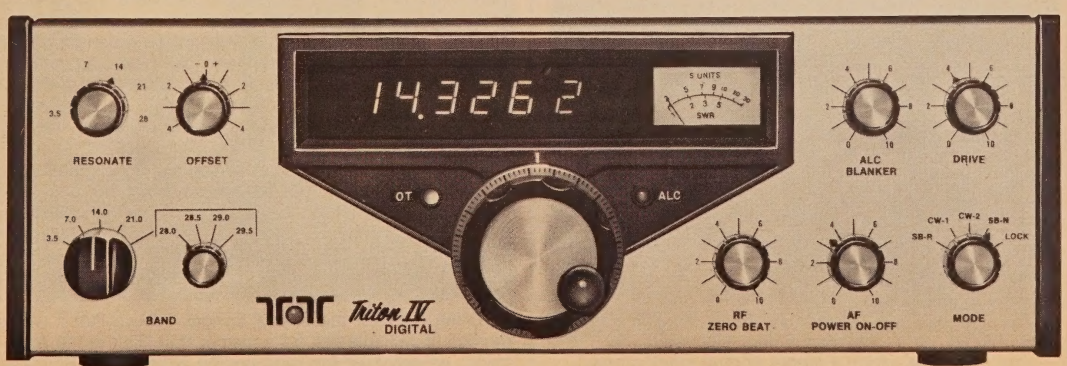
544 Digital –$869
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See the 544 and its companion 540 non-digital transceiver at your nearest TEN-TEC dealer, or write for full details.

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We have been notified that Motorola has been granted registration of the tradename "Triton." Consequently, TEN-TEC will refrain from using "Triton IV" when referring to our transceivers, beginning January 1, 1978. We say "goodbye" to the name, but certainly not to models 540 and 544.

ENCORE! ENCORE! TRITON GOES DIGITAL



What do you say to a leopard clawing his way into your home? How does it feel to take a small, barely pressurized plane rolling through and around the peaks of Mt. Everest? What's it like to score several firsts in amateur radio? Bill Rindone answers these and many more.

DXPEDITION TO NEPAL
9N1MM/7

BY BILL RINDONE*, WB7ABK

With VK9XX and Christmas Island behind us, we flew up the Molucca Strait buffeted by rough weather.[1] It was three o'clock in the afternoon and as black outside as midnight. I now knew how Jonah felt after being swallowed by the whale and except for the lightning bouncing around us on all sides we could have been on the Coney Island roller coaster working on a spot in the *Guiness Book of Records*.

When we arrived in Kuala Lumpur, the capital of Malaysia, the ground looked good and with my TS-520 in its carrying case and thoughts of operations to come I entered the airport terminal.

The welcoming committee was there in the form of a 10 foot high sign which read "THE FOLLOWING ITEMS ARE PROHIBITED: #1—Wireless Transmitters . . ." At that point I stopped reading . . . after all you can't do any better than first place. The next signs read "NOTHING TO DECLARE" and "GOODS TO DECLARE," naturally, I took the latter. I beckoned a porter to grab my suitcase and antenna, having learned long ago that a tourist who utilizes the local labor force always has an edge. Hoping that my porter's cousin would be the customs inspector, we approached the moment of truth.

"What do you have to declare" came the monotone that only repetition brings. Pointing at my case, I smiled and said "I have a radio in here." "That's all right" came the reply and I waived the porter on before we could get into a "what's that?" with the antenna.

The next day we were in Bangkok with Udo, HS1ALB and surveyed the difficulties of amateur radio in the Southeast Asia of today. "BARELY TOLERATED," would certainly read the epitaph of any amateur station in the area. I was to learn that this attitude applied not only to amateur radio, as there was a definite open aggressive hatred for Americans, prevalent outside of the "tourist trap" main stream. The nine foot high fence and padlocked, wrought iron gate around Udo's home were definite signs of uncertainty. Whether departing or arriving we darted down the narrow alleys at high speed, aware that the disenchanted only rolled grenades under slow moving cars.

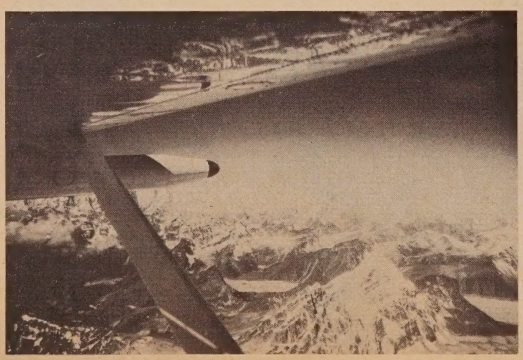
Still no word had been received from the Indian government regarding permission to visit the Andaman Islands. Fred Barn, VU7ANI, had been pulling the strings thru friends in Delhi, but so far, the puppets were not dancing. As time was short I elected to make the run to Katmandu in Nepal and back track, if and when the permission ever came thru. The Indian government can never be catagorized as helpful and as this is being written in mid-1977 the request for Andamans is still pending. In the interim, Fred has passed away and VU7 stands alone without amateur population.

The rain continued to thunder down in Bangkok and the temperature rested at 105° Fahrenheit. It was the beginning of the wet season and I was glad to get on board the Royal Nepal Airways flight and climb above the weather, wending our way to the northwest. This bird carries 125 passengers, but today, only about thirty are making the run.

Loking out over the Bay of Bengal, I muse that it would be nice to get approval for a visit to Port Blair in the Andamans, as some of the surrounding islands are Burmese.

*3049 Doris Ct., Lake Oswego, Oregon 97034

[1]Rindone, W. R., "VK9XX DXpedition To Christmas Island," CQ p. 16, May, 1977.



The Himalaya's from a single engine small plane.



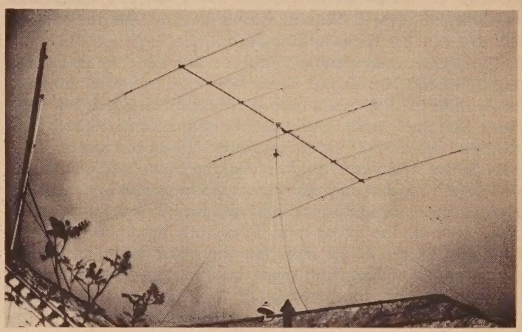
Looking up the Khumba Ice Field from 22,000 feet we can see Mt. Everest, Mt. Nuptse and Mt. Lhotse.



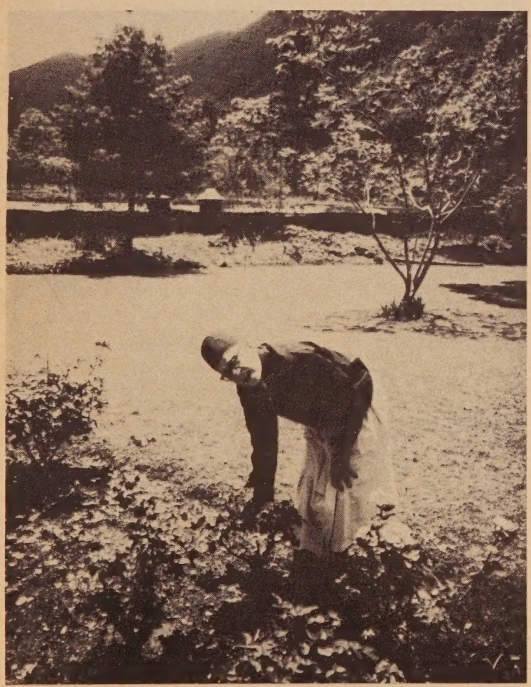
Snow blowing off Everest's peak while we roll the plane to look straight up the south face.



A Tibetan shrine with Prayer Flags and a young monk turning a prayer wheel.



The 9N1MM rotary TH-6 tribander.



Father Moran as you expect him to look.



The Father Moran I know! He's ready for an errand in town.

With my friends valid XZ license it would only require a small boat and generator to provide a quiet location for an operation.

A short time later on the ground in Calcutta, I wondered whether I would pass this way again. The temperature was still 105° and I considered that I had fared very well in the heat of the last couple of months. Ninety degrees had been the cool spot and my feet were still covered with water blisters. Back in the plane, I picked up pen and paper and wrote to my wife at home in the states:

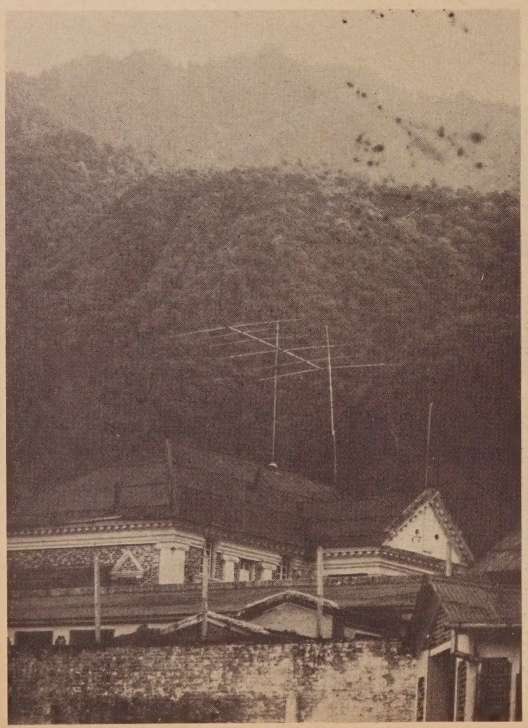
"I've learned that home can be wherever I hang my hat. It doesn't require any effort, it's just that way. Now the bird is rolling down the runway, five hundred, a thousand, five thousand feet over the rice fields flooded by the river Ganges. Now her nose swings away from the south, and the starboard wing dips over this mass of humanity we call Calcutta—we're across the river and sweeping northwards towards Nepal; where the wildest dreams of few are but the facts of Katmandu.

The Indian sub-continent flattens out beneath us in the haze and the Himalayas lie in front of us—stolid as they have been for the thousands of years since the earth tore them from her belly and sent them on their jagged and lofty path in search of the heavens. Now I too search this plateau for answers, as men before have and as those who follow must surely do. The clouds are low and powder white—like a bed of fleece that appears to float on a quiet lake, without ripples or man to disturb them. And now—although we are at full altitude—the ground begins to rise up to meet us. Here and there a small opening occurs in the clouds and the bottom of the pond can be seen through the haze of mist which appears as only a reflection. The sun is bright, far brighter than usual and leaves its impact on the eyes. Now a second, higher, layer of clouds comes into view and the silver bird noses lazily through them, as tho it were as sure of flight as when returning north in the spring. Now we are descending thru the mist that floats off of the Himalayas into the land of the Sherpa. Beneath us small rivers flow winding and twisting on their way south in search of the sea, hundreds of miles away. They are so prominent that they form an abstract paisley print on the floor below. Here and there a tiny village is seen where men still squeeze out a bare existence.

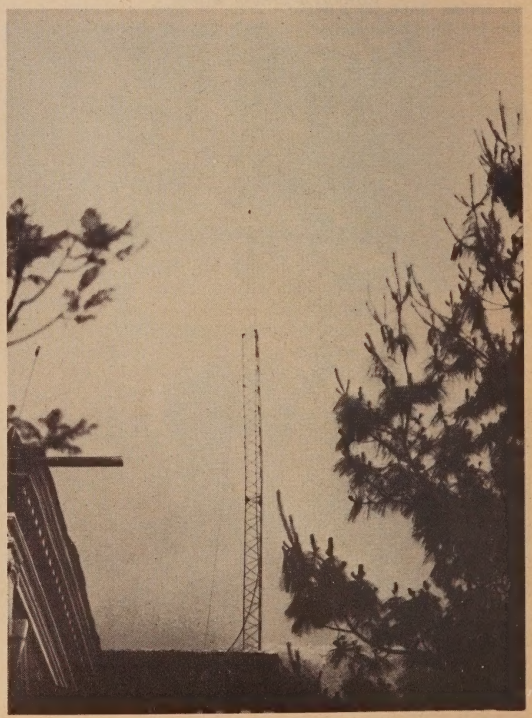
...And there they are, white and reaching skyward in a long line—rising almost 30,000 feet in the air. The gateway to Tibet—the southern face of Nanda Devi and Dhaulagiri are above us. We are winding thru the mountain passes and the terrain is exceptionally rugged. We clear one jagged outcropping by a scant distance and turn sharply to avoid another which is too high for us. We continue to wind torturously and suddenly we open on to the valley of the Katmandu, bank sharply and like a corkscrew descend. The runway appears to my left . . . we are over it and circling our way down—round and round thru the mist and it's hard to write. Still banking as you must to get into the field, three hundred feet and banking—now dropping—the homes are old—dirty—we bounce—reverse throttle and start to slow—and finally to rest. — 11:16 AM Katmandu."

Once inside the small one room thatch covered building, which serves as Nepals international arrival point, I look for Father Moran, 9N1MM, and spot him on the other side of the glass exit doors. The luggage arrives and I prepare for Customs—it's always different.

Opening my suitcase, the inspector questions "Do you carry more than one camera?" and I nod in the affirmative. "What is this?" he squints, and holds aloft the external v.f.o. "It's a variable frequency oscillator for a radio" is my



The southern path to 9N1MM/7.



The 14AVQ vertical which gave the first 80 meter QSO ever from 9N1.

simple reply. He sets it aside and continues rummaging until he finds my electronic keyer. With a jaundiced eye, he again asks "What is this?" Luckily the paddle is packed in my hand luggage and my response of "electronic keyer" seems to do the trick. At this point I was a bit worried and pointing behind my side of the counter exclaimed to the small man in spectacles "What you are looking for is in here!" I thought it best to show them the transceiver and ask that it be put in Customs bond until my departure. Ignoring me he trundled off and returned with what must have been the head man on duty. The scene repeated itself with the same lines, only a change in the cast of characters. When my turn came to proclaim "...in here!", he smiled and with his dusty yellow chalk initialed the bags and uncurled his weary fingers in the direction of the door. I beat a hasty retreat and arriving at the exist was scrutinized by the guard on duty. Just as I thought we had passed muster, he noted the lack of chalk dust on our hand case, where the TS-520 was securely encased. Hell, I thought we had really opened Pandora's Box with this play, but there was nothing left to do except go back to the counter. As luck would ordain, we were received by a third official who had missed the first two acts of our scenario. I pointed at all of the initials and then pointed at the one bag without. He smiled and quickly added his monogram to the transceiver case.

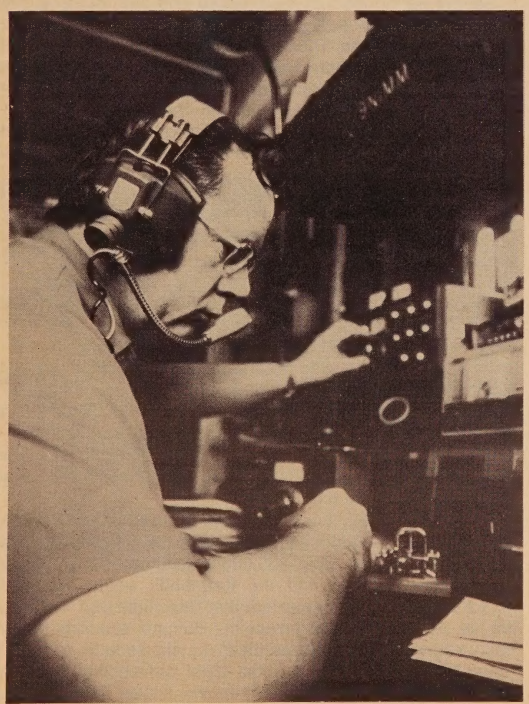
On the other side of no-mans-land, we found Father Moran and headed for his car. At seventy years of age, he looks and acts several years younger. Normally he would have ridden his Yamaha the 15 miles to town and left the Volvo wagon at Godavari where his school is located. We stowed the gear in back, and as we prepared to get in, we were approached by a young chap who asked if he might ride into town with us. The conversation was in Nepali and soon the three of us were settled and I caught my first glimpse of the capitol. We took the long way around town and the conversation was light, as noteworthy areas were pointed out by "Moran" as he refers to himself on the air. In the center of town a short exchange of Nepali took place and our passenger thanked us for the ride. As he turned to leave, Moran broke into English and asked him if he was with the airport security police, to which he nodded his head in the affirmative.

Godavari is located about fifteen miles outside Katmandu, nestled in amongst the foothills which in our midwest would be called mountains. As we traversed the one lane road east, we passed thru ancient adobe villages with their ocre brown terraced fields in the background. It was summer and the shafts of wheat were spread here and there on the road so that they might be crushed by the carts or occasional Chinese trucks that passed. In this way they managed to separate the wheat from the chaff in the time honored method of their forefathers.

Arriving at Godavari, I settled my belongings on the edge of the compound near the river. Twenty minutes later we were on the air on schedule with Don, 9VISH, Udo, HS1-ALB and Dick, YBØABV. Following the sked, I moved down to c.w. and started passing out contacts. Nepal had not been activated on c.w. since Gus Browning signed the same call sign in October of 1963. The demand was there and the QSO rate climbed to near 200 an hour at one point.

The 20 meter band opened at 5:00 a.m. local time and by 9:00 a.m. *all* bands were dead. Not until 3:00 p.m. when 15 meters opened, was it feasible to operate. Then by shifting thru the bands one could stay with it until 2:00 a.m. local time.

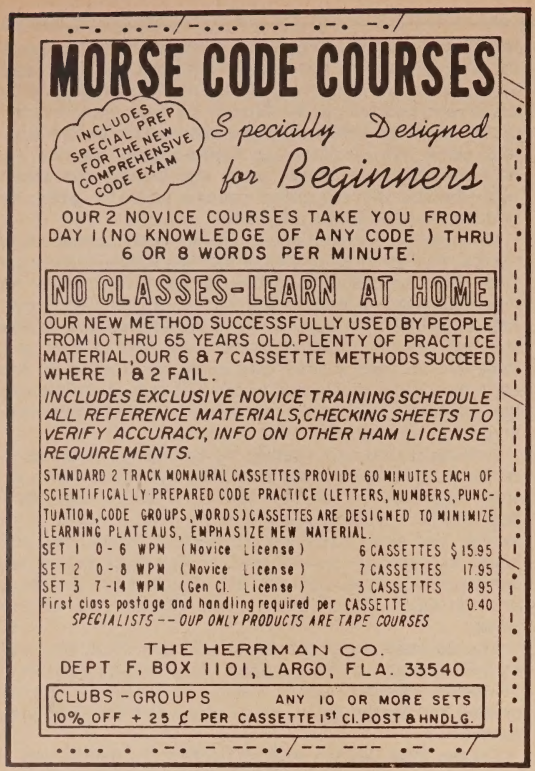
On the third day we pushed hard on 40 meters and a



Bill Rindone operating 9N1MM/7.



Patna, the oldest continuously occupied city in the world.



number of firsts were established including the first 9N1—North America 7 MHz QSO which went to KL7AI. The first 40 meter W's were W6MUR, K6AO and K6GA. At the time of these contacts, W7NCO was on frequency, but not audible. Twenty four hours later, W7NCO was heard and a two way finally established. When we fired up on 3.5 MHz, we established the first 80 meter QSO ever, this went to JA4FHE. KL7AI was QSO #8 and he now had a pair of No. American firsts on both 40 and 80 meters! Oceania went to YB0ABV the next night, and a day later UK2GKW took Europe. The 3.5 So. American is still available, but Hal, PY1ZAE got thru on 7 MHz. for the first 40 meter QSO from that continent. Some of the other 80 meter firsts went to OH7RF — SMØCQE — UB5UCH — UK6LAZ — UA9CM — 9K2DR — PAØTA — UL7GAY — EP2OD — ON4UN — DL8VN — UK2PAF — SP8GH — UR2RJ and OK1ADM.

Conditions to the eastern U.S.A. were fair but the western reaches saw few of the 3000 c.w. QSO's. The TH6 beam and 14AVQ vertical worked surprisingly well, while staring into the face of mountains which blocked our main propagational paths.

We slept across the compound, some 100 yards from the rig. By necessity we covered the distance in the dark whether closing down or opening up. One morning, while following our normal pattern, we awoke at 4:20 a.m. to find a leopard on our roof. He was busy trying to claw his way in, while screaming as only the spotted ones can. We had hunted leopard three years before and the seven footer in our den had given us a familiarity with them, that few people get. They are particularly fond of eating domestic dogs, and countless canines have fallen prey to them. This one was obviously hoping that one of the two dogs in the compound would come to investigate or that if that failed he could settle for an early rising dx-er. After about twenty minutes, he bounded down and headed away down the stream immediately behind us. In the days to come, we picked our way carefully thru the darkness of the compound, while thinking about our four legged friend who also liked to call CQ Dog Xray.

A few mornings later, I sluggishly dressed and set out for the main building. Half way there I felt dizzy and folded up. After 30 minutes, I had made my way only as far as the front steps. What ever it was, it had really taken hold and I knew I couldn't make it up the two flights of stairs to the rig. I decided to try for my room and after another thirty minutes, managed to crawl across the room and search my suitcase for the emergency antibiotics I've learned to carry for such occasions. I swallowed them dry and pulled myself into the bunk. When I came to, hours later, I had company and they managed to get a little water down me. My fever was 105° and had taken all the curl out of my hair. When it finally broke, it left me so weak that I had difficulty just pouring water from a bottle. Drinking it was a second exercise, for which I had to wait and accumulate the strength to lift the glass.

Leaving Godavari, I moved into the "Anapurna" in town and made air reservations for the next day on the first available flight to the States. With a 24 hour delay on my hands, I contacted a mutual acquaintance and arranged to fly to Mt. Everest in a single engine, Pilatus Porter. I was still sick, but, I had come this far and wasn't going home without at least seeing the mother of all mountains.

My Swiss pilot doubted that we could get above 15,000 feet due to the turbulence and wind at this time of year. But if I was game, he would try it.

We climbed to 15,000 feet and flew toward the Tibetan border. It was a long run without oxygen or pressurization, and the goose down jacket I had carted thru the tropics really felt good. The Himalayas stretched out beneath, above and in front of us.

Shortly we donned oxygen masks and started using the scant 20 minute supply available to us. At 22,000 feet we leveled out with the Khumbu ice field on our right. I had carried both my 35mm Nikon, and a Eumig 8mm movie camera, and as I unlimbered the latter, we flew directly into the south face of Everest. At the last moment my friend rolled the plane so that I could get some additional film footage. I was staring straight up the south face which was still 7,000 feet above me. My stomach said "enough," but my mind said "keep shooting." We then entered Chinese air space to shoot the Tibetan ascent to Everest. My stomach had had enough, but, the film was still running.

Finishing up, I had one last desire. I fired off the planes s.s.b. rig on 40 meters and called CQ till a UA9 answered me at 22,000 feet over Tibet while I watched the wind blow the snow off the peaks of Everest and Lhotse. The temperature in the cockpit was 19° below zero, but at this point I didn't really care.

From there we landed at Thyong Boche, to drop off a fuel drum for the joint expedition currently on "the mountain". The strip there is carved into the hillside and the end of the runway has a 5,000 foot drop away to help you get airborne, when you fly out.

From here it was back to Katmandu and a rendezvous with what was supposed to be a Royal Nepal Airways flight. I am biased after 250,000 air miles and won't fly some airlines. I had told the Katmandu agent this and noted that although I wanted the first flight out I would not fly Air India for any reason. He had assured me it was unnecessary and amended my ticket with a Royal Nepal flight. When my Air India flight arrived that evening in New Delhi, it was 100° Fahrenheit. It was 125 degrees warmer than the slopes of Everest but at this point the only thing that mattered was that we were closer to home. ■

Dig them out of the refrigerator, they've chilled long enough. Empty out all of those old cigar boxes where they've been waiting for you to do something. With a little work on your part they can do a lot of work for you.

A BULK NI-CAD RECHARGER

BY JOHN J. SCHULTZ*, W4FA

Not many people will question the economy of using nic-cad batteries in battery operated equipment—if one can purchase the nic-cads at a reasonable price. If one has been slowly buying nic-cads at sale prices for amateur equipment as well as household devices, one could easily have up to 30 or more such batteries in use. Obviously, simple rechargers become awkward to use if any quantity of bateries have to be charged at the same time.

The bulk recharger described in this article should be useful to anyone who already has or is starting to accumulate a quantity of nic-cad batteries in the usual AA, C and D cell sizes. There is nothing new in the circuitry used in the recharger but the unit is a practical realization of various ideas on nic-cad chargers. The configuration of the recharger can be changed to suit one's own needs. Basically, the recharger as presented can handle up to 12 AA cells, 10 C cells and 8 D cells. The charging rate is separately determined for each type of cell and may either be made fixed or variable if one wants to make the unit a bit fancier. The recharger is also "expandable". That is, the circuitry used in the recharger will handle up to 20 units of *each* type cell but the recharger chassis only has room for the 30 cells mentioned above. So, a provision can be made by means of a jack on the recharger chassis to plug in an additional chassis with more cell positions when and if needed.

The circuit of the recharger is shown in fig. 1. A single transformer is used which supplies about 24 volts d.c. after rectification. Three separate regulators are run off of this one d.c. source. The only difference among the regulators is the emitter variable resistor used. The regulator for the AA cells uses a 100 ohm resistor to vary the charge rate for those cells from a minimum of 6 ma to a maximum beyond their normal charge rate of 45 ma. Similarly, the C cell regulator uses a 25 ohm resistor so the charge rate

*U.S. Consulate, Box "L", FPO New York 09544

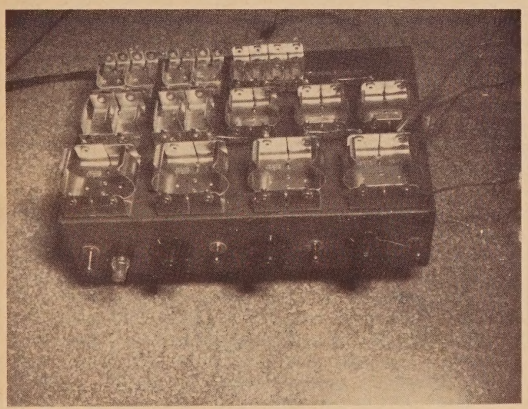


Fig. 2—This top view of the charger shows how the various type cell banks are arranged. Expansion of the charger is possible up to 20 cells of each type by plugging in a chassis with more cell holders. The interconnecting means for another chassis need only continue the series wiring of the cell holders of each type. As explained in the text, metal holders only (Radio Shack or Keystone) should be used.

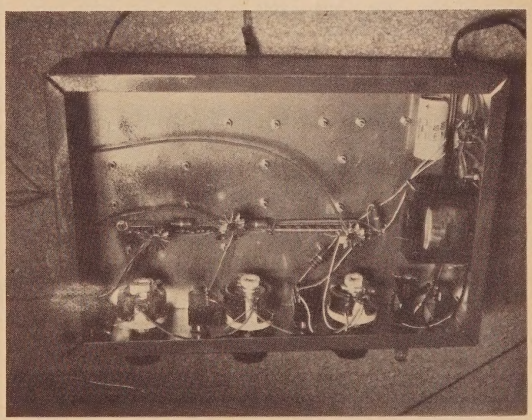


Fig. 2—This underside view shows the wiring of the charger. Darlington NPN transistors using the chassis as a heat sink would be preferable to the 2N4896's shown with fin type heat sinks. The rheostats used are surplus 25 watt units but any unit rated at 2 watts or more can be used.

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NOTES
1. Models prefaced ' ** ' will be available 1/77.
2. All models above are furnished with crimp/solder lugs.
3. All models can be furnished with a SO-239 female coaxial connector at additional cost. The SO-239 mates with the standard PL-259 male coaxial cable connector. To order this factory installed option, add the letter 'A' after the model number. Example: 40-20 HD/A.
4. 75 meter models are factory tuned to resonate at 3950 kHz. (SP) models are factory tuned to resonate at 3800 kHz. 80 meter models are factory tuned to resonate at 3650 kHz. See VSWR curves for other resonance data.

MODEL	BANDS (Meters)	PRICE	WEIGHT (Oz/Kg)	LENGTH (Ft/Mtrs)
40-20 HD	40/20	$49.50	26/.73	36/10.9
**40-10 HD	40/20/15/10	59.50	36/1.01	36/10.9
80-40 HD	80/40 + 15	57.50	41/1.15	69/21.0
75-40 HD	75/40	55.00	40/1.12	66/20.1
75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
**80-10 HD	80/40/20/15/10	76.50	50/1.40	69/21.0

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can be varied from 24 ma up to a maximum beyond the normal 125 ma charge rate for these cells. The D cell circuit uses 10 ohms for a charge rate minimum of 60 ma and up to a maximum beyond the normal 150 ma charge rate for those cells.

The charge rate for any circuit can be made fixed, if desired. The required resistance is approximately 0.6 divided by the desired charging rate in ma. But, there are a few advantages to having the charge rate variable. If one is in no rush to recharge the cells they can be recharged at a slower rate, thereby perhaps getting a bit longer life out of them. Similarly, a quicker charge rate may be appropriate at times if one has a mix of regular nic-cad batteries and quick charge types and is recharging the latter type. Also, one may have a few oddball type nic-cads around which do not physically fit the cell holders on the recharger but can be properly handled by the charger (if the charging rate is variable) by hooking them in with clip leads. Or, the button type nic-cads used in some calculators can be handled by placing them in series in a plastic sleeve and putting them in the charger in place on an AA cell.

The batteries of each type to be recharged must be in about the same state of discharge. They are recharged in series which is not the ultimate way to do it but the most practical one unless one wants to build a separate regulator circuit for each cell.

As shown in fig. 2, the battery holders used are of the *metal* type. The metal type is preferred because even in the multiple cell holders of this type, there are separate connection lugs for each terminal of each battery. The cell holders are wired in series and the clip lead used to connect to the minus terminal of the last battery in the string. But, if one's battery usage pattern changes one can easily wire the cell holders around to recharge two banks of batteries of the same type from two different regulator circuits, as one example. Plastic cell holders do not allow such versatility.

The clip leads are placed on the end of the chassis from the "start" end so they can reach over to another extension chassis plugged into the main chassis. The main chassis itself is a 12 × 8 × 3 inch one. This size proved a very convenient one to hold the variety of cells described.

The 2N4896 transistors used in the current limiting regulators are a bit of "overkill" for this application but they were used because they were on hand. Any inexpensive silicon NPN having a dissipation of a few watts and an *Hfe* of 100 or so can be used. For example, any Darlington NPN. A heat sink should be used or the transistor fastened to the metal chassis in such a way that the latter acts as a heat sink. The charging rate controls can be calibrated by the one-time use of a meter. There is a danger in the

(Continued on page 110)

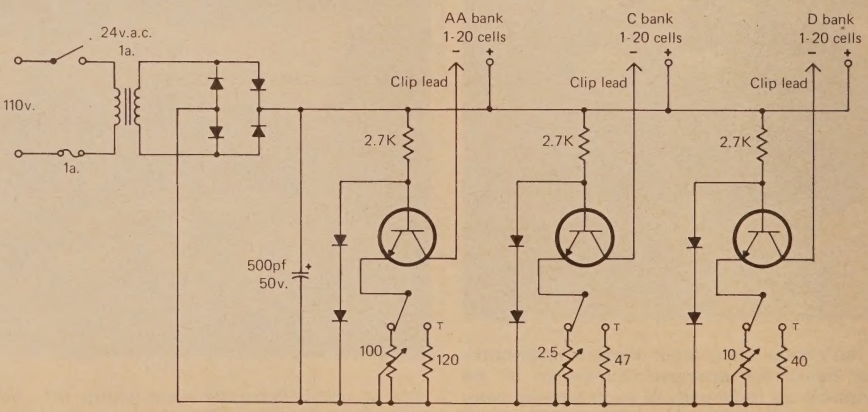


Fig. 1—The charger diagram. Each type of cell is charged from a separate automatic current limiting circuit. The toggle switches choose either a preset charge rate or a trickle charge rate. The transistors used were 2N4896's but almost any Darlington NPN will work and is preferable. The diodes are all 1N4002's.

Results of the 1977 CQ World Wide WPX SSB Contest

BY BERNIE WELCH,* W8IMZ

CJ3DCB — Highest All-Time Score.

JT1AN — First Mongolian Entry.

YU2HDE/3 — First Yugoslavia 160 Meter Entry.

W8ILC — QRPp — 1 Watt worked 85 Prefix Multipliers.

KP4AST — New North American Multi-Single Record.

4J9B — A 5-Million Plus Score.

HOW SWEET IT WAS—Yes, indeed. It was the all-time record year. We had a multitude of unique prefixes from more different countries than ever before in the 21 year history of the contest. In fact, our available data indicates that it was possible for a station to have contacted over 500 different prefix multipliers. However, unlike the high of 517 in the '76, the top number achieved this year was 489 by YU1BCD followed by DK3BJ with 483 and OF1AA's 468. We can not begin to acknowledge each individual, group, club and agency responsible for making these different prefixes possible. We assure you the efforts were greatly appreciated. The countries providing the greatest variety were: Canada, Finland, Mexico, Italy and Australia, followed by Peru, Argentina, Brazil, Bolivia, Russia, Iran, El Salvador, Portugal-Madeira Islands, Sweden, Norway, Switzerland and Hungary, — a record total of 17. Among the most unusual were: AY8, VB3, 4C1, HU1, AX2, 3, 4, 5 and 6, ZW6, OI2, 9D5, 4J9, CT9, HB4, VC9, CPØ, PT7, CJ3, SJ9, IBØ, 4A1, OF1 and 2, PI1, RB5, LH2, CK3, VA7, 4T4, HG5, IK1 thru Ø, 4J6, PA9, ON8, IY4, RA9, and Ø, GU3, 4CZ1, RA3, PP2, SK6, IA5, and IC8.

The new USA "N" prefix received a great deal of attention, especially in California where all first place, single operator certificate awards were won by N6 stations. How about that? We hope we can expect plenty of "N" action from all the states in the '78 contest. New prefixes like WB1 and 3, WD4, 6 and 8 certainly provided added stimulus as did JF, JI, and JJ from Japan and the German DFs. Good friend Walt Smith, DA1BD, also known as K1DWQ, (we made an expedition together to "LX" in 1968) just informed me the rare "DA4" prefix will probably be an entry in our '78 contest.

Pete, WB1AUD, assisted by WA1SQB, WA1QNF and WA1WEM, operating from Connecticut, won the first certificate award for a "WB1" station. (We understand the FCC may be assigning more new prefixes in the upcoming months.) Occasionally we get mail from a WPX contestant whose country has not issued new or special prefixes. He feels that the unique prefixes give a station an unfair advantage. We do not see it that way, as each prefix has its own multiplier value, equal to any other different prefix. And, of course, never underestimate the operator's ability, regardless of prefix. Sometimes it can make a difference. Rare and semi-rare DX stations such as CR3, JT1 7XØ, JW7, CEØ, D4, 5T5, OY1, AX9, /LH, EL3, OX3, CT3, 5B4, YBØ, HL9, A9, VR3, VP2, 4X, GU3, ISØ, and VU2 made many a WPXer happy and provided hard to find countries for DX award chasers. We also had a record number of high scoring stations this year. Fifty-five passed the one-million plus mark. The highest score ever attained in a WPX SSB Contest was 6,688,860 by the multi-multi Canadian station CJ3DCB. The third highest all-time score was also established this year by 4J9B, with a big 5,201,056.



The fourth world-high European multi-single group at Czechoslovakian Station OK5CRC. Ops: (L to R) OK2-SFS, OK2SSS, OK2BLI, OK2AOP, OK2SIR and holding the call sign OK2RZ.

*7735 Redbank Lane, Dayton, OH 45424



What a thrill to chat with Lloyd, W6KG and Iris, W6QL at Dayton. This renowned couple won the '77 WPX-DXpedition Plaque for their VP2MAQ venture.



The new All-Time Multi-Single North American Champion is Puerto Rican Station KP4AST. Top ops: (L to R) Pedro Sr., KP4ES; Pedro, KP4AST; Ed, KP4EKI and Chet, KP4EAJ. Watch for them at the '78 Dayton Hamvention.



Mike Wetzel, WA9BWY (center) received his '76 WPX Contest USA Single-Op Award, (donated by Jerry Hagen, N6AV) from Frank, W1WY at the '77 Hamvention. Honor guard is (right) Dick Ross, K2MGA, CQ Assoc. Publisher and yours truly, W8IMZ.

As if the new prefix and high score records were not enough for one year, we are also very pleased to report that this was a record year of participation and logs. Let us not forget that it takes many, many stations of all sizes, —of low, medium, and high power, using any type of antenna imaginable to make the big super scores possible. Without each of you, we would not have all of these new records to boast about. We hope you will continue to support us in '78.

World wide propagation conditions must have improved as we received just a few unhappy remarks pertaining to sunspots, blackouts, solar storms, high noise and etc. In fact, J. R., EI2BB, a member of the EI1AA Contest Group gave me all the credit—quote—"Bernie '8IMZ provided good conditions at long last." I wish I had that kind of ability—anyway, thanks J. R.!! During the preceding five years, poor to rotten conditions had been a major subject of complaint. It can only get better for the upcoming years.

This was the first go at this contest by the Lichfield Amateur Radio Society with their station G3WAS and the boys hoped that the G4DAA group would be on for some extra British competition. However, they decided against entering this year and now the Lichfield operators feel that perhaps they (G4DAA) couldn't stand the competition. (I think that sounds like a big challenge for the '78 event. — hi, hi) You've heard about U.S. amateurs operating from many different locations—so here is a switch. Giuseppe, I1MOL found it nice to work the contest from Oak Park, Michigan ARC station, W8MB. However, he said—"from the home QTH it is a lot easier."

As there are no mail facilities, either in or out of Willis Island before the end of June, Bill McDermott, AX9ZM transcribed his contest log via radio to his QSL Manager, John Wilson, VK4ABW, so it would arrive at the *CQ* headquarters by the required deadline date. Now that's team work. Wish the KC4 stations would work out a similar arrangement. Bill Rindone, WB7ABK gave it a big effort from his QTH in Oregon and was a bit disappointed that he couldn't top his ZK2AQ score of last year. Wonder what rare location is on Bill's agenda for the next WPX?

Tom, PA9TOM said this was his farewell contest from the Netherlands, and he wished to thank all amateurs for their support. Tom, wherever you go—we hope you'll find a way to join us each year on the last full weekend of March. Brian Clark's (AX4AAU/LH) DXpedition to Lord Howe Island was not without incident. He had sent his transmitter early to arrive there by the 23rd of March, but unknown to him, it was off loaded at Brisbane Airport and consequently he arrived at LH without a transmitter. It finally did arrive at 0415 GMT on the 26th. Apart from this, Brian said the DXpedition was a success and he really enjoyed the contest.

The Southeastern DX Club had excellent representation by members K4SB, K4KZP, K4LRO, W4MGX, W4UYC, WA4HNL and WB4HNC. Each gave proper club competition information on their individual summary sheet. They were one of the many clubs indicated by an impressive 239 different stations.

The official club competition begins with the 1978 WPX-SSB Contest. The Ontario Contest Beavers Club of Canada has agreed to donate a trophy to be awarded each year to the club or group that has the highest aggregate score from logs submitted by members. It is necessary that you indicate on your summary sheet the name of your club or affiliation. Complete details are in the 1978 rules.

One of the toughest decisions of the contest is the awarding of the DXpedition Plaque. At least 8 different stations qualified and could have easily won it, but as you well know in this case, its impossible to divide the plaque in eight ways. VP2MAQ was the '77 award winner. My

only regret is that we have but one award to give each year in this popular category.

As promised last year, the first annual "All-Time WPX/SSB Contest Records" was published on page 22, July 1977 issue of *CQ*. It looks very impressive and amplifies the achievements. A few of the records have already been shattered in this year's event. If you decide to try for new records, the article will also give you an idea of the challenge.

As announced by Ade Weiss, K8EEG in his QRPp column of Sept. '77, the WPX-SSB Contest will have a QRPp section beginning with our next competition in March '78. All scoring will remain the same. The results will be listed in a separate section and certificate awards will be given and identified as "QRPp". In other words, QRPp stations will only be competing with other QRPp stations. QRPp power must not exceed 5 watts output to qualify. In all fairness, you must state on your summary sheet, the actual output watts used and denote QRPp in order to be listed and compete in the special section. We are looking for a trophy or plaque donor, so that special recognition can be given to the top world-wide scoring QRPp station each year. If you would like to be a donor, please drop me a line so we can work out the details with W1WY. Complete rules for the QRPp section will be included with the '78 rules. All you QRPpers send in your contest logs—you may win a beautiful certificate award.

We've received logs in every shape and form—from computerized read-out sheets and bound book types to self-devised forms, basically following our format. Naturally our official log forms and summary sheets are more desirable, however we realize, these are not always possible from our participants. While some other contests do require the use of only their official forms this has never been our policy. Official log forms and summary sheets are always available from the *CQ* office, by sending a SASE or IRCs.

A long time WPX contest policy is that a station in a call area different than that indicated by its call sign is required to sign portable. This is especially necessary in this contest since the portable identifier must be the prefix multiplier.

In finalizing we thought you might be interested to know we received 8 competitive logs for 1.8 MHz and 52 for 28 MHz. Many of the multi-band stations also worked 160 and 10 meters. With the improved conditions forecasted for next year and the additions of the QRPp section and also the Club Competition category, I surmise the returns will be much greater on these bands in the future. Why not give it a go? Remember to send in your log, regardless of the number of contacts or score. This is very important. Photos are welcome.

I have been appointed the Contest Forum Moderator for the big 1978 DAYTON HAMVENTION, scheduled for the 28th, 29th, and 30th of April. Plans include Frank Anzalone, W1WY, —*CQ* Contest Chairman for the presentation of trophy awards; members of the *CQ* Contest Committee; ARRL Contest Advisory Group; and other well known contest personalities, plus a surprise or two. We hope to include contestants from all different types of radio contests. Those of you from outside the Continental USA, who are planning to attend the Hamvention, please contact W8IMZ as soon as possible, as we would like to introduce you and perhaps include you in our forum program. I hope to hear from many of you. See you at the forum.

The next WPX-SSB Contest is on the weekend of the 25th and 26th of March 1978. The rules are basically the same as this year, with the additions of the QRPp and



The Canadian All-Time Multi-Multi High Score Champion station CJ3DCB. Ops: (L to R rear) VE3EDC, VE3KZ, VE3FAC, VE3DSS, VE3IXE, VE3BMV, VE3FFA and VE3DCB. An outstanding achievement!!



The local interest in amateur radio was so great that everyone joined in to help Erik, SMØAGD get on the air from Guinea Bissau, Africa as CR3AGD. This is Amateur Radio for International Friendship at its very best.



Joe, LU8CW, usually stationed in Washington, D.C. made a special trip to the home QTH to operate with the special prefix call AY8CW. The team: (L to R) Ron, LU2AFH; Martin, LU8AGC; Joe; and Raf, CX3BR.



The CQ booth at the '77 Dayton Hamvention was the site for the presentation of several CQ Contest Trophy Awards. Here Don Riebhoff accepts the World Multi-Single Award for Station CT4AT achievement in the '76 WPX Contest. CQ Editor, Alan Dorhoffer, K2EEK and CQ Contest Chairman, Frank Anzalone, W1WY presented the award on behalf of the donor, Don Miller, W9WNV. Don (CT4AT) is now the new 40 meter, All-Time record holder.

the Club Competition sections. Complete up-dated rules should be in the January 1978 issue of *CQ*. Certificate awards will be in the mail at the earliest possible date.

I sincerely thank each contestant, the Club and Contest Managers, the QSL managers who exert extra effort to see that we get logs from their DX stations, and Frank, W1WY, our Contest Chairman, and my XYL, Eleanor, who clerically assists us with these results. Hope to work ya in the next one. . . .

73, Bernie, W8IMZ

Random Contest Comments

"I was hoping my new call would have arrived prior to the contest—no luck. This is the next best contest after the *CQ* WWDX . . . W1MDO. Bad luck this year, receiver didn't work on 40 meters (XTal failed) . . . W1DYH. More courteous operating on 3.8 MHz than in any other contest . . . W1CF op. K1OME. Got in to work a few new prefixes and got carried away . . . K2VV. Spend as much time looking up the 'odd prefixes' as I did working them! Hi . . . WA2PCF. Finally got my 220th country . . . W2LEJ. Spent 1½ hours to work FR7ZL/T about 1 month ago—came back to my CQ in this contest . . . WB2ZGI. Two D4s on 75!! . . . N2CW. Please try a formal club competition on a trial basis for three years . . . W3LPL op. K3NA. Enjoyed contest very much . . . W3EUJ. Be back next year with a vertical . . . W3KA op. WA3SXH. Good contest: Able to play 2 softball games and eat out and still put in 30 hours contest time . . . K4YFQ. Lets have C.W. WPX in May . . . K4SB. I am QSL Manager for 8P6ES in Barbados . . . K4GLJ. Best JA opening in years . . . WA4EYR. My first contest—terrific . . . WA4KCR. Snagged my first CT3 type on phone . . . WB4WHE. Great contest! Don't usually chase prefixes, but always like to work DX. How about C.W. WPX? . . . WB5SBH. Biggest thrill—adding new countries to my DXCC list . . . K5DEC. Very frustrating Sunday to find I had been operating on my inverted Vee rather than the Quad . . . WB5DDI. How can we get Europe to listen stateside for this contest on 40? . . . W5TMN. Excellent conditions to Europe both days . . . N6AV ex. WA6GLD. 1st WPX contest with my own station gear and new call (was W6CFM) . . . W6CN. As always a fun test . . . W7CB/6. Worked 22 new prefixes for new totals on WPX SSB Honor Roll . . . W6YMV. A lot of good clean fun . . . W6YMH. Worked my first European Contact OH8OS with low power and vertical antenna . . . W6ILH. Wish DX stations on 40 would spend more time listening in W/K Phone Band . . . WB6GFJ. Very convenient propagation paths, beam south for everything . . . WA7YRP. Working on the weekend, sure cuts contest time . . . WB7COH. My first WPX Contest, lots of fun . . . W7ISX. First 3 hrs. of test produced nearly 75% of total score . . . K7SS. Would be operators didn't show up—so operating time was minimal . . . W8NGO. QRPp can work contests! Greatest thrill was to get 7X4MD and CT2SH with first call in pile-up . . . W8ILC. This is the first year I have entered this class . . . K8YZW. Wisdom toothache didn't help! . . . K8ETO. Very enjoyable contest as usual . . . W8LRL. I was just trying to give the boys points, Hi Hi, my new call now is K8CD . . . WA8OWU. Limited operating partially due to blown final after about the first five hours . . . WB9EBO. I was surprised that I could get out barefoot! . . . W9LT. Being a YL has its advantages in a pile-up. I really enjoyed my first contest . . . WB9TDR. Keep up the good work . . . W9CYL. Drove 138 miles to find out that 4—400A's won't replace 3—400Z's in my linear—lost Saturday and went "shoeless" . . . WBØRET. Too many other obligations on contest weekend to operate maximum time . . . W0UYL. First attempt at a contest from this QTH and managed to break a million—how about that! . . . VE6HN. We expected about 500-700 contacts. The only prefix we missed was a VC9-multiplier, ourselves . . . VC9UM op. VE4VV. Might have done better if Glenn (VE3ICR) hadn't been allergic to the cats . . .



Bob, WBØCGJ, WPX Contestant.



Here's the Marconi Memorial Station, IY4FGM. Ops: (L to R) Clay, I4RYC; Clay, I4VEQ; Clay, I4USC; Bob, I4BFY; and Sil, I4ZSQ. The second highest scoring European multi-single station.

VB3ZM op VE3IAT. DX was in this year for a change and we also improved our antenna system. Keep up the good work and the fine magazine that you publish . . . VE4PO. The WPX and CQ WW are by far the best contests around . . . VE6AGV. Stopped operating Saturady to install verticals to operate on 10 and 15 mtrs . . . KZ5JM. Bettered last year's score. Worked two new ones . . . HI8MOG. Nice opening on 10 meter band during the contest . . . HI8LC. The HU1A call was a special permission for the *CQ* WW-WPX Contest only . . . YS1JWD. Nice to work a few more new countries—lots of fun . . . VE2AQS/TG9. We have say tnx to our authorities, giving us (6 Amateurs) the special prefix . . . 4C1HR. Beam stuck to the NW at the start of contest—never so difficult to work Europe and so easy to work Asia . . . XE1LLS. Incidently fellows, I am EX VU2-DKZ, VUØDK, VU25DK . . . VU2DK. I recommend a WPX-C.W. test. Too few Ws workable on s.s.b., especially with huge mountains to the north of Tehran QTH. An "everybody works everybody" contest is far more exciting than one in which contacts are more restricted . . . 9D5A. QTH is Golan Heights . . . VE2DQC/4X4. Wish I had just a bit more power, can't wait till next year . . . WA9BVB/4X. Big-

(Continued on page 110)

TOP SCORES

SINGLE OPERATOR ALL BAND

UA9BE	**2,035,740**	OZ3SK/CT3	1,013,032
9D5A	1,504,395	**W3LPL**	**987,973**
UB5WE	1,290,990	D4CBC	903,144
IK3PRK	1,115,856	VU2DK	895,520
ZL3GQ	1,078,735	7XØBI	871,872
VE2AQS/TG9	1,051,278	ZW6AHU	828,530
KH6IJ	1,039,554	PY3APH	816,816

SINGLE BAND

28 MHz

N6EE	24,601
IT9KZW	22,968
YU3TPM	19,380
JA9NGS	17,490
JA2DYI	16,561

7 MHz

CT4AT	**1,212,070**
DK5WL	445,200
YU2RTW	354,380
IK5FCK	278,096
UP2OU	223,560

21 MHz

PY5EG	912,776
YV4AA	807,695
KZ5FR	718,434

3.5 MHz

I3MAU	508,200
W1CF	460,908
DL8PC	300,468

VK2XT	600,831	FØCGP	286,848
YU2RBY	578,584	VE7IG	254,250

14 MHz

OI2BA	**1,571,140**	VE3BBN	15,444
YU2CDS	1,427,664	YU2HDE/3	5,992
YV2AMM	1,370,304	G4BXT	3,036
VO1HH	**1,208,919**	W8LRL	2,800
OF2MM	1,166,736	K2BQO	2,184

1.8 MHz

MULTI OPERATOR

Single Transmitter

4J9B	**5,201,056**	HG5A	1,860,738
4J6A	4,021,944	VE3AKG	1,773,720
KP4AST	**3,547,776**	UK6LAZ	1,756,800
K2BA/4X	3,194,928	OK5CRC	1,753,206
UK3ABB	2,869,830	EI1AA	1,681,956
DM2DUK	2,514,838	UK3SAB	1,623,812
AY8CW	2,257,840	**VP2MAQ**	**1,517,360**
IY4FGM	2,205,269	SJ9WL	1,509,579

Multi Transmitter

CJ3DCB	**6,688,860**	YU1BCD	4,002,465
OF1AA	4,458,636	HB9AUS	2,550,975
DK3BJ	4,447,947	VE3DU	2,216,060

Number groups after call letter denotes: Band, Score, QSO's and Prefixes. Bold listings are certificate winners.

SINGLE OPERATOR NORTH AMERICA

United States

W1HFB	**A 786,534 880 307**
WA1JMP	" 61,053 185 141
W1MDO	" 45,934 150 119
W1DYH	" 32,340 126 98
WA1QNF	" 29,798 129 94
W1PLJ	" 3,007 35 31
WA1WFS	**14 121,625 330 175**
W1WY	" 37,544 140 104
W1YNE	" 1,496 23 22
W1CF	**3.8 460,908 969 186**
	(Opr. K1OME)
W1BB	1.8 24 2 2
K2VV	**A 351,330 566 245**
WA2YCQ	**A 311,436 505 246**
WA2PCF	" 93,939 230 173
W2LEJ	" 82,467 226 153
W2FGY	" 37,074 135 111
WA2AUB	" 6,728 68 58
W2MNK	" 1,848 28 24
W2CJX	" 377 16 13
WB2ZGI	**21 37,996 167 118**
W2MYA	**14 88,040 234 155**
WA2ZWH	" 44,732 149 106
W2GKZ	" 1,625 25 25
N2CW	**3.8 27,864 211 86**
KP6BE/W2	" 15,900 189 50
K2BQO	**1.8 2,184 78 42**
W3LPL	**A 987,973 1055 371**
	(Opr. K3NA)
K3ZO	**A 721,578 833 319**
	(Opr. WA1FEO)
W3EUJ	" 20,145 103 85
WA3UXP	" 17,538 86 74
W3CM	" 4,070 42 37
W3FCI	" 2,580 30 30
K3LWM	**21 55,476 207 134**
WB3DET	" 53,724 215 132
W3GG	**14 434,602 653 259**
W3KA	**1.8 1,080 44 27**
	(Opr. WA3SXH)
K4YFQ	**A 737,750 861 325**
K4SB	**A 261,944 443 239**
W4WRY	" 147,681 313 183
W4UYC	" 111,048 271 168
WA4UFW	" 102,290 232 193
N4BP	" 80,724 344 186
K4GLJ	" 43,758 160 102
K4II	" 38,994 151 97
W4KMS	" 36,410 164 110
WA4KCR	" 35,310 138 107
WA4CGX	" 18,711 92 77
W4MGX	" 8,802 71 54
WA4MSX	" 4,005 49 45
WB4JRX	" 3,675 38 35
WA4HNL	" 3,570 45 34
WB4VQO	" 3,066 48 42
WB4WHE	" 49 7 7
WA4YNP	**28 2,133 30 27**
WA4OSM	**21 168,844 395 191**
N4MM	" 110,547 293 173
K8JRM/4	" 35,190 152 102
WA4SHL	" 30,888 143 104
K4APL	**14 161,874 336 207**
K4KZP	" 103,620 241 165
WB4HNC	" 57,834 177 126
W4EEO	" 3,230 35 34
N4RA	**3.8 37,682 221 83**
WB4RUA	" 15,958 112 79
WA4DRU	" 2,788 54 41
K4LR0	1.8 108 11 9
K5UA	**A 80,542 224 154**
WB5SBH	**A 68,526 234 141**
K5OOU	" 65,637 256 143
W5OB	" 59,094 219 134
K5DEC	" 13,780 86 65
K5RF	" 10,962 88 63
W5DMM	" 10,890 70 55
W5IO	" 6,109 50 41
WB5KWU	" 4,403 44 37
W5HMM	" 1,702 25 23
W5EFA	" 867 19 17
K5FKD	**21 75,692 219 149**
WB5DDI	" 33,756 158 116
K5VTA	" 20,833 113 83
W5NA	**14 256,788 445 252**
W5TMN	**7 194,143 364 131**
WA5VDH	**3.8 32,538 282 87**
N6AV	**A 482,310 692 230**
WB6GFJ	**A 349,084 649 197**
N6RM	" 316,131 703 167
W6BJB	" 140,739 433 129
W6OKK	" 112,472 313 136
W6CN	" 63,580 227 110
W7CB/6	" 61,845 197 133
W6YVK	" 42,848 197 103
W6YMV	" 33,919 157 107
WA6TKT	" 28,350 147 81
WA6UFY	" 23,595 132 65
W6KYA	" 21,692 111 68
W6YMH	" 12,851 116 71
W6CLM	" 1,750 26 25
W6RQZ	" 1,420 25 20
WA6BFL	" 1,197 25 21
N6EE	**28 24,601 158 73**
N6CW	**21 509,535 1118 169**
N6HR	**14 259,778 600 193**
N6AW	" 100,230 283 130
W6CFG	" 6,210 52 45
W6ILH	" 1,809 32 27
W6EMD	7 448 16 14
N6VV	**3.8 15,620 158 71**
WB7ABK	**A 812,520 1168 244**
W7EKM	" 120,839 304 149
W7HAD	" 71,904 217 96
WA7YRP	" 9,955 82 55
WA7LQQ	" 7,344 80 54
K7SS	**21 174,976 512 128**
WA7PEZ	" 114,620 400 110
W7ISX	**14 53,456 190 104**
W7AYY	" 38,419 155 103
WA7OBH	" 2,016 29 28
WA7OTT	**3.8 25,920 158 60**
WB7COH	" 3,690 75 45
W8FF	**A 337,955 538 257**
WB8CTA	**A 246,600 520 225**
WD8CRY	" 75,932 275 164
W8IMZ	" 46,112 176 139
W8QGP	" 17,854 105 79
W8ILC	" 15,895 132 85
WB8WZS	" 3,136 37 32
W8YGR	" 1,716 23 22
W8KOD	**21 28,034 128 107**
W8LT	" 21,360 138 89
	(Opr. WB8TXE)
W8TA	" 15,390 119 81
K8YZW	**14 659,295 805 315**
W8MB	**14 327,564 533 243**
	(Opr. I1MOL)
K8ETO	" 68,040 193 135
W8RC	" 67,860 201 116
WA8OWU	" 3,240 37 30
W8TIV	" 2,552 32 29
WA8OGR	" 1,102 20 19
WA8LXJ	**7 23,630 112 85**
K8LUU	" 22,680 117 84
W8CNL	" 20,640 151 80
W8SQ	**3.8 25,420 148 82**
W8LRL	**1.8 2,800 100 40**
WA9BWY	**A 63,468 256 129**
WB9DVV	" 23,987 112 83
WB9EBO	" 10,962 69 58
W9ZGV	" 5,890 50 38
WB9GYL	" 5,125 47 41
KOCVA/9	**28 1,200 23 20**
W9LT	**14 29,820 123 105**
WB9TDR	" 9,408 66 49
WB9OBX	" 7,636 63 46
WA9RKK	" 7,014 58 42
W9CYL	" 6,660 52 45
WB0RET	**A 68,114 245 134**
W0CDC	" 29,120 115 79
WØWUU	" 13,656 83 64
WØLCN	" 9,256 65 52
WBØCGJ	" 4,218 43 37
WØPKO	" 290 13 10
WAØFAA	**14 77,248 202 136**
WØUYL	" 25,844 122 91
WBØIRL	" 8,554 61 47
WBØMAE	" 1,920 29 24
WBØHAD	" 585 15 15
WBØLLR	**7 26,406 143 81**

Alaska

KL7HDX	**14 4,719 65 33**

Canada

VE1AIH	**A 327,429 467 201**
VO1HH	**14 1,208,919 1472 327**
CK3UOT	**A 412,080 695 240**
VE3BBN	**1.8 15,444 99 39**
VE4KM	**A 149,120 428 128**
VE4RP	**A 145,559 313 163**
VE4PO	" 15,808 126 64
VE4UA	14 432 12 12
VE6AGV	**A 283,492 590 187**
VE6KW	**14 277,548 603 202**
VA7BGK	**14 1,088,640 1609 280**
VE7AQF	**14 588,512 1141 212**
VE7AZG	**7 41,904 194 54**
VE7IG	**3.5 254,250 562 113**

Canal Zone

KZ5JM	**A 319,808 753 152**
KZ5FR	**21 718,434 1305 239**

Dominican Republic

HI8MOG	**A 766,221 1136 237**
HI8LC	**28 10,004 120 41**
HI8JAG	**14 42,292 179 97**

El Salvador

HU1A	**A 322,000 715 175**
	(Opr. YS1JWD)

Greenland

OX3ZM	**A 9,900 76 55**

Guatemala

VE2AQS/TG9	
	A 1,051,278 1716 249

Mexico

4C1HR	**A 606,336 1300 192**
4A1X	**A 595,848 1373 183**
4CZ1FX	" 87,704 437 76
4C1U	" 40,425 242 77
XE1LLS	**14 100,110 465 94**

Panama

HP1MH	**A 38,056 263 71**

AFRICA

Algeria

7XOBI	**A 871,872 871 239**

Rep. of Cape Verde

D4CBC	**A 903,144 929 264**

Guinea Bissau

CR3AGD	**A 40,392 160 88**
	(Opr. SMØAGD)

Liberia

EL3A	**14 379,296 605 216**

Madeira Is.

OZ3SK/CT3	
	A 1,013,032 1166 278
CT9BK	**A 709,019 901 233**
CT3BM	" 168,835 317 151
CT3BD	" 129,002 353 106

Mauritania

5T5CJ	**A 11,077 71 53**

ASIA

India

VU2DK	**A 895,520 1182 290**

Iran

9D5A	**A 1,504,395 1626 303**

Israel

VE2DQC/4X4	
	A 249,489 505 170
WA9BVB/4X	
	14 292,764 549 186

Japan

JA6BSM	**A 532,515 755 271**
JA2OJ	**A 308,947 505 227**
JA6CNL	" 146,124 377 164
JH6EFI	" 74,949 215 129
JA1QZY	" 70,692 214 129
JA4UDP	" 45,430 172 110
JA5GSL	" 43,400 183 100
JH4MVB	" 21,320 99 82
JH6SQI	" 19,800 120 75
JR6HJD	" 7,008 59 48
JR3CVO	" 5,076 51 36
JH6WRW	" 3,456 46 32
JA7JGD	" 1,080 24 18
JH1OEL	" 760 21 20
JA5UBW	" 560 18 16
JR3MTJ	" 216 8 8
JH6WRV	" 180 11 9
JA0XWE	" 18 5 5
JA9NGS	**28 17,490 167 66**
JA2DYI	**28 16,884 136 63**
JA5FBZ	" 15,561 133 63
JE1FHQ	" 5,136 81 48
JA1BHJ	" 4,275 56 45
JH4LWL	" 3,731 68 41
JF1XDM	" 240 11 10
JA6LLO	**21 286,880 504 220**
JA6UBK	**21 271,575 483 213**

TROPHY WINNERS

WORLD—Single Operator, Single Band. Jack Reichert, W3ZKH Trophy. Won by: **Seppo Sisatto, OI2BA.** (14 MHz)

WORLD—Single Operator, All Band. North Florida DX Association Trophy. Won by: **W. Chentsov, UA9BE.**

WORLD—Multi-Operator, Single Xmtr. Ted Thorpe, ZL2AWJ Memorial. Awarded by Don Miller, W9WNV. Won by: **Club Station 4J9B. (Oprs. UA9AN, UA9ACZ, UA9AEN, UA9-165516, Victor, Valery & Vitaly).**

WORLD—Multi-Operator, Multi Xmtr. Chuck Swain, K7LMU Memorial. Awarded by Don Miller, W9WNV. Won by: **Station CJ3DCB. (Oprs. VE3BMV, VE3DCB, VE3DSS, VE3-EDC, VE3FAC, VE3FFA, VE3IXE, VE3KZ).**

CANADA—Single Operator, Single Band. Gene Krehbiel, VE7KB Trophy. Won by: **Maxwell Powell, Jr., VO1HH.** (14 MHz)

CANADA—Single Operator, All Band. Garth Hamilton, VE2VY Trophy. Won by: **Station CK3UOT. (Opr. Ron Vander Kraats, VE3-BUV).**

U.S.A.—Single Operator, Single Band. Joe Johnson, W5QBM Memorial. Awarded by the Richardson Wireless Klub. Won by: **John R. Leishman, K8YZW.** (14 MHz)

U.S.A.—Single Operator, All Band. Bob Epstein, K8IA Trophy. Won by: **Station W3LPL. (Opr. Eric L. Scace, K3NA).**

WORLD—DX-Pedition. Contest Director's Award By Bernie Welch, W8IMZ. Won by: **Station VP2MAQ. (Oprs. W6KG and W6QL). SPECIAL CQ AWARDS—Station KP4AST and Station CT4AT.**

JA9BMP	"	97,681	302	137
JH4LEL	"	92,796	266	148
JH6ETS	"	69,696	231	132
JF1EEK	"	47,410	193	110
JR1WHW	"	29,498	147	86
JA1GSK	"	29,392	140	88
JH1AHU	"	26,623	151	79
JA5VOB	"	23,184	125	84
JE2LYG	"	6,900	59	46
JR6HJK	"	6,579	54	43
JJ1IJS	"	4,750	56	38
JR3CVJ	"	4,032	45	36
JA8XMC	"	2,492	33	28
JA5UYE	"	1,407	27	21
JH1UUT	"	1,386	25	21
JE2GAL	"	90	6	5
JR1ANA	**14**	**358,680**	**565**	**244**
JA3DGC	**14**	**242,535**	**478**	**185**
JA2NPC	"	70,214	278	101
JA1BUI	"	68,544	237	112
JA8SW	"	60,653	194	131
JA0SC	"	60,297	204	101
JA8ROC	"	58,535	195	115
JA9AQE	"	55,330	190	110
JA7BAL	"	37,525	145	95
JA6GZR	"	30,972	133	89
JA8JTZ	"	30,960	154	80
JH2EVL	"	25,872	110	84
JR2FNL	"	21,970	129	65
JA2IU	"	19,170	102	71
JA4AQZ	"	10,200	74	50
JA9SV	"	8,319	69	47
JA4DZ	"	7,440	68	40
JA4GXS	"	7,290	73	54
JA1MZM	"	6,880	64	40
JA1PUK	"	5,632	44	44
JR2BDF	"	3,472	47	28
JF1UKJ	"	1,794	27	26
JG1OWV	"	1,728	36	27
JAØVBJ	"	1,155	24	21
JH2VQB	"	1,140	23	20
JA3BCT	"	1,083	26	19
JA1AAT	"	570	16	15
JA1BNW	"	264	13	8
JA1ZSX	"	12	2	2
JA2BAY	**7**	**195,160**	**333**	**140**
JA4BKL	"	6,084	44	39
KA6KJ	**A**	**412,452**	**667**	**228**
KA6YL	**A**	**197,925**	**372**	**195**
KA6DX	"	24,642	130	74
KA6JC	**28**	**5,115**	**64**	**33**
KA6RO	"	4,536	60	36
KA6DI	**14**	**11,532**	**78**	**62**
JT1AN	**A**	**66,528**	**401**	**108**

U.S.S.R.

Asiatic

UA9BE	**A**	**2,035,740**	**1345**	**393**
UA9TS	"	53,489	171	89
UW9VH	"	5,895	50	45
UA9UTF	**28**	**1,624**	**48**	**28**
RA9CIU	"	429	18	13
RA9CAS	"	200	11	10
UA9AED	"	150	15	15
RA9ODC	"	132	12	11
UV9WF	**21**	**232,734**	**880**	**158**
UA9XV	"	4,680	98	39
UA9MQ	"	4,346	68	41
UA9MS	**14**	**755,430**	**1063**	**298**
UA9FCP	"	41,194	171	86
UA9FBC	"	14,256	82	66
UV9DO	"	7,881	83	37
UA9QAQ	"	5,254	52	37
UA9CBO	**7**	**126,312**	**222**	**114**
UW9SG	**3.5**	**4,662**	**45**	**21**
UA9FGF	"	4,400	39	22
UAØCCW	**28**	**7,009**	**99**	**43**
RAØSCQ	**28**	**6,280**	**141**	**40**
UAØLBU	"	5,805	80	45
UAØLFK	"	5,358	79	47
RAØSER	"	4,879	105	41
RAØAAN	"	1,482	55	26
RAØABJ	"	600	30	20
UAØSFN	"	77	11	7
UAØIAW	**21**	**7,500**	**249**	**30**
UAØSAU	**14**	**451,333**	**831**	**242**
UAØPJ	**14**	**166,423**	**602**	**163**
UWØLI	"	146,318	505	149
UAØBAC	"	39,104	169	104
UWØIX	"	35,256	138	104
UAØSBO	**3.5**	**3,916**	**54**	**22**

Azerbaijan

UD6DFD	**A**	**183,276**	**321**	**108**
UD6CC	"	29,680	116	106
UD6DKZ	**21**	**317,520**	**700**	**196**
UD6DER	**14**	**35,070**	**126**	**105**

Georgia

UF6DZ	**A**	**716,259**	**976**	**257**

Kazakh

UL7LAW	**A**	**717,332**	**878**	**274**
UL7GAA	**A**	**282,165**	**835**	**195**
UL7EAH	"	6,752	87	32
UL7PCK	**28**	**1,155**	**47**	**21**
UL7TA	**21**	**40,788**	**209**	**103**
UL7QF	"	5,544	148	36
UL7AAQ	"	1,173	24	23
UL7DA	14	12,546	94	51
UL7JAW	**7**	**54,824**	**163**	**77**
UL7IBC	**3.5**	**103,020**	**221**	**85**
UL7PAS	"	10,920	72	30
UL7CT	"	3,872	38	22

Tadjik

UJ8JGJ	**14**	**503,386**	**768**	**247**

Uzbek

UI8ACC	**14**	**321,843**	**679**	**213**
UI8LAG	**3.5**	**169,952**	**280**	**113**

EUROPE

Austria

OE2BZL	**A**	**578,214**	**959**	**273**
		(Opr. DK5AD)		
OE1SBA	"	2,664	40	36
OE5CWL	**3.5**	**94,944**	**332**	**138**

Belgium

ON4XG	**A**	**100,625**	**322**	**161**
ON8XU	"	56,392	245	133

Bulgaria

LZ1QO	**A**	**213,900**	**507**	**230**
LZ2ZB	"	146,793	402	167
LZ1MH	"	17,688	131	88
LZ1FJ	"	1,161	34	27
LZ1QR	**14**	**41,624**	**239**	**121**
LZ1BY	"	19,436	113	86
LZ2VP	**3.5**	**48,336**	**214**	**106**

Czechoslovakia

OK2BLG	**A**	**244,950**	**578**	**230**
OK2JK	**A**	**194,688**	**489**	**192**
OK1IQ	"	130,682	365	181
OK1KZ	"	128,312	407	172
OK1KIR	"	103,532	363	143
		(OPR. OK1DKS)		
OK1EP	"	74,910	237	165
OK2QX	"	66,445	248	137
OK2PEQ	"	49,489	199	121
OK2PBG	"	25,542	152	99
OK3YCA	"	20,792	139	92
OK3EA	"	15,000	100	75
OK1FCA	"	12,078	89	66
OK2BEF	"	5,207	59	41
OK1DKS	"	4,017	60	39
OK2BNK	"	2,660	44	35
OK1DVK	"	1,566	27	27
OK1AIA	"	560	19	16
OK3CAW	"	280	10	10
OK3CEE	**28**	**714**	**23**	**17**
OK1ASQ	**21**	**11,316**	**85**	**69**
OK2SPS	"	4,185	59	45
OK3ZAV	"	1,034	23	22
OK1FV	**14**	**287,640**	**630**	**204**
OK1ATE	"	159,280	383	181
OK1AJN	"	20,880	137	90
OK3TOA	"	19,680	143	82
OK3CFS	"	4,851	67	49
OK1AJY	"	2,652	44	26
OK1FAR	**7**	**95,200**	**304**	**136**
OK1AFN	"	2,640	42	33
OK3ZWA	**3.5**	**207,756**	**533**	**174**
OK1DWA	**3.5**	**175,392**	**491**	**174**
OK3YCL	"	79,230	300	139
OK2HI	"	66,294	264	127
OK1HCH	"	12,416	107	64
OK3KWZ	"	9,860	96	58
OK1MNV	"	8,056	79	53
OK1GO	"	5,452	60	47
OK1MIZ	"	5,040	64	42
OK2BBS	"	3,060	45	34

Denmark

OZ6RT	**A**	**540,440**	**752**	**295**
OZ4HW	"	32,428	214	121
OZ7SG	"	11,999	100	71
OZ9ZS	"	1,134	32	27
OZ1LO	"	57	6	3
OZ5VT	**28**	**1,960**	**47**	**35**
OZ6YO	**21**	**10,064**	**122**	**68**
OZ2BM	"	2,580	36	30
OZ2PG	**14**	**507,370**	**898**	**226**
OZ6SV	"	5,208	55	42
OZ3IR	"	108	10	9
OZ5EV	**3.5**	**172,040**	**507**	**107**

England

G4DMN	**A**	**193,930**	**455**	**215**
G4ETK	**A**	**166,859**	**483**	**197**
G3NFV	"	94,944	266	172
G2AJB	"	46,168	223	116
G4DBW	"	19,836	166	87
G3IRM/M	"	3,741	59	43
G3RMF	**28**	**1,000**	**36**	**25**
G3SSO	**21**	**70,468**	**225**	**158**
G4AHO	"	10,570	90	70
G4DKT	**14**	**101,775**	**356**	**177**
G4CVZ	"	86,900	379	158
G3VOF	"	78,814	302	157
G4ALG	**7**	**72,192**	**268**	**128**
G4BBA	**3.5**	**12,804**	**78**	**66**
G4BXT	**1.8**	**3,036**	**42**	**33**

Faroe Is.

OY1A	**A**	**6,344**	**76**	**61**

Finland

OH1MA	**A**	**814,416**	**1252**	**282**
OH6JW	**A**	**249,993**	**530**	**197**
OH2KP	"	61,600	233	140
OH3OF	"	33,696	182	104
OH1TD	"	27,864	161	108
OH3IN/2	"	2,275	46	35
OH9TD	"	896	28	28
OH3ZH	"	30	5	3
OI2BA	**14**	**1,571,140**	**2112**	**340**
OF2MM	**14**	**1,166,736**	**1611**	**327**
OH2LU	"	47,318	186	118
OH2BDA	"	8,395	81	73
OG2BH	"	6,201	69	53
OH5PA	"	4,284	52	42
OH2JQ	"	3,150	49	42
OH6VV	"	1,248	26	26
OH2BCV	**21**	**203,444**	**490**	**181**
OH2NW	"	95,436	300	132
OH1KF	"	58,032	229	117
OH2BMP	"	26,085	188	47
OH6PT	"	8,216	77	52
OH2BIC	"	5,332	58	43

France

F6BFH	**A**	**261,280**	**519**	**230**
F6ENT	**A**	**93,026**	**270**	**193**
F6DLM	"	34,034	141	119
F5RD	"	9,344	110	64
F5RC	"	8,820	80	63
F2RO	"	6,705	57	45
F9OJ	"	6,100	58	50
F6DRP	"	4,940	80	60
F6API	**14**	**21,008**	**154**	**104**
F2VO	**7**	**17,400**	**120**	**75**
F8TM	"	10,858	87	61
FØCGP	**3.5**	**286,848**	**535**	**216**

Germany (DDR)

DM2CDL	**A**	**175,070**	**461**	**205**
DM4ZDA	**A**	**105,248**	**334**	**176**
DM2YLO	"	93,318	332	151
DM4DE	"	85,377	292	149
DM5UUL	"	56,574	204	126
DM3HF	"	37,070	156	110
DM2FBN	"	29,224	156	104
DM3PFF	"	28,910	150	98
DM5JL	"	21,504	124	96
DM3SB	"	20,296	130	86
DM3NGB	"	19,152	115	84
DM3UNL	"	4,944	70	48
DM3LE	"	4,240	47	40
DM3CF	"	3,880	45	40
DM4UVL	"	3,237	45	39
DM5YVL	"	1,770	35	30
DM3VUH	"	1,764	35	28
DM3ZDG/P	"	1,100	27	25
DM2CTF	"	988	20	19
DM4XOL	"	450	16	15
DM3SIC	"	448	16	14
DM2BPF	"	300	13	12
DM2EBH	"	128	8	8
DM3BGO	21	3,698	49	43
DM2EHL	**14**	**15,471**	**150**	**81**
DM3BE	"	6,448	81	52
DM6ZAC	"	5,904	99	48
DM2BLE	"	4,656	68	48
DM2DEO	"	2,046	32	31
DM3WDJ	"	1,012	30	24
DM2BGC	"	434	14	14
DM4HO	**7**	**39,676**	**174**	**109**
DM3UFJ	"	34,744	165	101
DM3WDJ	"	10,370	85	61
DM2BPB	"	4,860	56	45
DM4YUG	**3.5**	**133,630**	**390**	**161**
DM3WMJ	**3.5**	**107,700**	**350**	**150**
DMØFA	"	71,568	302	126
		(Opr. DM2BTO)		
DM4WPF	"	65,928	264	123
DM4OLG	"	62,744	256	124
DM3ZEN	"	36,720	192	102
DM3BF	"	28,512	165	88
DM2CDH	"	26,680	149	92
DM2GOL	"	15,096	113	68
DM4VZA	"	14,840	110	70
DM2DTD	"	14,338	114	67
DM3MGB	"	13,912	105	74
DM4YXD	"	13,800	116	69
DM4VKF	"	13,386	103	69
DM4XEK	"	13,056	98	68
DM4WZA	"	7,840	76	56
DM3TNA	"	6,912	74	54
DM4WKF	"	4,284	56	42
DM2CON	"	3,024	42	36
DM3WPL	"	2,516	40	34
DM2CJF	"	1,450	30	29
DM3XD	"	200	11	10
DM5XIG	"	70	7	7

Germany (FRG)

DK5AIA	**A**	**294,745**	**649**	**233**
DK5WN	**A**	**185,234**	**514**	**202**
DK8FS	"	163,116	361	207
DK8AK	"	123,540	390	174
DK5WQ	"	38,940	211	118
DF2RG	"	23,668	156	97
DK8KC	"	13,213	109	73
DL7QG	"	11,385	101	69
DL2RM	"	9,912	101	59
DJ9QD	"	3,680	52	40
DK9NH	"	2,775	49	37
DJØEX	"	100	21	20
DK5VO	**21**	**39,406**	**164**	**122**
DJØMS	**14**	**26,967**	**198**	**89**
DK5WL	**7**	**445,200**	**635**	**265**
DF5SF	"	73,682	279	133
DK3FB	"	16,512	104	64
DL2QT	"	6,468	67	49
DL8PC	**3.5**	**300,468**	**647**	**219**
DA2KD	**A**	**102,879**	**350**	**161**
DA1PQ	"	27,216	160	84
DA1QH	**3.5**	**40,906**	**237**	**113**

Guernsey (Channel Is.)

GU3YIZ	**3.5**	**37,050**	**188**	**95**

Hungary

HA5NP	**A**	**191,857**	**621**	**173**
HA1ZD	"	49,644	236	126
HA9RU	**3.5**	**207,582**	**580**	**174**
HA3KHC	"	37,632	224	96

Italy

IK3PRK	**A**	**1,115,856**	**1274**	**336**
I6NOA	"	244,408	535	223
I2MQP	"	51,912	212	126
I4NBS	"	39,208	205	116
I2LPA	**28**	**6,120**	**53**	**45**
IK5VXG	"	1,386	25	21
IK5WCN	**21**	**285,963**	**558**	**199**
IK5PZQ	"	165,025	457	175
I3BYT	"	76,874	258	119
I4GZV	"	34,986	158	98
I5WPC	"	84	6	6
I1GPK	**14**	**1,114,272**	**1459**	**292**
I3HSN	**14**	**510,632**	**896**	**248**
I8ZLW	"	63,536	304	152
I8TCW	"	29,468	207	106
IK2LVN	"	23,300	151	100
IK5FCK	**7**	**278,096**	**464**	**208**
I3MAU	**3.5**	**508,200**	**773**	**242**

I.T.U.

4U1ITU	**A**	**35,256**	**178**	**113**
		(Opr. HB9AW)		

Luxembourg

LX1GG	**A**	**15,750**	**130**	**70**

Netherlands

PAØZH	**A**	**642,582**	**1068**	**261**
PAØIJM	"	44,958	209	118
PAØATY	"	3,813	44	41
PAØSMS	"	3,320	50	40
PAØLEG	"	1,550	26	25
PAØLVK	**14**	**5,432**	**67**	**56**
PAØTO	"	2,508	50	38
PAØTK	**3.5**	**50,328**	**202**	**108**
PAØRRS	**3.5**	**49,220**	**220**	**115**
PA9AWG	"	40,768	154	98
		(Opr. WB9JEN)		

Norway

LA5JS	**A**	**129,238**	**435**	**179**
LA2GN	"	17,372	129	86
LA1KQ	"	1,377	30	27
LA6U	"	759	22	11
LA6XI	"	119	7	7
LA1NG	**14**	**156,999**	**485**	**177**
LA2ZN	"	92,225	365	155
LA3UQ	"	40,330	196	109
LA2AD	"	13,608	88	63

Poland

SP5BB	**A**	**139,594**	**427**	**169**
SP5ALP	**A**	**128,185**	**399**	**155**
SP3IBS	"	82,344	336	147
SP6IHE	"	59,280	246	130
SP9IGY	"	49,704	239	114
SP7EBM	"	49,654	240	122
SP3CQP	"	39,114	206	106
SP5IVC	"	34,452	186	108
SP3GEM	"	29,370	201	89

U.S.A. TOP SCORES

Single Operator

All Band	W3LPL	987,973
28 MHz	N6EE	24,601
21 MHz	N6CW	509,535
14 MHz	K8YZW	659,295
7 MHz	W5TMN	194,143
3.8 MHz	W1CF	460,908
1.8 MHz	W8LRL	2,800

Multi Operator

Single Xmtr.	K3RV	1,177,105
Multi Xmtr.	N7XX	235,585

SP2GNB	"	24,104	166	92
SP9AVZ	"	23,310	166	90
SP9BLF	"	21,930	123	85
SP5BSG	"	17,739	114	81
SP3YG	"	17,630	123	86
SP6AGD	"	13,280	105	80
SP4AS	"	3,597	40	33
SP5KHO	"	3,564	51	33
		(Opr. SP5GDY)		
SP9ZD	"	2,294	39	37
SP5DED/9	"	420	15	14
SP9FLY	"	300	13	12
SP3DOI	**28**	**1,550**	**30**	**25**
SP4DM	**21**	**19,600**	**123**	**80**
SP8ECV	**21**	**10,500**	**79**	**60**
SP6DNS	"	6,570	62	45
SP3BQD	"	5,568	59	48
SP9FSH	"	4,040	44	40
SP9PT	"	2,233	37	29
SP9BPF	"	2,175	35	29
SP5KGT	"	893	23	19
		(Opr. SP5FKW)		
SP5ENA	**14**	**56,307**	**240**	**137**
SP2FAP	**14**	**51,625**	**252**	**125**
SP6ECA	"	33,330	185	101
SP9CTW	"	18,176	112	71
SP6ANY	"	8,784	94	61
SP3CB	"	5,123	55	47
SP7BCA	"	2,318	46	38
SP2DVH	"	1,274	37	26
SP7ASZ	"	918	21	18
SP2ADW	"	860	22	20
SP9CGH	"	627	25	19
SP9EWM	**7**	**7,548**	**78**	**51**
SP9EMI	"	6,720	68	48
SP9AHA	"	3,978	52	39
SP1OT	**3.5**	**23,408**	**151**	**77**
SP9AKD	**3.5**	**19,272**	**136**	**73**
SP8RJ	"	13,392	108	62
SP1ZEK	"	12,804	101	66
SP9BDQ	"	9,020	80	55
SP2BSX	"	8,466	82	51
SP9HRP	"	1,352	27	26
SP5EVN	"	544	19	17
SP3JDX	"	200	10	10

Portugal

CT4AJ	**A**	**7,504**	**83**	**56**
CT4IT	**14**	**38,564**	**301**	**124**
CT4AT	**7**	**1,212,070**	**1045**	**305**
		(Opr. K7ZZ)		

Romania

YO6KEI	**A**	**483,933**	**702**	**291**
YO8ATT	"	30,375	181	81
YO6KBM	"	20,992	195	82
		(Opr. YO6OO)		
YO4AYE	**14**	**51,623**	**247**	**143**
YO5BQ	"	11,966	105	62
YO2BIC	"	5,940	88	55
YO3BEJ	**7**	**32,669**	**185**	**91**
YO3AC	"	5,904	68	48
YO2II	**3.5**	**34,278**	**197**	**87**
YO8BDA	"	5,226	62	39
YO4ATW	"	2,016	36	28

Sardinia

ISØMVE	**A**	**253,821**	**655**	**219**
ISØXDD	**A**	**199,408**	**473**	**206**

Scotland

GM3CFS	**A**	**158,067**	**456**	**193**
GM5AXY	3.5	2,940	44	35

Sicily Is.

IT9KZW	**28**	**22,968**	**126**	**87**

Spain

EA1TA	**A**	**45,114**	**183**	**146**
EA4QR	"	34,606	222	121
EA2IA	28	12	4	4

Svalbard Is.

JW7FD	**A**	**11,078**	**70**	**58**

Sweden

SM5AOE	**A**	**476,544**	**782**	**272**
SM7BZV	**A**	**154,137**	**394**	**191**
SM5CAK	"	52,281	228	111
SM6ID	"	33,166	173	103
SM7AIO	"	25,596	138	108
SM7TV	"	9,945	103	65
SMØCGO	"	1,590	35	30
SM7AAQ	"	1,375	27	25
SM7ASN	"	816	19	16
SM6FAX	**28**	**1,998**	**55**	**37**
SM4DQE	**21**	**9,636**	**106**	**73**
SM7DMN	**14**	**280,825**	**643**	**239**
SM5CMP	**14**	**63,536**	**256**	**152**
SM5GA	"	16,350	111	75
SM6BXV	"	2,001	29	29
SM7FSV	"	377	13	13
SMØBDS	"	280	14	14
SM7EFI	"	224	10	8
SMØAJU	**7**	**147,900**	**340**	**174**
SM6FYJ	**7**	**124,800**	**364**	**150**
SM6FPG	**3.5**	**102,704**	**399**	**131**

Switzerland

HB9UD	**A**	**10,335**	**76**	**65**

Wales

GW3SLA	**A**	**84,747**	**333**	**159**
GW4FVT	**28**	**924**	**43**	**21**
		(Opr. GW4CJC)		
GW5BI	**21**	**35,090**	**203**	**121**
		(Opr. GW3GHC)		

Yugoslavia

YU2RLK	**A**	**265,203**	**534**	**237**
YU1NZW	"	117,030	331	166
YU2RJV	"	43,798	320	122
YU3TPM	**28**	**19,380**	**119**	**76**
YU2RUA	**28**	**13,608**	**90**	**63**
YU2CAW	"	9,360	87	60
		(Opr. YU2ROZ)		
YU2CQ	"	4,480	47	35
YU1OFT	"	162	10	9
YU2RBY	**21**	**578,584**	**907**	**248**
YU3ZV	**21**	**538,160**	**807**	**248**
YU3EY	"	505,500	780	250
YU1OBA	"	123,409	326	143
YU1SF	"	1,045	25	19
YU2CDS	**14**	**1,427,664**	**1721**	**336**
		(Opr. YU2CT)		
YU3DBC	**14**	**1,103,586**	**1666**	**253**
YU4GXY	"	5,668	79	52
YU2RTW	**7**	**354,380**	**555**	**235**
YU2BHI	"	57,798	208	117
YU2AKL	**3.5**	**159,600**	**433**	**175**
		(Opr. YU2RFM)		
YU2CBK	**3.5**	**140,614**	**393**	**167**
		(Opr. YU2RNQ)		
YU4VBR	"	31,270	282	135
YU1ELM	"	75,140	284	130
		(Opr. YU1OFT)		
YU3TUQ	"	54,466	240	113
YU2HDE/3	**1.8**	**5,992**	**109**	**28**

U.S.S.R.

European

UA3DFK	**A**	**371,868**	**734**	**266**
UA4HAL	**A**	**343,720**	**714**	**260**
UA6LXZ	"	328,168	772	254
UV3DN	"	293,400	662	225
UA6LWI	"	185,542	594	203
UA4PA	"	108,216	328	167
UA3TN	"	85,461	240	183
UA6AJG	"	65,065	227	143
UA3AEW	"	50,407	218	133
UW1BM	"	44,896	239	122
UA4ZA	"	41,174	172	119
UA3DCY	"	38,396	199	116
UA3HB	"	24,225	118	85
UA1AET	"	24,084	156	108
UK3XAM	"	20,056	147	92
		(Opr. UA3XBO)		
UA3PBY	"	9,116	70	53
UW3UG	"	6,750	60	50
UA6HBU	"	6,615	81	63
UA1JM	"	5,040	50	48
UA3TH	"	4,847	102	37
UA6LBQ	"	1,196	28	23
UA6ADC	**28**	**4,961**	**54**	**41**
UA6LED	"	1,950	37	26
RA3ALQ	"	54	6	6
RA3DFN	"	24	6	6
UW6DR	**21**	**252,048**	**742**	**178**
UA6LBC	**21**	**119,700**	**403**	**180**
UA6HGG	"	83,460	427	156
UA3DDF	"	55,510	238	122
UA6BV	"	47,348	217	133
UW3EQ	"	43,780	170	110
UW3UO	"	18,054	134	51
UA1DZ	**14**	**685,440**	**1151**	**280**
UW1CX	**14**	**640,224**	**1062**	**312**
UW1AR	"	224,802	611	207
UA1MU	"	94,958	320	158
UW6LC	"	73,760	289	160
UV3CS	"	52,472	297	139
UA3GM	"	51,960	202	120
UA6NF	"	42,744	232	137
UA1AAP	"	38,064	248	122
UA3AH	"	34,615	192	115
UW3RR	"	9,398	93	74
UA3TR	"	4,929	57	53
UA6RB	"	3,828	52	44
UA6APP	"	1,584	32	24
UA3XP	"	1,363	31	29
UK3AAY	"	1,275	32	29
UK6AAJ	"	980	22	20
		(Opr. UA6AYR)		
UA3XM	**7**	**179,872**	**379**	**176**
UA3QAQ	**3.5**	**72,150**	**290**	**111**
UA3QBX	**3.5**	**34,272**	**176**	**84**
UA6WAL	"	33,852	185	78
UV6AF	"	13,520	141	52
UV3FD	"	12,272	113	52
UA6LMT	"	9,844	83	46
UA4CK	"	2,600	42	25

Estonia

UR2AW	**A**	**23,937**	**121**	**101**
UR2REC	28	2	1	1
UR2QD	**14**	**837,168**	**1220**	**321**
UR2FQ	**14**	**596,970**	**1003**	**297**
UR2QI	"	478,972	932	302
UR2MG	"	384	20	20
UR2RCN	**3.5**	**24,820**	**137**	**85**

Kaliningrad

UA2EC	**A**	**12,864**	**80**	**64**
UA2FBZ	**7**	**30,794**	**157**	**89**

Latvia

UQ2GCN	**A**	**338,742**	**800**	**243**
UQ2DV	"	13,774	122	71
UK2GAA	"	1,624	32	28
		(Opr. UQ2PJ)		

Lithuania

UP2NV	**A**	**724,507**	**1068**	**301**
UP2BAT	"	50,740	239	118
UP2BAW	"	29,580	165	85
UP2AV	"	13,601	107	67
UP2BAR	21	2,280	33	24
UP2OM	**14**	**112,350**	**360**	**150**
UP2PT	"	32,780	190	110
UP2OU	**7**	**223,560**	**520**	**180**
UP2PBW	**3.5**	**54,136**	**252**	**101**
UP2BCD	"	27,208	156	76

Moldavia

UO5AP	**A**	**206,960**	**554**	**208**
UO5BZ	"	15,275	96	65
UO5DN	**14**	**61,350**	**245**	**150**
UO5ODX	"	55,440	307	144

Ukraine

UB5WE	**A**	**1,290,990**	**1536**	**345**
UB5MDI	**A**	**616,326**	**1113**	**278**
UT5HP	"	140,556	390	204
UB5ML	"	61,963	219	131
UB5LU	"	21,296	131	88
UY5YY	"	14,016	101	73
UB5UBI	"	10,360	80	56
UT5OV	"	9,576	74	57
UB5UAL	"	7,955	59	43
UB5CAY	"	3,300	40	30
UB5AAF	"	3,115	40	35
UB5VAZ	"	1,404	32	26
UB5GBY	**28**	**2,220**	**42**	**30**
RB5TBA	**28**	**2,160**	**46**	**30**
RB5CCK	"	2,028	33	26
RB5IOV	"	2,001	37	29
UB5VCD	"	828	23	18
RB5MJG	"	528	23	16
UB5AAQ	**21**	**15,042**	**111**	**46**
UY5HV	"	1,160	20	20
UB5WAD	**14**	**467,640**	**885**	**216**
UY5OO	"	174,216	447	168
UB5SJ	"	29,998	169	106
UT5BN	**7**	**52,500**	**216**	**105**
UB5GBD	"	48,552	205	102
UB5GDG	"	5,698	55	37
UB5UBJ	**3.5**	**96,750**	**334**	**129**
UB5XBU	"	90,740	313	130
UB5EDU	"	76,160	274	119
UB5UCJ	"	75,040	290	112
UB5DAG	"	45,400	212	100

White Russia

UC2BF	**A**	**26,970**	**128**	**93**
UC2ABT	**3.5**	**154,224**	**450**	**153**

OCEANIA

Australia

VK3AH	**A**	**780,783**	**1117**	**233**
AX2BJL	**A**	**318,465**	**805**	**135**
AX4ADC	**A**	**251,370**	**600**	**147**
VK5MF	**A**	**223,704**	**732**	**104**
AX2OW	"	52,215	290	61
VK6IH	**A**	**41,148**	**261**	**54**
VK5RX	"	10,692	67	54
AX5NPN	"	96	8	8
VK2XT	**21**	**600,831**	**1369**	**153**
VK5NDK	**21**	**518,556**	**1094**	**159**
AX3SM	**21**	**53,350**	**266**	**70**
AX6NE	**21**	**32,835**	**211**	**55**
VK4UU	14	90	7	5

Guam

WA6EVX/KG6	**A**	**365,470**	**914**	**115**

Hawaii

KH6IJ	**A**	**1,039,554**	**2385**	**138**

Indonesia

YBØACH	**A**	**43,070**	**204**	**73**
YBØACT	**21**	**554,230**	**983**	**190**

Lord Howe Island

AX4AAU/LH	**A**	**100,188**	**387**	**99**

New Zealand

ZL3GQ	**A**	**1,078,735**	**1433**	**245**
ZL1BKX	**A**	**671,328**	**889**	**259**
ZL3BK	"	196,536	453	152
ZL2ACP	**21**	**356,025**	**853**	**141**
ZL1RE	**14**	**256,122**	**562**	**162**

Philippines

DUØEG	**A**	**15,015**	**140**	**35**

Willis Island

AX9ZM	**A**	**206,949**	**682**	**101**

SOUTH AMERICA

Bolivia

CPØEL	**A**	**245,030**	**741**	**214**
CPØAT	**A**	**131,362**	**318**	**154**

Brazil

ZW6AHU	**A**	**828,530**	**975**	**290**
PY3APH	**A**	**816,816**	**1021**	**272**
PY5AFL	"	121,346	261	166
PY7AZQ	"	80,400	221	134
PT7WA	"	45,630	182	90
PT2JB	"	6,468	60	44
PY2VJ	"	1,007	22	19
PY5EG	**21**	**912,776**	**1104**	**284**
K4LC/PY8	"	6	2	2
PY4OD	**14**	**771,280**	**1073**	**248**
PY2FBI	"	11,100	76	60
PY1ZBJ	"	7,350	54	50
PP2ITU	**7**	**64,350**	**127**	**99**
		(Opr. PY2ELZ)		
PY2FUP	"	39,200	101	80

Easter Island

CEØAE	**A**	**48,705**	**201**	**85**

Neth. Antilles-Aruba

PJ9LOF	**3.5**	**7,560**	**44**	**30**
		(Opr. K9LOF)		

Peru

OA8V	**A**	**161,980**	**428**	**130**
OA4AHX	**A**	**132,200**	**450**	**100**
4T4AHA	**14**	**1,022,270**	**1196**	**302**
4T4ALP	**7**	**200,214**	**270**	**147**
OA4VR	**3.5**	**124,450**	**231**	**95**

Venezuela

YV4AA	**21**	**807,695**	**1181**	**235**
		(Opr. YV4YC)		
YV2AMM	**14**	**1,370,304**	**1343**	**351**

MULTI-OPERATOR SINGLE TRANSMITTER

United States

K3RV	**1,177,105**	**1080**	**397**	
K7SV	**1,084,043**	**1420**	**243**	
WA4EYR	**971,265**	**1058**	**365**	
W9XR	**770,125**	**911**	**305**	
WA9JCO	512,001	827	301	
WB1AUD	**468,032**	**963**	**284**	
WB6JOD	**238,056**	**590**	**156**	
W4SME	162,936	350	186	
WA1VCV	158,187	330	201	
WA6DRE	57,001	254	119	
WA3UXZ	7,614	64	51	

NORTH AMERICA

KP4AST	**3,547,776**	**3685**	**384**	
VE3AKG	**1,773,720**	**1574**	**360**	
VP2MAQ	**1,517,360**	**2211**	**260**	
VE6HN	**1,029,632**	**1394**	**256**	
VB3ZM	**842,270**	**1071**	**286**	
VC9UM	**799,606**	**1916**	**173**	

ASIA

K2BA/4X	**3,194,928**	**2633**	**396**	
5B4ES	**1,185,520**	**1445**	**290**	
JA9YBA	**330,885**	**608**	**215**	
JA3YKC	**252,500**	**473**	**202**	
JA3YOO	90,282	275	123	
JA1YYB	41,085	202	99	
JA6YFT	36,100	170	95	

EUROPE

DM2DUK	**2,514,838**	**2344**	**419**	
IY4FGM	**2,205,269**	**2130**	**433**	
HG5A	**1,860,738**	**2185**	**363**	
OK5CRC	**1,753,206**	**1955**	**399**	
EI1AA	**1,681,956**	**1935**	**342**	
SJ9WL	**1,509,579**	**1803**	**369**	
DLØJK	**1,502,843**	**1807**	**361**	
OH8OS	**1,496,872**	**1921**	**296**	
G3WAS	**1,482,075**	**1828**	**315**	
PA9TOM	**1,231,145**	**1509**	**365**	
HA7KLG	**1,155,510**	**1442**	**370**	
OH3EW	1,001,538	1352	306	
IBØCBM	1,001,382	1597	318	
HA9KPU	988,603	1329	347	
G3ZAY	960,111	1274	321	
YU4EXA	**902,836**	**1073**	**374**	
SP6PZB	**868,560**	**1245**	**308**	
DLØUE	839,466	1151	298	
G8JC	827,134	1303	287	
OK1KSO	783,380	1220	299	
SP9KRT	782,500	1211	313	
IA5AT	781,337	1328	323	
F6CLQ	**768,358**	**1120**	**314**	
DLØRCA	750,006	1109	306	
SP5PWK	744,106	1074	298	
YU2CTF	633,036	929	284	
HA6KVB	589,665	1109	285	
OK1KCU/P	583,918	996	281	
IC8HTA	521,153	973	272	
HA4KYH	497,038	807	257	
PAØSMK	**493,568**	**901**	**241**	
HB4FF	**479,598**	**829**	**266**	
G3XEP/A	371,464	698	236	
HA6KNI	337,832	752	242	
SP9PDF	325,867	689	229	
OK2KWI	300,150	651	230	
YU1GMN	285,852	691	249	
OK3KAP	240,300	583	225	
DM8TU	192,556	520	182	
PI1MHN	125,584	390	188	
LA4MV	**97,185**	**434**	**155**	
OK3KWK	91,245	351	165	
OK1KCI	82,384	310	152	
DM3BJ	76,797	314	159	
SP9PEZ	76,311	307	139	
LH2A	65,800	250	100	
OH2AR	63,825	293	115	
SP9KDC	48,906	213	117	
PI1ARS	39,312	220	108	
DM4NJ	26,226	169	93	
OK3KJJ	23,688	157	84	
PI1KMA	23,128	141	98	
SP6AYP/9	20,436	148	78	
OK2KWL	16,940	117	77	
OK1KPY/P	9,387	91	63	
SK6HA	4,268	60	44	
SP9KCB	3,861	46	39	

OCEANIA

AX3BHN	**755,820**	**1121**	**228**	
VK4APS	**537,823**	**1292**	**143**	

SOUTH AMERICA

AY8CW	**2,257,840**	**2280**	**338**	
LU2DNC	**1,155,885**	**1400**	**263**	
PY1CHP	**358,683**	**556**	**221**	
CE3AOX	**338,124**	**509**	**228**	

U.S.S.R. CLUB STATIONS

ASIA

4J9B	**5,201,056**	**4165**	**434**	
4J6A	**4,021,944**	**2932**	**412**	
UK9CAE	**1,450,270**	**1430**	**323**	
UK9FER	753,270	941	255	
UK7LAH	**704,051**	**950**	**263**	
UK9UAO	623,052	1118	243	
UK8BAJ	**601,656**	**900**	**264**	
UKØSAJ	**507,654**	**1066**	**237**	
UK7GAL	459,243	853	233	
UK9OBI	405,900	954	220	
UK8BAA	402,375	630	185	
UK7LAF	352,070	598	218	
UK9FAA	351,894	556	223	
UK6QAA	**274,536**	**501**	**164**	
UKØAAC	259,256	666	184	
UK9OAD	107,068	343	142	
UK9WBD	86,559	238	129	
UK9AAQ	44,044	118	91	
UK8AAB	41,184	241	88	
UK6FAF	32,856	154	74	

EUROPE

UK3ABB	**2,869,830**	**2573**	**405**	
UK6LAZ	**1,756,800**	**2074**	**384**	
UK3SAB	1,623,812	2030	332	
UK3AAC	1,264,302	1750	351	
UK4WAB	1,075,827	1571	291	
UK5QBE	**823,365**	**1268**	**321**	
UK2WAF	**652,000**	**1061**	**250**	
UK3DAH	560,025	926	285	
UK6YAB	542,300	1069	290	
UK5HAA	529,224	925	319	
UK6LKP	455,430	866	282	
UK5QAV	450,730	908	274	
UK4WAR	417,480	722	213	
UK4LAC	360,960	873	240	
UK3AAH	315,618	588	246	
UK5EAQ	291,579	711	249	
UK5VAA	290,560	668	227	
UK5ECN	263,438	658	217	
UK5JAO	225,687	683	231	
UK3YAV	213,180	567	204	
UK2BAG	**208,690**	**501**	**205**	
UK5IBB	204,340	407	170	
UK3ABQ	188,356	521	196	
UK5IAN	171,675	555	167	
UK3EAK	148,248	486	174	
UK2PAT	136,344	395	184	
UK2PAO	129,438	413	153	
UK2GAB	**126,228**	**410**	**157**	
UK2IAJ	121,464	418	168	
UK5VAP	119,600	393	158	
UK5MBP	118,026	371	158	
UK4WAC	111,321	263	171	
UK2RAX	**77,928**	**298**	**136**	
UK3DBE	75,240	304	152	
UK2BAS	67,260	246	114	
UK3TBF	56,574	213	126	
UK2GCL	45,308	224	94	
UK6AJN	39,480	184	105	
UK3ABQ	34,520	203	111	
UK4HAC	33,200	206	100	
UK3ACW	28,785	150	101	
UK2RAQ	22,644	142	102	
UK3EAZ	6,970	99	41	
UK3MBH	2,592	39	32	
UK3DAU	2,496	42	39	
UK3ACM	2,418	36	31	

MULTI-OPERATOR MULTI-TRANSMITTER WORLD WIDE

CJ3DCB	**6,688,860**	**4610**	**460**	
OF1AA	**4,458,636**	**4202**	**468**	
DK3BJ	**4,447,947**	**3870**	**483**	
YU1BCD	**4,002,465**	**3207**	**489**	
HB9AUS	**2,550,974**	**2336**	**457**	
VE3DU	**2,216,060**	**1986**	**385**	
PY5CIT	**1,143,900**	**1387**	**279**	
KL7FBI	**589,138**	**1577**	**122**	
N7XX	**235,585**	**585**	**127**	
JA3YKB	**219,051**	**548**	**171**	
JA1YXP	**197,540**	**434**	**166**	
JA8YAU	193,587	418	173	
DF3QG	133,940	432	185	
W8NGO	**29,574**	**115**	**93**	
JAØZAV	26,600	120	76	

Our thanks to the following stations who submitted their logs for checking purposes: DM2BTO, DM2DOD, DM3XM/DM3WYJ, DM4KZD/P, EL2BK, GM3LRG, JR1ZSG, JR3BJN, JA8BHA, K4IFG, K4KSV, K8CFU, K8ITH, K9NA, OK1DWA, OZ4RP, OZ8DJ, SM3BP, SM7GXE, UC2ACA, UC2WE, UK2AAB, UA3DN, UK3DBT, UK3AAI, UK3DBG, UK4HBB, UK4YYY, UK5CAO, UK5UBB, UK6LEZ, UKØABG, UWØMF, VE7DEW, W1PM, W2HL, WA4HUT, W6TCQ, W8EQG, W8OBI, WB8EUN, WB8SDC, W9DWQ, YO3QK, YO3ZP, and SWL Stations: France —REF 30989; W. German—DLRO1/1617521; Netherlands—NL 449.

How to modify your Collins S-line for full break-in operation on c.w.

Vacuum Relay QSK in a Commercially Equipped Station. Part I: The Collins S-line.

BY RICHARD KLINMAN*, W3RJ

Successful application of the vacuum relay QSK unit described in an earlier issue of *CQ*[1] has made c.w. operation much more enjoyable for many amateurs. While all those who contacted me were able to easily build an operational QSK unit, there appears to be a general lack of understanding of how to properly interconnect the QSK with the station transmitter so as to have full break-in operation. In order to clarify this situation, I will describe in detail the method of connecting the QSK into the Collins 32S-3 transmitter driving a grounded grid, zero bias type linear amplifier. With this example as a guide, it should not be difficult for other similar equipment, to be modified and connected to the QSK for break-in operation on c.w. and normal VOX or PTT operation on s.s.b. A complete description of how to do this with the Heathkit SB-400/401 will appear in a future issue of *CQ*.

RD 1, Flint Hill Road, Coppersburg, PA 18036

[1] Klinman, R., "A Vacuum Relay TTL QSK Antenna Switch." *CQ*, July 1976

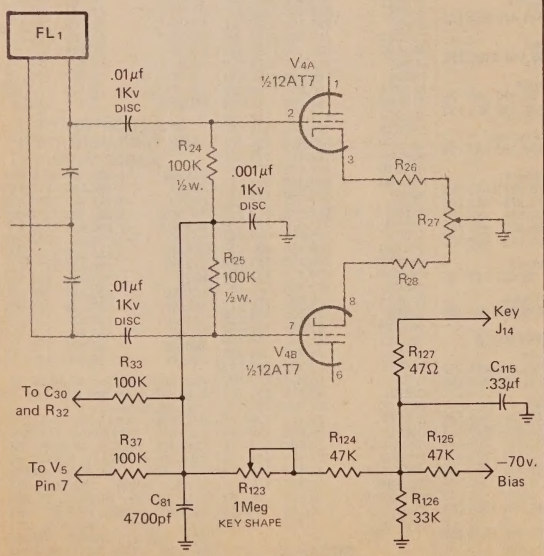


Fig. 1—Collins 32S-3 first mixer (partial circuit) with modifications shown in bold face.

Break-in with the Collins S-Line

The Collins 32S-3 transmitter, while being a first rate piece of gear, is not designed for break-in on c.w. It functions perfectly as received from the factory using VOX receive-transmit control on c.w., but I get the impression, as with most s.s.b. equipment, that c.w. was added after most of the design was completed. As a matter of fact, early versions of the S-Line Transmitter had very bad design flaws on c.w. In order to make the 32S-3 work break-in c.w., three very simple modifications are required. Only two of these actually are changes in the circuits of the transmitter, and only three additional parts are added. If a careful job is done, you can not see any of these modifications, inside or out. It will take only a few hours at most to completely set up the S-Line, linear, and QSK for break-in operation. But it makes a world of difference on c.w.

As delivered from the factory, the 32S-3 is in the standby mode with the key open while in the c.w. mode. With the VOX properly adjusted, closing the key causes both the VOX control relay (Collins

part K1), the antenna change over and external antenna control relay (Collins part K2) to close. Closing the key also grid block keys the second mixer, V5. Since the VOX relay can not follow the keying, break-in is impossible. Whenever the VOX relay is activated, as it is between dots, dashes, and words, and the receiver is not completely muted, an annoying signal is always fed through the transmitter to the receiver. This "back-wave" makes it impossible to hear anything between characters. The back-wave is caused by the oscillators, mixer and amplifier that are continuously running when the VOX relay is closed.

The solution to the problem is to use the vacuum relay QSK to switch the antenna between receiver and transmitter, close the VOX relay continuously while in c.w., and somehow key the stages generating the "back wave." Closing the VOX relay can be done by shorting the PTT line, J4 on the 32S-3, to ground. This places the internal antenna relay and receive-transmit relay in the transmit state all the time, but this is of no consequence because the antenna and linear will be controlled by the QSK. Only three additional stages of the 32S-3 must be keyed. These are the 12AT7 first mixer, V4, the 6CL6 driver, V7, and the 6146A final amplifiers, V8 and V9. Parts of this problem have already been nicely solved.[2,3] If these earlier articles are available reading them before modifying the 32S-3 might be of some additional assistance.

In essence, the first mixer and the driver are simply added to the existing grid block keying line. No change in wave-shape on c.w. or any operation on s.s.b. is caused by these changes. On c.w. a slight, but insignificant, reduction in the final grid drive will occur after modification because the driver will be operating with slightly more negative bias. With the VOX relay closed, the final amplifiers are drawing their full idling plate current of 45 mA. It is desirable to have these tubes also cut-off during key-up. Grid block keying is impossible since in a properly adjusted 32S-3 insufficient negative bias voltage exists inside the transmitter. The solution is to electronically control the screen voltage to the final amplifier in step with the keying. Very inexpensive high voltage transistors are available to do this job. With zero screen voltage, the 6146A finals draw insignificant plate current. Collins was very kind to have provided a break in the final amplifier screen supply via the two P.A. disable jacks, J5 and J9. The QSK has the necessary signal to key the screen voltage in step with the antenna change over vacuum relay.

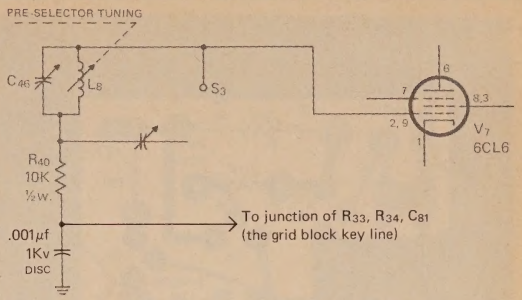


Fig. 2—Collins 32S-3 driver grid circuit (partial) with modifications shown in bold face.

Control of the station linear amplifier is also simple and requires minimal modification of most commercial amplifiers. The normal amplifier control relay is continuously closed by inserting a shorting plug in the amplifier control jack. Normally, this would allow the final to continuously run at its full rated idling current. Some way to reduce this idling current to zero during receive and to allow it to flow during transmit must be provided.

Most commercial amplifiers use the zero bias, grounded grid, triodes in the 3-500Z family.

A large cathode bias resistor will effectively cut-off any of these tubes. This self-bias can be removed in step with the keying by K3, the linear bias control relay, in the QSK. Measurements with a high impedance VTVM have never indicated more than 100 volts from either end of the cathode bias resistor to ground.

Shafer, "Cleaner Break-in with the 32S-3," *QST*, November 1970

Wade, C. W. and Hallock, D.B. "CW Break-in for the Collins S-Line," *QST*, September 1970

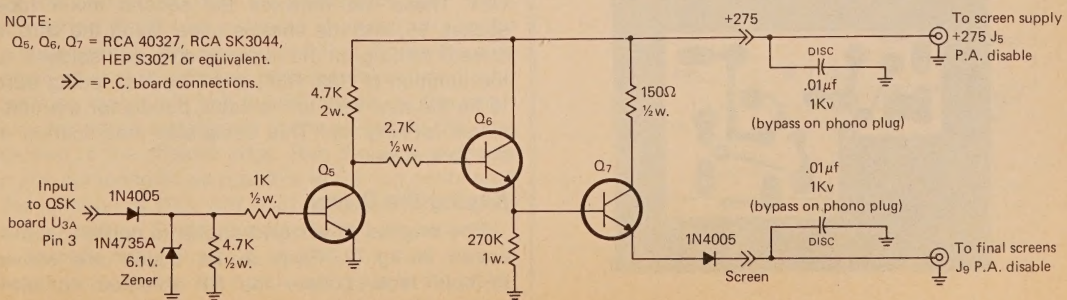


Fig. 3—Screen keying circuit (see Figs. 4 and 5 for parts and p.c. board layout information).

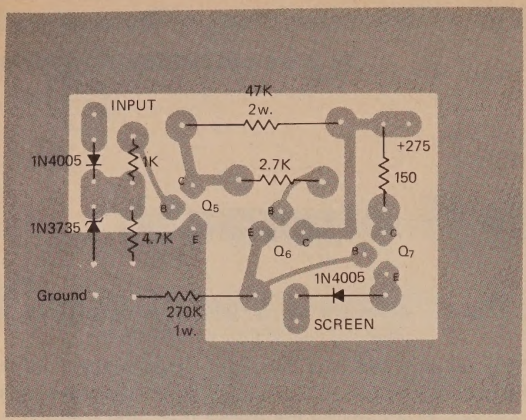


Fig. 4—Parts layout—QSK screen keying board (foil side, scale 2:1; actual size 2½ x 2 inches).

To use the 32S-3 transmitter as modified above with the QSK on s.s.b. requires only a slight modification to the original QSK circuit and the proper station interconnect cables. When transmitting on s.s.b. the key line must be closed to shift the antenna relay from receive to transmit, apply the screen voltage to the 32S-3 final amplifier, and enable the linear amplifier idling current. Since the 32S-3 antenna relay control contacts are not used to switch either the linear control or antenna relay, it is available to do this job. The 32S-3 antenna relay jack, J17, is simply connected to the key input of the QSK while in s.s.b. However, on c.w. this shorting of the key line must be defeated. A single miniature switch is added to the QSK to do this.

Most commercial linear amplifiers are wired so that the driver is fed directly through to the antenna when the power is turned off. This feature is unaltered by any previously mentioned modification. These simple modifications produce a station that is a dream to use on c.w. while operating on s.s.b. in either VOX or PTT remains unchanged.

Shown actual size

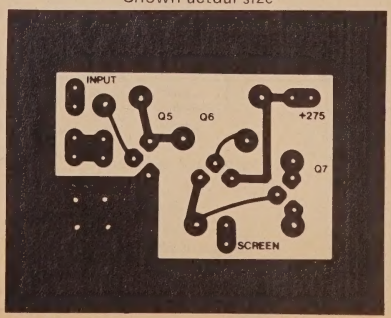


Fig. 5—P.C. mask—QSK screen keying board (shown actual size).

MODIFICATION OF THE 32S-3

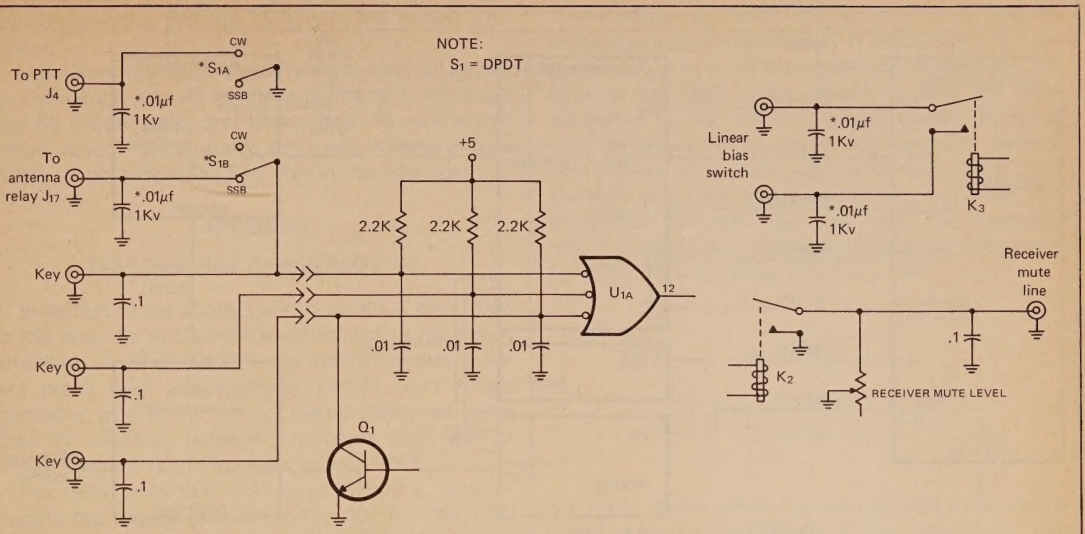
Keying the First Mixer

The original circuit of the 32S-3 first mixer is partially reproduced in figure 1. Added parts are shown in bold face. Locate the 12AT7 first mixer tube, V4. Remove the two 100K ½ watt resistors connected from ground to pin 2 and pin 7 of V4 by clipping the leads as close as possible to the ground and tube socket pins. Carefully unsolder the center conductor of the miniature coaxial cables connected to pin 2 and pin 7 of V4. Remember which coax was connected to which pin. Be careful not to overheat the coax insulation, it melts easily. With all parts disconnected, you can clear off the wires from pin 2 and 7 of V4. Using short leads, connect a new .01 mf 1 kv disc capacitor to pin 2 and another to pin 7 of V4. These should fit neatly on either side of the tube socket running parallel to the side and toward the rear of the chassis. Solder the coaxial cable center conductor that previously was connected to pin 2 to the free end of the capacitor now connected to pin 2. Solder it as close as possible to the body of the capacitor. Do the same thing with the capacitor connected to pin 7 and the coax that used to be connected to pin 7. Connect a new 100k ½ watt 5 percent resistor to pin 2 and a similar resistor to pin 7 of V4. Keep leads short for a neat job. Route these resistors so that they will not short to other components and so that the free ends can be connected together over the side of the tube socket facing the front panel. Solder the free ends of these resistors together with leads as short as practical. Connect a .001 mf 1 kv miniature disc capacitor from the junction of these 100k resistors to ground with leads as short as possible. Make sure you solder the resistors and capacitor to pin 2 and 7 of V4.

Solder one end of an insulated standed wire to the junction of the new 100k resistors and the .001 mf disc. Route this wire directly to the edge of the chassis and along the cable bundle toward the front panel. Locate the terminal strip and particular lug containing the junction of the two 100k resistors, R33 and R37, and the 4700 pf bypass disc capacitor C81. These are between the second mixer tube socket, V5, and the chassis edge. Bend the wire in toward this lug on the terminal strip and solder it to the junction of R33, R37, and C81. Use lacing cord to tie the new wire to the cable bundle for a professional looking job. This completes modification of the first mixer.

Keying the Driver

The original driver grid circuit is partially reproduced in fig. 2. Parts to be added are shown in bold face. Locate the RF shielded compartment under the chassis containing the grid tuning components of the 6CL6 driver, V7. This is the sec-



ond shield from the rear of the chassis. This shield contains the 10k ½ watt resistor, R40. Carefully remove the fiberglass bandswitch shaft and the RF shield. Reference to the 32S-3 instruction manual may be useful. The job is not difficult if you are careful. The most difficult part is maintaining proper alignment of the various bandswitch wafers. A special wrench is necessary to loosen the setscrews holding the bandswitch shaft to the switch indentor mechanism, but this tool is supplied by Collins with the 32S-3.

Once the shield is removed, locate the 10K ½ watt resistor, R40. It is soldered across two terminals of the lug strips. Locate the ground lug and carefully cut the resistor lead soldered to this ground lug. With short leads solder a .001 mf 1 kv disc capacitor from this ground lug to the free end of R40. Place the body of the disc toward the chassis so that it will not rub the bandswitch shaft when it is reinserted. Cut off any excess lead length of R40. If available, a miniature ceramic standoff insulator can be used to both replace the self-tapping screw securing the terminal lug to the chassis and provide a good mechanical support for the junction. It must be low enough to clean the bandswitch shaft when reinserted. Solder an insulated stranded wire to the junction of the .001 mf disc and R40. Route the wire down against the chassis between the coil and trimmers so that it will exit the RF shield via the semicircular notch already cut in the shield on the side closest to the chassis edge. Run the wire under as many components as possible to the lug containing the junction of R33, R37, C81, and the wire keying the first mixer. Solder the wire to this lug terminal.

Replace the RF shield so that the new wire is properly located in the notch and replace the bandswitch shaft. Make sure all switch positions are properly aligned and coincide to the band indicated by the front panel switch. This modification may slightly detune the driver grid circuit. Follow the 32S-3 manual and repeak only the trimmers contained in the shield you just replaced.

Final Amplifier Keying

As received from the factory the 32S-3 has a jumper soldered across the two P.A. disable jacks, J5 and J9. Carefully cut out both ends of this jumper. This modification is standard by Collins for use of the 32S-3 with their transceiving converter. This completes modification of the 32S-3 transmitter. To return the 32S-3 to factory operation, simply connect the P.A. disable jacks together with an insulated jumper cable.

The screen keying circuit, figure 3, is built on a small circuit board and is added to the QSK box. The parts layout is shown in figure 4, and the circuit board mask in figure 5. Two phono jacks must be added to the QSK box for connection to the P.A.

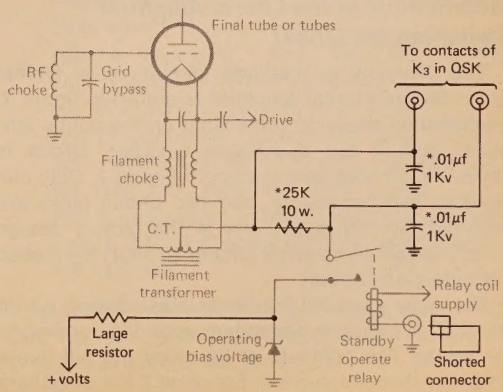


Fig. 7—Typical grounded grid linear (partial circuit) with additional parts indicated in bold face.

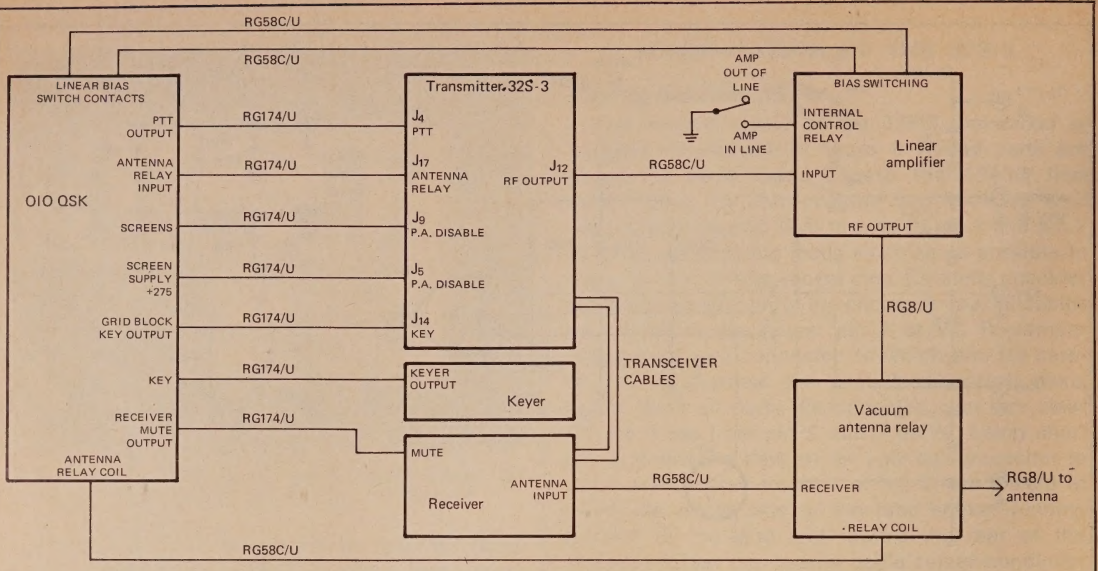


Fig. 8—Station interconnection for QSK operation on cw and normal operation on ssb with Collins S-line and linear amplifier.

disable jacks on the 32S-3. Be careful as these jacks have +275 volts on them.

Additional Modification to the QSK

The QSK would be troublesome if it were inconvenient to switch between c.w. and s.s.b. To use the QSK on s.s.b. one switch and two phono jacks must be added to the QSK control box. The additional circuitry is shown in figure 6.

Through S1 in the QSK, on s.s.b. the transmitter antenna relay control contact is used to short the key line input of the QSK. This allows the vacuum antenna relay and linear bias relay to close, and energizes the 32S-3 screen voltage. On c.w. the switch grounds the PTT line.

Modification of the Linear Amplifier Switching the Linear

The filament or cathode circuit of a typical grounded grid linear amplifier is shown in figure 7. Modification depends some what on the actual amplifier circuit, but a suitable modified circuit is shown in the bold face portion of Figure 7. Only one resistor, two capacitors, and two phono jacks are required. To return the unit to the factory design simply install an external jumper to short the added cathode-bias resistor.

The relay used for the linear bias control, K3, in the QSK is critically dependent upon the currents in the linear. The contacts of K3 carry the full linear amplifier cathode current. For most 2 kW amplifiers this is approximately one amp. It actively switches only the idling plate current, usually a couple of hundred mills at most. The relay must be fast enough to follow the keying. I have used non-descript surplus, mercury wetted reed relays designed to work with TTL levels and rated at two amps contact current. Less expensive reeds (see appendix) would most likely work for most 2 kW linears. The relay should be able to be driven from TTL levels. The 7400 gate will supply about 40 mA at four volts to pull in a relay.

Operation of the QSK and Modified S-Line

Interconnection of the station is detailed in figure 8. For initial tests place both the transmitter and QSK in the s.s.b. mode, turn the RF drive to zero, and turn off the VOX. Close the PTT line on the microphone or foot switch. The VOX relay in the 32S-3 should close, the 32S-3 plate meter should read the proper plate idling plate current, the receiver should mute and the antenna relay should switch to the transmit position. Opening the PTT line will return the equipment to the receive mode and no plate idling current should be present on either the exciter or linear. With the VOX activated, speaking into the mike should produce identical results to closing the PTT line above. Turn up the drive level and the equipment should tune up and sound exactly as it always did.

Place the transmitter and QSK in c.w. with the drive level at zero. The VOX relay in the 32S-3 should be continuously closed as evidenced by the glow in the voltage regulator, V13. With the key open the receiver should be active, and no plate current should be flowing in either the exciter or linear. Closing the key should mute the receiver and

cause the idling currents to flow in the exciter and linear.

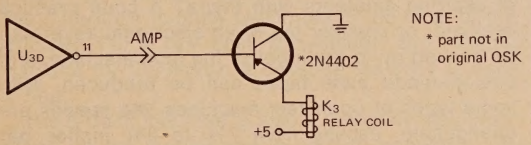
Make sure the QSK is properly adjusted so as not to hot switch any RF in the antenna line. Increase the RF output level and make sure the key wave-slope control is properly adjusted. You are now ready to go with QSK. See you in the pile-ups!

APPENDIX

The Linear Bias Control Relay, K3

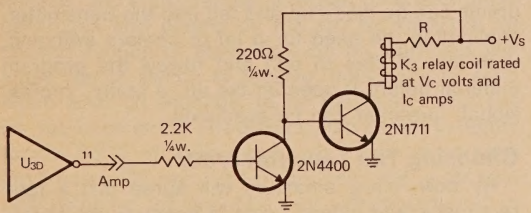
Selection of the contact rating for K3 is described in the text, the section on modification to the linear amplifier. As indicated in the following list, there are many reed and mercury wetted reed relays available to do the job at reasonable cost (less than five dollars). However, amateurs may wish to utilize surplus relays to save money.

For relay coils that will operate from a +5 volt supply but require more than the 300 mA the 7400 circuit (U3D) can supply, the following driver circuit is recommended.

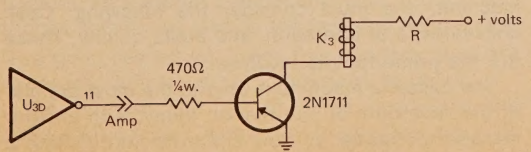


Since the relay K3 is not located on the printed circuit board, it is not inconvenient to add the driving transistor.

For relays requiring more than five volts, the following circuit may be used.



The following circuit is for use with relays having both normally open and normally closed contacts, the normally closed contacts being used for the linear bias control outputs.



The additional parts may be located on a small breadboard near the relay. A source of voltage between +7 and +17 at moderate current is available in the QSK power supply across the filter capacitor in the +5 volt power supply at some point between the bridge rectifier and the input to the 7805. If this does not match the rated relay voltage, a resistor may be added in series with the relay coil between the coil and the transistor emitter. The value of this transistor is calculated by using the following formula:

$$R = \frac{(V_s - V_c)}{I_c}$$

with a power rating of at least

$$P = I_c (V_s - V_c)$$

where V_s is the measured supply voltage, V_c is the rated relay coil voltage, I_c is the rated relay coil current. If only the relay coil voltage, V_c, is specified and the coil resistance, R_c can be measured with an ohmmeter, then I_c can be calculated from $I_c = \frac{V_c}{R_c}$.

Sources for K3

The following relays should be suitable for use as K3 in the QSK, as determined from manufacturers' specification. They cost about $5.00.

Magnecraft

5575 North Lynch Ave., Chicago, IL 60630
(312) 282-5500

W102MX-1—contacts: 1 amp, 200 volts, or 15 watts. coil: 40 mA at 100 ohms (4 volts). operation time: 3 ms.

Struthers-Dunn, Inc.

Pitman, NJ 08071
(609) 589-7500

RRN1A—contacts: 1 amp., 350 VDC, 15 watts. coil: 6 VDC, 190 ohms (32 mA), will pickup at 4.8 VDC max. operation time: 2 ms.

RRE1A—contacts: 1 amp, 250 VDC, 15 watts. coil: 6 VDC, 200 ohm (30 mA), will pick up at 4.8 VDC max. operation time: 1 ms.

RR1A—contacts: 1 amp, 250 VDC, 15 watts. coil: 6 VDC, 190 ohms (32 mA), will pick up at 4.8 VDC max.

Poly-Packs, P.O. Box 942, Lynnfield, Mass. 01940 Cat. No. 92 CU3679 (WABASH 5504-11011) SPDT 2 amp contacts at 500 volts. 12 v.d.c. at 450r coil ($2.50)

(continued on page 111)

Here's a new addition for your shack that can double as part of your stereo system.

Put A Tape Recorder To Work In Your Shack

BY JAMES R. KATES*, WB8TCC

One of the most useful articles to find its way into a ham shack these days is the tape recorder. Many amateurs now use a tape machine in the shack, and wouldn't be without it. For those of you who may be unfamiliar with the types of machines available or their application for amateur use, read on.

Taping QSOs

The uses for a tape machine in the shack are many. Probably the most obvious use is for recording the QSO itself. For this, the tape recorder is simply hooked to the audio output of the receiver, either by a tap to the speaker, or a special auxiliary output jack found on some receivers for the purpose of connecting to a tape machine. The tapes can be a record of QSOs, or can even serve as a logging aid when working pile-ups and the hands are not always free to write in the log. For this, a reference time is recorded at the beginning of the tape, and when the tape is played back, all log entries can be made according to the time so many minutes after the reference time. Those rare QSOs can also be preserved on tape for the next time you want to show them off to your friends. The playback of that QSO with a ZD8 is also very suitable for making someone jealous.

Taping CQs and Transmissions

If you're the type who might tend to get tired of the routine of sending CQs on the phone band, how about putting them on tape instead? They are easily played back, either by the "El Cheapo" method (holding the mike up to the speaker of the recorder (or by feeding the audio output of the recorder into the mike jack of the transmitter. A switch can be installed to facilitate the changeover of the transmitter input from tape to "live." This might seem a trifle silly, but it can save an unimaginable amount of time, especially in a situation where lots of CQs are required, as in a contest.

Have you ever wondered what your signal sounded like to another fellow who was hundreds or thousands of miles away? Another amateur's transmission can be recorded via the audio output of the receiver, rewound and played back through your transmitter during your next transmission, so he *can* hear exactly what he sounds like on the air. Verrrrry interesting!

Code Practice

Want to brush up on your code, or help a group of aspiring amateurs with theirs? A code practice oscillator or speaker tap of an electronic keyer can be hooked up to the input of the tape machine, and custom-made code tapes can be produced. With some types of open reel machines, the speeds are changeable, usually from 7½ to 3¾ inches per second. A code tape recorder at 7 w.p.m. for Novice practice can be played back at 14 w.p.m. for general class hopefuls, and *vice versa*.

Slow Scan TV

The tape machine is, of course, almost indispensable to the SSTV enthusiast. Video signals can be recorded onto the tape for reference, SSTV programs can be made up and fed into the transmitter, eliminating the need for a lot of camera swinging. With lots of time to edit and review the program material before it goes on the air, a really "professional" program can be produced.

Choosing The Tape Recorder

By now, many amateurs will agree that a tape recorder could indeed come in handy in the shack. But how does one choose among the myriad of brands and tape formats available to the public today?

There are basically three types of machines available on the market these days. These are: Cassette, reel to reel, and 8-track cartridge. In choosing a machine, one must consider the following: Cost, convenience of operation, and audio quality. These are the prime factors involved.

The cassette machine is among the most popular of the recorders on the market today, with an ever increasing number of fans since its introduction a few years ago. The reasons for its popularity are

*3887 North M-52, Owosso, MI 48867.

obvious. The cost of a small cassette recorder is within the reach of most anyone, with the cheapest machines starting at around 25 dollars. The frequency response and distortion figures are admirable enough, usually about 50-6,000 Hz in the average portable machine. High fidelity stereo decks are now available in the cassette mode with responses up to 17,000 Hz. These machines sell for around 200 dollars, which is not too high a price to pay considering that a machine of this quality could double as a component in your stereo system, if you are so inclined.

The disadvantages of cassettes? For one, editing them is very difficult. The recessed head design of most cassette recorders makes it difficult to cue a tape with absolute accuracy. The audio quality of even the best cassette recorders, though it may come close, cannot match that of a good reel to reel machine. This is because the tape in a cassette is only ⅛ inch wide and the machine runs at only 1⅞ inches per second. An open reel recorder uses quarter inch tape and may run as fast as 15 inches per second in the case of higher priced models, permitting a higher frequency response. However, this difference is quite negligible in the case of the amateur. For a low cost, convenient, and reliable machine for the shack, a cassette machine is hard to beat.

The 8-track machine is also a relatively new innovation on the market and is gaining popularity. Its quarter inch tape and narrow track arrangement allow for 8 channels of mono or 4 channels of stereo information to be recorded. The 8-track cartridge is actually a continuous loop of tape, so if left alone will play indefinitely. For this reason, it is suited to repetition tapes, such as phone CQs. Short cartridges in lengths of 60 seconds or so can be purchased, and a CQ can be recorded on one of these cartridges and played on the air. No reply? A 30 second section of blank tape on the cartridge will allow you to switch to receive, then back to send again after 30 seconds, to let the tape call a CQ for you once more. The 8-track also comes in handy for the SSTV op, who can fix up a tape of perhaps ten frames (80 seconds) of his call, with a 30 second listening (or should I say viewing) period in between "takes".

Alas, though, the 8-track machine has its drawbacks. The audio quality, though good enough for most work, cannot match that of a good cassette or open reel deck. For this reason, the 8-track is not recommended for use as a machine that doubles as a stereo component. Also, 8-track cartridges sometimes jam on the inside when the tape loop gets messed up. When this happens, they are extremely difficult, if not impossible, to repair.

For the man who has, or wants, everything, the open reel machine is the way to go. Ever since its commercial introduction in the 1950's, the open reel recorder has been *the* machine used in critical recording applications. The frequency response and distortion figures are the best of any recorders made. In addition to this, the open reel format offers many combinations of tape speeds, reel formats, and accessories, which makes them extremely versatile. The open head design of most reel to reel recorders makes editing a snap, and many have cuing or "pause" controls which allow the tape to be rocked across the heads with the amplifier circuit on and the motors off so a precise spot on the tape may be located.

As always there are disadvantages. The only real drawback of the open reel recorder is its cost. A good open reel machine sells in the 3 figure area, with the Professional quality home machines retailing for as high as 1200 dollars. Of course, at this price, the machines have features like mike/line mixing, sound on sound, etc., that not every amateur would use too often. A good quality machine for the shack with such features as a cue control, two speeds, and stereo/mono switching will usually run in the range of 200-300 dollars, depending on the brand, and other features included.

No matter what type of tape machine you choose, it will probably be wisest to remember the age old buyer's rule: *You get what you pay for.* Stick with the name brand, pay what you can afford, and you will most likely get your money's worth. ■

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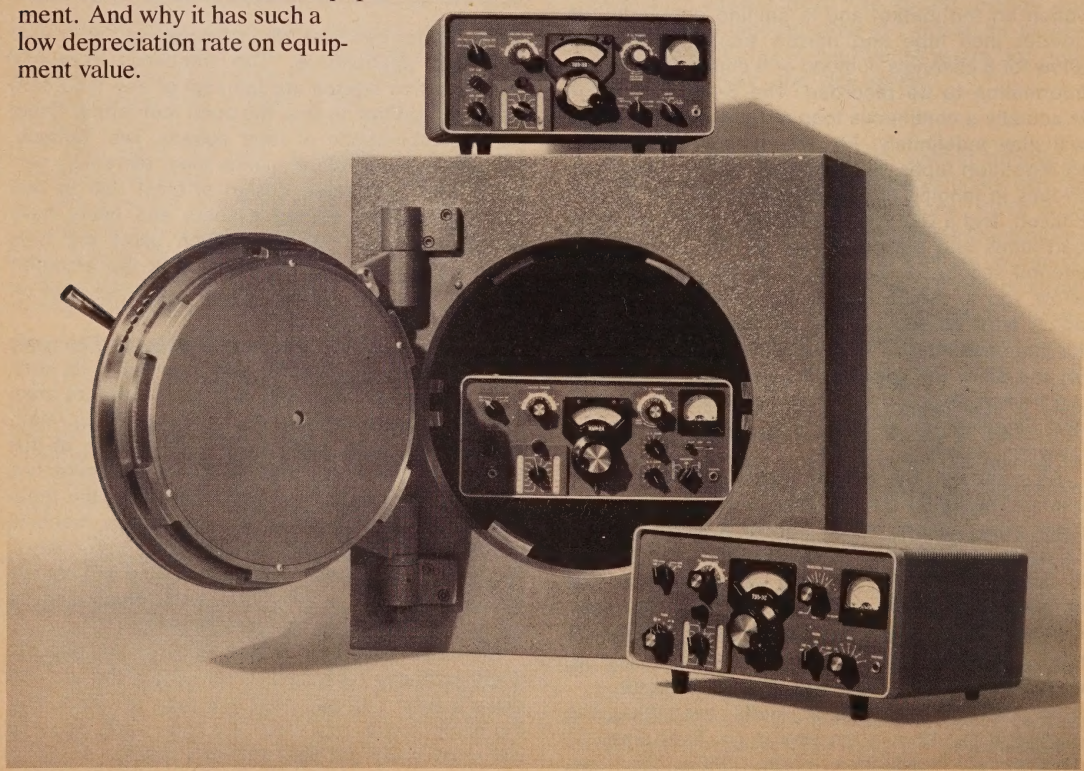
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a monthly feature by

BILL DEWITT, W2DD

In Focus

Television on the Amateur bands

Holiday Greetings And A Note Of Thanks

It hardly seems possible, but this is my third opportunity to wish readers of "In Focus" Happy Holidays and all good things for the coming year.

During the two and one-half years of its existence, "In Focus" has brought you over 150 pictures of slow scanners, their equipment, and their projects. A goodly share of these were sent to me by readers of this column.

News of what YOU are doing WITH SSTV, pictures of SSTV projects, and pictures of YOU and YOUR equipment, are what make this column of interest to slow scanners everywhere. My thanks for your generous support from the very start of "In Focus"! Please keep those letters coming my way in '78.

Calling All Generals!

Calling all Generals—General Class amateur ticket holders, that is. As indicated in this column last month, I am inclined to favor the extension of SSTV privileges for General Class amateurs to their phone allocations in the 15, 20, 40, and 80 meter bands.

Some may feel that adding SSTV privileges for the Generals in these bands is contrary to the purpose of incentive licensing. I don't! It's my feeling that the sooner an operator has "hands on" experience with a given mode, the more proficient he'll become in a given period of time. With SSTV activity at a low level on 10 meters (and poor band conditions to boot), there's little to encourage a General Class operator to get fired up on SSTV.

It would be hard to argue that progress in the field of SSTV is dependent upon increased numbers of amateurs using this mode. However, it seems to me that rather than attaching a "drag-line" to those who are interested in a relatively new and effective mode of communication, they should be encouraged to get started early (in SSTV) and to learn enough so that in time, they too can become "contributors to" instead of just "users of" picture transmission technology.

*2112 Turk Hill Road, Fairport, NY 11450

Is there a lawyer in our midst who would like to draw up a nice legal proposal for FCC consideration?

SSTV In Romania! YO2BGP Hopes To Pioneer

A letter from George Pataki WB2AQC, tells an interesting story about his father-in-law, Stefan Redei, YO2BGP, of Timisoara, Romania, who has recently started receiving SSTV pictures. George's letter tells it best: "Dear Bill, W2DD,

This spring when I visited my country of origin, Romania, I took my father-in-law my Robot 70 monitor and Robot 80 camera. He is YO2BGP, in the city of Timisoara.

This gear is presently the first and only factory made SSTV equipment in Romania. Stefan readjusted everything for the local power line (50 Hz., 220 V.) and started to make one way SSTV contacts. He can receive pictures but is not allowed to transmit because there is no provision for it in the present amateur regulation. It is expected that when the new regulation comes out, it will have provision for SSTV. There is no doubt that he will be the first YO active on SSTV.

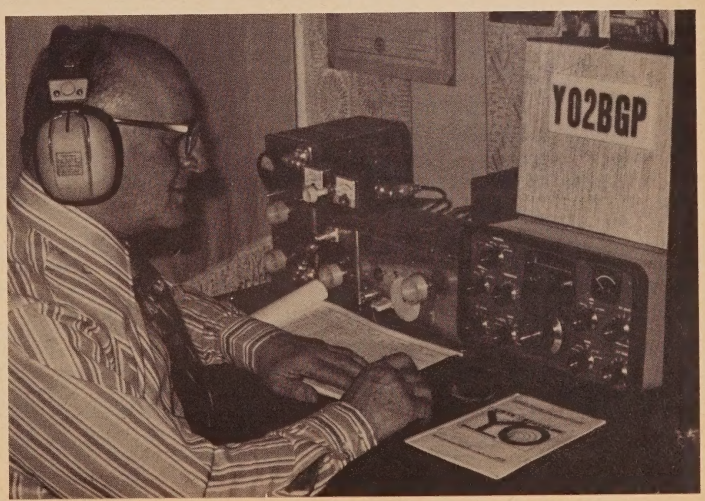
I just received the enclosed photos from him and thought that perhaps you would want to publish them in your column. His daughter, my wife Eva, is WA2BAV, was active on s.s.b. just a couple of years ago (as I was)—going on DX-expeditions to Africa, etc.

Stefan has recorded lots of SSTV on cassettes. Other amateurs from YO2-land are coming to him to see the pictures and find out how everything works! SSTV is spreading even where there is no regulation for it.

YO2BGP's address is Stefan Redei, str. Doja No. 10, Timisoara, Romania. If anyone would like a schedule with him, they can write to him direct.

73, George Pataki, WB2AQC."

In numbers of years, Stefan could be called a senior citizen. However, he acquired his amateur ticket at the age of 65 and pursues his radio and SSTV interests with all the enthusiasm of a college-age scientist! Fig. 1, shows Stefan copying DX at his neatly arranged station. Since this photo was taken, he has acquired a Heathkit 101A



Stefan Redei, YO2BGP seems to be concentrating on DX! His neat and compact station now includes a Heath 101A transceiver and Robot SSTV gear.



SSTV picture from YV5EV as received by YO2BGP.

transceiver in addition to the Robot gear mentioned above.

Some examples of SSTV pictures received by YO2BGP are shown in figs. 2 and 3. Congratulations on the photography, Stefan.

My thanks to George, WB2AQC, for this interesting look at the beginnings of SSTV in Romania. We can all hope that the Romanian authorities will encourage amateur participation in SSTV communication by including provision for it in the new regulations.

Practical Uses Of SSTV— Some Feedback From SSTV's Inventor

Cop Macdonald, who now signs VE1BFL, in Charlottetown, Prince Edward Island sent along a note regarding my recent quest for practical uses of SSTV. As all early-on slow scanners know, Cop has always been interested in making more than name and call-swapping use of SSTV. Here's Cop's thought-provoking suggestion: "An SSTV News Net?

"It's no secret that the world today is burdened with a heavy load of serious problems. But do you have as much trouble as I do getting to the heart of various contemporary issues? We're inundated with information from the news media, yet much of it seems incomplete, contradictory, one-sided, out-of-context, and otherwise limited in enlightment value. Each of us has only so much time for news and information gathering, and so our perspective remains limited. I, for one, could use some help.



A little QRM messed up this nice picture of YV5GU's XYL as received by YO2BGP.

"Why don't we start an SSTV 'News Net'? You and I read different newspapers and watch different TV news shows. And we read lots of different magazines. If each of us skimmed the cream off the top of all the information we're exposed to, and shared it with other slow scanners who are doing the same thing— wouldn't we have a lot of fun, and broaden our perspective in the process?

"Participants could be encouraged to bring a 'golden nugget' or two of news to each net session. The visuals used could be pictures or charts cut right out of the particular magazine or newspaper, or even 'frame-snatched' from the TV news. After the item was presented to the group, the others could comment and possibly add information which *they* had picked up. We would start to see key isues from a variety of points of view—and thus build a more complete understanding of what is going on in this crazy world. Individual items could be humourous, serious, local, or international; whatever the participants felt would help make the net fun, interesting, and educational. I can see those editorial cartoons already!

"I'd be delighted to work with any other slow scanners who'd like to give something like this a try.

Cop Macdonald, VE1BFL"

Well, there you are, slow scanners— a well delineated proposal for a different and stimulating kind of SSTV communication. To get things started, why not discuss Cop's proposal with other slow scanners on the Saturday net and otherwise to find out who'd like to join-in? The matter of time and frequency for such a net needs some thought. Weekends probably offer the best possibilities for participation.

I, for one, would like to take part in the kind of net that Cop proposes. It *would* mean that you'd have to put your brain in gear before you started talking or showing pictures—but that never hurt anyone too much!

For those who may wish to contact Cop on this subject by mail, his address is: Copthorne Macdonald, 99 Fitzroy Street, Charlottetown, PEI, Canada.

Hamming It Up In The Future

Every once in a while, I get to wondering if there will ever be some august committee whose responsibility it is to set design objectives for future amateur equipment. To my knowledge, there's never been any technical group who've taken it upon themselves to ask, "What is it we need the mostest— and what are we doing to get it?" This happens in military, government, education, and industrial fields—maybe even in medicine! But not for amateur radio.

Solid state keyer designs, speech processors, canned-goods packaged transmitters, etc. seem to get "designed" in abundance— but is *anyone, anywhere,* saying, "What is amateur radio's greatest technical need? It's hard to program inventions, but it might help to spell out the areas where we really need some good technical thinking. Certainly some short term and long term goals could be set that would offer a challenge to those having the ability to design in the communications field.

One example of a short term goal might be the design of an effective h.f. antenna not to exceed three feet in length.

An example of a long term goal might be the design of a completely micro-processor controlled amateur station having voice, c.w., RTTY, and SSTV capability.

The recent introduction of the versatile micro-processor controlled CB transceivers by Texas Instruments and Hy-Gain indicates that a complete departure from the hardware of today's amateur station is a real possibility.

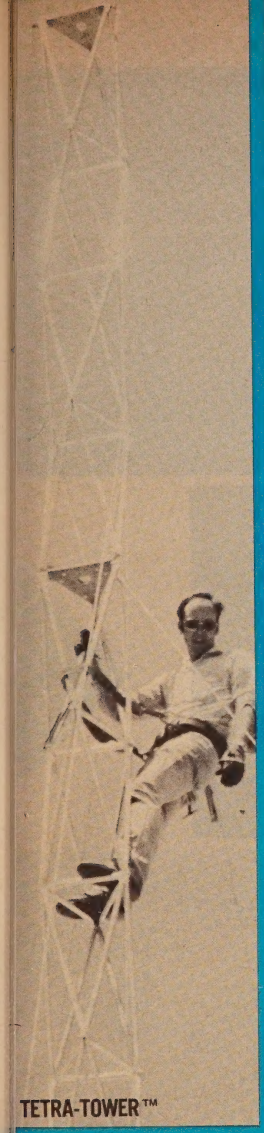
It has become a matter of great pride to point to the growth rate of amateur radio. On the other hand, it can be understood by even the dullest among us that interference on some of the amateur bands will reach metropolitan CB levels (!) within a couple of years if this growth rate continues. How will we cope with *that* situation?

Your thoughts on this subject will be most welcome. I am offering a year's subscription (or renewal) for the best letter on this subject received by March 1st, 1978. Please send your letters direct to me, not via *CQ's* office address.

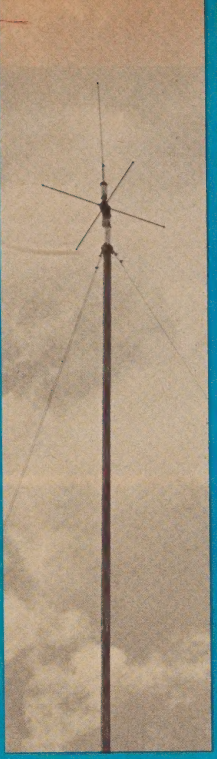
Robot's Commercial Scan Converter, Model 500

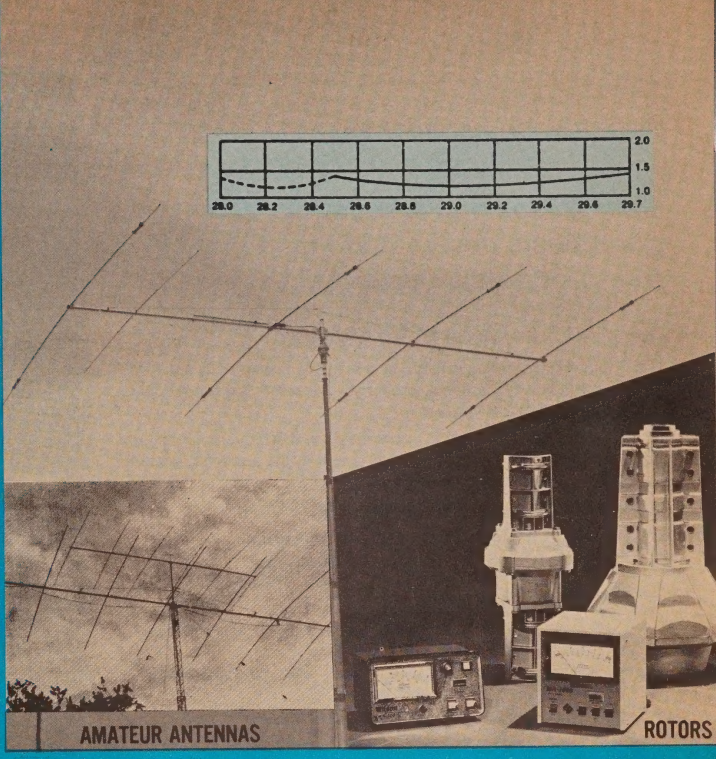
Robot Research has introduced a commercial model of the well-known 400 known as the Model 500. The commercial unit is not suitable for amateur use—it's designed for telephone line operation and will be marketed through dealers throughout

(Continued on page 112)



TETRA-TOWER™

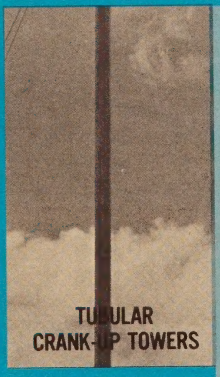




AMATEUR ANTENNAS

ROTORS

Wilson

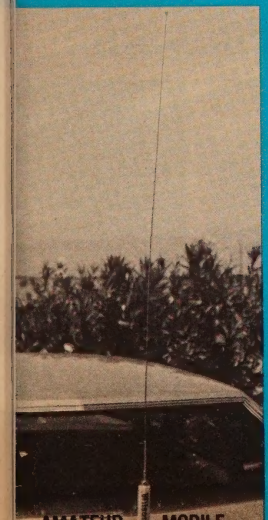


TUBULAR
CRANK-UP TOWERS

- ANTENNAS
- TOWERS
- ROTORS
- RADIOS



AMATEUR HAND-HELDS



AMATEUR MOBILE

BUYERS SELECTION GUIDE AND SPECIFICATIONS

No frills, no gimmicks, no clever words . . .

from Wilson you just get top quality, good basic design and maintenance-free products at lower prices.

Why Wilson?

Our products are made available by Hams for Hams, with a dedication to provide well designed, properly engineered quality products to our customers at fair prices.

The language and descriptions contained in this Buyer's Guide are being presented with both the novice as well as the seasoned amateur in mind.

Should additional information be desired, let us know.

Let's begin with amateur antennas . . .

For amateur antennas, your choice is easy . . . compare these features:

- **BOOM TO ELEMENT MOUNTING**

  On 2" boom models, a heavy duty vise-like extruded aluminum clamp is used (Fig. "D").

  The 3" boom antennas have a heavy duty angle aluminum bracket in conjunction with u-bolts and saddles (Fig. "B").

  Both methods assure that the elements will not rotate on the boom.

- **BOOM TO MAST MOUNTING**

  Rugged ¼" thick aluminum plates are used in combination with sturdy u-bolts and saddles for superior clamping power (Fig. "A") and (Fig. "H").

  With 3" boom models a boom tilt feature is included to facilitate assembly and adjustments. The boom may be mounted on the mast, tilted, and then the elements installed.

- **TOP QUALITY TAPER SWAGED ELEMENTS**

  Taper swaged elements (Fig. "F") provide strength where it counts and lower wind loading than conventional telescoping elements. Full circle extruded aluminum clamps provide excellent electrical and mechanical contact.

- **BOOMS**

  2" O.D. booms feature .057" wall aluminum tubing in the center with .060"wall reinforcing sleeves on the long 2" O.D. booms where required. 3" booms are .065" wall with .125"center sleeves. Guy support cable used on booms are aircraft type 6/18 steel.

- **CLEAR ASSEMBLY INSTRUCTIONS**

  You'll like our step-by-step illustrated assembly manuals. All details are clearly shown and explained to speed assembly (Fig. "C").

- **IMPROVED GAMMA MATCH**

  New improved gamma matching system features two adjustments to bring reflected power to a minimum.

  A coaxial connector is an integral part of the match for direct attachment of a PL259 type connector. NOTE: All Wilson antennas using gamma matching system do not require a balun. They are fed directly with a 52 ohm coax.

. . . a word about vibration.

In virtually any antenna installation, the supporting structure transmits ground vibrations to the antenna causing it to vibrate continually.

Add to this wind vibration and torque and one can easily see how much of a "beating" an antenna takes.

The results are annoying element "singing" and fatigue of the tubing causing premature breakage.

Wilson supplies high quality 5/16" polypropylene rope which should be strung inside the entire length of the elements. The rope deadens the sound caused by wind and acts as a cushion to absorb vibration of the elements.

The results are a mechanically quiet antenna that will last much longer. Tri-bander trapped elements to not require this remedy since the vibrations are absorbed by the trap assemblies.



Fig. "A"
Boom to Mast Mounting

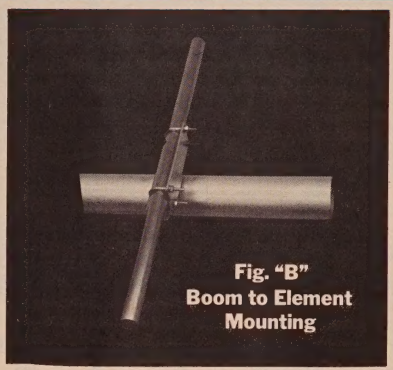


Fig. "B"
Boom to Element Mounting

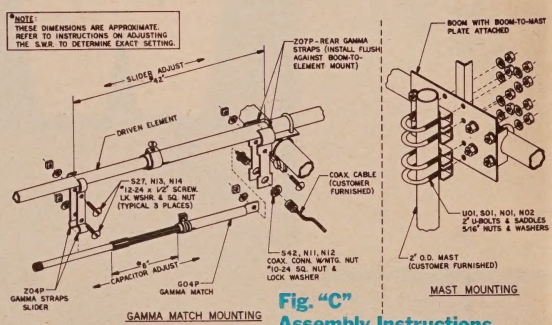


Fig. "C"
Assembly Instructions

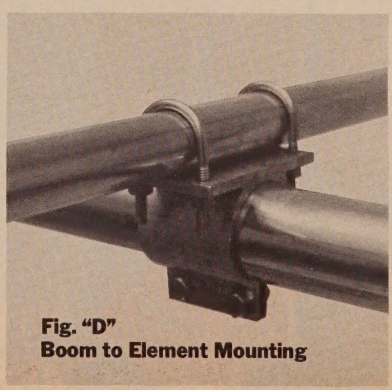


Fig. "D"
Boom to Element Mounting

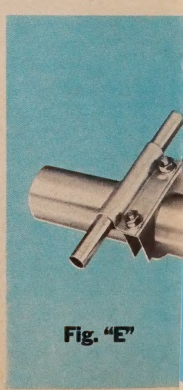


Fig. "E"



Fig. "F" Taper Swaged Element

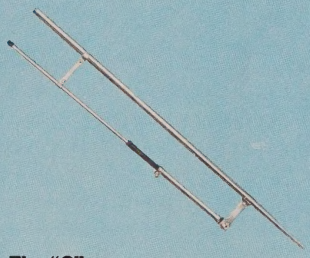


Fig. "G"
Improved Gamma Match

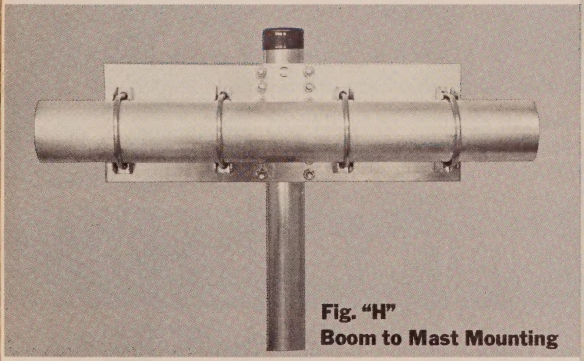


Fig. "H"
Boom to Mast Mounting

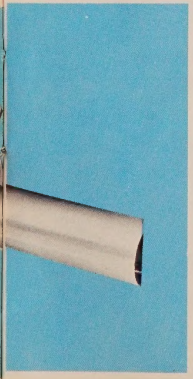
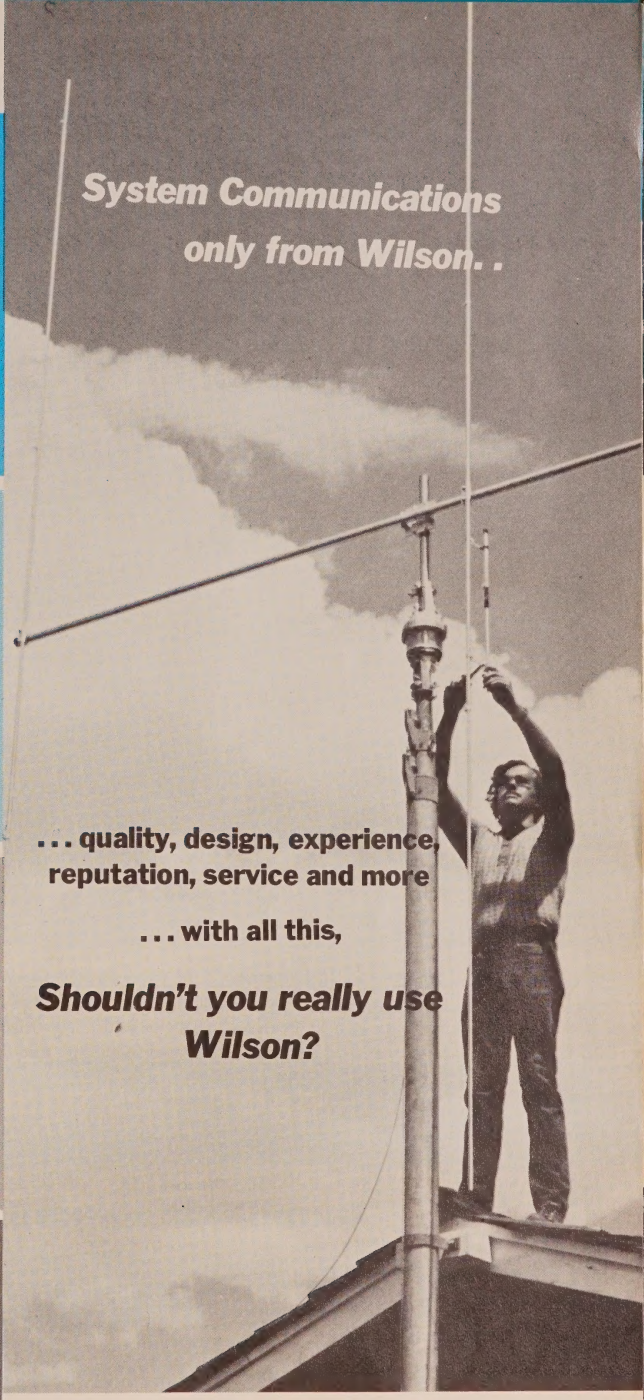




Fig. "J"
Large Diameter Trap



. . . quality, design, experience, reputation, service and more

. . . with all this,

Shouldn't you really use Wilson?

BUYERS GUIDE CONTENTS

Amateur Antennas	Pages 2 - 11
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Wilson Electronics Corp. reserves the right to make improvements and modifications to any product without prior notice.

SYSTEM ONE™

TRI-

SYSTEM ONE TRIBANDER ANTENNA IS HERE...

SYSTEM ONE™

FOR 20, 15 and 10 METERS

Monoband performance with 4 elements on 20 meters on a 26' boom.

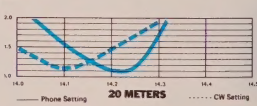


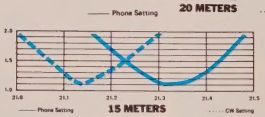
(See Page 15)

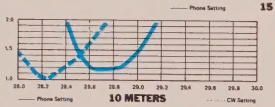
The new standard of performance for Tribanders is the Wilson System One!!! A DX'ers delight, operating 20 meters on a full 26' boom with 4 elements, 4 operational elements on 20-15-10, plus separate reflector element on 10 meters for correct monoband spacing. Featured are the large diameter High-Q traps, beta matching system, heavy duty taper swaged elements, and rugged boom to element mounting. Additional features: • 10 dB Gain • 20-25 dB front-to-back ratio • SWR less than 1.5 to 1 on all bands.

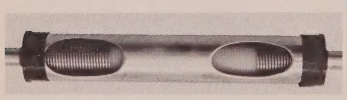
MODEL SY-1 SPECIFICATIONS:

Matching Method	Beta	F/B Ratio	20-25 dB	Mast Diameter	2" O.D.
Band MHz	14-21-28	Boom Length	26' (2" O.D.)	Boom Diameter	2" O.D.
Maximum Power Input	Legal Limit			Surface Area	8.6 sq. ft.
Gain	10 dB	No. of Elements	5	Windload	215 lbs.
VSWR (at Resonance)	1.5 to 1	Longest Element	26'7"	Assembled Weight	55 lbs.
Impedance	50 ohms	Turning Radius	18'6"	Shipping Weight	60 lbs.

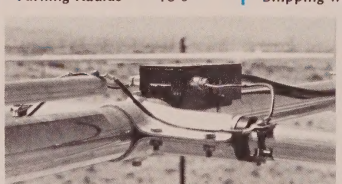








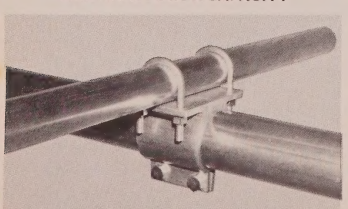
ADVANCED DESIGN LARGE DIAMETER HIGH-Q TRAPS FOR MINIMUM LOSS AND MAXIMUM POWER CAPACITY



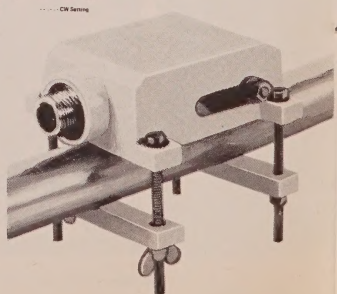
INSULATED DRIVEN ELEMENT WITH PRECISION BETA MATCH AND HEAVY DUTY ELEMENT MOUNTS

Note: Balun not included

Requires only one feed line



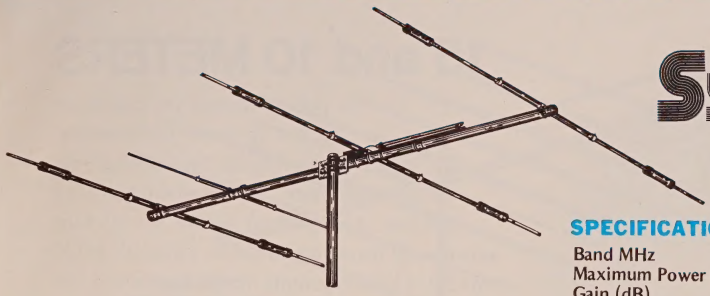
HEAVY DUTY BOOM TO ELEMENT EXTRUSION



New Optional Tri-Bander Toroid Core Balun recommended for use with System One and System Two. (Not furnished with antenna). See Page 11 for specifications.

BANDER FOR 20, 15 and 10 METERS

SYSTEM TWO



SYSTEM TWO™

SPECIFICATIONS SY-2

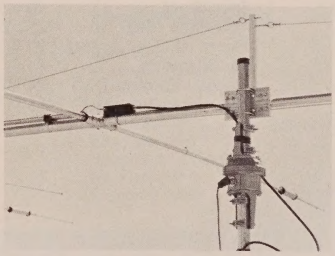
Band MHz	14-21-28	Mast Diameter	2" O.D.
Maximum Power Input	4 Kw	Boom Diameter	2" O.D.
Gain (dB)	8.5	Surface Area (Sq. Ft.)	6.15
VSWR (ar Resonance)	1.5:1	Wind Loading at 80 mph	153
Impedance	50 Ohms	Assembled Weight (Lbs. - Approx.)	47
F/B Ratio (dB)	20-25	Shipping Weight (Lbs. - Approx.)	50
Boom (O.D. x Length)	2" x 18'6"	Matching Method	Beta
No. Elements	4		
Longest Element (Ft.)	26'7"		
Turning Radius (Ft.)	16'4"		

Only one feed line required.

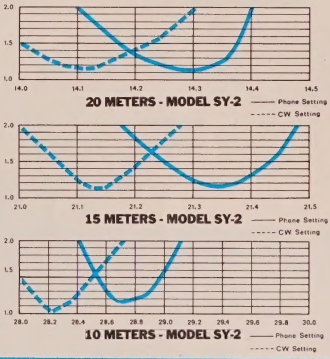
Delivers outstanding performance on 20, 15 and 10 meters, Features Wilson's large diameter High-Q Traps, feeds with 52 ohms coax, a beta match method presents tapered impedance which provides most efficient 3 band matching and DC ground to eliminate precipitation static. The result is SWR less than 1.5 to 1 at resonance on all bands and maximum front-to-back. An added feature is the separate 10 meter reflector for correct monoband spacing. Add to this the rugged boom to element mounting, heavy duty taper swaged elements, and 8.5 dB gain and you have

SYSTEM TWO™

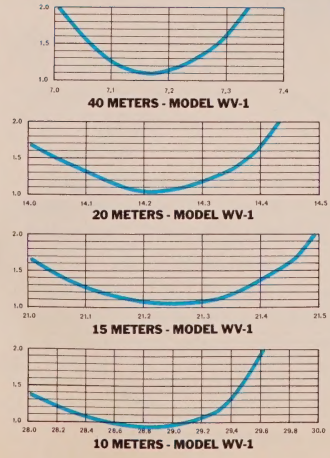
. . . space efficient, high performing, cost effective new tribander.



WILSON'S WR-500 ROTOR AND SST-64 CRANK-UP TOWER USED WITH SYSTEM TWO

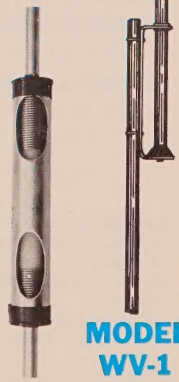


40 THRU 10 METERS VERTICAL TRAP



WV-1 WILSON VERTICAL TRAP ANTENNA

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across full width of each band. Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity. Easily assembled, the WV-1 is supplied with base mount bracket to attach to vent pipe or to mast driven in the ground.

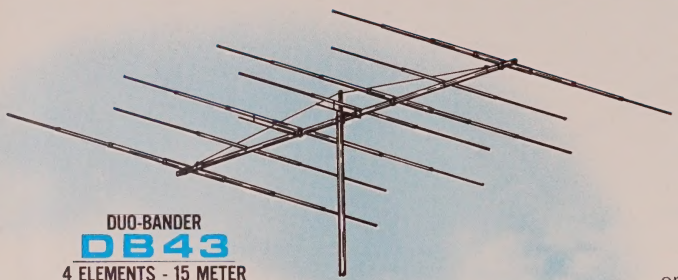


MODEL WV-1

SPECIFICATIONS

Input Impedance: 50 Ohms • Powerhandling capability: Legal Limit • Two High-Q Traps with large diameter coils • Low Angle Radiation Omnidirectional performance • Taper Swaged Aluminum Tubing • Automatic Bandswitching • Mast Bracket furnished • SWR: 1.5:1 on all Bands.

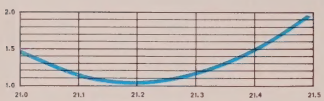
Wilson DUO-BA



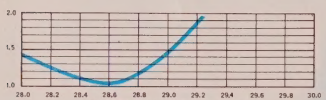
DUO-BANDER
DB43
4 ELEMENTS - 15 METER
3 ELEMENTS - 10 METER

15 and 10 METERS

The perfect answer for maximum 15 and 10 meter performance. The ideal contest antenna for working both DX and stateside . . . also where space is a problem. An excellent choice for stacking above a 20 meter monobander (Wilson's M320 or M420). Features gamma match system and low SWR on both 15 and 10 meters.



15 METERS - MODEL DB 43

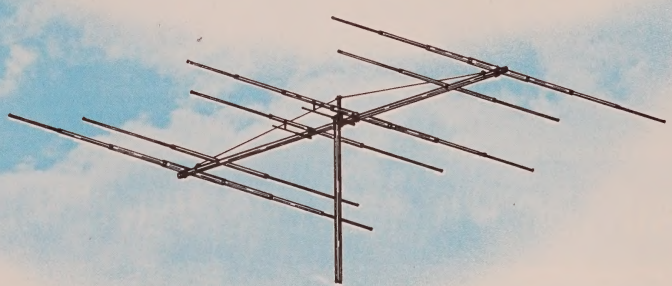


10 METERS - MODEL DB43

SPECIFICATIONS

Band MHz	21 - 28	Mast Diameter	2" O.D.
Maximum Power Input	4 Kw	Boom Diameter	2" O.D.
Gain (dB)	10.0 - 8.5	Surface Area (Sq. Ft.)	6.0
VSWR (at Resonance)	1.1:1	Wind Loading at 80 mph	150
Impedance	50 ohms	Assembled Weight (Lbs. - Approx.)	37
F/B Ratio (dB)	25 - 20	Shipping Weight (Lbs. - Approx.)	42
Boom (O.D. x Length)	2" x 19'	Matching Method	(2) Gamma
No. Elements	4 - 3		
Longest Element (Ft.)	24' 3"		
Turning Raduis (Ft.)	15' 5"		

Requires two feed lines



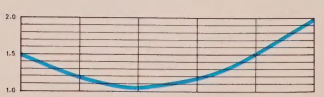
DUO-BANDER
DB33
3 ELEMENTS - 15 METER
3 ELEMENTS - 10 METER

Engineered spacing gives uncompromising performance, with low SWR over entire 15 and 10 meter band. Also an excellent choice for stacking above a Wilson M420 or M320.

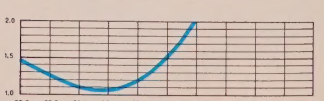
SPECIFICATIONS

Band MHz	21 - 28	Mast Diameter	2" O.D.
Maximum Power Input	4 Kw	Boom Diameter	2" O.D.
Gain (dB)	8.5	Surface Area (Sq. Ft.)	4.5
VSWR (at Resonance)	1.1:1	Wind Loading at 80 mph (Sq. Ft.)	112
Impedance	50 ohms	Assembled Weight (Lbs. - Approx.)	31
F/B Ratio (dB)	20	Shipping Weight (Lbs. - Approx.)	35
Boom (O.D. x Length)	2" x 17'	Matching Method	(2) Gamma
No. Elements	3-3		
Longest Element (Ft.)	24' 3"		
Turning Radius (Ft.)	14' 10"		

Requires two feed lines



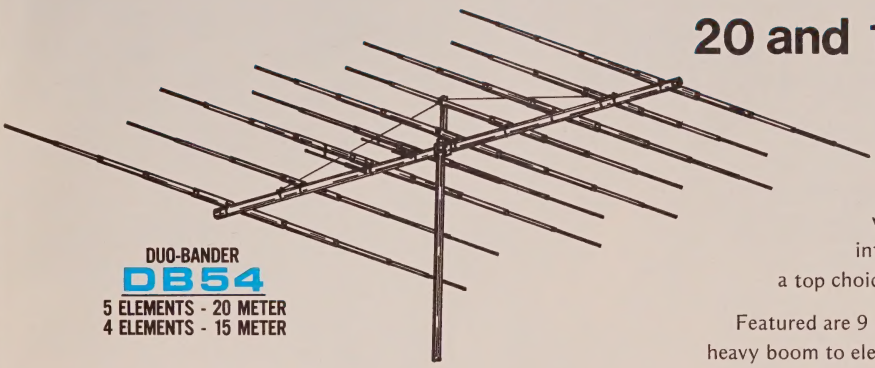
15 METERS - MODEL DB33



10 METERS - MODEL DB33

20 and 15 METERS

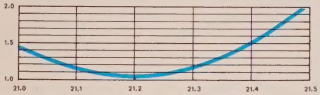
Long 40' Boom



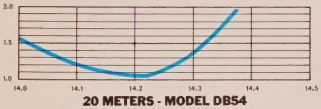
DUO-BANDER
DB54
5 ELEMENTS - 20 METER
4 ELEMENTS - 15 METER

The recognized standard by knowledgeable amateurs worldwide as the "KING" of interlaced designs, the DB54 is a top choice for the professional DXer.

Featured are 9 elements on a 40' boom and heavy boom to element mounting. Proper care should be taken to select the correct tower and rotor due to the massive size of this antenna.



15 METERS - MODEL DB54



20 METERS - MODEL DB54

SPECIFICATIONS

Band MHz	14 - 21	Turning Radius (Ft.)	26'8"
Maximum Power Input	4 Kw	Mast Diameter	2" O.D.
Gain (dB)	12.0 - 10.0	Boom Diameter	3" O.D.
VSWR (at Resonance)	1.1:1	Surface Area (Sq. Ft.)	15.2
Impedance	50 ohms	Wind Loading at 80 mph	380
F/B Ratio (dB)	26 - 25	Assembled Weight (Lbs. - Approx.)	110
Boom (O.D. x Length)	3" x 40'	Shipping Weight (Lbs. - Approx.)	139
No. Elements	5 - 4	Matching Method	(2) Gamma
Longest Element (Ft.)	35'2"	Requires two feed lines	

40 METER BEAMS

MODEL M340 3 Element Monobander

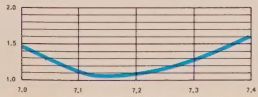
Full Sized Elements

Recommended Rotor WR1000

A real killer on the 40 Meter Band! Work stations you never even heard before on 40. Three full sized reinforced elements on an extra heavy duty 3" O.D. 40 ft. boom give you the performance that only a wide spaced full sized Yagi can. One simple screwdriver adustment sets the SWR to minimum at band center, giving low SWR across the entire band.



M340
3 ELEMENTS - 40 METER



40 METERS - MODEL M340

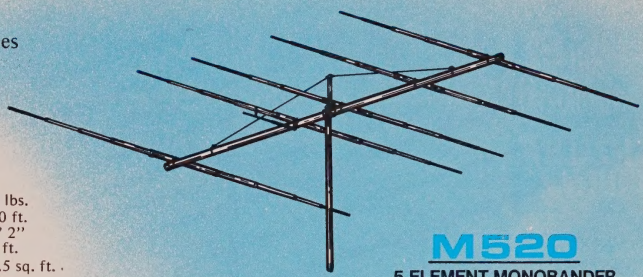
SPECIFICATIONS

Band MHz	7
Maximum Power Input	2 Kw
Gain (dB)	8.5
VSWR (at Resonance)	1.1:1
Impedance	50 ohms
F/B Ratio (dB)	20
Boom (O.D. x Length)	3" x 40'
No. Elements	3
Longest Element (Ft.)	73'
Turning Radius (Ft.)	41'7"
Mast Diameter	2" O.D.
Boom Diameter	3" O.D.
Surface Are (Sq. Ft.)	16
Wind Loading at 80 mph	400
Assembled Weight (Lbs. - Approx.)	180
Shipping Weight (Lbs. - Approx.)	232
Matching Method	Gamma

Wilson 20 METER BEAMS

M-520

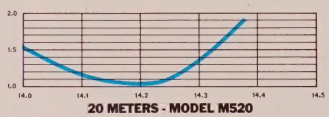
The M-520 offers the discriminating DXer an unexcelled beam antenna that really punches through the QRM . . . ask anyone who owns one! Features 5 full sized elements on a 3" O.D. x 40 ft. boom. Low SWR across the entire 20 meter band.



M520
5 ELEMENT MONOBANDER

SPECIFICATIONS

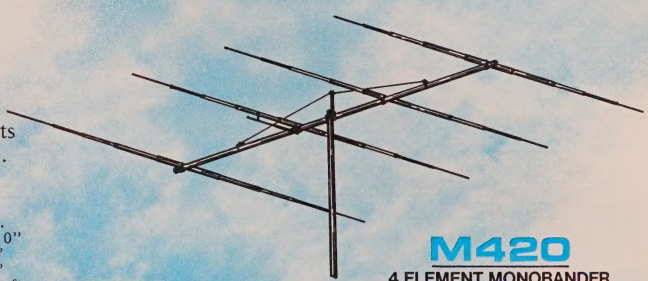
Forward Gain	12 dB	Assembled Weight	91 lbs.
Front-to-Back RAtio	26 dB	Boom	3" O.D. x 40 ft.
Front-to-Side Ratio	30 dB	Longest Element	35' 2"
SWR (at resonance)	1.1 to 1	Turning Radius	27 ft.
Windload	337 lbs.	Surface Area	13.5 sq. ft.
Impedance	50 ohms	Shipping Weight	120 lbs.
Maximum Power Input	4 Kw		



20 METERS - MODEL M520

M-420

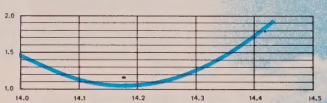
The magic 20 meter beam . . . 4 elements on a 26' boom. Super front to back and side rejection.



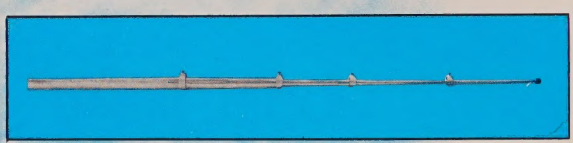
M420
4 ELEMENT MONOBANDER

SPECIFICATIONS

Forward Gain	10 dB	Assembled Weight	45 lbs.
Front-to-Back Ratio	25 dB	Boom	2" O.D. x 25' 10"
Front-to-Side Ratio	30 dB	Longest Element	36' 4"
SWR (at resonance)	1.1 to 1	Turning Radius	22' 6"
Windload	186 lbs.	Surface Area	7.4 sq. ft.
Impedance	50 Ohms	Shipping Weight	51 lbs.
Maximum Power Input	4 Kw		



20 METERS - MODEL M420



TYPICAL 20 METER TAPER SWAGED ELEMENT

M-320

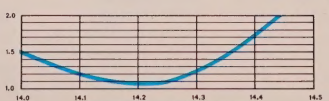
The perfect answer to a 20 meter beam that must fit on a "city lot" QTH. Three full sized elements on a 2" O.D. 19 ft. boom.



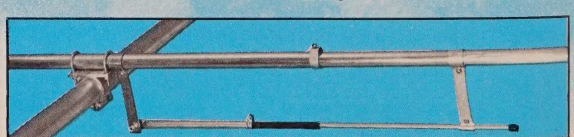
M320
3 ELEMENT MONOBANDER

SPECIFICATIONS

Forward Gain	8.5 dB	Assembled Weight	35 lbs.
Front-to-Back Ratio	20 dB	Boom	2" O.D. x 19 ft.
Front-to-Side Ratio	30 dB	Longest Element	34'9"
SWR (at resonance)	1.1 to 1	Turning Radius	19'10"
Windload	136 lbs.	Surface Area	5.25 sq. ft.
Impedance	50 ohms	Shipping Weight 40 lbs.	40 lbs.
Maximum Power Input	4 Kw		



20 METERS - MODEL M320

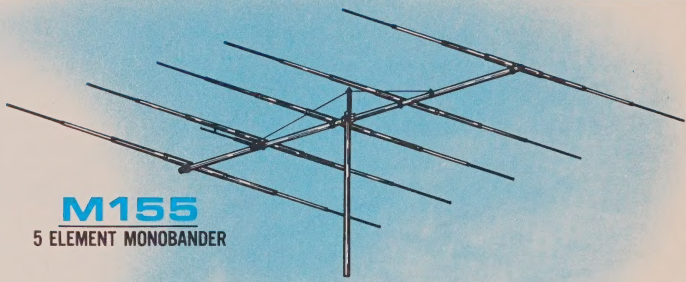


20 METER GAMMA MATCH

15 METER BEAMS

M-155

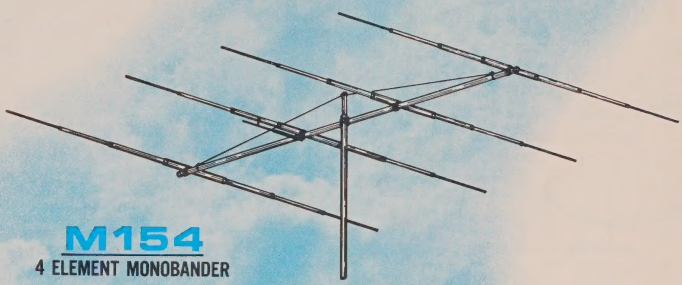
Top of the line 15 meter monobander. This is the one for the serious DXer. Top performance that will make you heard on 15! 5 elements wide spaced on a 26' boom.



M155
5 ELEMENT MONOBANDER

M-154

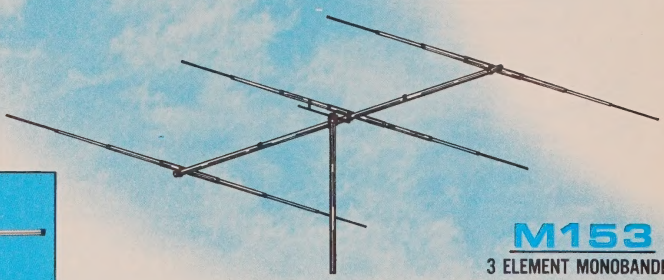
Just right for all around operation on 15. Low VSWR across entire band for excellent results on both CW and phone portions of the band.



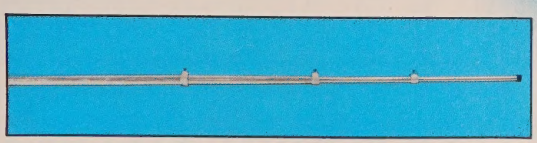
M154
4 ELEMENT MONOBANDER

M-153

The perfect "first" 15 meter monobander for the novice or newcomer to the band. Wide spacing assures outstanding gain and front-to-back.

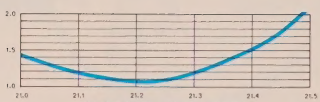


M153
3 ELEMENT MONOBANDER

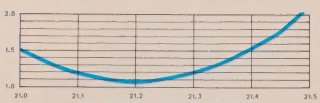


TYPICAL TAPER SWAGED 15 METER ELEMENT

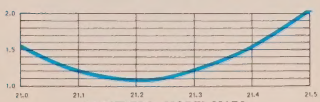
SPECIFICATIONS	MODEL M155	MODEL M154	MODEL M153
Band MHz	21	21	21
Maximum Power Input	4 Kw	4 Kw	4 Kw
Gain (dB)	12.0	10.0	8.5
VSWR (at Resonance)	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	26	25	20
Boom (O.D. x Length)	2" x 25'8"	2" x 19'	2" x 17'
No. Elements	5	4	3
Longest Element (Ft.)	24'3"	24'3"	23'2"
Turning Radius (Ft.)	17'8"	15'5"	14'10"
Mast Diameter	2" O.D.	2" O.D.	2" O.D.
Boom Diameter	2" O.D.	2" O.D.	2" O.D.
Surface Area (Sq. Ft.)	5.0	4.0	3.0
Wind Loading at 80 mph	100	80	60
Assembled Weight (Lbs. - Approx.)	40	30	23
Shipping Weight (Lbs. - Approx.)	45	35	27
Matching Method	Gamma	Gamma	Gamma



15 METERS - MODEL M155



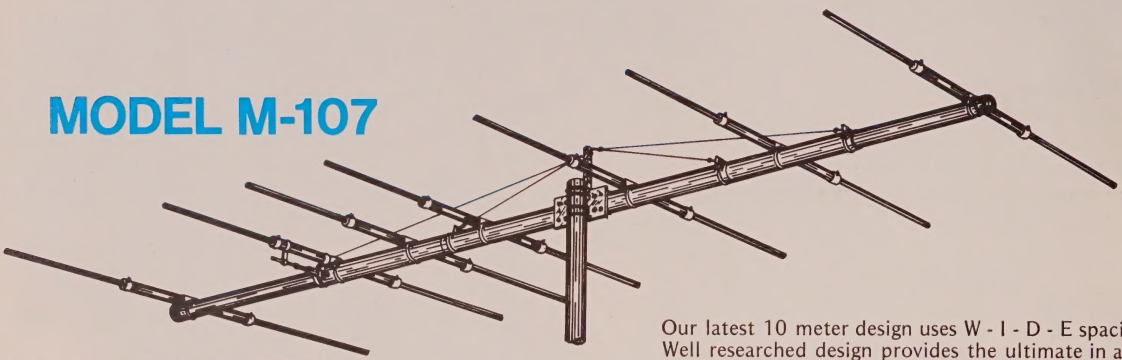
15 METERS - MODEL M154



15 METERS - MODEL M153

Wilson 10 METER BEAMS

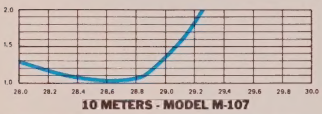
MODEL M-107



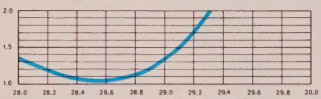
Our latest 10 meter design uses W - I - D - E spacing. Well researched design provides the ultimate in a 10 meter antenna. 7 elements on a 37' boom.

With the 10 meter band making a strong comeback, choose from four models to fit your needs. Three, five, six or seven wide spaced elements will provide a top performing antenna.

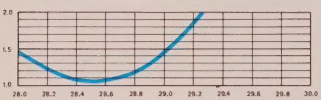
All 10 meter beams use an extruded boom to element mount which accommodates 5/8" O.D. element centers and 1/2" O.D. element tips providing strength with light weight. Recommended rotor for all 10 meter antennas is the WR500.



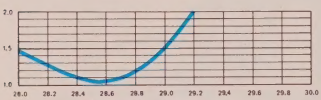
10 METERS - MODEL M-107



10 METERS - MODEL M-106



10 METERS - MODEL M-105



10 METERS - MODEL M-103

SPECIFICATIONS	MODEL M107	MODEL M106	MODEL M105	MODEL M103
Band MHz	28	28	28	18
Maximum Power Input	4 Kw	4 Kw	4 Kw	4 Kw
Gain (dB)	13.5	13.0	12.0	8.5
VSWR (at Resonance)	1.1:1	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	26	26	26	20
Boom (O.D. x Length)	2" x 37'	2" x 31'	2" x 25'8"	1½" x 11'6"
No. Elements	7	6	5	3
Longest Element (Ft.)	17'2"	17'2"	17'2"	17'2"
Turning Radius (Ft.)	20'8"	17'8"	15'5"	10'4"
Mast Diameter	2" O.D.	2" O.D.	2" O.D.	1½" O.D.
Boom Diameter	2" to 1½" O.D.	2" O.D.	2" O.D.	1½" O.D.
Surfact Area (Sq. Ft.)	5.8	5.1	4.5	2.0
Wind Loading at 80 mph (Sq. Ft.)	145	127	112	50
Assembled Weight (Lbs. - Approx.)	57	34	28	13
Shipping Weight (Lbs. - Approx.)	82	39	33	15
Matching Method	Gamma	Gamma	Gamma	Gamma



2 and 6 METERS 5/8 WAVE MOBILE

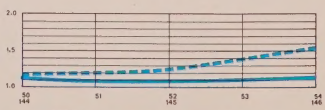
Featured is the PH25 stainless steel whip and tip, coax with PL259 connector, and easy installation instructions. Comes with universal mounting bracket.

Wide band characteristics, good looks and easy trunk or roof top installation makes the Wilson WM62 an outstanding buy!



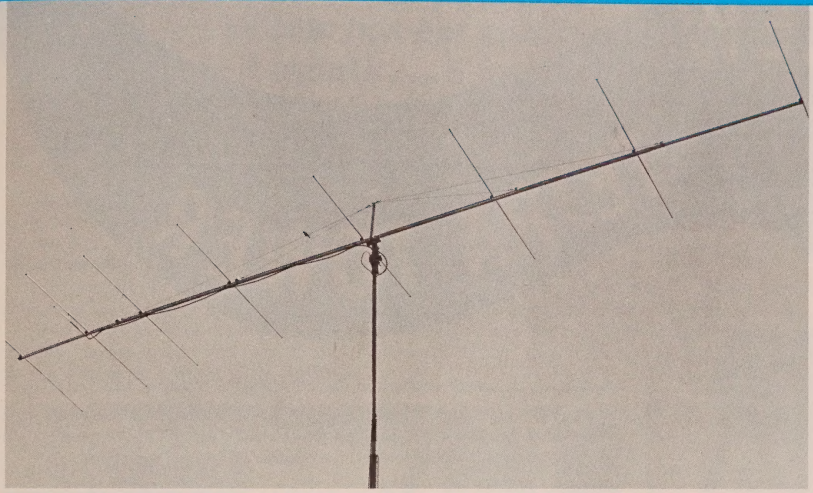
SPECIFICATIONS

5/8 Wave on 2 Meters 3.2 dB Gain
1/4 Wave on 6 Meters 0 dB Gain



6 & 2 METERS - MODEL WM-62

6 METER BEAMS

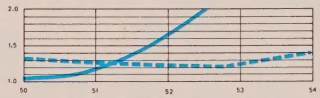


MODEL M68

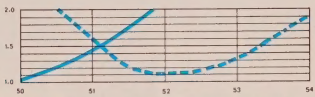
8 elements
W - I - D - E spaced
on a L - O - N - G 37' boom . . .
for those long hauls
to JA and VK land!

Choose 4, 6 or 8 elements
to put you in the action
on six meters.

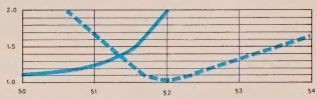
SPECIFICATIONS	MODEL M68	MODEL M66	MODEL M64
Band MHz	50	50	50
Maximum Power Input	4 Kw	4 Kw	4 Kw
Gain (dB)	13.5	13.0	10.0
VSWR (at Resonance)	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	26	26	25
Boom (O.D. x Length)	2" to 1½" x 36'10"	2" x 25'8"	1½" x 11'6"
No. Elements	8	6	4
Longest Element (Ft.)	9'8"	9'8"	9'8"
Turning Radius (Ft.)	19'0"	13'10"	7'6"
Mast Diameter	2" O.D.	2" O.D.	1½" O.D.
Boom Diameter	2" to 1½" O.D.	2" O.D.	1½" O.D.
Surface Area (Sq. Ft.)	5.8	4.5	1.5
Wind Loading at 80 mph	145	112	37
Assembled Weight (Lbs. - Approx.)	34	26	11
Shipping Weight (Lbs. - Approx.)	39	31	13
Matching Method	Gamma	Gamma	Gamma



6 METERS - MODEL M68



6 METERS - MODEL M64



6 METERS - MODEL M66

WILSON BROAD BAND BN-50A TOROID BALUN

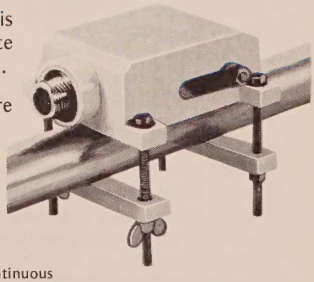
The Wilson BN-50A Balun features a toroid core which is far superior to round core baluns being marketed.

The BN-50A can be used with any beam type antenna in the 3 to 30 MHz range, and is ideal for tribander antennas such as the Wilson System One and System Two.

The Wilson Balun provides a way to couple a 52 ohm unbalanced transmission line into a 52 ohm balanced driven element or doublet system.

Additionally the transfer of energy to the antenna is improved thus eliminating stray RF from the feed line and supporting tower. The electrical principal of operation is similar to that of a 1:1 transformer. It is frequency independent and will operate over all ham bands between 3 and 30 MHz.

Comes complete with installation hardware for both beam and doublet use.

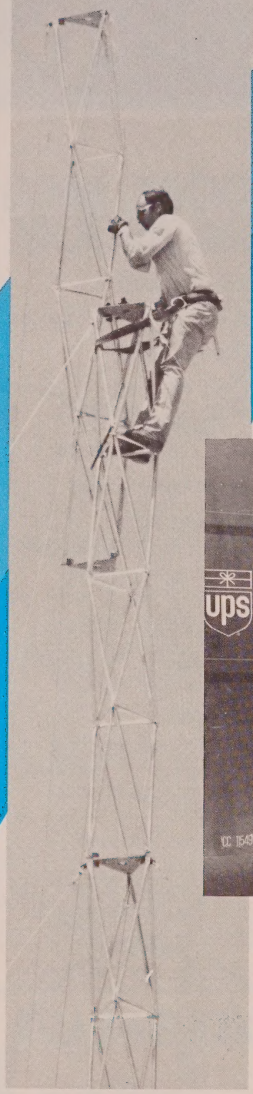


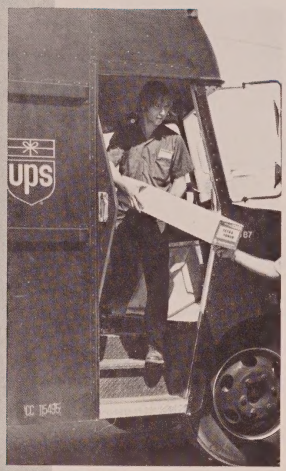
SPECIFICATIONS

Bandwidth	3 thru 30 MHz Continuous
VSWR	1:1 (when terminated with a Bal. 52 ohm lead)
Power Rating	4 Kw PEP
Impedance Transformation Ratio	1:1 at 52 ohms
Input Connector	SO-239
Dimensions	3¼" x 4"
Weight	1 lb.
Construction	High impact molded plastic - internally weather sealed.

Introducing . . .

Wilson's NEW TETRA TOWER®





SHIPS U.P.S.!
PACKS
IN BOX
6" x 8" x 29"
WEIGHS
25 LBS.!
11'4" SECTION

A uniquely designed tetrahedron shaped triangular tower we call Tetra-Tower.® Lightweight and easy to assemble, this tower has been engineered to allow 11'4" modular sections stacked to create the height tower you desire . . . 4 sections will make a 45'4" tower, 6 sections a 68' tower, and so on.

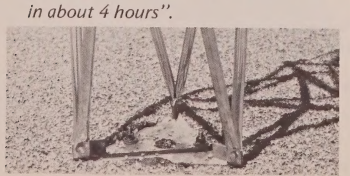
FEATURES:

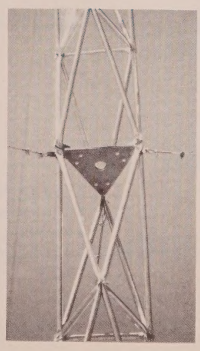
- Each 11'4" tower section is packed in a small carton that weighs 25 lbs., ships United Parcel and can be carried home under your arm or in the front seat of your car.
- Everything needed is included: strong heavy wall 36" stick 1" O.D. aluminum components, fasteners, and top/bottom mounting plates.
- Tested to accept in excess of 4,000 lbs. vertical loading.
- Each section should install in less than an hour!
- Clear step-by-step illustrated instructions make assembly fun and simple.
- Ideal for remote and hard-to-get-to installations.
- No gin pole needed to erect.
- Attractive unique design.
- Top plate designed to accept rotor or 2" O.D. antenna mast.
- Guy tabs furnished on section top plates . . . tower must be guyed . . . it is recommended at every 22'8" level. (Note: Guy wire and accessories not furnished.)
- Top plate and rotor plate kit is available as an accessory. Fits Wilson rotors WR500 and WR750.
- Maximum load of antenna is 10 sq. ft. at 68 ft. height.

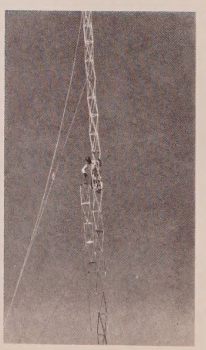
TETRA-TOWER®. . . the unique one from Wilson . . . looks unusual but really works!!!

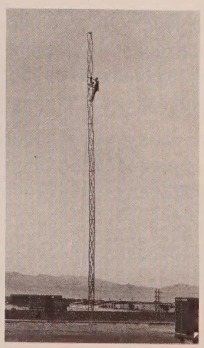
Says Cecil Miller, experienced tower installer;

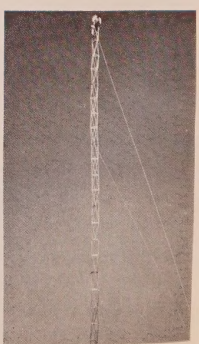
"Over the years, I've probably installed every tower imaginable, and this new Wilson Tetra Tower is a snap . . . fun and easy to assemble . . . I put up the 80' tower pictured here in about 4 hours".











Wilson CRANK-UP TOWERS

Wilson has put quality and dependability where it counts . . . 5 freestanding and guyed models offer features unparalleled by any other tower system.

(Pages 14 and 15 have specifications, dimensions and features.)

Designed with convenience, safety and utility in mind. A new generation in advance designed towers is here . . . no more expensive installation costs . . . Wilson towers install in about an hour with only two men. No more inconvenient and dangerous climbing of towers . . . Wilson towers crank down and allow all work to be performed from roof-top or ground.

And best of all, no more buying a more expensive structure than you need . . . Wilson towers are available in a variety of sizes and types to fit your height requirements . . . and are priced right, too!

And for the ecology minded, your Wilson tower looks like a flag pole. Engineered for heavy stress and abuse, quality is built into every feature. Compare our design, specifications, and construction. You will then want to use a Wilson Crank-up Tower.



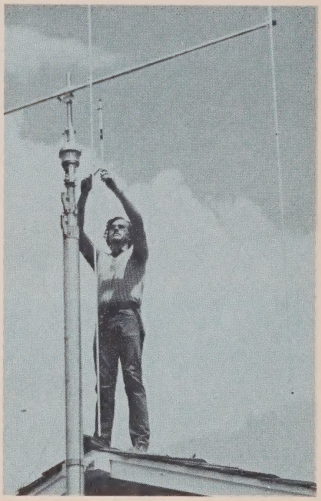
Hinged Base Plate - Concrete Pad
Heavy Duty Winch



Hinged Base Plate allows tower to be lowered for access to antenna and rotor from the ground.



Mounting House Bracket



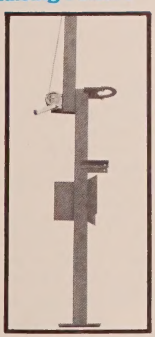
Easy access to antenna from roof top makes adjusting or maintaining your antenna a breeze.

OPTIONS and ACCESSORIES

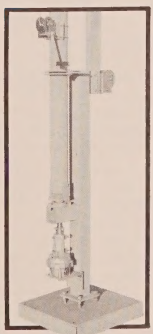
- **Concrete Base Raising Fixture**
- **Soil Base Raising Fixture**
- **Rotating Base w/Raising fixture**



CBRF-10 *
CBRF-20



SBRF-10 *
SBRF-20



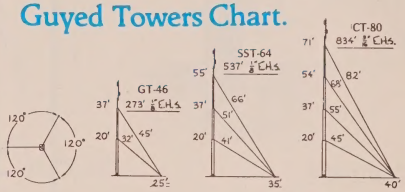
RBRF-10 *
RBRF-20

THE CONCRETE AND SOIL BASE FIXTURES can be used for mounting any of the towers away from the house. The towers cannot be rotated with either the concrete or soil base as they are strictly a fixed mounting accessory.

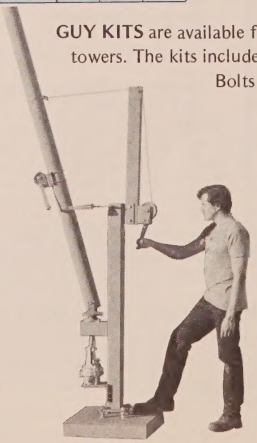
* Note: Only difference between the 10 Series and 20 Series Base is the size of tubing.

	TOWER MODEL	GT-46	SST-64	CT-80
	KIT NUMBER	GK-46	GK-64	GK-80
A	Cable	273'	537'	834'
B	Cable Clamps	24	36	72
C	Thimbles	12	18	24
D	Turnbuckles	6	9	12
E	Equalizer Plates W/Hardware	3	3	3
F	Eye Lag Bolt	3	3	3

Guyed Towers Chart.



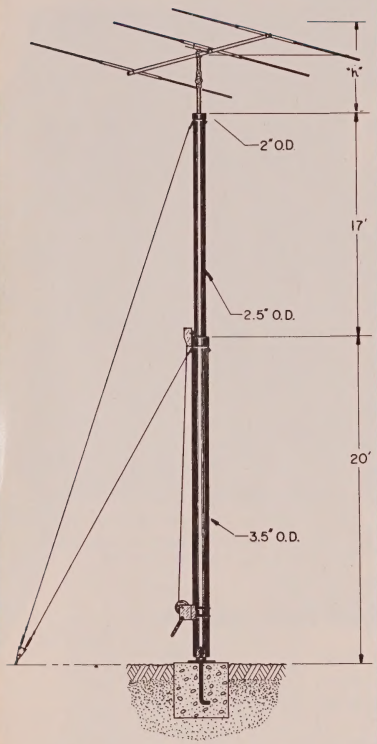
GUY KITS are available for the GT-46, SST-64 and CT-80 guyed towers. The kits include • Heavy 1 x 19 Strand Guy Cable • Lag Bolts • Malleable Turnbuckles • Thimbles and • Cable Clamps.



THE ROTATING BASE AND RAISING FIXTURE provide a means to mount your tower away from the house. The tower can be lifted from the horizontal to vertical position by one person using the raising fixture. In addition, the rotor is mounted on the bottom under a heavy duty thrust bearing allowing the entire TT-45 or MT-61 to rotate, allowing multiple beams to be stacked.

GUYED CRANK-UP

Mighty Might GT-46
46' GUYED TOWER



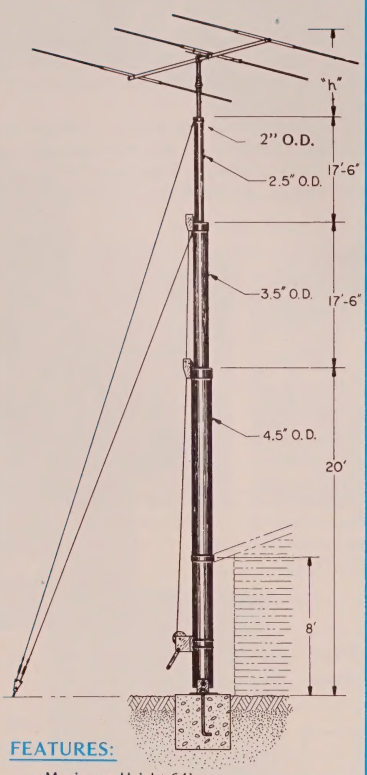
FEATURES:

- Maximum Height 46'
- 800 lb. winch w/padlock safety feature
- 2000 lb. raising cable
- Only one cubic foot of cement required
- Total weight, 117 lbs.

Recommended base accessories:
SBRF-10, CBRF-10

The GT-46 is the most economical tower to get you on the air with a Wilson System Two or possibly a 6 element six meter beam . . . remember this tower needs at least one set of guys at the top if used on the side of the house, and can be roof mounted for extra height.

Skyscraper SST-64
64' GUYED TOWER



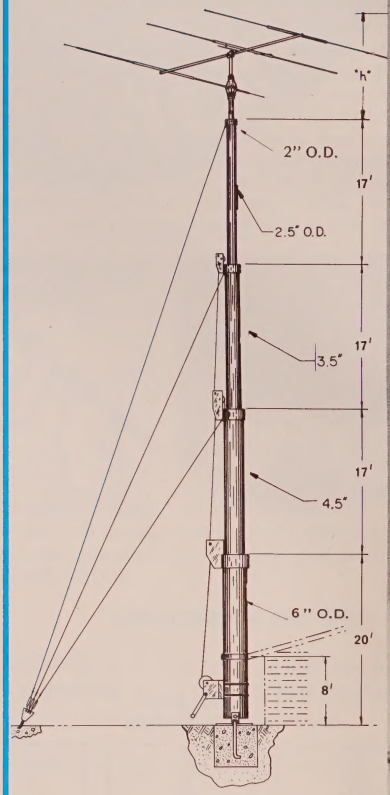
FEATURES:

- Maximum Height 64'
- 1200 lb. winch
- 4200 lb. raising cable
- Total weight 250 lbs.
- Requires only 1½' x 1½' x 1½' concrete base

Recommended base accessories:
SBRF-10, CBRF-10

The SST-64 can get your System One Tri-Bander way up there. This tower needs two sets of guys if side mounted to the house. Mount the WR500 Wilson Rotor on top of the 2" mast with the TB-50 thrust bearing accessory with a set of top guys to the TB-50 for support to the rotor allowing maximum wind loads.

Cloudbuster CT-80
80' GUYED TOWER



FEATURES:

- Maximum Height 80'
- 1500 lb. winch
- 4200 lb. raising cable
- Total weight is 400 lbs.

Recommended base accessories:
CBRF-20, SBRF-20

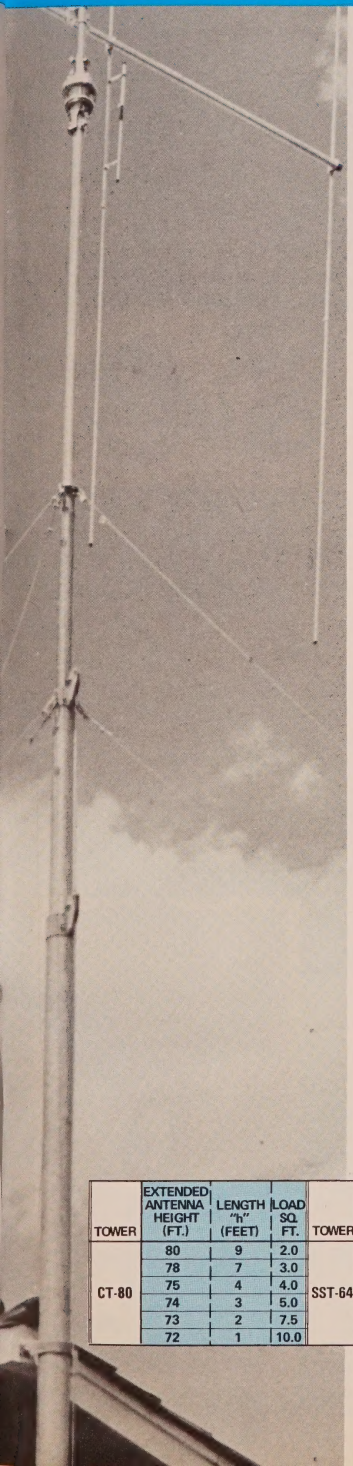
The CT-80 is the tower for a person who really wants to get to the clouds! It will go up to 80' and must have three sets of guys if attached to the house. The TB-50 thrust bearing accessory is recommended if a rotor is used.

GENERAL FEATURES

All towers use high strength heavy galvanized steel tubing that conforms to ASTM specifications for years of maintenance-free service. The large diameters provide unexcelled strength. All welding is performed with state-of-the-art equipment. Top sections are 2" O.D. for proper antenna/rotor mounting. A 9' push-up mast is included in the top section of each tower. Hinge-over base plates are standard with each tower. The high loads of today's antennas make Wilson crank-ups a logical choice.

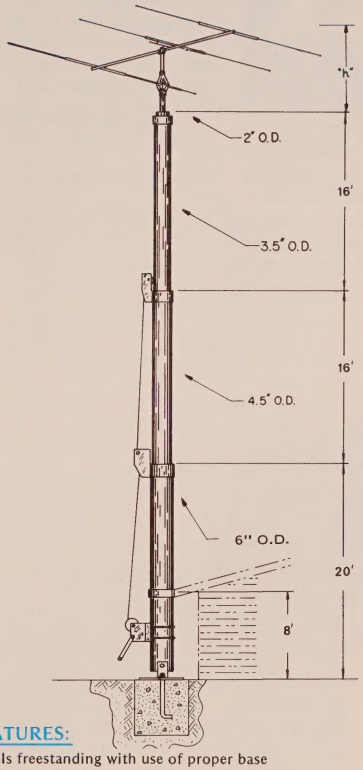
Drawings Not to Scale.

TOWERS FREESTANDING



Mountain Top MT-61

61' FREESTANDING TOWER



FEATURES:

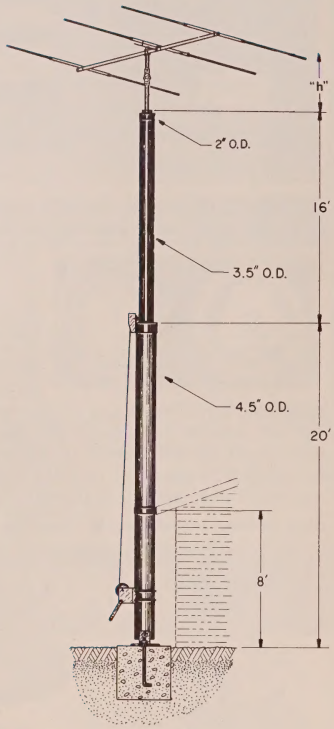
- Is freestanding with use of proper base
- Maximum Height is 61'
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight 350 lbs.

Recommended base accessories:
RBRF-20, SBRF-20, CBRF-20

The MT-61 is our largest and tallest freestanding tower. By using the RBRF-20 rotating base fixture, the MT-61 is ideally suited for stacking beam antennas. If you plan to mount the tower to your house, caution should be taken to make certain the eave is properly reinforced to handle the tower. If not, one of the base accessory fixtures should be used.

Treetop TT-45

45' FREESTANDING TOWER



FEATURES:

- Maximum Height 45'
- 800 lb. winch with padlock feature
- 2800 lb. raising cable
- Totally freestanding with proper base
- Total Weight 189 lbs.

Recommended accessories:
RBRF-10, SBRF-10, CBRF-10

The TT-45 is a freestanding tower. Ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected.

TOWER	EXTENDED ANTENNA HEIGHT (FT.)	LENGTH "h" (FEET)	LOAD SQ. FT.	TOWER	EXTENDED ANTENNA HEIGHT (FT.)	LENGTH "h" (FEET)	LOAD SQ. FT.	TOWER	EXTENDED ANTENNA HEIGHT (FT.)	LENGTH "h" (FEET)	LOAD SQ. FT.	TOWER	EXTENDED ANTENNA HEIGHT (FT.)	LENGTH "h" (FEET)	LOAD SQ. FT.	TOWER	EXTENDED ANTENNA HEIGHT (FT.)	LENGTH "h" (FEET)	LOAD SQ. FT.
CT-80	80	9	2.0	SST-64	64	9	2.0	MT-61	61	9	2.0	GT-46	46	9	2.0	TT-45	45	9	2.0
	78	7	3.0		62	7	3.0		59	7	3.0		44	7	3.0		43	7	3.0
	75	4	4.0		59	4	4.0		56	4	4.0		41	4	4.0		41	5	5.0
	74	3	5.0		58	3	5.0		55	3	5.0		40	3	5.0		40	4	6.0
	73	2	7.5		57	2	7.5		54	2	7.5		39	2	7.5		39	3	8.0
	72	1	10.0		56	1	10.0		53	1	10.0		38	1	10.0		38	2	10.0

NOTE: Dimension "h" refers to length of extended push-up mast.

(CHART BASED ON 78 MPH WIND)

NOTE: Towers will perform to specifications when guyed to engineered factory instructions.

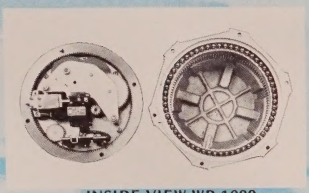
. . . EVERYWHERE YOU TURN . . . ROTORS BY WILSON!!!



Fulfilling the need for a cost effective quality line of rotors, Wilson presents two size rotors with unmatched design and features.

The **WR 1000** is the rotor everyone has been waiting for. Called the "King Kong" of rotors, it is capable of turning the largest antenna arrays with ease. Superior to prop pitch rotors, the WR 1000 has such turning torque that you will never have to worry about turning your antenna in the wind, or have the brake strip out. The heart of the unit is the 30" stainless steel spur-ring gear and the huge brake drum using controlled wedge brake which locks the rotor for ultimate braking strength and 116 ball bearings capable of withstanding loads of over one ton balanced weight. The unit includes attractive lighted control box and weatherproof plug-in control cable recepticals (no terminal strips to contend with).

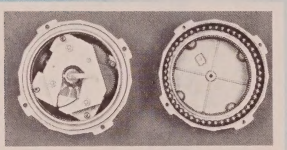
For the ultimate in rotors . . . it's the WR 1000.



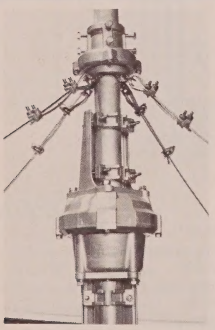
INSIDE VIEW WR 1000

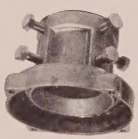
The **WR 500** features durability and top performance powered by a high torque motor with 860 inch pound stall torque, and disc type brake holds the antenna where you want it. 98 steel ball bearings will support loads up to 750 lbs. balanced weight. A real heavyweight, the WR 500 will handle arrays up to 6.5 sq. ft. (10 sq. ft. with STB-50 accessory). Included are weatherproof plug-in cable receptacles all hardware, and attractive lighted control box.

Ideal for most amateur beams.



INSIDE VIEW WR 500







STB-50

Thrust bearing accessory when used with the WR 500 Rotor permits increased antenna loads and reduces wear on the rotor bearings.

The WR 500 Rotor will handle up to 10 sq. ft. of antenna when mounted inside of tower with a bearing accessory, or with the STB-50 thrust bearing accessory, above the top of the rotor.

	SPECIFICATIONS	
	WR 1000	**WR 500**
Antenna Loads	40 Sq. Ft.	6 Sq. Ft. *
Motor	Stall Torque of 4000 in. lbs.	860 in. lbs. of Stall Torque
Brake Type	Solonoid Controlled Wedge Type Brake Override	Disc
Brake Torque	12,000 in. lbs.	1,300 in. lbs.
Gears	Stainless Steel Spur-Ring	Stainless Steel Drive
Bearings	116 Steel Ball Bearings	98 Steel Ball Bearings
Voltage	115V AC - 60 Hz	115V AC - 60 Hz
Mast	Accepts 2" to 3" Masts	Accepts up to 2¼" Masts
Housing	Heavy Duty Cast Aluminum	Heavy Duty Cast Aluminum
Control Box Dimensions	5-7/8"x6-3/4"x5-7/8"	6-3/4"x3-3/16"x5-1/8"
Rotor Dimensions	11" Dia. x 19" High	7" Dia. x 17" High
Shipping Weight	65 Lbs.	20 Lbs.
Mounting	Plate Mounting Only - 8 Bolts	In Line or Tower

*NOTE: When used with STB-50 Accessory, rotor will handle 10 sq. ft. of antenna.



ILLUSTRATED IS THE WR 500 ROTOR INSTALLED WITH A WILSON M103 – 3 ELEMENT BEAM AND CRANK-UP TOWER.

Available soon! The WR750 Rotor for arrays in the 25 sq. ft. range

2 METER SYNTHESIZED PORTABLE



Riding the crest of the new wave of multi-channel two-meter rigs is the Wilson WE-800. Designed as an all-purpose mobile or portable unit, the WE-800 is loaded with enough features to satisfy even the most discriminating amateur. The "800" is for channels, from 144 to 148 MHz in 5 KHz steps, up or down 500 KHz for your local repeater. There are even provisions for pre-programming five of your favorite frequencies or changing to two optional offsets, in case your area repeater is non-standard. Add to these features; internal rechargeable power pack optional (uses 10 AA NiCad cells, not included), detachable rubber flex antenna, built-in S-meter/output indicator, built-in high-low power option switch (1 or 12 watts, when used mobile or base), built-in connectors for external antenna, speaker and power. Whether you're just getting your feet wet on two-meters, or a seasoned amateur, you'll find the WE-800 to be the most light-weight, versatile base/mobile/portable rig on the market today.

The WE-800 comes complete with plug-in speaker-microphone, mobile mounting bracket/handle, rubber flex antenna, 12V DC Charger Cord, instruction booklet and 90 day limited warranty. Rechargeable internal battery pack optional.

GENERAL SPECIFICATIONS

• Frequency range:	144.000 - 147.995 MHz
• No. of channels:	799 @ 5 kHz, or 399 @ 10 kHz
• Operating mode:	Direct frequency modulation
• Type of communication:	Simplex or transmitter offset ±600 kHz
• Operating voltage:	13.6 VDC negative ground (10 to 15 VDC range)
• Current drain:	Transmit – 290 mA @ 1 watt output. 2 amps @ 12 watts output. Receive – 45 mA squelched 250 mA at full AF rated output
• Antenna impedance:	50 ohms nominal
• Size:	8-1/4 x 6-3/4 x 1-7/8 inches (209.6 x 171.5 x 47.6 mm)
• Weight:	1 lb. 15 oz. (4.13 Kg); (3 lb. 11 oz. (8.16 Kg) with batteries
• Frequency determination method:	C-MOS phase locked loop
• Offset Option	Two optional offset TX positions also available

PERFORMANCE SPECIFICATIONS

Transmitter

• RF output:	Hi . . . 12 W Lo . . . 1 W
• Frequency stability:	.001% -10°C ∿ +60°C
• Local oscillator:	Simplex . . . 21.4 MHz Offset +600 kHz . . . 22. MHz -600 kHz . . . 20.8 MHz (Options for two more offsets other than 600 kHz)
• Harmonics & Spurious:	More than 60 dB below carrier
• Deviation:	±5 kHz
• Audio response:	+1; -3 dB of 6 dB/Octave Pre-emphasis characteristics from 300 to 3000 Hz

Receiver

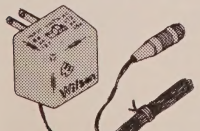
• Receiving system:	Double conversion Superheterodyne
• First local oscillator:	PLL output of (F-21.4 MHz)
• First IF:	21.4 MHz (with 2 pole monolithic filter)
• Second IF:	455 kHz (with a ceramic filter)
• Stability:	.001% -10° ∿ +60°C
• Sensitivity:	.3 μV for 20 dB quieting
• Squelch sensitivity:	.2 μV
• Spurious and Image Rejection:	Better than 80 dB
• Intermodulation:	60 dB
• Selectivity:	±6 kHz at 3 dB ±15 kHz at 80 dB
• Channel Spacing:	15 kHz
• Audio Output:	2 W (10% distortion to 4 ohm)

HAND-HELD OPTIONS AND ACCESSORIES

The following are available for Wilson's Hand-Helds, presented on Pages 18 and 19.



• **110V-AC DESK BATTERY CHARGER**
For new units Mark II, IV - use the Model BC-2; for Models 1402, 1405, 1407, 2202 and 4502, use Model BC-1.



• **WALL BATTERY CHARGER**
110V-AC Charger . . . use WC-12 for 1402, 1405, 1407, 2202, 4502; use Model WC-14 for Mark II, IV.

• **SPEAKER MIC**
• SM1 – for Models 1402, 1405, 1407, 2202, 4502.
• SM3 (Mark II,Mark IV)



• **LEATHER CARRYING CASE**
• LC-1 for 1402SM
• LC-3 for Mark II, IV
• LC-2 all others



• **RECHARGEABLE BATTERY PACKS**
Use the following Ni-Cad Packs for the unit you select:
• BP-1 . . . 10 loose cells - 500 mA (1402, 1405)
• BP-2 . . . strapped cells - 600 mA (1405, 2202, 4502)
• BP-4 . . . Mark II, Mark IV pack
• BP-7 . . . 1407SM high power pack

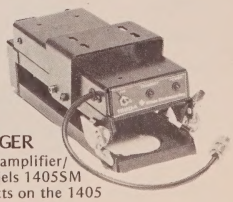


BP-2
NI-CAD
BATTERY PACK

Other options include:
• Touch Tone® Pad (installed only)
• XF-1 Monolithic Filter (1402, 1405, 1407)
• TE-1 Eone Encoder
• TE-2 Encoder/Decoder
• BNC Rubber Duck Antenna
• TNC Rubber Duck Antenna



• **BC12 - CIGARETTE LIGHTER MOBILE POWER PLUG**



• **MOBILE AMPLIFIER/CHARGER**
The Model 1420A is a mobile amplifier/charger for the hand-held models 1405SM and 1407SM. Produces 20 watts on the 1405 and 25 watts on the 1407 when engine is charging above 12V-DC, and charges internal Ni-Cad battery pack.

Wilson 2 METER AMATE

SPECIFICATIONS

	1402SM	1405SM	1407SM	MARK II	MARK IV	2202SM	4502SM
GENERAL							
Frequency (MHz)	144 - 148 MHz	144 - 148 MHz	144 - 148 MHz	144 - 148 MHz	144 - 148 MHz	220 - 225 MHz	420 - 450 MHz
Channels	6	6	6	6	6	6	6
Oscillation System	Xtal Controlled	Xtal Controlled	Xtal Controlled	Xtal Controlled	Xtal Controlled	Xtal Controlled	Xtal Controlled
Communication System	Press-to-talk	Press-to-talk	Press to talk	Press-to-talk	Press-to-talk	Press-to-talk	Press-to-talk
Type of Emission	F3 (Phase Modulation)	F3 (Phase Modulation)	F3 (Phase Modulation)	F3 (Phase Modulation)	F3 (Phase Modulation)	F3 (Phase Modulation)	F3 (Phase Modulation)
Antenna Type	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible	Helical Wound Qrtr. Wave Rubber Flexible
Microphone	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic
Power Supply	Type "AA" Rechargeable (12 VDC Total)	Type "AA" Rechargeable (12 VDC Total	Special High Current Wilson Rechargeable Ni-Cad Batt. Pak	Special Battery Pak Wilson Rechargeable	Special Battery Pak Wilson Rechargeable	Type "AA" Rechargeable (12 VDC Total)	Type "AA" Rechargeable (12 VDC Total)
Battery Indicator	Yes	Yes	Yes	No	No	Yes	Yes
"S" Meter	Yes	No	No	No	No	No	No
Case Type	High Impact	Lexan®	Lexan®	Lexan®	Lexan®	Lexan®	Lexan®
Crystals Furnished	146.52/52	146.52/52	146.52/52	146.52/52	146.52/52	223.50/.50	446.00/.00
Power Consumption:							
Stand-by	15 mA (Squelch on)	15 mA (Squelch on)	15 mA (Squelch on)	15 mA (Squelch on)	15 mA (Squelch on)	25 mA (Squelch on)	23 mA (Squelch on)
Receive	100 mA (Unsquelched)	100 mA (Unsquelched)	100 mA (Unsquelched)	100 mA (Unsquelched)	100 mA (Unsquelched)	100 mA (Unsquelched)	100 mA (Unsquelched)
Transmit	450 mA @2.5W	400 mA @1W 900 mA @5W	1.2A (7W)	500 mA	900 mA	350 mA@1W 480 mA @2.5W	400 mA@1W 600 mA @1.8W
Operating Condition:							
Ambient Temperature	−10°C to +50°C	−10°C to +50°C	−10°C to +50°C	−10°C to +50°C	−10°C to +50°C	−10°C to +50°C	−10°C to +50°C
Relative Humidity	+40°C −95% or less	+40°C −95% or less	+40°C −95% or less	+40°C −95% or less	+40°C −95% or less	+40°C −95% or less	+40°C −95% or less
Power Variation	12V ± 10% or less	12V ± 10% or less	12V ± 10% or less	10.8V ±·10%	10.8V ± 10%	12V ± 10% or less	12V ± 10% or less
Dimensions:							
Inches (HxWxD)	8-7/8 x 2-7/8 x 2-13/16	8-7/8 x 2-3/4 x 1-13/16	8-7/8 x 2-3/4 x 1-13/16	6" x 1.770" x .2440"	6" x 1.770" x .2440"	8-7/8 x 2-3/4 x 1-13/16	8-7/8 x 2-3/4 x 1-13/16
mm (HxWxD)	225 x 75 x 55	232 x 71 x 46	232 x 71 x 46	(151 x 45 x 62 mm)	(151 x 45 x 62 mm)	232 x 71 x 46	232 x 71 x 46
Weight							
Without Batteries	1 lbs. 4 oz. 567 g	1 lb. 5 oz. 595 g	1 lb. 5 oz. 595 g	13 oz. 370 g	13 oz. 370 g	1 lb. 5 oz. 595 g	1 lb. 5 oz. 595 g
With Batteries	1 lb. 11 oz. 765 g	1 lb. 12 oz. 794 g	1 lb. 12 oz. 794 g	19 oz. 540 g	19 oz. 540 g	1 lb. 12 oz. 794 g	1 lb. 12 oz. 794 g
TRANSMITTER							
RF Output	2.5 Watts	1 & 5 Watts	1 & 7 Watts	2.5 Watts	4 Watts	1 & 1.8 Watts	1 & 2 Watts
Frequency Stability	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C	± .001% from −10°C to +50°C
Modulation	16F3 ± 5 KHz at 100% Modulation	16F3 ± 5 KHz at 100% Modulation	16F3 ± 5 KHz at 100% Modulation	16F3 ± 5 KHz at 100% Modulation	16F3 ± 5 KHz	16F3 ± 5 KHz at 100% Modulation	16F3 ± 5 KHz at 100% Modulation
Crystal Multiplication	12 X	12 X	12 X	12 X	12 X	18 X	24 X
Crystal Type	HC25/U	HC 25/U	HC 25/U	HC 25/U	HC 25/U	HC 25/U	HC 25/U
Spurious & Harmonics	More than 50 dB below carrier	More than 55 dB below carrier	More than 55 dB below carrier	More than 50 dB below carrier	More than 55 dB below carrier	More than 50 dB below carrier	More than 50 dB below carrier
FM Noise	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz	At least −50 dB below ± 3.3 KHz deviation @ 1000 Hz
Audio Response	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz	+1, −3 dB of 6 dB Octave/ Pre-emphasis Characteristic from 300 to 3000 Hz
Output Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50Ω	50 Ω
RECEIVER							
Receiving System	Double Conversion Superheterodyne	Double Conversion Superheterodyne	Double Conversion Superheterodyne	Double Conversion Superheterodyne	Double Conversion Superheterodyne	Double Conversion Superheterodyne	Double Conversion Superheterodyne
1st Local Oscillator Freq.	F−10.7 MHz 9	F−10.7 MHz 9	F−10.7 MHz 9	F−10.7 MHz 9	F−10.7 MHz 9	F+10.7 MHz 18	F−21.4 MHz 24
Intermediate Frequency:							
1st IF	10.7 MHz Mono Filter Option	10.7 MHz Mono Filter Option	10.7 MHz Mono Filter Option	10.7 MHz Monofilter	10.7 MHz Monofilter	10.7 MHz	21.4 MHz 2 pole monolithic filter
2nd IF	455 KHz (Ceramic Filter)	455 KHz (Ceramic Filter)	455 KHz (Ceramic Filter)	455 KHz Ceramic Filter	455 KHz Ceramic Filter	455 KHz (Ceramic Filter)	455 KHz (Ceramic Filter)
Frequency Stability	.001% from −30°C to +60°C	.001% from −30°C to +60°C	.001% from −30°C to +60°C	.001% from −30°C to +60°C	.001% from −30°C to +60°C	.001% from −30°C to +60°C	.001% from −30°C to +60°C
Sensitivity	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting	.3 μV or less for 20 dB Quieting
Squelch Sensitivity	.25 μV or less at Threshold	.25 μV or less at Threshold	.25 μV or less at Threshold	.25 μV or less at Threshold	.25 μV or less at Threshold	.25 μV or less at Threshold	.25 μV or less at Threshold
Selectivity	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting	More than 80 dB at ± 30 KHz for 20 dB Quieting
Spurious/Image Rej.	−60 dB	−60 dB	−60 dB	−60 dB	−60 dB	−60 dB	−60 dB
Audio Output	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion	500 mW to the Spkr with less than 10% distortion
Intermodulation	60 dB	60 dB	60 dB	60 dB	60 dB	60 dB	60 dB
Channel Spacing	15 KHz	15 KHz	15 KHz	15 KHz	15 KHz	15 KHz	15 KHz

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As the smallest size hand-helds ever marketed, the radios feature excellent adjacent channel selectivity, and innermod/image rejection. The attractive blue-gray Lexan® outer case is rugged and durable.

Features:

• 6 channel operation • individual trimmers on all TX/RX Xtals • microswitch control of TX/RX • includes improved rubber flex antenna and one pair Xtals 146.52/.52 installed • built-in microswitch speaker-mic • 90 day warranty • BNC type antenna connector • can be modified for MARS or CAP • inexpensive rechargeable Ni-Cad battery power source • easily accessible circuitry. • a variety of accessories and tone options are available. (See Page 17.)

MARK II
2.5 watt

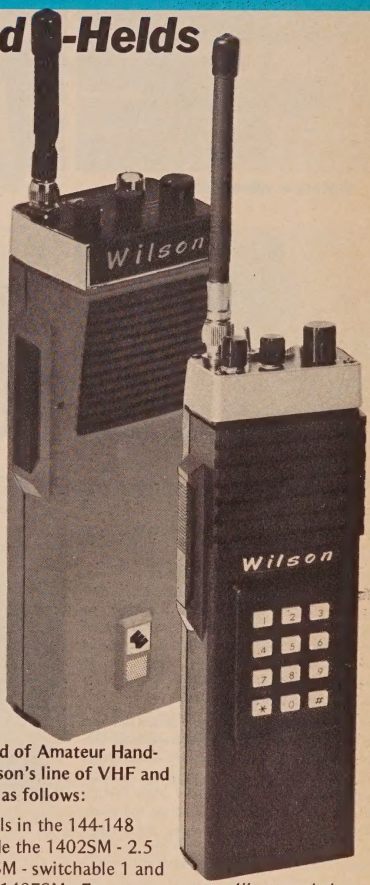
MARK IV.
4 watt



Illustrated is the Mark IV 4 watt unit with optional touch tone pad.

FCC Certification Pending

Illustrated at right is Model 1402SM 2.5 watt 144-148 MHz



The standard of Amateur Hand-Helds is Wilson's line of VHF and UHF radios as follows:

Three models in the 144-148 range include the 1402SM - 2.5 watt, 1405SM - switchable 1 and 5 watt, and 1407SM - 7 watt units, one unit in the 220 band: Model 2202SM - 2.5 watt, and Model 4502SM – switchable 1 and 1.8 watt unit is in the 450 range.

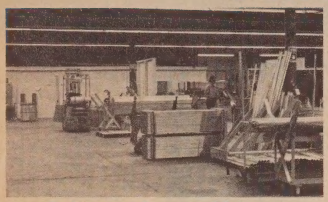
Illustrated above is 1405SM with optional Touch Tone Pad (Models 4502 and 2202 have similar appearance.

COMMON FEATURES

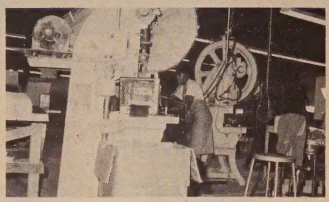
- 6 Channel Operation
- Individual Trimmers on all TX/RX Xtals
- All Xtals plug in
- Microswitch control of TX/RX
- Rubber Flex Antenna furnished
- Convenient Size . . . Fits in hip pocket
- 90 Day Warranty
- Can be modified for MARS or CAP
- Built for rugged use
- Inexpensive power source with rechargeable Ni-Cads
- Easily accessible circuitry
- One pair Xtals furnished with each radio installed.
  1402SM: 146.52/.52 4502SM: 446.00/.00
  1405SM: 146.52/.52 2202SM: 223.50/.50

See Page 17 for accessories and options on these radios.

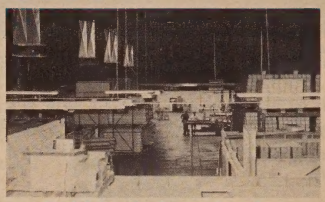
Wilson means Quality, Dependability, Experience, Performance and Value . . .



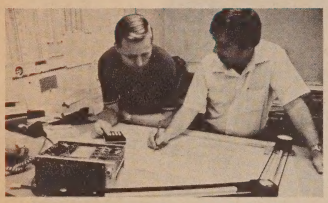
Antenna sub-assembly area



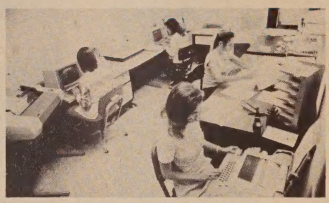
Up to date production equipment



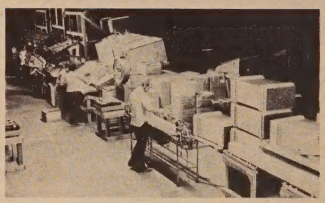
Finish product warehousing



Engineering and product design



In-house computer center



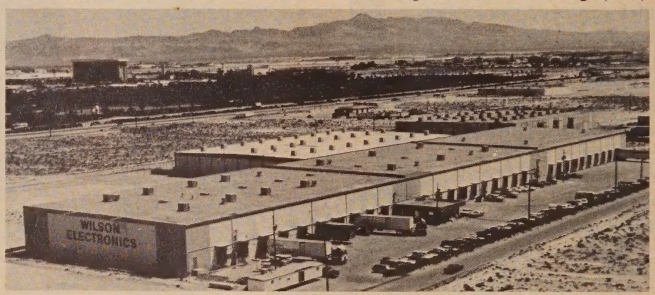
Efficient production line assembly

The Wilson Story

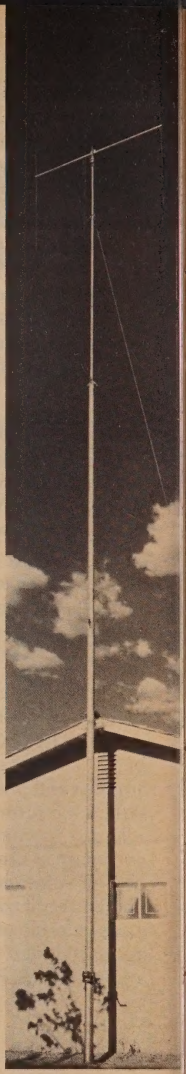
Wilson Electronics Corporation, a worldwide communications company, was founded ten years ago and is known as a major manufacturer of CB antennas, amateur antennas, towers, rotors, FM two-way portable radios and communication equipment. Years of experience in the design and construction of antennas and towers have made the Wilson brand name known throughout the world as a high quality product at reasonable cost.

Extensive research and development laboratories and fully staffed engineering capabilities have kept Wilson in the forefront of state-of-the-art design. In the United States alone, over 122,000 square feet of space is dedicated to design, manufacturing and distribution facilities. Additional facilities are also located in the Philippines.

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To obtain warranty service, return the ANTENNA, TOWER or ROTOR to your dealer, or should this be inconvenient, pack it securely, and ship it with proof of purchase date and a letter explaining the problem, shipping cost prepaid, to WILSON ELECTRONICS CORP., CUSTOMER SERVICE DEPARTMENT, P. O. BOX 19000, LAS VEGAS, NEVADA 89119.

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Here's how to get some more mileage out of your tower. It can do more than just stand there supporting your beam.

Using Your Tower As An Antenna

BY CARL C. DRUMLLER*, W5JJ

An antenna of some sort is an essential part of a radio station. You can buy a manufactured transmitter, receiver, microphone, key, and other ancillary items "off the shelf," but the antenna is something that must be compatible with the station's site. That site, the environment within which the antenna must be accommodated and must perform its function, often determines the type of antenna you're going to use. With the ever-increasing price of land and the resultant decrease in the size of city lots, room to put up the traditional half-wave doublet often is not available. Many station owners look to the vertical antenna as a solution to their problems. And that brings us to the subject of this article.

A single pole or tower can support antennas of many types. Beams, inverted Vs, slanted wires often are used. The tower, itself, may be a radiator. Usually, though, this is thought to require that the tower be insulated at its base, a rather expensive undertaking.

Let's consider a case in which we assume that a tower already is in place, perhaps supporting a beam and even several inverted Vs. You want to use a frequency lower than any covered by any of the existing antennas, and there's just not enough room on your lot to permit installing an inverted V for that frequency. You think of a vertical, but another pole would interfere with the swing of your beam. You look at your tower and quickly realize the impracticability of insulating it at its base. But don't give up hope! You can shunt feed that grounded tower!

There's no magic associated with shunt feed. It's just that we're so accustomed to think of wire antennas in terms of some sort of series feed that we forget the common use of a form of shunt feed (the gamma match) conventionally used with beams. If our memories go far enough into the past, we can dredge up recollection of the delta-fed half-wave doublet. Were we to slice a delta-fed doublet in two and stand one half on end, we'd have an example of a shunt-fed quarter-wave Marconi. So,

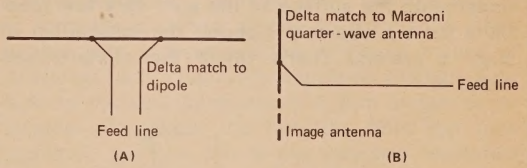


Fig. 1—(A) Delta matching a dipole, (B) a shunt fed quarter-wave Marconi antenna.

you see, shunt feeding is not a new and mysterious thing.

That is, it's not new and mysterious if we think in terms of feeding a resonant antenna. But that tower sitting in your back yard, it's not (in all probability) a quarter wave or an odd multiple of a quarter wave on any amateur band you plan to use. So where does that leave you?

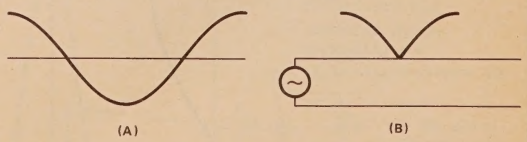


Fig. 2—(A) a full-wave horizontal antenna, (B) The same antenna folded in on itself, depicting 180° of a two wire transmission line.

Again, don't despair! Although we're brainwashed into thinking that only a resonant antenna will radiate, this is an erroneous belief. True, a resonant antenna is easier to feed r.f. energy into; true it has some slight edge in efficiency of radiation. But non-resonant antennas still do an excellent job. Ask

*5824 N.W. 58th St., Warr Acres, Oklahoma 73122

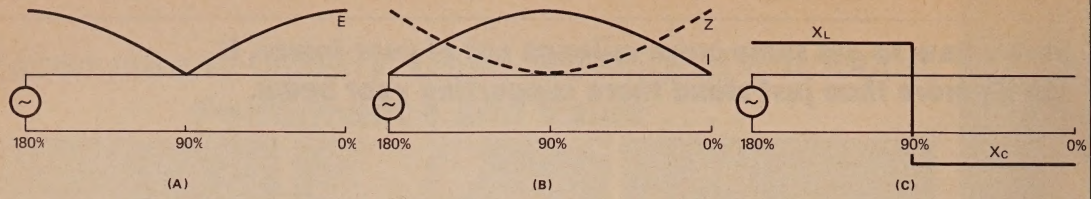


Fig. 3—Voltage, current, impedance and reactance curves for open-circuited half-wave line.

the user of any rhombic! Or of a disc-cone. Or of a Beverage. So, freed of the limitations of false teachings, let's tackle the job of putting that tower of yours to work.

As it will be used as a Marconi, the first consideration should be given to the "underground" portion of the proposed radiation system. Although Marconi antennas can (and do) function with a degree of user satisfaction when mated to a haphazard ground system, it's an indisputable fact that a good ground system contributes very substantially to the performance of a Marconi antenna. The only question is that of weighing the ideal against the practicable! The ideal consists of 100 to 120 equally-spaced wires running out from the base of the antenna for 0.4 of a wavelength and buried just underneath the surface of the soil. Very few amateurs have a site that'll permit the installation of such a system. That's where the compromises come in.

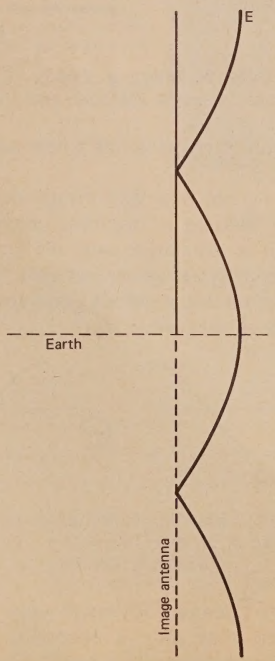


Fig. 4—The high voltage point is at ground potential, an transmission line.

How much can you compromise? Well, if your tower is near your house or other building, you can forget about ground radials running 0.4-wave in that direction. And if your tower is near a property line, it's best to abandon any thoughts of running radials under your neighbor's sod. What do you have left? Forget the ideal and do the best you can. Run as many and as long radials as you can. Perhaps toward your house they may be only a few feet long. Put them in, anyway. Lots of them. There's a concentration of ground current near your tower's base; so give that current an opportunity to travel through a low-resistance path. Ground to every metal fence or other conductive object that lies in the near-field of your antenna. (Back in the 200-meter days it used to be a standing joke that if a visitor dropped a dime on the floor, you immediately soldered a ground wire on to it!) You can even drive a few ground rods. Remember, though, that these rods make contact only with r.f. that's traveling deep into high-resistance earth. What you want to do is to intercept that r.f. with a copper wire before it imparts too much of its expensive power in warming earthworms with its I^2R losses. Be unkind to earthworms and keep those I^2R losses low!

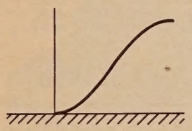
Let's say that you've put in the best ground system that your site, ambition, and finances permit and are ready to consider what goes above ground. At this point, it's a good idea to review a little theory, starting with a full-wave Hertz antenna. Fig. 2 shows first a full-wave horizontal antenna, then folds that antenna in on itself to depict 180° of a two-wire transmission line. Fig. 3 shows that line section marked with electrical degrees, starting, as is custom, at the "far" end. The voltage standing wave, the current standing wave, and the impedance curve also are illustrated. Note, too, that for the first quarter-wave back from the open-circuit termination, the line exhibits capacitive reactance; for the second, inductive reactance. Now, let's unfold the feedline, recreating an antenna, then cut the antenna in two at its center point and stand it on end, letting that ground system you just installed provide the phantom "image section."

Standing back to look at it, you'd see that it presented an impossible condition: The high-voltage point is at ground potential! That tells you the antenna must be used at a lower frequency, one at which a high-current point is at or near ground

potential. From this conclusion you deduce that the antenna must be used at a frequency such that it represents a quarter-wave, somewhat greater than a quarter-wave, or somewhat less than a quarter-wave. For example, a 40-foot tower could be used for 40 meters, 80 meters, and 160 meters. It seems a bit short for 160 meters until you remember that a radiator does not lose a significant portion of its radiating effectivity until it is reduced to something approaching a tenth of a wavelength.

Were you to elect to load your tower on 80 or 160 meters, you'd find that you'd be faced with the problem for feeding r.f. power into a load that exhibited a high impedance with considerable capacitive reactance. It, though, fortunately contains a resistive (ohmic plus "radiation resistance") component, and means exist for readily introducing power into a load containing a resistive element.

As we're going to do this impedance matching in conjunction with shunt feed, it's well to digress a moment to examine one method of visualizing how you can energize a whole grounded tower by just introducing current into a small portion of it.



NOTE:
$Z = R^2 - X_C^2$
R = Ohmic resistance + total losses + radiation resistance
Z approaches 36Ω at ground point.

Fig. 5—Impedance matching and resistive components.

If you'll recall the principle of the autotransformer, shown in fig. 6, it's easy to see how the power fed into a tower between the feed point and ground excites the whole dimension of the tower. Any method of introducing the r.f. energy into the tower is more or less equally effective. One method involves inductive coupling, effected by forming a toroidal coil around the tower near its base and feeding the r.f. into the coil. The tower then acts as a partial-turn secondary, picking up energy induced from the toroid.

Any method employed must cope with the problem presented by the impedance of a non-resonant radiator. For our case, you'll recall, we're concerned with impedance constituted of resistance and capacitive reactance. To make such a combination accept power, we must cancel the capacitive reactance with an equal amount of inductive reactance. Then we can effect a transformation of the remaining purely resistive component to the magnitude needed to match our r.f. power generator or, rather, the transmission line carrying that power from the generator to the antenna's matching device.

One method of coping with reactance is by coupling the load to a resonant circuit, one with a wide range of adjustment. As the reactance is

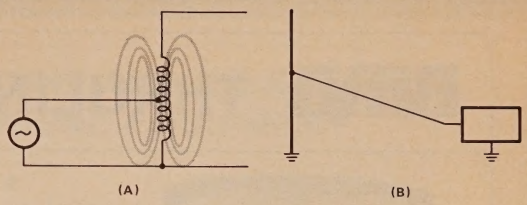


Fig. 6—Autotransformer principles.

coupled to the LC tank, it'll detune the tank. Retuning can bring it back into resonance, thereby establishing a purely resistive condition. This resistance is altered by transformation ratio to the value needed to match the transmission line.

Fig. 7 shows the circuit used at W5JJ to match a 40-foot triangular tower to RG-8/U transmission line. The frequency is 2000 kiloHertz, and the r.f. power source is a Johnson Valiant transmitter.

Although the tune-up procedure is straightforward, it does require a reasonable adherence to a logic-based sequence of operations. A certain amount must be purely explorative moves, moves made to "get into the ballpark," but others must have a deliberately-selected goal. The first step is to tune the matching device to resonance while loaded with a resistive load. A simple means of providing such a load is to couple an ordinary light bulb to the tank by means of a turn or two of insulated wire about the inductor. With the tank resonant, you can cancel the inductive reactance of the primary coil by means of the variable series capacitor. A handy way of ascertaining this state is by switching the transmitter from a non-reactive dummy load to the matching device and noting whether it's necessary to reresonate the transmitter's tank to re-establish resonance. At W5JJ a coaxial relay made such a switch quick and easy. Needless to say, the assistance of another person

(Continued on page 111)

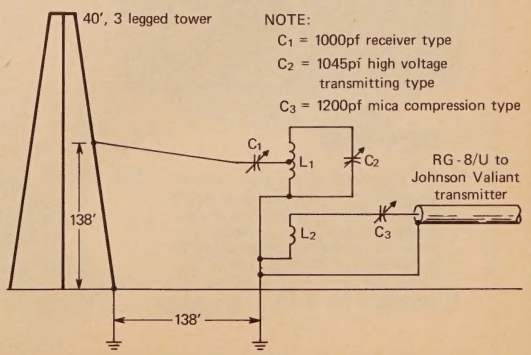
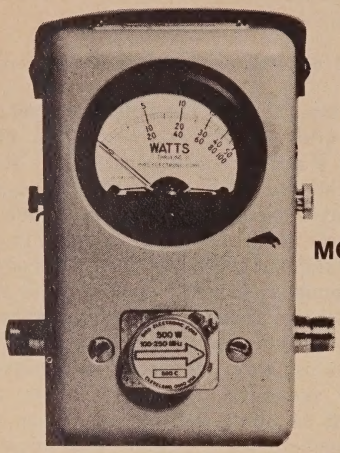


Fig. 7—Circuit used by the author to match a 40 foot triangular tower to RG-8/U transmission line.

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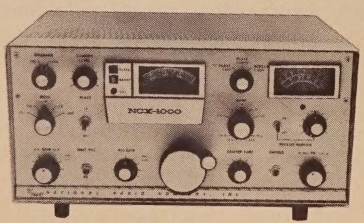
Power Range	Frequency Bands (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 watts	—	5A	5B	5C	5D	5E
10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					

Table 2
LOW-POWER ELEMENTS

1 watt	Cat. No.	2.5 watts	Cat. No.
60-80 MHz	060-1	60-80 MHz	060-2
80-95 MHz	080-1	80-95 MHz	080-2
95-125 MHz	095-1	95-150 MHz	095-2
110-160 MHz	110-1	150-250 MHz	150-2
150-250 MHz	150-1	200-300 MHz	200-2
200-300 MHz	200-1	250-450 MHz	250-2
275-450 MHz	275-1	400-850 MHz	400-2
425-850 MHz	425-1	800-950 MHz	800-2
800-950 MHz	800-1		

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NCX-1000

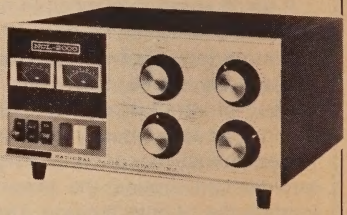
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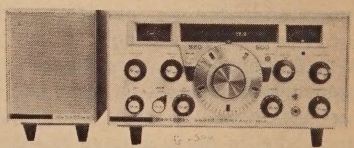
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$229.00





$249.00

IC-502. 6 METER SSB & CW PORTABLE, XCVR. Includes antenna & battery pack. 3W PEP & stable VFO for fun & FB QSO's. Covers first 800 KHz of 6M band, where most activity is.

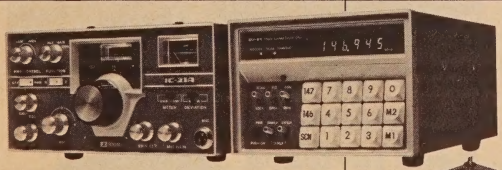


IC-211. 4 MEG, MULTI-MODE 2M XCVR. 144-145 MHz on SSB & CW, plus 146-147 MHz on FM. Work AMAT OSCAR six or seven. LSI synthesizer with 7 digit LED. MOS FET RF Amp, 5 helical cavities, FET mixer & 3 I.F. filters.
$749.00

$299.00



IC-22S. 145 MHz FM 10W XCVR. CMOS synthesizer can be set to any 15 KHz ch. between 146 & 148 MHz by diode matrix board. Spurious attenuation far better than FCC spec. 10W or 1W. IDC modulation control.



IC-21A. 146 MHz FM 10W XCVR. MOS FET RF Amp & 5 helical resonator filter, plus 3 I.F. filters. IDC modulation control. Variable output pwr: 500 MW to 10W Front panel discriminator meter. SWR bridge. 117 VAC and 13.6 VDC pwr supplies.
$399.00

DV-21. DIGITAL VFO. Use with IC-21A to complete 2M band.
$299.00

IC-202. 2 METER SSB PORTABLE XCVR. Puts sideband in your hand! Internal C batteries or external 12 VDC. 3W PEP. True I.F. noise blanker. 144.0, 144.2 on two other 200 KHz bands, selectable. Hamtronics stocks 145.2 and 145.8 - 146.0 MHz for calling frequency & satellite band.
$259.00





IC-30A. 450 MHz FM LOW XCVR. 1W or 10W. Low noise MOS-FET RF Amp & 5 section helical filter. 22 CH. capacity. S-meter & relative power output meter. IDC modulation control.
$399.00

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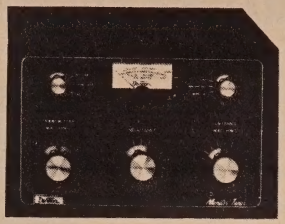
HAMTRONICS-WHERE THE HAM IS KING

DenTron 3 Kilowatt Tuner Matches Everything From 160 to 10

160-10 MAT

Built-In Wattmeter

Front Panel Antenna Selector for Coax, Balanced Line and Random Wire.



only $299.95

1000 to 1200 WATTS OUTPUT TO YOUR ANTENNA

DenTron SUPER AMP



$499.50

If the amplifier you're thinking of buying doesn't deliver at least 1000 to 1200 watts output, to the antenna, you're buying the wrong amplifier.[1]

Our New Super Amp is sweeping the country because hams have realized that the DenTron Amplifier will deliver to the antenna, (output power), what other manufacturers rate as input power.

The Super Amp runs a full 2000 watts P.E.P. input on SSB, and 1000 watts DC on CW, RTTY or SSTV 160-10 meters, the maximum legal power.

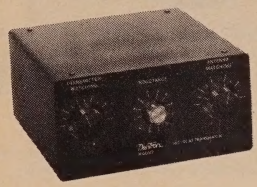
The Super Amp is compact, low profile, has a solid one-piece cabinet assuring maximum TVI sheilding.

The heart of our amplifier, the power supply, is a continuous duty, self-contained supply built for contest performance.

We mounted the 4 - 811 A's, industrial workhorse tubes, in a cooling chamber featuring the on-demand variable cooling system.

The hams at DenTron pride themselves on quality work, and we fight to keep prices down. That's why the dynamic DenTron Linear Amplifier beats them all at $499.50.

NOW AVAILABLE WITH 572 B[2] FOR **$574.50**



DenTron Super Tuner

160-10 Meters
Balanced Line, Coax, Random or Long Wire

Maximum Power Transfer, Xmitter to Antenna.

1 KW Model $129.50 **3 KW Model $229.50**

DenTron ANTENNAS

The Sky Openers



SKYMASTER

A fully developed and tested 27 foot vertical antenna covers entire 10, 15, 20, and 40 meter bands using only one cleverly applied wave trap. A full 1/4 wave antenna on 20 meters. Constructed of heavy seamless aluminum with a factory tuned and sealed HQ Trap, SKYMASTER is weatherproof and withstands winds up to 80 mph. Handles 2 KW power level and is for ground, roof or tower mounting. Radials included in our low price of

$84.50

Also 80 m resonator for top mounting on SKYMASTER.

$29.50



SKYCLAW

A tunable monoband high performance vertical antenna, designed for 40, 80, 160 meter operation. SKYCLAW gives you the following spectrum coverage:

BAND (Meters)	BANDWIDTH (kHz)
160	50
80	200
40	entire band

Tuning is easy and reliable. Rugged construction assures that this self-supporting unit is weatherproof and survives nicely in 100 mph winds.. Handles full legal power limit.

$79.50

EX-1

The DenTron EX-1 Vertical Antenna is designed for the performance minded antenna experimenter. The EX-1 is a full 40 meter, ¼ wave, 33', self-supporting vertical. The EX-1 is the ideal vertical for phasing.

$59.50



TRIM-TENNA

The antenna your neighbors will love. The new DenTron Trim-Tenna with 20 meter beam is designed for the discriminating amateur who wants fantastic performance in an environmentally appealing beam. It's really loaded! Up front there's a 13 foot 6 inch director with precision Hy-Q coils. And, 7 feet behind is a 16 foot driven element fed directly with 52 ohm coax. The Trim-Tenna mounts easily and what a difference in on-the-air performance between the Trim-Tenna and that dipole, long wire or inverted Vee you've been using. 4 & 6 Forward Gain Over Dipole.

$129.50



ALL BAND DOUBLET

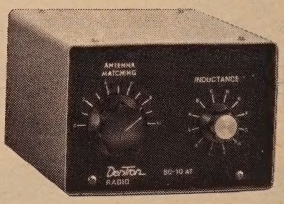
This All Band Doublet or inverted Type Antenna covers 160 thru 10 meters. Has total length of 130 feet (14 ga. stranded copper) although it may be made shorter if necessary. This tuned Doublet is center fed through 100 feet of 450 ohm PVC covered balanced transmission line. The assembly is complete. Add rope to the ends and pull up into position. Tune with the DenTron Super Tuner and you're on 10 through 160 meters with one antenna! Now just for the DenTron All Band Doublet.

$24.50

DenTron ANTENNA TUNER

The 80-10 Skymatcher

Here's an antenna tuner for 80 through 10 meters, handles 500 w P.E.P. and matches your 52 ohm transceiver to a random wire antenna.

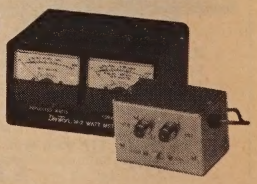


- Continuous tuning 3.2 - 30 mc
- "L" network
- Ceramic 12 position rotary switch
- SO—239 receptional to transmitter
- Random wire tuner
- 3000 volt capacitor spacing
- Tapped inductor
- Ceramic antenna feed thru
- 7" W. 5" H. 8" D., Weight: 5 lbs.

$59.50

DenTron W-2 PAD INLINE WATTMASTER

Read forward and reflected watts at the same time



Tired of constant switching and guesswork?

Every serious ham knows he must read both forward and reverse wattage simultaneously for that perfect match. So upgrade with the DenTron W-2 Dual in line Wattmeter.

$99.50

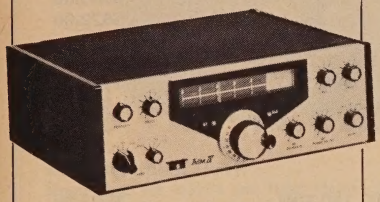
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TRITON IV EQUIPMENT



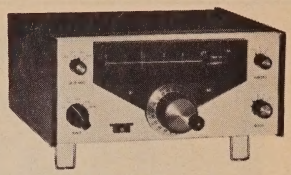
TRANSCEIVERS

MODEL 540-200W, SSB/CW
3.5 - 30 MHz $699.00

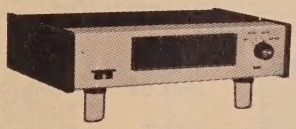
MODEL 544- DIGITAL, 200W
SSB/CW, 3.5 - 30 MHz
$869.00



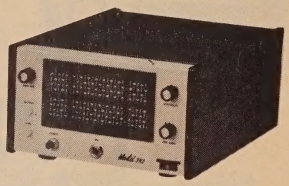
MODEL 240 $97.00
ONE - SIXTY CONVERTER



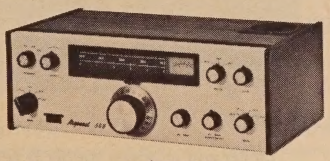
MODEL 242 $169.00
REMOTE VFO



MODEL 244 $197.00
DIGITAL READ OUT/COUNTER



MODEL 262-G $139.00
DELUXE POWER SUPPLY

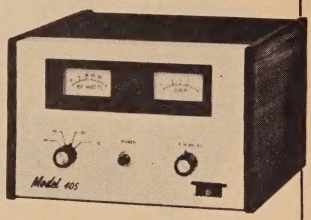


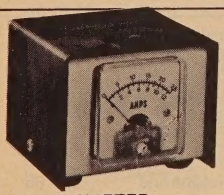
ARGONAUT

MODEL 509 $359.00
SW, SSB/CW, 3.5-30 MHz

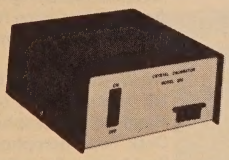
LINEAR AMPLIFIER

MODEL 405 $159.00
100W, 3.5 - 30 MHz



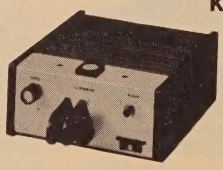


AMMETER
207 $14.00



XTAL CALIBRATOR
206 $29.00

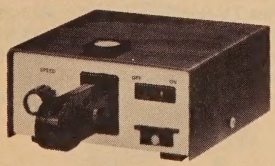
KEYERS



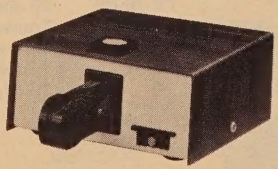
ELECTRONIC KR-50
$110.00



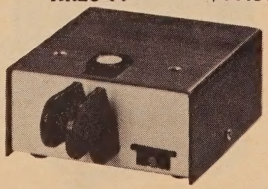
ELECTRONIC
KR20-A $69.50



ELECTRONIC KR-5A
$39.50



KR-2A $17.00



KR1-A $35.00

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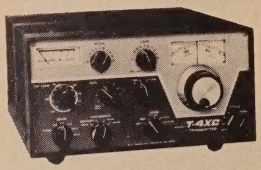
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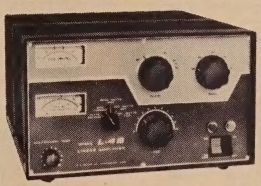
KNOWN FOR QUALITY THROUGHOUT THE WORLD

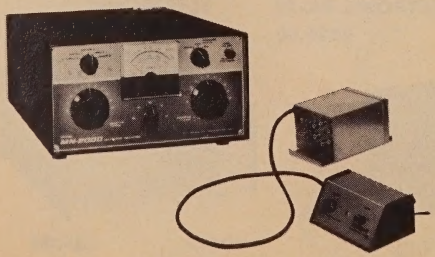












RECEIVERS

SSR-1	General Coverage, .5 to 300 MHz	$350.00
SPR-4	Programmable, Solid State	$629.00
DSR-2	VLF-HF Digital Synthesized SSB, AM, CW, ISB, RTTY	$2950.00
R-4C	C-Line. HF. 160-10M	$599.00
4NB	Noise Blanker for R-4C	$70.00
5NB	Noise Blanker for SPR-4	$70.00

TRANSMITTER

T-4XC	C-Line. HF. 160-10M	$599.00

TRANSCEIVERS

TR-4CW	80-10M. SSB, AM, CW	$699.00
TR-33C	2M, FM, 12 CH. Portable	$229.95
MMK-33	Mobile/Dash/Desk Mount for TR-33C	$12.95
34PNB	Plug-In Noise Blanker for TR-4 Series	$100.00
MMK-3	Mobile Mount for TR-4	$7.00
RV-4C	Remote VFO for TR-4 CW	$120.00
FF-1	Crystal Control for TR-4	$46.95

SYNTHESIZER

FS-4	General Coverage for 4-Line and SPR-4	$250.00

LINEAR AMPLIFIER

L-4B	Linear and w/power supply & tubes	$895.00

MATCHING NETWORKS

MN-4	Antenna Matching Network. 200W	$120.00
MN-2000	Antenna Matching Network. 1000W	$240.00
RCS-4	Remote Control Antenna Switch	$120.00
W-4	RF Wattmeter, 1.8 to 54 MHz	$72.00
WV-4	RF Wattmeter, 20 to 200 MHz	$84.00
7072	Hand Held Microphone	$19.00
7075	Desk Top Microphone	$39.00
1525EM	Pushbutton Encoding Microphone	$49.95
HS-1	Head Phones	$10.00
AA-10	10W, 2M Amplifier	$49.95
TV-300-HP	300 ohm High Pass TV Set Filter	$10.60
TV-75-HP	75 ohm High Pass TV Set Filter	$13.25
TV-42-LP	Transmitter Low Pass Filter. 100W	$14.60
TV-3300-LP	Transmitter Low Pass Filter. 1000W	$26.60
TV-5200-LP	Transmitter Low Pass Filter. 1000W. 100W, 6M	$26.60

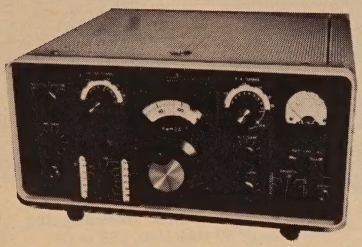
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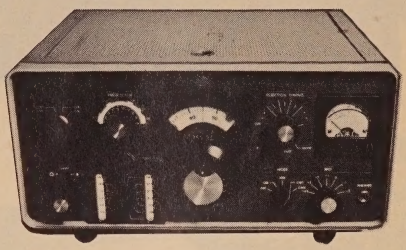
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THE LOWEST POSSIBLE PRICES

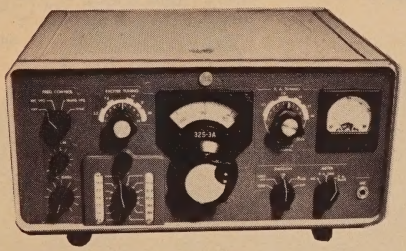
COLLINS AMATEUR EQUIPMENT



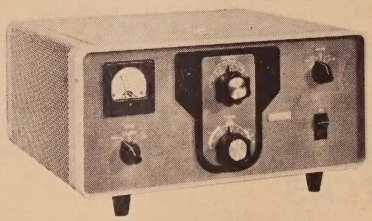
KWM-2A TRANSCEIVER **$3533.00**
Unmatched for mobile and fixed station applications. 175W on SSB, 160W on CW. Switch select up to 14 optional Xtals. Can be used for RTTY. Filter type SSB generation. Automatic load control. Inverse RF feedback. Reimeability-tuned variable oscillator.



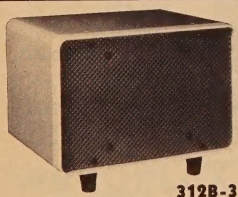
75S-3C RECEIVER **$2504.00**
Sharp selectivity. SSB, CW and RTTY. Single control rejection tuning. Variable BFO. Optional mechanical filters for CW, RTTY and AM. 2.1 KHz mechanical filter. Zener regulated oscillators. 3-position AGC.



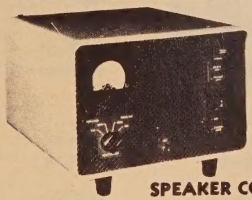
32S-3A TRANSMITTER **$2597.00**
Covers all ham bands between 3.4 MHz and 30 MHz. Nominal output of 100W. 175W, SSB and 160W CW. Dual conversion. Automatic load control. RF inverse feedback. CW spotting control. Collins mechanical filter.



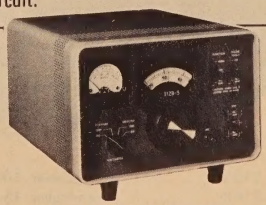
30L-1 LINEAR AMPLIFIER **$1536.00**
1000 watts PEP on SSB and 1000 Average on CW. Single control rejection tuning (50 dB). Variable BFO. 2.1 kHz Mechanical filter. Zener regulated oscillators. 3 position AGC. Exclusive comparator circuit.



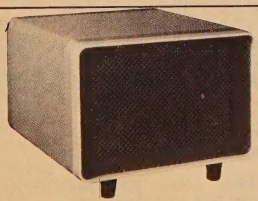
312B-3 SPEAKER
$80.00



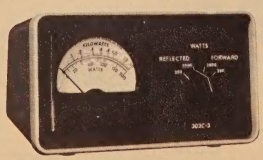
312B-4
SPEAKER CONSOLE
$546.00



312B-5 VFO CONSOLE
$1212.00



516F-2 AC POWER SUPPLY
$440.00



302C-3 DIRECTIONAL WATT METER
$360.00



DL-1 DUMMY LOAD
$270.00

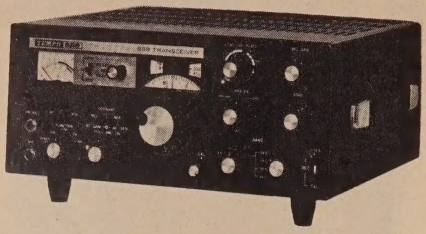
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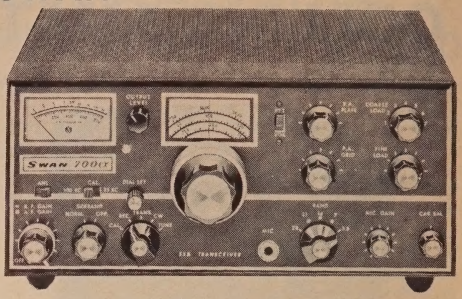
TEMPO ONE	HF Transceiver. 80-10M. USB, CW & AM	399.00
AC/ONE	Power Supply for TEMPO ONE	99.00
VF/ONE	External VFO for TEMPO ONE	109.00
TEMPO VHF/ONE	Transceiver. 2M. 144 yo 148 MHz. PLL	399.00
TEMPO SSB/ONE	SSB Adapter for TEMPO VHF/ONE	199.00
TEMPO 2020	Transceiver. 80-10M. USB, LSB, CW and AM. PLL. Digital	759.00
FMH	2W, VHF/FM, 6 Ch. Hand Held. 144-148 MHz	199.00
RBF-1	Wattmeter & SWR Bridge	42.95
DM-20	Desk Mike. 600 or 50K ohm. PTT & Lock Switches	39.00
MS-2	4 Ch. Pocket Scanning Rcvr.	99.00

ATLAS

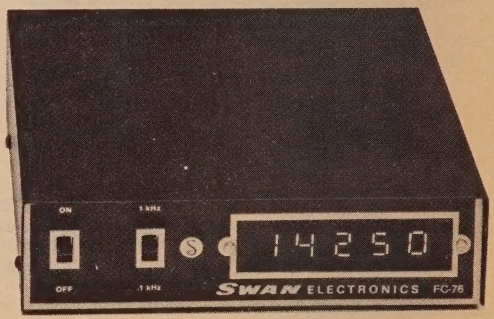


210X	Transceiver. 10-80M. 200W	679.00
215X	Transceiver. 15-160M. 200W	679.00
OMK	Deluxe Mtg. Kit for 210X & 215X	48.00
220CS	AC Console for 210X & 215X	149.00
350-XL	Transceiver. SSB. Solid State. 10-160M. 350W.	995.00
DD6-XL	Digital Dial Readout for 350-XL	195.00
305	Plug-In Auxiliary VFO. For 350-XL	155.00
311	Plug-In Auxiliary Crystal Oscillator for 350-XL	135.00
350-PS	AC Pwr Supply w/Spkr & Phone Jack for 350-XL	195.00
DMK-XL	Mobile Mounting Bracket for 350-XL. Easy Plug-In	65.00

SWAN



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VX-2	Plug-In VOX for 700 CX	44.95
SS-16B	Super Selective IF Filter for 700 CX	99.95
MARK II	Linear Amplifiere Full Legal Power. W/100W input. 80-10 M.	849.95
1200 X	Portable Linear Amplifier. 1200W PEP. SSB. 700W, Ch. 300W, AM. 80-10M.	349.95
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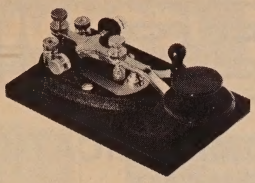
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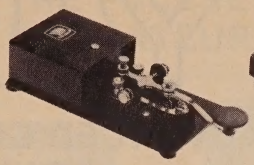
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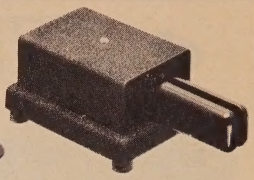
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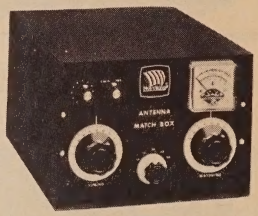
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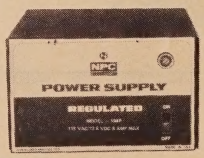
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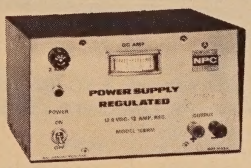
6 AMP

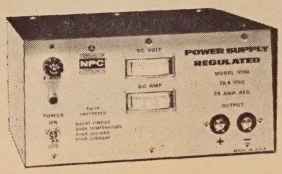


104R 49.95

12 AMP

108 RM
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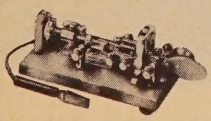




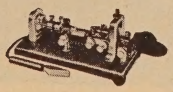
25 AMP

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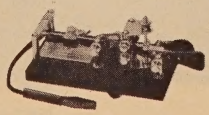
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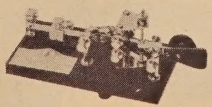
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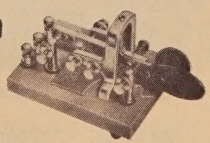
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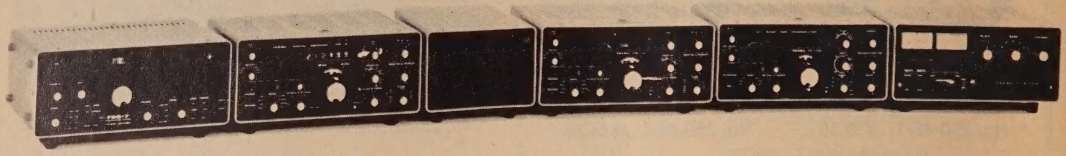
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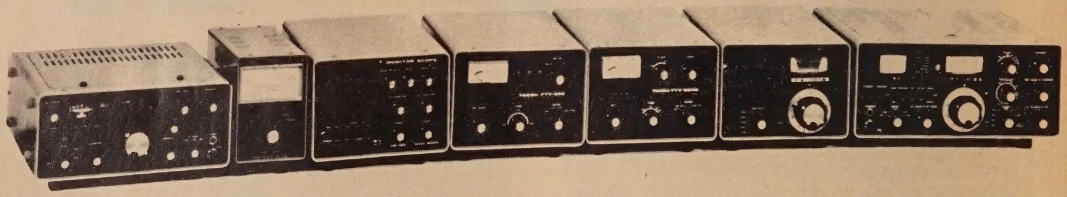
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Left to right – FRG-7, Solid State Synthesized Communications Receiver • FR-101 Digital, Solid State Receiver • SP-101B, Speaker • FR-101, Digital Solid State Receiver • FL-101, 100 W Transmitter • FL-2100B, 1200 W PEP Input Linear Amplifier



Left to right – FT-620B, 6 Meter Transceiver • YP-150, Dummy Load Wattmeter • YO-100, Monitor Scope • FTV-250, 2 Meter Transverter • FTV-650, 6 Meter Transverter • FV-101B, External VFO • FT-101E 160-10 M Transceiver



Left to right – YC-601, Digital Frequency Display • YC-355D, Frequency Counter • FP-301, AC Power Supply • FT-301S Digital, All Solid State Transceiver • FV-301, External VFO • FT-221, 144-148 All Solid State All Mode Transceiver

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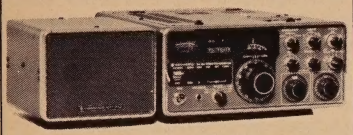
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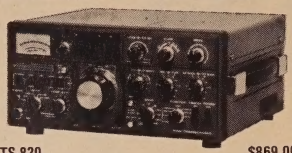
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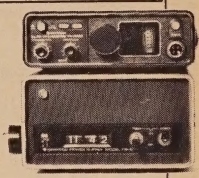
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Optional external speaker for better readability.

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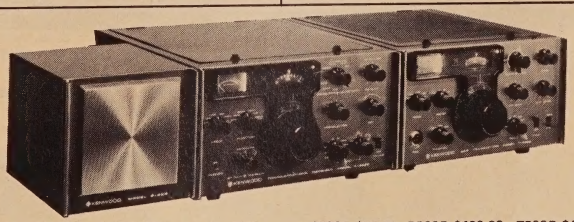
TR-7200A **$229.00**

2M MOBILE/BASE FM TRANSCEIVER. Ignition interference control. 2 pole Xtal filter in IF rcvr. Protection for final stage transistor & reverse polarity connections. Priority Ch. switch. Quick release mount. LED CH. indicators. Switchable 10W or 1W output.



MC-50 **$39.50**

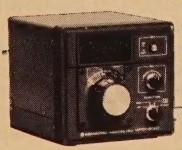
Dynamic microphone designed expressly for amateur radio operation. Complete with PTT and LOCK switches, and a microphone plug. (600 or 50k ohm)



COMMUNICATIONS RECEIVER. 1.8 to 29.7 MHz, WWV and CB band. 50 MHz, 144 MHz converter optional. Stable VFO & oscillator for 5 fixed channels. 1 KHz dial readout. Xtal filters (SSB/8 pole, CW/8 pole, AM/6 pole). Squelch. S meter. Noise blanker.

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SSB TRANSMITTER. 3.5 to 29.7 MHz. Stable VFO. 1 KHz dial readout. 8 pole Xtal filter. AM Xmission available. Built-in AC pwr supply. Split frequency control available.

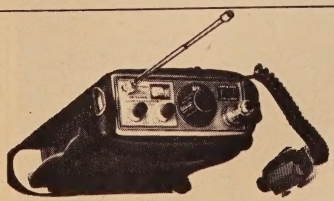


VFO-820 **$145.00**

Designed exclusively for use with TS-820. RIT circuit and control switch. Fully compatible with optional digital display.

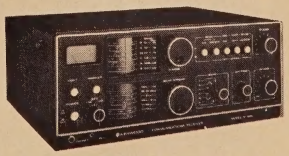
VFO-520 **(Not Shown)** **$119.00**

Solid State Remote VFO. RIT circuit with LED indicator.



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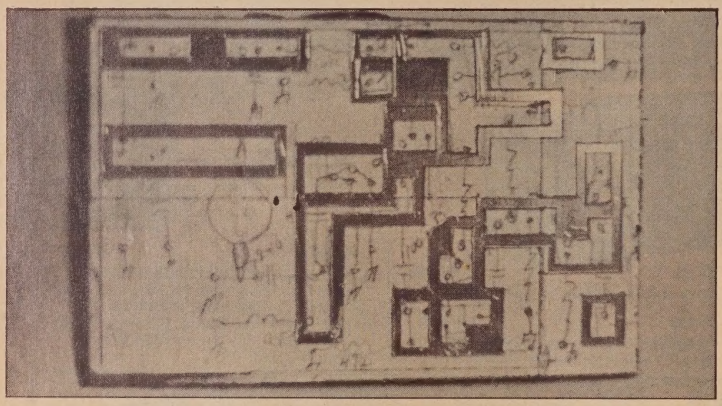
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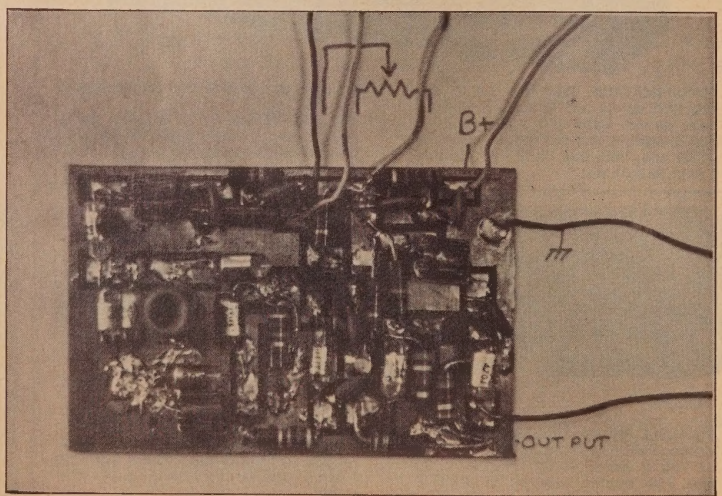
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QRP

The art of very low power operating



This is a shot of the p.c. board ready for etching. The board has been covered with address labels, the pads drawn on with a sharp tip pencil, and the unwanted label material cut away with a sharp-tip penknife and straight-edge. The copper will be removed from areas not covered by the address label material.



The completed v.f.o. with leads drawn on the background. The zener regulated B+ line stretches across the top of the board from r-l, with bypass, 200 ohm R, bypass, R3, bypass capacitor, RFC1, VR1, and C1a. Middle l-r C1c-d, Li, C2, C3, Q1, D1/47K; RFC2/C4 below L1. Q2 and Q3 bottom right quadrant.

Solid State V.F.O. Transmitter for 7-14 MHz: Part II, 7 MHz Seiler V.F.O. Seiler V.F.O.

The one watt exciter/transmitter described in the first part of this paper can be used either with 7 MHz crystal control, or with a 7 MHz v.f.o. providing about 0.45 V rms (1000 ohm load) drive. In this part, such a v.f.o. will be discussed and construction information provided. A fairly compact, stable 1 watt transmitter for 7-14 MHz results when the two units are combined. In the next installment, details will be provided for the addition of an optional 10 watt final amplifier.

7 MHz Seiler V.F.O. Circuit

The v.f.o. circuit shown in fig. 1 is the familiar Seiler circuit which has grown in popularity over the past several years. It is a relatively stable circuit and readily achieves a 100 Hz drift rate if reasonable care is taken in board design and parts selection and mounting. The circuit employs three stages—an oscillator followed by two buffer stages. The B+ line is zener regulated and decoupled between stages. The frequency control system utilizes a varactor tuning diode and potentiometer, a system which has definite advantages over the traditional mechanical variable capacitor approach. Several parts of the circuit can bear detailed comment for a better understanding of circuit operation by those experimenters who are just starting out with homebrew.

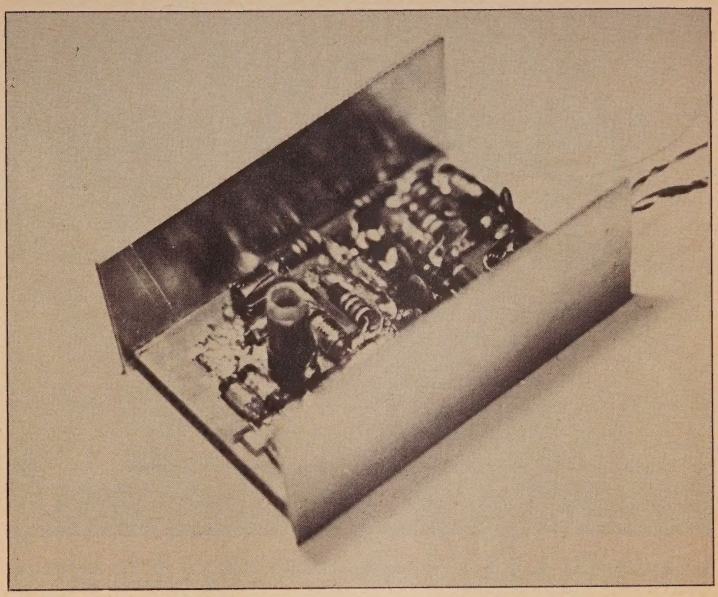
The primary consideration in v.f.o. design and construction is isolating the oscillator stage from any type of interaction that will cause an undesired change in oscillator frequency. Stability is of the essence. Several sections of the circuit of fig. 1 are intended to achieve the kind of isolation necessary

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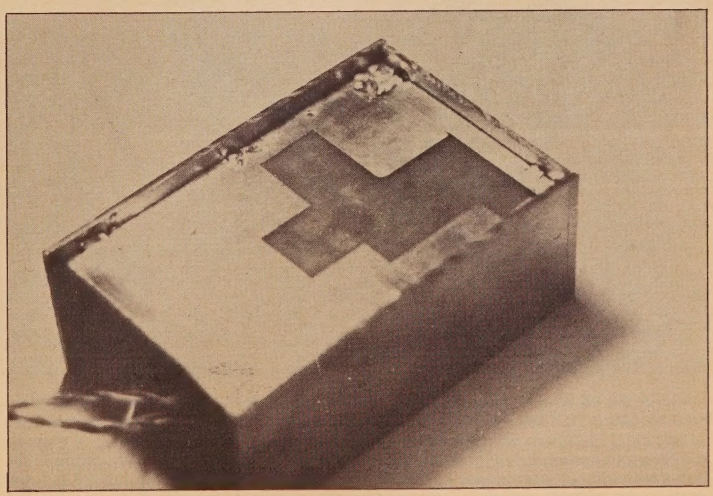
for proper operation. First off, changes in the supply voltage powering the oscillator will definitely cause changes in oscillator frequency. Hence, the supply voltage must be well-regulated to avoid instability. in fig. 1, a 200 ohm resistor in combination with a 7.1 volt zener diode stabilize the voltage which powers the oscillator, and holds that voltage to within 0.1 volt despite very wide fluctuations external to the v.f.o. (9-20 volts). The zener is rated at ½ watt dissipation, and the purpose of the 200 ohm resistor is to drop the voltage to a point where the current flowing thru the zener will produce less than ½ watt dissipation. Since the frequency control voltage to the varactor tuning diode is taken from the zener source, good regulation is a must.

Next, since the external B+ supply also powers later transmitter stages, there is a possibility that r.f. power will feedback from later stages through the B+ line and affect the oscillator. In order to eliminate this unwanted r.f. feedback, the B+ line is bypassed before and after the dropping resistor. In some cases, an r.f. choke could be required, but not in the unit described. Further isolation is provided at Q1 and Q2 through the 100 ohm decoupling resistors and .01 mf bypass capacitors. Q3 is isolated by means of an r.f. choke and bypass capacitor. These components isolate the three stages from each other and from any r.f. feedback present on the B+ power supply line. The above precautions eliminate effects on oscillator frequency along the B+ path.

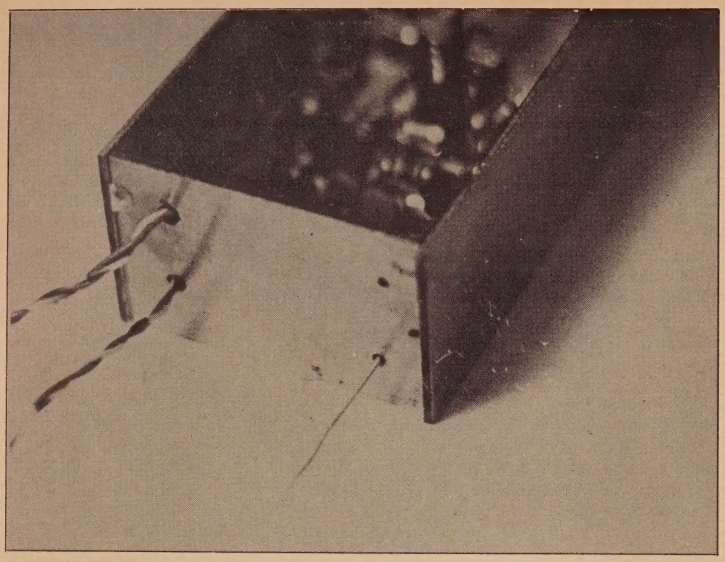
Oscillator frequency may also be affected through the signal path because of changes in the load presented to the final v.f.o. stage. Usually a v.f.o. looks into a constantly changing load which is caused by numerous variations in transmitter stage operating conditions. For example, tuning a buffer stage, such as Q1 in the transmitter described earlier, through resonance will change the load impedance presented to the v.f.o. by the base of Q1. This can have an effect on the oscillator frequency unless adequate isolation is achieved. Something as simple as an antenna swinging in the breeze can "pull" the frequency of an unisolated v.f.o. The purpose of Q2-Q3 stages in fig. 1 is to provide isolation of the oscillator from such load variations presented to the v.f.o. output by later stages. In a perfectly isolated v.f.o. circuit, no shift in oscillator frequency will result from shorting the v.f.o. output to ground. This ideal is rarely achieved, and not really necessary. In the units described here, shift is about 200 Hz from open-to-shorted output. A buffer stage isolates by the virtue of the



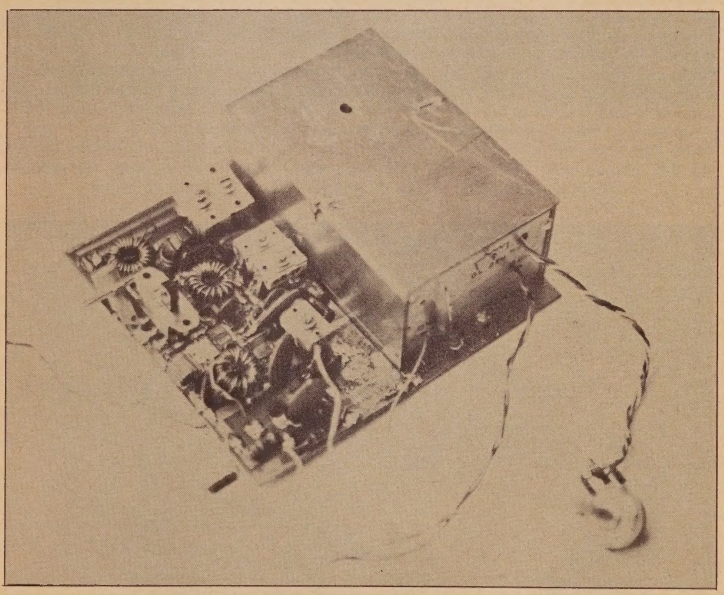
The v.f.o. is housed in a box made from double-side p.c. board stock. Photos 3-6 show details of this type of construction. Here side walls have been spot-soldered to the underside foil of the v.f.o. board. Note that the side walls extend beyond the edge of the v.f.o. board about 3/32 inch so that the end walls will butt-joint with them. In order to insure a neat job, very carefully measure all edges before cutting, and use a knife to inscribe the cutting guide-line. It is wise to use one pre-cut edge of the p.c. board stock as the basic guide-line, and measure all other lines at a distance from it and at right angles to it. Some filing will be required to bring the hacksawed edges into perfect alignment with the initial pre-cut edge. Note also that the v.f.o. board is located about 1/4" above the bottom edge of the wall.



Bottom view showing the v.f.o. board mounted about 1/4" above the bottom of the walls. During initial assembly of the box, only spot-solder joints are made. Once the box is fit together as perfectly as possible, a bead of solder is run along the entire joint between continugous walls.



End wall with v.f.o. leads shown leaving the enclosure. Note that the end wall fits between the side walls, with some side wall clearance remaining for the solder joint. Leads should be tied in a knot on the inside of the enclosure so as to avoid any strain on the lead connection to the p.c. board.



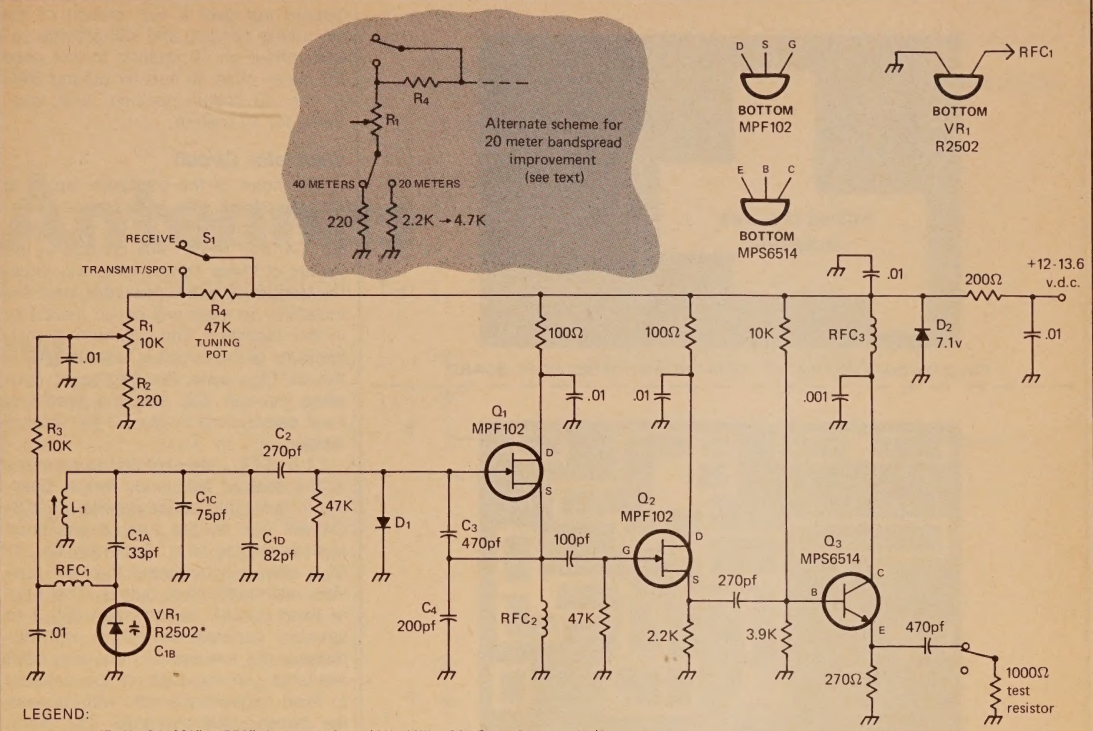
A shot of the completed v.f.o. enclosure with base soldered in place. Note that the base extends about 1/2" beyond the end walls. Mounting holes may be drilled in this base extension. The top is not connected by a continuous solder bead, since it may be necessary to remove it if difficulties arise. It is held in place by two solder beads to the end walls, and two bent pieces of lead wire to the side walls. The hole toward the rear of the top is directly over the L1 slug and permits access of the alignment tool. Overall, the photo shows the 1 watt exciter attached to the v.f.o. by means of wire leads soldered to the v.f.o. base and exciter p.c. board at three places along their continuous edges. The combination has been tested on the air in this configuration, and it could be put in a cabinet if permanent use is desired. The frequency control potentiometer R1 is seen at the lower right corner, somewhat out of focus.

fact that it is biased for little or no forward gain, and is deliberately mismatched to the previous stage. The deliberate mismatch means that the stage is inefficient in "passing along" either the drive power from the preious stage, or reflecting back to the previous stage load variations from later stages. Buffering is a trade-off between gain and isolation, and since gain is unimportant in a v.f.o. there is no real loss in the trade-off.

Typically, a buffer stage is coupled to the low-impedance point of the previous stage, or reflecting back to the vious stage through as small a coupling capacitor as will allow required output levels. Usually a point is reached where decreasing the size of the coupling capacitor earns no increase in isolation, and that is a good point for choosing the size of the capacitor. As can be seen in fig. 1, the first buffer Q2 is coupled directly to the source of the oscillator Q1 and the critical frequency determining part of the oscillator circuit. With this in mind, it is not difficult to understand the critical need for adequate isolation of the oscillator stage from the output.

A typical source of mechanical and electrical instability in a v.f.o. is the use of a mechanical air variable capacitor as a frequency control. Instability can arise because of faulty rotor-swiper contacts, or because of shaky r.f. bearing leads that are not securely fastened to the chassis. In the unit discussed, a varactor tuning diode replaces the usual air variable capacitor with the resultant elimination of these possible sources of instability. The varactor diode functions as a capacitor when reverse bias is placed across it. The amount of capacitance developed across the diode junction is proportional to the amount of reverse bias. Currently available varactor diodes are designed to exhibit a fairly linear voltage vs capacitance curve. In a pinch, the collector-base junction of a NPN transistor can be used as a varactor diode, but the linear tuning characteristic will be lost.

The major advantage of using a varactor in place of an air variable is that it eliminates the need for any lead associated with the critical frequency determining circuitry leaving the v.f.o. board. As can be seen in fig. 1, the varactor control voltage circuit (RFC1 thru R4) is isolated at r.f. from the oscillator circuit through RFC1 and the bypass capacitors. In practice, this means that the control voltage leads and tuning potentiometer will have no undesired effects from mechanical causes on frequency stability. They can be banged, touched, scraped, etc., and the oscillator will be unaffected. How-



LEGEND:

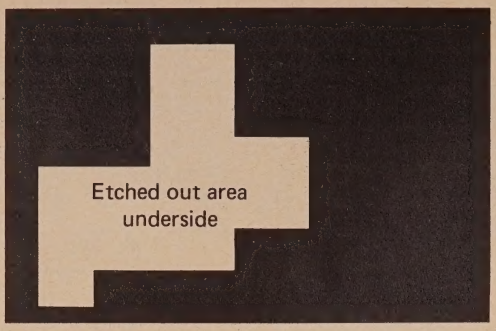
L_1 = 17t No.24,.281" x .750" slug tuned form (J.W. Miller 23A014–3, green dot)
VR_1 = Motorola R2502/MV2105, 15pf varactor diode or HEP R2502
RFC_1 = 25t No. 28, Amidon FB-43-801 "jumbo bead" (or 100μh, Miller 4632-E)
RFC_2 = 14t No. 28, Amidon FB-43-801
RFC_3 = 22t No.28, Amidon FB-43-801
D_1 = 1N456, 1N914 or similar switching diode
D_2 = 6.8/9.1v. Zener, 1N4736/1N4739 or 1N757
R_1 = 10K linear taper potentiometer
Capacitors in pf are polystyrene type

Fig. 1—The 7 MHz Seiler v.f.o. circuit. Capacitors in pf are polystyrene type.

ever, the potentiometer can be heat-sensitive, as with any other part of the circuit. Excessive heating or cooling will cause a significant change in its resistance, and hence, vary the level of control voltage and frequency. Otherwise, no problems arise. Another advantage of the varactor diode approach is that the tuning potentiometer can be located at any distance away from the v.f.o. board, since the leads bear no r.f. current and have no effect on frequency except in terms of total resistance, which, in relation to the potentiometer resistance, will always be totally negligible.

Linearity of bandspread tuning will depend upon selection of voltage divider values (R1, R2, and R4 if it is to remain in the circuit) which will produce a constantly changing voltage as the potentiometer is rotated. These values can be determined experimentally using a v.t.v.m. A glance at the manufacturer's capacitance vs. reverse bias voltage chart will show the minimum-maximum voltage spread necessary to produce a given change in capacitance, so initial selection work can be done without actually inserting the varactor into the tuned circuit. The April, 1975 QRPp column provides information on initial calculations of approximate capacitance changes required for a given bandspread in the specific LC circuit (p. 40). With the R1-R2 shown bandspread will be nonlinear: cramped at the lower frequency end, and spread out at the upper frequency end. The use of a three resistor scheme would produce more linear results, but the present approach was deemed adequate for a transmitter, and it is not difficult, in fact, to zero-beat stations with only a ½ inch knob on the potentiometer; the addition of a vernier results in considerable improvement in bandspread. With the values shown in fig. 1, bandspread on 7 MHz is about 80 kHz. Since this results in 160 kHz when doubling to 14 MHz, a possible scheme for attaining better bandspread on 20 meters is to switch between the 220 ohm R2 shown, and another much larger resistor (2.2-4.7 K or larger) in order to reduce the amount of change in voltage produced across R1 as it is rotated. This suggested alternate scheme is shown in fig. 1.

Since the v.f.o. runs continuously so as to enhance stability, the oscillator signal may leak through the receiver and interfere with the desired incoming signal. SW1 switches R4 in and out of the circuit to produce a change in varactor control voltage which causes an oscillator frequency shift or "offset". This removes the oscillator from the operating frequency until SW1 removes R4 from the circuit, and the oscillator returns to the operating frequency. This switching could be accomplished automatically with the addition of transistor switch circuitry, but this was ruled out as adding to the complexity of the circuit. The offset resistor R4 can also be utilized for achieving better bandspread for 20 meters. By using a 15K ohm R4, the 100 kHz 20 meter c.w. band can be



FOLD ON DOTTED LINE TO FORM TWO FOIL SIDES OF PC BOARD

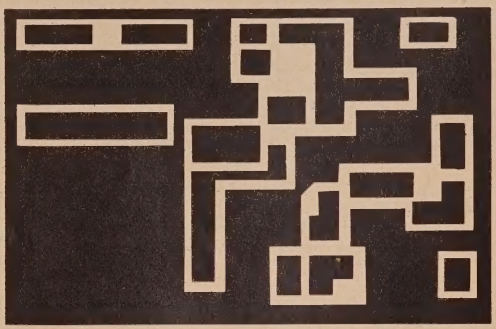


Fig. 2—Full sized templates (p.c. board) for the Seiler v.f.o.

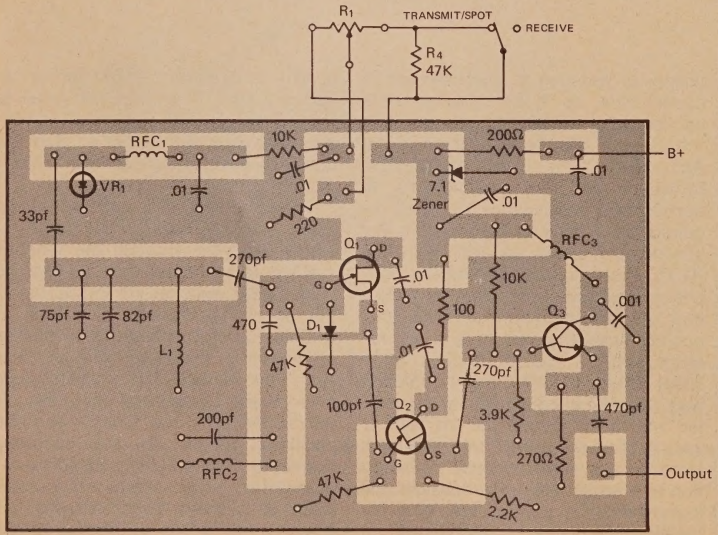


Fig. 3—Parts placement for the 7 MHz Seiler v.f.o.

spread out over a full rotation of the R1 tuning control, and still provide usable offset on 40 meters. In this case 20 meter offset is had by putting SW1 in the 40 meter position, and vice-versa for 40 meters.

Oscillator Circuit

The heart of the oscillator circuit is comprised of the gate-source components, consisting of L1, $Cl_{a\text{-}d}$, C2, C3, C4, and RFC2. Any change in the values of these components will affect the frequency of the oscillator, and any instability in them will cause instability in the oscillator. The optimum operating level of the circuit is established by the L1/$Cl_{a\text{-}d}$ ratio, the degree of coupling through C2, and the feedback level established by the C3-C4 voltage divider.

L1 and $Cl_{a\text{-}d}$ are selected to resonate in the desired frequency range, bearing in mind that series-parallel C2-C3-C4 will add to the total capacitance represented by $Cl_{a\text{-}d}$. Generally an L1-$Cl_{a\text{-}d}$ ratio will be found that will provide maximum v.f.o. output. The ratio of fixed parallel capacitance ($Cl_{c\text{-}d}$) to variable capacitance ($Cl_{a\text{-}d}$) will determine the amount of frequency shift available. An increase in the variable to fixed capacitance ratio will increase the bandspread available. The April, 1975 column provides information for initial calculations of variable vs. fixed capacitance required for a given shift in frequency. In making calculations, bear in mind that $Cl_{a\text{-}b}$ are in series, and the total parallel capacitance presented by the two will be smaller than either alone. The *ARRL Handbook* provides formulae for calculations. In general, the larger Cl_a is, the greater effect on frequency Cl_b will have.

Two capacitors are shown at $Cl_{c\text{-}d}$ in parallel, and could be replaced by a single 157 pf capacitor. The reason for using two rather than one is to split the r.f. current between them and decrease the possible foil heating effects which can arise from that current flow. Silver mica capacitors have been found to be noticeably affected by r.f. currents in oscillator circuits and often are a source of heat-releated drift. Polystyrene or NPO ceramic disc capacitors are far superior to silver micas in this respect. If temperature compensation is desired, $Cl_{c\text{-}d}$ can be traded off with the proper N750 compensating capacitors until heat drift effects are cancelled. But this can be a quite laborious trial-and-error task and was deemed unnecessary for the present project, which is quite stable without temperature compensation.

The operating level and gain of the oscillator circuit is determined pri-

(Continued on page 112)

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

"Well, by golly, 1977 is drawing to a close," said Pendergast. "Here I am, a year older, and not a penny richer." He closed his logbook and pushed aside a stack of QSL cards that he was filling out.

"What do you think was the DX highlight for this year?" I asked.

"That's easy," replied my friend. "The outstanding DX highlight was the slow increase in the sunspot cycle during 1977 and the start of the new sunspot cycle 21. Already the bands are picking up. Fifteen meters is jumping and have you listened on 10 meters? That band is finally beginning to show signs of life."

"Do you want to make a guess as to when this new sunspot cycle will peak and what that peak will be?", I asked.

"Certainly," replied Pendergast. "My motto is *often in error, never in doubt.* Based on that presumption, I'll bet the cycle peaks during the fall of 1982 and the peak numbers will be between 55 and 75." He scribbled the numbers on a piece of paper and handed it to me.

"We'll just have to wait and see what George Jacobs, W3ASK, has to say about this in his column," I said.

"Don't forget that George gets his propagation data from me," laughed Pendergast, as he dismissed the subject with an airy wave of his hand. "Suppose we stop second-guessing and talk about antennas. They provide the results, regardless of the sunspot number!"

"O.K.," I said briskly. "Let's start out with our friends 'down under,' specifically the magazine *Amateur Radio,* which is the publication of the Wireless Institute of Australia. There's a nifty article by VK5TT and VK3MO concerning the effect of the ground on the directional pattern of a 20 meter Yagi beam antenna.

"The problem was to determine the actual directional pattern of VK3MO's antenna which consisted of stacked 20 meter, three element Yagis. The top Yagi was at 100 feet.

*48 Campbell Lane, Menlo Park, CA 94025.

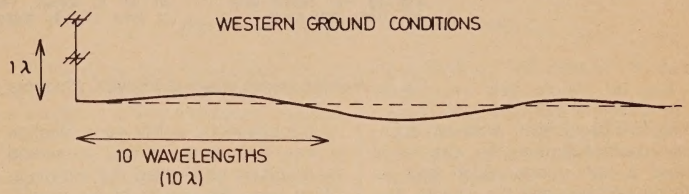


Fig. 1—Ground conditions at VK3MO to the west.

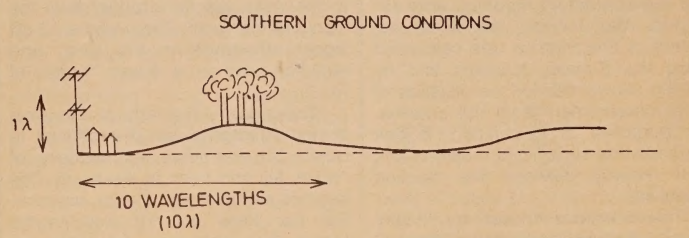


Fig. 2—Ground conditions to the south.

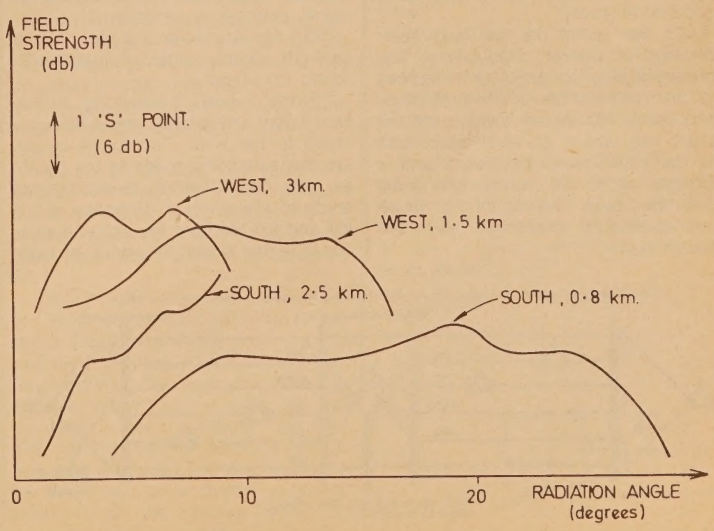


Fig. 3—Field strength measurements at VK3MO made by airplane. (Courtesy of WIA.)

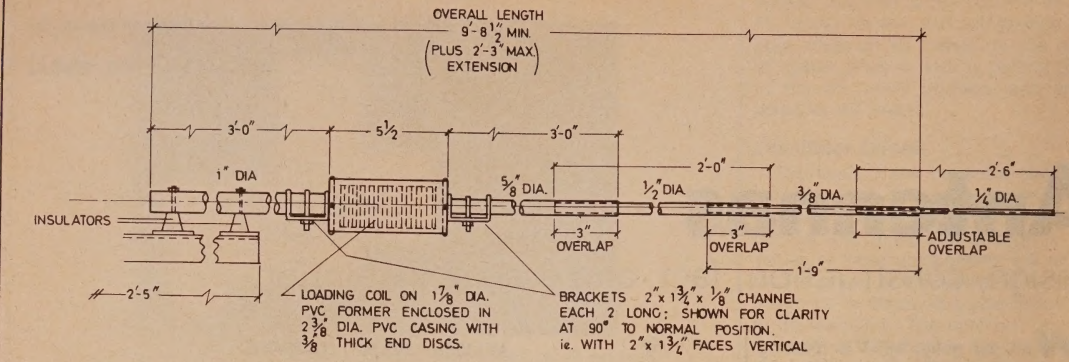


Fig. 4—Half the loaded dipole at VK3AZX. (Courtesy of WIA.)

"A TS-520 receiver with an accurately calibrated S-meter was taken aboard a light plane which had an antenna tied between the wheels. The plane flew at various heights and headings relative to the Yagi antenna and signal strength readings were recorded. After landing, the directional pattern of the antenna was calculated using the S-meter readings and by making allowances for the distance of each measurement from the antenna. For purposes of calculation, it was assumed that the emitted radiation was from midway between the stacked antennas.

"The directions chosen for inquiry were to the west and south of the antenna (figures 1 and 2). The land was clear to the west for at least 10 wavelengths. The soil in this direction was volcanic in nature, having reasonably good conductivity.

"To the south, the soil was sedimentary of poorer conductivity. The ground rose at an angle of 4 degrees to the antenna for a short distance and about 150 meters away, atop the slight rise, was a grove of trees. Also to the south were the house and a garage, about 0.5 wavelength away from the tower. The top of the house was about 0.25 wavelength below the lowest beam."

"It looks like a pretty good location to me—in both directions," remarked my friend as he studied the drawings. "What were the results of the tests?"

"Well, the results were very interesting," I replied. "First of all the signal to the west was far stronger than the signal to the south. There was a 12 dB signal advantage to the west, and radiation was at a lower "angle of fire."

"The signal advantage to the west is very interesting, but it is difficult to isolate the individual contributions of house, hill and trees to the south. The treetops are level with the top antenna. But the trees are 10 wavelengths (nearly 800 feet) away from the antenna. The hill subtends an angle of four degrees to the antenna, so radiation below this angle is effectively blocked. Even so, the difference in signal strength is profound."

"Did the article have a plot of field strength versus angle of radiation?" asked my friend.

"It did," I said. "Look at fig. 3. The two higher curves are measurements made to the west. The lower curves are measurements made to the south. As you can observe, measurements made to the south at distances of 0.8 kM and 2.5 kM from the antenna were considerably down in signal strength compared to the western measurements."

"It's a puzzlement," admitted Pendergast as he studied the drawings. "I can see that the hill to the south could cut off *some* low angle radiation and the presence of the house *may* have some slight affect. But how do you account for the tremendous difference in signal strength between the two directions?"

"My guess would be soil conductivity," I replied. "I just hope that VK5-TT and VK3MO have the opportunity to make further measurements to try and isolate the various factors. After all, the question of what makes one location better than another one is vital and of interest to all radio amateurs!"

"Anything else from Australia?" asked Pendergast as he copied the antenna data in his notebook, pushing the pile of QSL cards to one side with his elbow.

"Yes, indeed. VK3AZX has a great article in *Amateur Radio* concerning a short 40 meter loaded dipole (fig. 4). The drawing shows half the dipole. Overall length is about 22 feet. Since the antenna is quite short, the bandwidth is rather narrow, being about 1.2-to-1 over 15 kHz. That gives an operational range of about 50 kHz before the s.w.r. tends to get out of hand.

"VK3AZX has compared the compact dipole against an inverted-V antenna and a vertical, loaded whip and reports that the dipole does the better job and has a lower noise level by one to three S-units.

"As far as construction goes, the drawing tells the story. Each half-element tapers from one inch diameter at the butt end to a quarter-inch diameter at the tip. The tip section is long enough so that each tip can be varied in length by 18 inches. That's a good

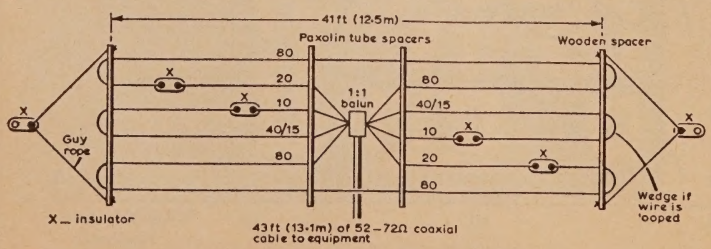


Fig. 5—Layout of the multiband dipole of G3KSK. (Courtesy of RSGB.)

idea because element length depends a lot upon element taper, and the taper is quite pronounced in this design.

"The element loading coils are wound on 1⅞" outside diameter PVC (polyvinylchloride) pipe commonly used for water lines. The coil form is 4½ inches long. End discs are made of the same material.

The coil casing is made of a 2⅜ inch length of PVC tubing, 5½ inches long.

"The coil is wound of fifteen feet of copper wire (size unspecified, unfortunately). It is closewound under tension and then spaced out by winding a thin cord between the turns. This provides a spacewound coil slightly less than 4½ inches long.

"Holes are drilled in the end of discs to take the coil form and the end discs are bolted to short sections of aluminum channel drilled to pass the aluminum elements on the parallel sides. A U-bolt through the channel clamps the coil firmly to the element sections. The bolts that hold the channel section also make connection to the coil winding so that when the coil is mounted to the element sections, a good electrical contact is made.

"The coil by itself is self-resonant at about 145 MHz. When it is complete, the casing is slid over the assembly and held in place with PVC cement.

"Lengths and overlaps of the element sections are shown in the drawing. When each assembly is complete, you have two 40 meter, quarter-wave whips, each about 11 feet long. You can test each one separately as a loaded vertical antenna working against ground plane radials. If you do this, adjust the tip sections so each one is resonant at the same frequency in the 40 meter band. However, you can mount the whips to the standoff insulators and the aluminum channel support and test the unit as a dipole."

"How about the feedpoint impedance," asked Pendergast, drawing furiously in his notebook. "Isn't it rather low?"

"Yes," I replied. "It runs close to 12 ohms. The easiest and best way to feed the antenna is to use a four-to-one balun reverse-connected. That is, to provide a stepdown ratio of four-to-one from the line to the antenna.

"The antenna can be mounted on a step ladder for preliminary test. It should be adjusted for lowest s.w.r. about 20 kHz higher in frequency than desired, because the resonant frequency will probably drop as the antenna is raised to its full height."

"That looks pretty nice," remarked my friend. "My compliments to VK3-AZX for an interesting little antenna."

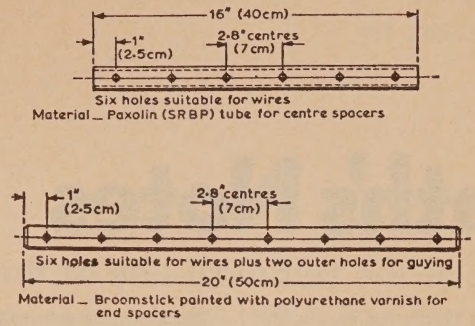


Fig. 6—Spacers for the multiband dipole.

"One more item before you run off to do your Christmas shopping. Here's a sketch of a very interesting compact multiband dipole for operation on 80, 40, 20, 15 and 10 meters (fig. 5). It is designed by G3KSK and is featured in *Radio Communication,* the magazine of the Radio Society of Great Britain. Basically, the arrangement consists of four dipoles fed in parallel and doubled back on themselves. The 40 meter dipole is used for 15 meters. G3KSK says the "construction is interesting and frustrating" as it is desirable to divide the strain equally between each of six wires. He left wire loops at the ends of the sections to make last minute adjustments.

"The assembly is 41 feet long and 20 inches wide. The spreaders are made out of wood and "Paxolin," which is something like PVC tubing. A coaxial transmission line 43 foot long was chosen because it provided a transformer action on 80 meters that boosted the low radiation resistance of the antenna to a value more suitable for the conventional pi-network circuit. It has no effect on the other bands.

"The spacers are shown in fig. 6 and a summary of dimensions is also given (Table 1)."

"It's not a bad idea," admitted Pendergast. "I think the only problem would be adjusting the tension on the various wires so that the assembly looks ship-shape when it is up in the air."

"That's right," I replied. "Why don't you build one up and try it out in your spare time? Meanwhile, you might as well read this note I just received from Dave, W7TO. He took the half-loop antenna described in June *CQ* and modified it for multiband operation (fig. 7). The vertical sections are 33 feet long and the horizontal section is 66 feet long. Dave placed a ground screen under the antenna tuning unit and laid out a number of 70 foot radials. He's had a lot of luck with it on the high frequency bands, including a WAS on 160 meters. He says it works very well on 80, 40 and 20 meters. He's also had contacts on 10 and 15 with it, but band conditions have been so poor there's no way to evaluate operation on those bands. And he says it works much better than an inverted-L antenna that he used before."

Pendergast said, "Some of the simple antennas work very well and are the answer when it is impossible to put up a more imposing antenna array."

Band (m)	λ/4 (ft)	λ/4 (m)
80	66	20
40 and 15	33	10
20	16-5	5
10	8-25	2-5

Table I—Values of λ/4 for the five bands. Note that some adjustment of length may be necessary on 80 and 40 meters due to the effect of bending back on resonance.

"Most amateurs *don't* have huge beams on high towers, contrary to what it sounds like in a DX pile-up," I admitted. "My correspondence indicates there's a great interest in simple antennas."

Pendergast sighed and reached for the pile of QSL cards. He opened his log book and started to fill out the cards. As he worked, he said, "What is your prognostication for 1978 as far as antennas go?"

(Continued on page 112)

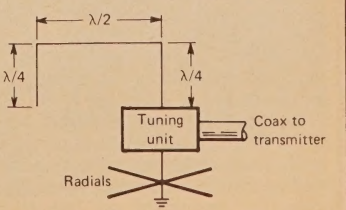


Fig. 7—The half-loop multiband antenna at W7TO. The antenna is cut for 40 meter operation, but works from 160 to 10 meters.

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

Since most electronics experimenters unfortunately cannot afford to own expensive high precision laboratory test equipment, imported, government surplus, and "kit" type equipment is usually employed. While such equipment is usually adequate for routine measurements, the accuracy and reliability of the individual items can be multiplied many times by observing a calibration and preventive maintenance program similar to the one used by industry. It is even quite possible to obtain near laboratory performance from certain pieces of equipment by a few modifications and industrial practices. This month we will suggest some ways in which an experimenter can obtain more from his equipment with little or no additional cost.

Before discussing individual items of test equipment, let us consider a few general details. All equipment purchased in "new condition" will usually operate within the rated specifications. This does not mean however, that it will operate at optimum performance. To fully utilize a test device of any kind, the following steps should always be observed.

1. All contact surfaces of probes or clips should be clean and bright.

2. Connectors, terminals, and binding posts should be tightened firmly.

3. Wires and cables should be of the proper gauge and have proper insulation for the voltages and currents involved.

4. Only rosin core solder should be used for connecting probes, alligator clips, etc. to test leads.

5. Leads which are connected to meters or generators should not be left hanging over a workbench where they will be accidentally caught by the hands or feet possibly pulling the instrument to the floor—a rather common occurrence!

6. Instruction manuals with schematic diagrams should be obtained for every piece of test equipment, no matter how simple or complex. When operating the equipment, all instructions should be followed to the letter.

*5 Melville Lane, Great Neck, NY 11020

While these six points may seem like common sense to most people, they are perhaps the most frequent causes of incorrect readings and damaged equipment to be found.

With these ideas in mind, let us now look at a few general ways that normal test equipment can be improved upon as well as cared for. Anyone using an "under $50" signal generator is probably faced with an array of r.f. connectors ranging from microphone jacks, to audio phono-jacks, not to mention some manufacturers who supply binding posts for 250 MHz signals! This procedure is fine if you are a producer of large volumes of test equipment as the savings over a BNC or UHF type coaxial connector is enormous. To assure proper coupling and shielding however, it is highly recommended that any of the popular BNC connectors such as UG1094 or UG447/U, be used as r.f. connectors. Equally important is to use good quality RG58/U coaxial cable with matching plugs as the r.f. leads instead of the cheap audio cable usually supplied. These simple measures will assure that the signal produced by the generator will appear only at the end of the cable—where you want it.

Signal generators can usually be calibrated with the aid of an inexpensive general coverage short wave receiver. Such a device is quite useful in the experimenter's laboratory as it can act not only as a wide range tunable detector for r.f., but as a receiver for the ultra-stable WWV signals. When calibrating signal generators, the use of WWV on 2.5, 5, 10, 15, and 20 MHz will asure accuracies well beyond the reading capability of the dial. To calibrate other frequencies, set the generator so that a harmonic of the frequency being calibrated falls on a WWV frequency, if possible. For non-WWV multiple frequencies, tune in standard broadcast and short-wave stations with known frequencies. A simple 0-100 logging scale attached to the receiver tuning dial will aid in the calibration of the receiver itself. Always keep the moving mechanical asemblies of the generator well lubricated and the potentiometers and switches carefully cleaned with one of the many chemicals available for the purpose. If the generator you have uses vacuum tubes it might be a good idea to allow it to operate continuously or at least the oscillator tube so that its filament is always on. This practice will enable all tubes to age properly, and greatly reduce drift and other instabilities. The addition of a voltage regulator tube and/or zener diode to the generator's power supply will also aid its overall stability.

Multi-range measuring instruments such as v.t.v.m.'s v.o.m.'s and various sorts of multi-meters are handy pieces of test equipment to possess. Many such meters are easily damaged however, by inexcusable negligence. Bent pointers, damaged movements, and burnt out divider resistors can all be eliminated by getting into the habit of simply switching the meter to the proper range *before* attaching the probes to the circuit being measured. There is nothing more distressing than to try to measure the output of a 400 volt power supply on the 10 v range of a v.o.m.

Meters should also be handled with care. Never expose one to excessive vibration, nor hammer in nails on the same table it is resting on. The jeweled bearings simply cannot take the shock and the accuracy will be impaired. A very useful and practical addition to any measuring instrument using a meter is a simple s.p.s.t. switch which sorts the movement when the instrument is either not in use or being transported. This practice heavily damps the delicate movement and prevents damage due to sudden rapid jolts of the instrument case.

One of the versatile pieces of test equipment in use today is the oscilloscope. A properly operating "scope" can be used to measure voltage, frequency, and time quite easily. The one major addition and modification before any other, should be to add a

(Continued on page 113)

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Novice—Amateur Radio Station Tips Part 2 of 5

The November 1977 Novice column started a series of related issues intended to help a Novice install an efficient amateur radio station. This month's column continues this series.

Transceiver Versus Transmitter And Receiver

Whether you build homebrew, assemble a kit, modify surplus, or buy commercial equipment, you are faced with a choice between getting a transceiver or a separate transmitter and receiver combination. The transceiver fad hit amateur radio very hard about 15 years ago and this resulted in very few separate amateur radio transmitters and receivers being manufactured since then. There are advantages to using the transceiver, just as there are reasons why you may decide to operate a separate transmitter and receiver. The following information is just intended to help you arrive at the correct decision in your own situation.

Transceivers

The word transceiver was coined from the first part of the word transmitter and the last part of the word receiver. Most early transceivers had some circuits that were used in both transmitting and receiving functions. Thanks to modern solid state devices and reductions in component sizes, the receiver and transmitter sections in today's transceivers are usually completely separate and the term transceiver just denotes transmitting and receiving equipment in a common single cabinet. Naturally, the transmitter and receiver portions of transceivers still share commonality of control circuits, power supplies, antenna changeover circuitry, and associated intercontrol between the receiving and transmitting sections. An advantage of the transceiver over separate units is that the interconnections between the receiver, transmitter, power supply, and control circuits are all inside the transceiver case.

If you do not have much room for your station you should give first consideration to a transceiver, since it is smaller than a comparable transmitter and receiver combination. Students often tell me that they are getting a transceiver because it can be used for either mobile or in a fixed station. This flexibility feature seems to be a strong point in favor of getting a transceiver but experience has shown that less than one out of every few hundred amateurs actually uses a transceiver as both a fixed and a mobile station. It would be realistic to assume that your transceiver operation would probably be from just one installation, usually the fixed station location. After you upgrade in license, you may decide to install a transceiver in your car and to install a better station in your home. If you do not switch your transceiver to mobile use after you upgrade, you will most likely sell it or trade it in towards the purchase of new gear.

A transceiver usually costs a little less than a comparable transmitter and receiver combination. Remember to compare transceiver costs against the combined cost of any transmitter and receiver, plus their required intercontrols. When considering transceiver cost, add in the costs of required accessories such as power supplies, code filter, noise blanker, crystal calibrator, external speaker, and external frequency control. Some transceivers have many features built-in, whereas most have to be purchased separately for use with transceivers.

Most transceivers are primarily designed to provide voice communication capability from a vehicle. Code capabilities of many transceivers are not satisfactory. Keying characteristics (the shape of transmitted dits and dahs) are often poor and some units emit an objectionable backwave (a signal output when key contacts are

2814 Empire Ave., Burbank, California 91504.



Here is Drew J. Pliszka (WB8YDP) of Newton Falls, Ohio. Drew is 16 years old and he has worked 43 states and 13 countries so far. His station includes a DX-60A Transmiter with an HG-10B VFO, HM-102 Wattmeter, HW-16 Transceiver, and a multiband dipole antenna. Drew has earned a 20 w.p.m. ARRL code proficiency certificate and is studying to pass the General Class written examination.



Here is part of the crowd at the 12th Annual Los Angeles Amateur Radio Convention held on May 21-22. This is actually the Lockheed Bloodbank Building and Bill Welsh, W6DDB (15 gallon Donor) was the first Blood Donor here when it opened. There was a mobile display area in the paved lot between the buildings.



Part of the mobile display area in the heat of the noonday sun. Races (K6CPT), Tristao, and others in the background.

open). Many transceivers have no delay or insufficient delay before the receiver activates (comes on) after key contacts are opened. If your delay is not long enough, the receiver is activated between each character or word you transmit when working at a slow code speed rate. Most Novices need about a three second delay and it should be adjustable so that it can be reduced as code proficiency improves. Some transceivers do not incorporate the sidetone oscillator feature, which enables you to hear your own sending while you are transmitting. This sidetone feature is important to amateurs who want to minimize sending errors by monitoring their own keying. It is not very important to be able to adjust sidetone pitch but sidetone volume should be separately adjustable to preclude the need to continually adjust transceiver volume controls. It is not particularly hard to add a sidetone oscillator to equipment lacking this important feature.

In addition to code transmitting deficiencies, some transceivers are not good for code reception on today's crowded Novice bands. Since modern SSB (single sideband) transceivers are primarily intended for voice communication use, many are delivered without a suitable (narrow bandwidth) code filter, although some have good code filters available as an accessory. There is no sense to listening to about 3000 hertz of interference from atmospherics and other stations when a good code filter (100 to 300 hertz) can be used to eliminate about 90 percent of this interference. If lack of a code filter lessens the usefulness of your transceiver, and you are unable to obtain an accessory (plug-in) code filter, you can select one of the several excellent external filter devices that are available and they will do the job very well for you. These external filters are simple to connect and use; they can be used to improve code reception of any receiver lacking this feature, such as most of the old communication receivers.

Some transceivers lack the required capability for the operator to tune the receiver above and below the transmitting frequency without also shifting the transmitting frequency. This feature is usually called RIT (receiver incremental tuning) or OT (offset tuning) on transceivers. Simply stated, RIT/OT lets you tune the receiver (only) a maximum of about 5 kHz above and below the frequency selected with the main tuning dial. This feature is very important since many operators will not answer your general call (CQ) exactly on frequency. You must be able to move your receiver to tune in a station answering your CQ call, but not answering on frequency. If you move your main tuning dial to tune in an off-frequency reply, the other station may lose you because you have also shifted your transmitting frequency. Even if the other operator does not lose you when you shift the main tuning dial, he/she may shift frequency to tune you in and you may lose their station. If two stations keep shifting frequency due to this type of problem, they may leapfrog clear out of a band. When answering another station, your RIT/OT should be set to zero (center point) or turned off, or you will not be answering exactly on frequency.

In summary, a transceiver can be an excellent choice as your first station but be sure you select one with superior code capabilities. You should also be aware that some transceivers do not fully cover all four Novice bands (3.7-3.75, 7.1-7.15, 21.1-21.2, and 28.1-28.2 mHz).

Transmitters and Receivers

If you use a transmitter and receiver, you will have to do some thinking and a bit of work to interconnect the transmitter and receiver so that they will provide optimum performance. Antenna changeover, sidetone injection, receiver muting during transmit, and other niceties that are built into transceivers must be thought out and added to separate units. Operating a receiver and transmitter is not very different from operating a transceiver, once proper interconnections have been established. However, the operator must also learn to quickly zero beat his transmitter frequency exactly to his receiver frequency when using separate units. It does take a little practice to be able to quickly match receiving and transmitting frequencies, but it is not difficult to acquire this capability. If you want to work cross band (such as listening on 40 meters and transmitting on 80 meters) per a pre-arranged schedule, you can do it with separate units but not with a transceiver. If you want to work cross mode (such as listening on SSB and sending code), this is much easier to do with separate units than with a transceiver. Cross mode is more common than most Novices think it is. It is not unusual for DX stations to answer on SSB when you make a general call to all stations (CQ) on code; this is particularly true on the 15 meter Novice band. There are several matched pairs of receivers and transmitters as both new and used equipment. These matched units provide a more uniform and acceptable appearance, which can be a factor if your station is being set up in an area where it is easily seen by others. In addition to the minor matter of appearance, these matched pairs provide almost all the advantages of transceivers (such as single frequency transceive capability and complete intercontrol between units) while still retaining the advantages of separate units.

Transmitter Considerations

Keying Characteristics

A Novice needs a transmitter with good code keying characteristics. Most modern units use grid-block keying or something similar to produce a very good output signal. Some older units use a brute force system of keying the cathode of the final stage and/or oscillator and driver stages. This brute force system is usually not as good and one often has to add an external key click filter to produce a signal that is acceptable to others on the bands.

Power

If you use a good directional antenna and a sensitive receiver, you can work stations all over the world with less than 100 watts input power to the final of your transmitter. There is no need to run the 250 watt legal Novice input power limit and running unnecesary extra power can considerably increase interference possibilities. There are many transmitters available that run 50 to 150 watts input and they will do an excellent job for you.

Frequency Ranges

Even if your initial setup does not include antennas for all bands, you should get equipment that completely covers all Novice bands. Antenna changes are not unusual with new amateurs and band preferences can change with time, so it is best to have equipment capable of being operated on all bands. Remember that Novice bands have changed several times in the past quarter century and some used transmitters do not cover all the Novice bands.

AM Voice

Many old amateur transmitters were designed to provide voice and code transmissions but the old AM (amplitude modulation) voice system is practically unknown on today's amateur bands. If you are buying this type of unit, the price should just be based on its code capability. If you have one of these old AM/code rigs, you should remove all tubes associated with its voice circuitry. These tubes draw power and generate unwanted heat. Many of these older units had been used by amateurs operating on the old 11 meter band. Be advised that the very old transmitters were de-

signed and built before television was available to the public. Such sets have little or no interference reduction and they require extensive modification to avoid TV interference. There is not a large selection of suitable transmitters available to Novices but you can find one with reasonable effort. If your finances will permit it, it is good to get a modern SSB/code transmitter that will meet your needs both as a Novice and as a General (or higher) class licensee.

Transmitter Accessories

Crystals

It is possible to have very good results operating crystal control and many of us have proven this too often to have it questioned. If your transmitter does not have a VFO, (variable frequency oscillator), used to establish transmitting frequency, you should get a few crystals to use on each band you are going to operate. Three crystals per band will provide enough flexibility to give you satisfactory operating results. Most rigs use 80 meter crystals for 80 meter output and 40 meter crystals for 40, 15, and 10 meter outputs. If you are going to operate in the 80 meter Novice band (3700-3750 kHz), a selection such as 3710, 3720, and 3730 kHz (± 2 kHz in each case) should be satisfactory. If you are getting crystals to use in the 40 meter Novice band (7100-7150 kHz), it is best to get ones ending in 2, 3, 7, or 8. There are extremely strong international shortwave broadcast stations every 5 kHz throughout this Novice band. Long range conditions improve dramatically on this band as night approaches and shortwave broadcasts boom in at 5 kHz intervals (7110, 7115, 7120, etc.). Operating between these stations can be difficult but it is possible on frequencies such as 7112, 7113, 7117, and 7118, which is why you are advised to get ones ending in 2, 3, 7 or 8. A selection such as 7112, 7123, and 7137 would be a typical good choice. The 15 meter Novice band (21,100-21,200 kHz) is twice as wide as the 80 or 40 meter Novice bands, but three rocks (crystals) will still suffice. Since most transmitters have the oscillator at 40 meters and use a frequency multiplier stage to triple up to 15 meters, the practical range of 15 meter Novice rocks is 7034 (21,102) to 7066 (21,198). Remember that crystals between 7034 and 7049 can be used to triple into the 15 meter Novice band and to quadruple into the 10 meter Novice band, providing operation on 21,102 to 21,147 and 28,136 to 28,196. Since DX activity is good at the low end of this band you should have a rock (7035-7039) to put you on 21,105 to 21,117. The 10 meter Novice band (28,100-28,200) is getting better in a hurry and activity is improving all the time. You can cover this wide Novice band quite well with just a few crystals. Since most transmitters use a 40 meter oscillator with a frequency multiplier to quadruple to 10 meters, a practical range of Novice 10 meter crystals is 7026-7049 to provide operation on 28,104-28,196. As a general rule, there is little to be gained by purchasing higher priced crystals. The lower cost crystals may not be ground as accurately as the high cost ones and their activity (piezoelectric effect) may be a bit lower, but they will function satisfactorily. Crystals are intended to be used with circuits that have a specific input capacitance (usually 22 or 33 picofarads). If you use a crystal in a circuit which does not have the designed characteristic, the resultant frequency is changed. However, this frequency shift is minor and crystals can be used in this mixed configuration. Circuit configurations differ between transmitter types and the same rock can produce slightly different frequencies if it is moved from one transmitter to another. If a crystal is intended to be used with an input circuit capacitance of 22 pfd, but is plugged into a 33 pfd circuit, the resultant frequency is slightly lowered. The resultant frequency is slightly raised if a 33 pfd crystal is installed in a 22 pfd circuit.

VFO

Some transmitters have the VFO (variable frequency oscillator) built into them and others having a matching external VFO. Many transmitters do not have a VFO but they can all be used with a VFO. It is not always easy to find a VFO on the used equipment market, but it can be done. VFO operation is much easier than crystal operation since you can just slide a little bit in frequency to get away from an interfering station. Crystal control operation forces one to do more calling to get other stations to answer on frequency. VFO operation allows one to pick out desired stations anywhere in the band and to answer them on their own frequencies. Some VFOs have internal power supplies and just need to be plugged into an a.c. power outlet and connected to the transmitter. Many VFOs do not have the built-in power supply feature and their required power must be taken from the transmitter. In either case, the VFO is easy to connect and simple to use. If you can't get a VFO when you first put your station together, it is something you should get as soon as possible.

SWR/Power Meter

Standing wave ratio (SWR) meters are used to get a rough idea of how good (or bad) the matching is between the transmitter output, transmission line, and antenna. The SWR meter is strictly a test device and it is not required for normal station operation. It is handy to borrow an SWR meter to conduct tests when the station installation is first completed. If you are going to use a longwire antenna in conjunction with a random wire tuner, you will need an SWR meter. Several newer pieces of gear have SWR metering built in for the operator's convenience. It is common practice to leave an SWR meter in the transmission line at all times but this is not really a good thing to do because it involves two more connectors and a separate length of transmission line. If one leaves the SWR meter in the line at all times, there is a slight unnecessary loss of transmitted and received signals.

Power meters are in the same category as SWR meters and the two are often combined in a single unit. A power meter is a useful piece of test equipment when checking a transmitter's r.f. output but it is not required for normal station operation.

Dummy Loads

The dummy load is used as an r.f. load for the transmitter when one performs transmitter tests and adjustments. A true dummy load does not radiate r.f. energy. It is a piece of test equipment that is not required for normal station operation.

Please understand that it is not safe to load a transmitter into a dummy load and to assume that no further transmitter adjustments are necessary when you switch from the dummy load to an actual antenna. The dummy load is a useful piece of test equipment but it does not present the same electrical load to a transmitter as is presented by an antenna. I frequently find Novices making this mistake, which results in poor operating results and ruined final r.f. amplifiers.

Amateurs often use incandescent light bulbs as dummy loads. This is a poor practice because light bulbs radiate signals and they do not act as the flat resistive load you should have when conducting transmitter tests. Light bulb dummy loads have been heard by amateurs thousands of miles away from the test location.

Part 2 Summary

The first two columns in this series about installing an efficient amateur

(Continued on page 113)

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

MERRY CHRISTMAS! FELIZ NAVIDAD! FROHLICHE WEIHNACHTEN! JOYEUX NOEL! BUON NATALE! S ROZHDESTVOM KHRISTOVYM! HAUSKAA JOULUA! SHINNEN OMEDETO! GLAEDELIC JUL! NODLAIG MHAITH CHUGHAT! KULL AM WA ANTUM BEKHIR! WESOLYCH SWIONTI CHANUKAH LESINCHAH! ST'ASTNE VANOCE! CH'ING CHU YEH SU SHENG TAN! to DXers the world over from the *CQ* DX Department staff.

The hot topic of the day, since the Federal Communications Commission mandated the use of one call sign countrywide regardless of call area, has been geographical limits for those applying for DX award certificates. Rule 1B for WPX has read as follows for the past 20 years: "All QSO's must be made from the same call area."

As the action of the FCC has rendered this rule virtually unenforceable, the CQ DX Awards Advisory Committee was asked to judge whether it should be reworded. The Committee's vote was a unanimous, albeit reluctant, yes. Several Committeemen argued that a mileage limit was highly desirable, but immediately conceded that it was no longer practical. Therefore, the new wording for WPX Rule 1B, effective immediately, is as follows: "All QSO's must be made from the same *country*."

The same philosophy will also apply to WAZ Rule 4 and CQ DX Awards Rule 2, last clause. The original wording for WAZ Rule 4 is as follows: "All contacts submitted by the applicant must be made within a 250 mile radius of the original location." The new wording is: "All contacts submitted by the applicant must be made from within the same *country*."

The original wording for the last clause of CQ DX Awards Rule 2 is: "all QSO's must be made from the same call area." The new wording is "all QSO's must be made from the same *country*."

One issue remains to be resolved, namely, should these rule changes be retroactive. Dave Aabye, W4QCU, argues strongly for the affirmative in the *De Extra* which follows.

De Extra

"The August DX column concluded with a call for opinion regarding the single-country limit vs. a mileage limit for DX awards. I am in favor of the new one-country rule for DXCC and would like to see the same rule applied to the *CQ Magazine* DX awards, *retroactively*!

"Fairness is a relative thing and no rule will be absolutely fair to all. Therefore, any award rule should strike a balance among conflicting goals and should simply attempt to be as fair as possible to all concerned. Rules should also reflect the realities of the world in which they will apply. In my view the old DXCC rule and CQ's 250 mile rule for WAZ does not comport with today's highly mobile and transient population. There can be little doubt that the frequency of work transfers has made us a nation of nomads. Most of us simply don't remain in the same location for a very long time. I believe the central question to be this—Who is penalized the greater, the relatively few people who operate for 10 years from the same location, (given a one-country rule) *or*, the people who, out of necessity, operate from several different places, given the 250 mile rule.

"It is true of course that when one operates from different, widely-spaced QTH's some relative advantage may result. In my opinion, this advantage, whether potential or real, is not too great in most instances. However, consider the inequity created by the existing 250 mile rule. My own case is both typical and atypical in that a long period of inactivity punctuates my two operating locations. In the late 1950's I was a youngster in high school operating from Chicago as K9BCK. In those years I worked 38 zones, including such countries as XZ, BV, 5A and ST. Since QRV in 1976 as W4QCU I have worked 37 zones with a vertical antenna. Between the two locations I currently have *all* zones worked (zones 23 and 28 were missed from Chicago). *But* on the basis of location, zones 23 and 28 are *more difficult* to work from Florida than from Chicago! Regardless of this fact, I am denied the WAZ award because of an arbitrary mileage restriction. In my case and surely in many others, the rule is simply unfair. Aside from this, but worthy of your thought, *CQ's* 250 mile limit permits an Italian station to travel to Monaco for a week or so to pick up a few missing zones. (Not really—WAZ rule 2 asks for the applicant's callsign. An Italian station could not legally operate from Monaco using his I-call.—DX Editor.)

The CQ DX Awards Program

S.S.B.
515...OE1SKC 516...I5NDR
517...G4AHJ

C.W.
272...W4DZZ

S.S.B. Endorsement
300...WB6DXU

C.W. Endorsement
310...W8KPL

Complete rules and application forms for the CQ DX Awards program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S.W., Seattle, Washington 98136 U.S.A.

*P.O. Box 205, Winter Haven, FL 33880.



Many a DXer owes his Sicily contact to IT9WGI in Palermo. Sr. Geraci has also qualified recently for CQ's WAZ Award using the fine station pictured above which includes a Drake transmitter and receiver.

"If I have a vote, it is cast for the retroactive application of the one-country rule. The penalty which could result is small, but the burden which would be relieved is large. Thanks for the opportunity to comment. 73, Dave, W4QCU."

DXer of the Month

This month *CQ* recognizes a prominent DXer active since the wild and wooly days of the great worldwide DXpeditions.

Bill Rindone, WA6SBO/WB7ABK, was first licensed in 1961, and got his start on the DXpedition trail with the last major Pacific and Indian Ocean operations by Don Miller, W9WNV, in the late 1960's. Since that time he has operated under 28 different DX callsigns including VQ8CB/A, VK9XX, VR4BS, G5AIA/TA, ZK2AQ, FØCSS/5R8, A35NN, IA6SBO, YMØAA, 4U2-ITU, VQ8CA, ST2SA, ST2SA/Ø and 9N1MM/7.

Bill estimates that he has traveled over "a quarter million DX miles" and made over 200,000 DX QSOs in providing new countries to the world's DXers. He established over 40 country to country, all time firsts on various bands. Among these were first North America to Burma on 40 meter s.s.b., first North America to VR5 80 meter s.s.b. QSO, first North America 40 meter s.s.b. QSO with Easter Island and first the 9N1 to North America 80 Meter QSO. He operated the first Nepal station ever on 80 meters.

Over the years Bill has won every major DX contest in the world on at least a regional basis, including several on a high score for the continent basis. Among the latter were the CQ Worldwide Phone, the CQ Worldwide C.W., the CQ WPX, the All Asian and the WAE. His current DXCC totals are 328 worked and confirmed.

For 4 years Bill was Trustee for the W6 QSL Bureau and filed over one million QSL cards during that interval.

CONGRATULATIONS! to Bill Rindone, DXer of the Month!

The DX Bulletins

A monthly DX column is no better than its sources of information, and as the year ends we would like to say thanks to the following special bulletins which provide much of the information we pass on to our readers. Names and addresses of the respective editors are provided for their recognition and to enable you to make contact with them. All active DXers should subscribe to a bulletin which can provide them with timely DX news. The listing is alphabetical:

DX News-Sheet—Geoff Watts, 62 Belmore Rd., Norwich NR7 OPU, England.

DX 'Press—A. J. Dijkshoorn, PAØTO, Jan van Gelderdreet 11, 2253 VH Voorschoten, The Netherlands. (VERON publication).

Long Island DX Association Bulletin—J. Harvey McCoy, W2IYX, P.O. Box 173, Huntington, N.Y. 11743.

Long Skip—Alan Leith, VE1AL/3, 11-311 Bunting Road, St. Catharines, Ontario L2M 3Y4 Canada (Canadian DX Association publication).

Mail-A-Prop—George Jacobs, W3ASK, 11307 Clara St., Silver Spring, Md. 20902.

North Florida DX Association News—Billy Williams, Jr., WA4UFW, 911 Rio St., Johns Drive, Jacksonville, FL 32211.

160 Meter DX Bulletin—Stewart S. Perry, W1BB, 36 Pleasant St., Winthrop, Massachusetts.



Max Gilliland, WBØNHG/WØKU, is the CQ DX Advisory Committeeman from the Mile-Hi DX Association, Denver, Colorado. Max has earned many major DX Awards including Single Band WAZ on 20 meter phone, S.S.B. WPX, the CQ S.S.B. DX Award, DXCC, WAS and WAC. He holds the Amateur Extra Class ticket, and engineering Ph.D. from UCLA and is V.P. Engineering for Denelcor, Inc. For DXing, Max uses a TS-820S with a Henry 4K Ultra to 5 elements on 20, 6 elements on 15 and 6 elements on 10 plus inverted VEES for 40 and 80 meters.

The Dxer—This publication is only for members of the Northern California DX Club and the address is withheld at the club's request.

The DXers Magazine—Gus Browning, W4BPD, P.O. Drawer DX, Cordova, S.C. 29039.

The Totem Tabloid — Chip Margelli, K7JA, 6729 Beach Drive, S.W., Seattle, WA 98137. (Western Washington DX Club, Inc. publication)

West Coast DX Bulletin—Hugh Cassidy, WA6AUD, 77 Coleman Drive, San Rafael, CA 94901.

Here and There

Single Band WAZ Plaques—To launch the Single Band WAZ Program 4 years ago, *CQ* offered a plaque for the first



Art Milne, G2MI, has been known as Mr. RSGB QSL Bureau for many years. He is one of England's premier DXers.

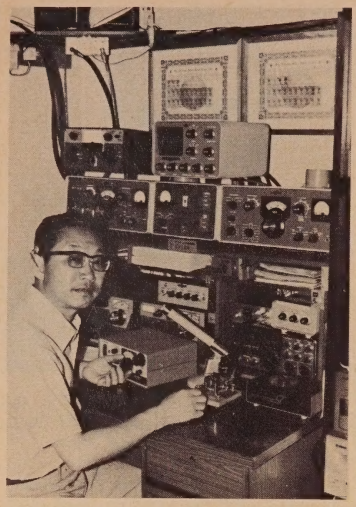
c.w. winner and the first phone winner on each band. Seven of these plaques have been awarded, but the following three remain outstanding: 80 meter c.w., 10 meter c.w. and 10 meter phone. Sunspots have been against the 10 Meter DXer, but things are looking up and an application should come rolling in soon. However, there should have been an 80 meter c.w. award as 2 have already qualified on 80 meter phone. Where are you 3.5 MHz, c.w., DXers hiding these days?

The single band WAZ plaque winners to date are as follows:

80 meter c.w.—(Up For Grabs)
80 meter phone—Fernando Juan Fernandez, EA8CR, June 24, 1975
40 meter c.w.—Stig Roskvist, SM5-AYY, Aug. 4, 1976
40 meter phone—Fernando Juan Fernandez, EA8CR, Aug. 12, 1975
20 meter c.w.—Dr. H. E. Stricker (Silent Key), Oct. 8, 1973
20 meter phone—R. G. (Bob) Parlin, WØSFU, Jan. 19, 1974
15 meter c.w.—Charles H. Jackson, SV0WTT, Oct. 5, 1975



Dr. Heribert Rechl, DL1MD of Murnau, West Germany. Dr. Rechl is the first European to earn the CQ WPX Award of Excellence. Congratulations OM from all the CQ staff.

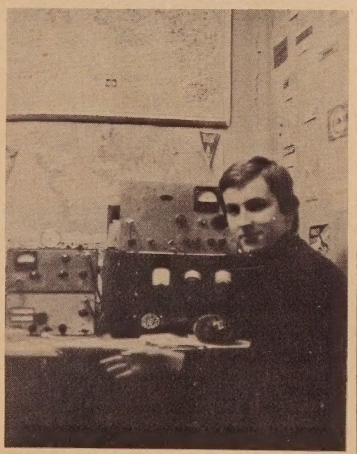


Akira Tani, JA1BN, with 316 countries confirmed is one of the best DXers from a country which produces more than its share of the world's top operators. Akira recently earned Single Band WAZ #47 on 20 meter phone. He uses the Collins S-line and the Drake line to a homebrew linear feeding a Mosley tribander. For QRP operation he uses a Heath HW-7.

15 meter phone—Franz Langner, DJ9ZB, Sept. 17, 1975
10 meter c.w.—(Up For Grabs)
10 meter phone—(Up For Grabs)

The first Single Band WAZ #2, on 80 meter phone, was won by Dale Hoppe, K6UA from the USA.

Caribbean Islands—In the September, 1977 DX column we listed a number of possible DX QTH's which might be available for the enterprising DXer interested in being on "the other end" during the CQ Worldwide Phone and C.W. DX Contests. K4IIF would appreciate learning of your experiences with licensing and accommodations if you tried one of these locations, and would also appreciate your suggestions of other DX QTH's for future listings.



SP5EWY, owned and operated by Dick Tymkiewicz of Warsaw, Poland, has worked all 40 zones on 20 meter c.w. The station includes a 90 watt, homebrew transmitter to a ground plane antenna. Dick has been licensed since 1971 and has worked over 260 countries. His sister, Danuta, SP5FVI, has worked 120 countries.

80 Meter DXing—This is the title of a new handbook by John Devoldere, ON4UN, one of the world's foremost DXers on the lower frequency bands. John has turned out a very well-organized and well-written book which will be a valuable addition to the library of anyone chasing 80 meter WAZ, 5-Band DXCC, the 3.5/7 MHz endorsement on a CQ DX Award certificate or a top score in one of the CQ Worldwide DX Contests.

The ON4UN book totals 68 pages, and there isn't any grist or filler material. It's all meat! His four major section headings and the amount of space devoted to each are as follows:

1. 80 Meter Propagation—17 pages
2. Antennas for 80 Meter DXing—30 pages
3. The 80 Meter DXers Station—6 pages
4. Operating Practices for 80 Meters—15 pages

Especially useful to a contest operator unfamiliar with the band is a section devoted to frequencies used by DXers in various areas of the world.

John Devoldere knows whereof he writes, as evidenced by the almost 300 countries which he has worked and confirmed on 3.5 MHz. *80 Meter DXing* is published by Communications Technology, Inc., Greenville, N.H. 03048.

Award of Excellence — Congratulations to Bob Berge, ON4QX, the most recent winner of the CQ Award of Excellence plaque for DX operation.

VE3FXT Expedition—On Nov. 1, 1977, Dr. George A. Collins, VE3FXT, left for a year in Africa. In earlier trips, George has made over 50,000 QSOs from VE3FXT/S8 in the Transkei, A2CAZ in Botswana, 3D2HE, 9J2PV in Zambia, 7P8BE from Lesotha and 9G1HE from Ghana. George is putting up $10,000 to establish amateur radio in technical colleges and is seeking matching funds.

Prefix News

AA—Shades of the Bicentennial, AA calls are reportedly scheduled for issue in the near future. USA prefix of course!

AP2—AP2KA can frequently be heard around 14230 or 14250 s.s.b. at 1500 GMT.

AP5—AP5HQ is active evenings after 0100 GMT near 14220-225 KHz.

BV2—Tim, BV2B checks in on Wednesdays from 1100-1400 GMT near 14215 KHz on s.s.b. Sometimes he shifts to 14050 c.w. using his c.w. call, BV2A.

CF1—CF1ISH was used by the Halifix, Nova Scotia Amateur Radio Club during the International Fisheries Exhibition last summer.

CK & **CY**—These prefixes have been in use in Canada.

DT7—DT7DK is DM7DUK in East Germany.

HD8—This was a special prefix requested for the benefit of WPX-ers by the Galapogos Islands DXpedition Sept. 16-20, 1977. The complete call sign was HD-8CD, the suffix being the initials of Charles Darwin who developed the theory of evolution after visiting the Galapagos.

The CQ WPX Program

Mixed

593...W2HAZ
594...PAØASD
595...PAØTO

S.S.B.

993...JA5PUL
994...SP4CLX
995...OZ4RP
996...YU2DX

C.W.

1617...G3JTO
1618...PY2FFA
1619...K4ZVS
1620...JA4CTL
1621...PAØUB
1622...YU2DX

Endorsements

Mixed: 1476 W2NUT, 1335 W7LLC, 950 SP9AI, 860 N6HR, 757 WA2AUB, 600 OK1DVK, N8BM, K4ZYU, 529 W2HAZ, 459 PAØTO, 402 PAØASD.
SSB: 1000 K2VV, 660 OE1PC, 512 JA3WBK, 500 SP4-CLX, YU2DX, 310 OZ4RP, 301 JA5PUL.
CW: 1000 WØAUB, 850 K2VV, 800 VO1KE, 500 YU2-DX, 452 K6YK, 448 PAØUB, 405 SP1ADM, 400 SP6FER, 353 K4ZVS, 303 JA4CTL, 300 G3JTO, PY2FFA.
80 Meters: N6JV.
160 Meters: OK3EA.
Asia: JA3WBK, SP4CLX.
Europe: JA3WBK, SP4CLX.
No. America: OK3EA.
Oceania: JA3WBK, OK3EA, K2VV.
So. America: K4RDU, OK3EA.

Complete rules for WPX can be found in the May, 1976 issue of *CQ* Magazine. Application forms may be obtained by sending a business size, self-addressed envelope to "CQ WPX Awards", 5014 Mindora Dr., Torrance, CA 90505, U.S.A.

The WAZ Program

Single Band WAZ

20 Meter C.W.

25...SMØGMG
26...EA8BK

20 Meter Phone

55...K5OVC
56...W5ØSH
57...9H4L

S.S.B. WAZ

1389...WB5HGS
1390...WA2HIN
1391...WK4LSP
1392...W2MPK
1393...W5FFW
1394...WØLYI

C.W.—Phone WAZ

4130...JA1SXH
4131...W2MPK
4132...WØIUB
4133...OH2DW

The complete rules for all WAZ awards are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

The WPX HONOR ROLL

The WPX Honor Roll is based on current confirmed prefixes which are submitted by separate application in strict conformance with *CQ* master prefix list. Scores are based on the current prefix total, regardless of an operator's all time count.

Mixed

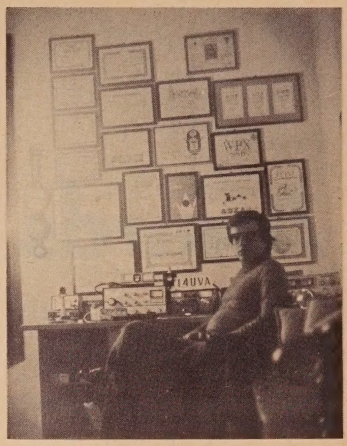
W4WV 1675	N4MM 1290	K6ZDL 1027	DL1CF 872	K8UDJ 750
K6JG 1552	W4BQY 1271	WAØKDI ...1019	W4BYU 859	K8LJG 750
F9RM 1537	K2VV 1250	SM6DHU ...1000	G3DO 849	CT1LN 749
YU2DX 1407	WB4KZG ...1230	N6JV 1000	I3ANE 848	WA5LOB 749
W2NUT 1400	PAØSNG ...1229	DL1MD 993	WØSD 844	W6ANB 741
ON4QX 1383	W9FD 1184	I6SF 988	YU1ODS 836	PY4AP 735
W9DWQ 1365	W8ROC 1181	K4KQB 960	JA1AG 831	KØBLT 733
W7LLC 1358	K5UR 1171	W4IC 950	W9WHM 811	K7NHG 719
W3PVZ 1347	WB4SIJ 1152	WA1JMP 948	YU3EY 811	WA6EPQ 713
VE3GCO ...1340	N6AV 1150	K5DB 923	W6NJU 811	PAØVB 706
YU1BCD ...1327	WØAUB 1107	WØSFU 908	W9ZTD 807	UA3FT 705
W2NC 1320	N6CW 1092	SM7TV 905	IØJX 803	OE6RP 622
W8LY 1319	YU1AG 1075	WA6TAX 899	IT9AGA 791	
W4CRW 1308	N2AC 1043	W3YHR 893	K2ZRO 782	
DJ7CX 1297	W6ISQ 1028	YU2OB 882	WA2AUB 757	

S.S.B.

F9RM 1443	HP1JC 1086	K5UR 922	N2SS 850	WA5LOB 747
W4UG 1433	YU1BCD ...1063	IT9JT 916	W4CRW 840	W2NC 730
IØAMU 1329	PAØSNG ...1034	F2MO 904	OE2EGL 839	W6YMV 720
K6JG 1277	DL9OH 1033	DL1MD 903	W6RKP 822	WB6DXU 708
I8KDB 1188	DK2BI 1003	WB4KZG 900	W3DJZ 818	CX2CN 702
IØZV 1181	WB4SIJ 1000	WØYDB 884	OK1MP 817	I4LCK 653
N4MM 1149	K2VV 1000	K2POA 883	PY3BXW 808	YU1ODS 648
I8YRK 1108	WB2NYM ...941	ZL3NS 874	W4IC 800	N2AC 630
I4ZSQ 1102	WA6TAX 925	W3YHR 868	YU1AG 785	CR7IK 613
W9DWQ 1089	CT1PK 923	DJ7CX 852	G3DO 765	

C.W.

W8KPL 1312	W4CRW 1041	WA2HZR 895	VO1KE 800	K2ZRO 649
W8LY 1300	DJ7CX 988	K5UR 892	I6SF 771	YU1ODS 639
K6JG 1205	W2AIW 972	N2AC 886	W4BYU 768	K1LWI 629
ON4QX 1197	G2GM 990	YU1AG 870	W4IC 754	OK2QX 600
DL1QT 1178	W3ARK 960	K2VV 850	SM5BNX 706	VE4OX 600
W2NC 1160	N6JV 955	IT9AGA 825	OK2BLG 698	
K6XP 1105	VO1AW 932	W6ISQ 824	OK2DB 693	
W9FD 1091	K6ZDL 915	K7ABV 812	WB4KZG 680	
YU1BCD ...1086	N4MM 905	VK3AHQ 809	KH6HC 649	



Allessandro Costa, I4UVA, is very active in the CQ DX Award's Program and holds both WPX and WAZ under his old call IT9UVA. His rig includes an R4C, FRDX-400, Italian XT600B linear, Hy-Gain tribander and a triangle loop for 40 meters. He is completing the requirements for an electronic engineering degree at Bologna University.

Amateurs in North America, South America and Asia should QSL to John Kroll, WA8TDY/K8LJG, 3528 Craig Drive, Flint, MI 48506. John is a member of the CQ DX Awards Advisory Committee. DXers in Europe and Africa should QSL to IØWDX.

IH9—IH9ONU on Panteleria Island was a special UNICEF station.

J28—This is the new prefix for newly independent Djibouti. J28AI was formerly FL8KT.

LG—This prefix is used for special purposes by Norwegian amateurs, normally LA.

OF—Finland is using the OF prefix to commemorate 60 years of independence. The normal prefix in Finland is OH.

SJ—Users of this prefix are not Jesuit priests. SJ is a new prefix in Sweden.

SP0—SP0DXC from Sept. 1-4, 1977 was a special callsign for the 10th Annual SP DX Meeting.

TF4—The Icelandic Amateur Radio Association operated TF4F from Flatey Island Aug. 6-8, 1977. QSL to the TF-Bureau, P.O. Box 1058, Rekjavik, Iceland.

U6O—The U6O stations on the air this past autumn were celebrating the 60th anniversary of Russia's October revolution.

UK1—The active station using the call UK1PAA is in Franz Josef Land.

VB3—This special Canadian prefix is assigned to the Guelph, Ontario area.

VC9—VC9UM is frequently operated by VE4VV.

VF3—This is another Canadian prefix. It is used in the Stratford, Ontario area.

XO1 & **XO2**—During the month of August, 1977, VO1 and VO2 stations were authorized to use the prefixes XO1 and XO2 respectively in conjunction with the Canadian Summer Games. XO1-CSG operated from the site of the games in St. John's, Newfoundland.

4T4—4T4AKL is OA4AKL from Peru.

Hard Zones

Zone 23—For those new DXers working toward WAZ—you should be aware that JT is not the only prefix for this hardest of all zones. A small section of the U.S.S.R., Tana Tuva, is in Zone 23. Listen for UAØ stations with the letter Y as the first letter of the suffix. For example, UAØYAD heard recently on 14027 KHz. A Mongolian station also heard recently is JT1BF on 14053 KHz at 1440 GMT.

Zone 34—This zone seems to get easier by the day thanks to the great increase in activity from Egypt. SU1IM and his daughter SU1MI are quite active using their Swan 500CX transceiver, and there are a number of stations operating portable SU. Some of these are OH6NO/SU on 14001 at 2300 GMT, OH9TH/SU on 14007 at 1930, W7FPX/SU (Jim) on 14213 after 2000 GMT, and K4SQT/SU on 14270

(Continued on page 113)



On the left is Dale Jones, K5MM/W7NQ, and on the right Moe Reda, SU1CR, who was recently relicensed in Egypt with the same call he used in the 1930's. This photo was taken in February, 1977 in Cairo during a business trip by W7NQ. SU1CR is a legend in the middle east among communications people, having been active for 40 years in YI, HZ, JY, OD5, and SU. He is the father of WBØYFM. (Photo courtesy Dale Jone, K5MM/W7NQ, ex-W7CFJ and ex-W6GEN.)

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The December, "Story of The Month" from Frank is:

Frank M. Koval, W8RSW
All Counties #160, 12-4-76
#1 All Two-Way CW

"Frank first saw daylight, December 1, 1920, in Cincinnati, Ohio where he grew up and was educated.

"His license was received in March 1938 and was put to good use in DX-ing, contests, making WPX, and participating in Traffic Nets.

"He enlisted in the U.S. Army Air Corps in 1942 and spent 2½ years in Panama in the 6th Air Force in the 28th Fighter Squadron and Army Airways Communication System (AACS).

"In April 1958, W8RSW, accompanied other members of the Ohio Valley Amateur Radio Association on the expedition to Navassa Island as KC4AF.

"On August 20, 1960, he persuaded Rita to marry him and they have two sons, Marty 16 and Mark 15, both presently attending La Salle High School.

"Frank started County Hunting on CW in 1962, never dreaming that he would eventually complete All Counties. But thanks to the efforts of many great operators, whom he met on the air, mostly on the CW County Hunters Net, he was able to achieve this feat of contacting All Counties Two-Way CW #1.

"Much credit has to be given to Rita for permitting him to forego other commitments in order to be able to spend weekends following the many fine mobile trips made by many of the other County Hunters.

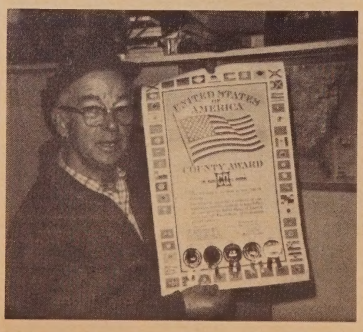
Special thanks to Gordy, WA5KQD; Bill, KØDEQ; Paul, W8CXS; Jim, K1ZFQ and *all* the others who helped him to attain this Award by mobiling to the rare Counties. Also to the Maui Radio Club, KH6RS, operators KH6BYG and KH6ILA for making the expedition to Kalawao, Hawaii for his *LAST* County!

"Frank is employed with the Cincinnati Electronics Corp./Avco/Crosley (37 years), presently as supervisor in Engineering Development Assembly. He enjoys golf, bowling, baseball and football.

For a good change of pace when DX conditions are poor, he urges all who have never tried County Hunting to check into the County Hunters Nets and meet some of the greatest operators in the world. It is quite a challenge and greatly rewarding. Thanks to *CQ* magazine for making this Award possible, and G. H. to all."

The equipment at W8RSW includes: Drake R4C, T4XC, L4B and a TH6-DXX antenna". (Ed. note—December is a good month for Frank, his birth, his All Counties, and his Story).

*P.O. Box 73, Rochelle Park, NJ 07662



Raleigh, W7PXA hoilding his All Counties #146.

Special Honor Roll
(All Counties)

#172—William B. Collins, W4YWV 8-8-77
#173—Ernest H. Scothorne, K1UNM 8-11-77
#174—Jack Prichard, W9CNG 8-20-77
#175—Grady P. Robinson, W4WHE 9-2-77

USA-CA Honor Roll

3000		2000		1000	
W4YWV	191	W4YWV	282	WA3UQR	446
K1UNM	192	K1UNM	283	K1UNM	447
W9CNG	193	WA6WCG	284	WB9OOE	448
W4WHE	194	W4WHE	285	WB2GFE	449
2500		**1500**		N5ZZ	450
W4YWV	241	K1UNM	331	W4WHE	451
W2SDU	242	WA6WCG	332	**500**	
K1UNM	243	W4WHE	333	WA3UQR	1189
K7WUR	244			WB2GFE	1190
WA2WCW	245			N5ZZ	1191
W4WHE	246			W4WHE	1192

Awards Issued

This was a big month for completions:

Bill Collins, W4YWV (wonder if he uses Collins equipment? Hi!) added to his collection: USA-CA-2000 and 2500 endorsed All SSB, All Mobiles, All 14 MHz. USA-CA-3000 endorsed All SSB, All Mobiles and All Counties endorsed All SSB.

Ben Scothorne, K1UNM (XYL June is now WB1ENJ) received USA-CA-500-#533 back in October 1965 and he finally got busy and added to his collection: USA-CA-1000, 1500, 2000 and 2500 endorsed All SSB. Also USA-CA-3000 and All Counties endorsed All Phone.

Jack Prichard, W9CNG, whose son, W9SUQ drove 1000 miles to give him his last—Hardy, West Virginia, caught USA-CA-3000 and All Counties.

Grady Robinson, W4WHE, took time out from mobiling to do his paper work and got USA-CA-500 through All Counties.

Bob Margolin, W2SDU, now K1BM, picked up USA-CA-2500 endorsed All SSB, All Mobiles.

Carol Kimber, K7WUR found time to collect USA-CA-2500 endorsed All SSB.

Howard Gifford, WA2WCW picked up USA-CA-2500.

Don Ronk, WA6WCG obtained USA-CA-1500 and 2000 endorsed All SSB, All Mobiles.

Keith Wiese, WA3UQR was issued USA-CA-500 and 1000.

Jim Latimer, WB9OOE applied for USA-CA-1000 endorsed All A-3.

Bob Baker, WB2GFE computerized for USA-CA-500 endorsed All SSB, All 20, All 80, and USA-CA-1000 endorsed All SSB, All 20.

Ross Harrell, N5ZZ (ex WA5LTQ) qualified for USA-CA-500 and 1000.

Awards

HI Award: The Radio Club Dominicano, Inc. issues the HI Award to all licensed amateur radio stations of foreign countries or from the Dominican Republic, that prove contacts with Dominican stations in accordance with the following rules. The same requirements are for SWLs.

All bands of authorized frequencies for amateur radio stations can be used in AM, SSB, CW, SSTV, RTTY or OSCAR.

All HI stations should present the QSL cards verifying such contacts.

Non HI stations should submit a certified list of QSLs in their possession and the list shall note: stations contacted, date, time (GMT), frequency and mode.

All QSOs from January 1, 1962 are valid.

This Award is permanent and will be issued in the following classes:

1. HI-100, QSOs confirmed with 100 HI stations.

2. HI-75, QSOs confirmed with 75 HI stations.

3. HI-50, QSOs confirmed with 50 HI stations.

4. HI-25, QSOs confirmed with 25 HI stations.

5. HI-5, QSOs confirmed with 5 HI stations.

Note: These rules replace the existing regulations for the HI-100 R.C.D. Award. The class 5, only can be obtained by stations from Asia and Oceania. The applications should be sent with 7 IRCs for foreign stations, and $1.00 peso for Dominican stations to: Award Manager, Ernesto Desangles, HI8EDS, P.O. Box No. 1157, Santo Domingo, Dominican Republic.

Islands Of The World-Amateur Radio Achievement Award: This Award is sponsored by amateurs residing on Whidbey Island in the State of Washington. It is available to all licensed amateurs in the world, for contacts made after October 1, 1977.

The AWARD will be issued for:

50 Islands including contact with Whidbey Island.

100 Islands including contact with Whidbey Island.

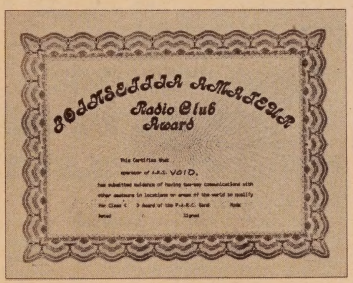
150 Islands including contact with Whidbey Island.

Maximum possible including contact with Whidbey Island.

Islands eligible are taken from the "Prefix By Country List", with the exception of Whidbey Island, as they appear in the Radio Amateurs Callbook. Each island must also be recognized as such by the National Geographic Society (At the moment the list totals 162 Islands).

To obtain this Award, proof of contact must be submitted on a self-prepared list showing the Island's Name, callsign of the amateur contacted, date of contact. This list is to be arranged in alphabetical order by Island. Do not send QSL cards. This list must be verified by at least two Amateurs, (General Class or above) or by a local Radio Club Secretary.

Send your verified list of contacts which must include Whidbey Island, include $1.00 and a self addressed stamped envelope to: Bill Gosney, WB7BFK, 4471 40th N.E., Whidbey Island, Oak Harbor, Washington 98277, U.S.A. Foreign amateurs may exclude the fee and the stamps on their return envelope. Rules governing this Award will be reviewed annually on October 1st. This Award is NOT to be confused



Poinsettia Amateur Radio Club Award

with Islands-On-The-Air Award issued by Geoff Watts, 62 Belmore Road, Norwich NR7 OPU, England.

Worked All California Counties Award: This Award is sponsored by the Poinsettia Amateur Radio Club. There is no time limit, so check your old QSL cards. Any band, any mode, in the Amateur bands OK, but Repeater contacts are not valid. A QSL card must be submitted for at least 20 California Counties, of which one must be a P.A.R.C. member—this is the minimum requirement for the Award. After complying with the minimum, you may submit California Counties in groups of ten on the way to a total of 58. All your contacts must be made from the same County. Portable or mobile units may be worked, these stations may confirm more than one County. Mobiles can not apply for the Award. Each QSL must have the County claimed printed or written on



If you were lucky enough to work T75AA, during September 16, 17 or 18th, send $2.00 to C.R.A.G., P.O. Box 115, Guatemala City, Guatemala.

it. Cost of the Award is $1.00 plus return postage for your QSL cards. The $1.00 is a *one time* fee. Return postage for QSLs only, for endorsements. Send entries to: Poinsettia Amateur Radio Club, P.O. Box 268, Ventura, California 93001, Attention: Awards Chairman. Schedules can be made by writing to the aforementioned address. A member will arrange a schedule with you. The Award is available to all licensed amateurs.

P.A.R.C. Special Award: Sponsored by the Poinsettia Amateur Radio Club.

1. Spell the words, "Poinsettia Amateur Radio Club" using QSL cards.

2. All contacts and cards must be dated after January 1, 1976.

3. Use letters from the suffix of the call sign. Use only the first or last, but not both. i.e. Use all first or all last, not a mixture of both.

4. Submit QSLs with $1.00 plus return postage for your QSLs.

5. Send to Poinsettia Amateur Radio Club, P.O. Box 268, Ventura, CA. 93001.

6. At least one QSL must be from a member of P.A.R.C.

P.A.R.C. First Award: Sponsored by the Poinsettia Amateur Radio Club.

(Continued on page 114)



HI Diploma

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 29.9 for August, 1977. Daily values ranged from a low of 15 on the 2nd and 23rd, to a high of 42 observed on the 15th and 22nd. This monthly level of solar activity results in a 12-month smoothed sunspot number of 18, centered on February, 1977. The sunspot cycle is measured by the level of smoothed sunspot number.

The *official* starting date for the present solar cycle, Cycle 21, has been determined as March, 1976. The smoothed sunspot numbers recorded during its first year of existence are shown below.

Cycle 21

March,	1976—12	Sept.,	1976—14
April,	1976—13	Oct.,	1976—13
May,	1976—13	Nov.,	1976—13
June,	1976—12	Dec.,	1976—15
July,	1976—13	Jan.,	1977—17
Aug.,	1976—14	Feb.,	1977—18

A smoothed sunspot number of 34 is forecast for December, 1977.

Typical wintertime propagation conditions expected during December should result in higher daytime frequencies and improved DX conditions on *10, 15* and *20* meters during the hours of *daylight*. It also means longer hours of darkness and considerably lower static levels, which should result in improved DX conditions on *40, 80* and *160* meters during the hours of darkness. All-in-all, it should be a relatively good month for DX propagation, whatever h.f. band you may operate on.

Expect *10* meters to open to several areas of the world when conditions are at least LOW NORMAL, with considerably improved chances when conditions are HIGH NORMAL or better. Signals should peak towards Europe, Africa and the east before Noon; towards South America during the early afternoon and towards the Pacific and Australasia during the late afternoon.

DX openings on *15* meters should follow a similar pattern, but the band should open considerably more often then *10* meters, stay open longer, and with generally stronger signal levels.

Look for *20* meter openings to just about every area of the world during a two-to-three hour window beginning at sunrise. Signals should peak towards Europe and the east around Noon; towards Africa during the late afternoon; towards South America during the late afternoon and into the early evening; towards the Far East, the Pacific area and Australasia during the early evening and towards Antarctica during the evening to about 10 p.m.

DX openings on *40* meters should begin during the late afternoon, with the first signals coming from Europe. After sundown the band should open to Africa and to South America. Signals from the Pacific area, the Far East and Australasia should peak just before sunrise, but the band should be open in these directions several hours earlier.

Good DX openings are also expected on *80* meters between sundown and sunrise. Signals from Europe, Africa and the east should peak before Midnight; signals from South America should be in for most of the hours of darkness, and signals from Australasia and the Pacific area should peak just before sunrise.

This should be a good month for *160* meter DX conditions. Check for openings towards Europe and the east beginning about 8 p.m. in all time zones, and lasting until about 2 a.m. in the EST zone; 1 a.m. in CST; Midnight in MST and 11 p.m. in the PST zone. Some openings towards the south, particularly to the Caribbean area and to Central America and the northern countries of South America, should be possible from about 10 p.m. to 2 a.m. in all time zones. Openings towards the Pacific and Australasia favor west coast stations, but it may be worth looking for them in all time zones between 4 a.m. and sunrise. Remember that DX conditions tend to peak on *160* meters about the time that the sun *rises* at the *easternmost* terminal of a DX path. This year's ARRL *160* Meter Contest will take place Dec. 2-4.

For *short-skip* openings during December of less than 250 miles, try *80* meters during the day and *160* meters at night. For openings between 250 and 750 miles, 40 meters should be best during the day and *80* during most of the nighttime hours, along with *160* meters. Between distances of 750 and 1300 miles, try *20* during the day, *40* during the early evening and *80* meters later in the evening and through-

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Dec., 1977

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Day				
Above Normal: 7, 23	A	A	B	C
High Normal: 6, 16-17, 22, 24, 29	B	B	C	D
Low Normal: 1-2, 5, 8, 13-15, 20-21, 25-27, 30-31	B	C	D	E
Below Normal: 3-4, 9, 12, 18-19, 28	C	D	E	E
Disturbed: 10-11	D-E	E	E	E

Where *expected signal quality is:*

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

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

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

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index,* use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a propagation index of (3) will be fair (C) on December 1-2; poor (D) on the 3rd and 4th; fair (C) on the 5th; good (B) on the 6th, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

*11307 Clara St., Silver Spring, MD 20902

out the hours of darkness until sunrise. Try *40* meters again for an hour or so after sunrise. For openings between 1300 and 2300 miles, *20* meters should be optimum during most of the daylight hours, but check *15* meters during the afternoon. Try *40* during the evening to about Midnight, *80* from Midnight to sunrise, and *40* meters again for an hour or so after sunrise. An occasional short-skip opening between approximately 1500 and 2300 miles should be possible on *10* meters during the afternoon, particularly when conditions are HIGH NORMAL or better.

V.h.f. Ionospheric Openings

Expect quite a bit of meteor activity during December. *Geminids,* a major meteor shower, should begin on December 12 and last for about three days. Maximum intensity is expected at approximately 10 p.m. EST on December 13, with an expected meteor rate of about one a minute. This should permit fairly good meteor-type openings on both the *6* and *2* meter bands. A second, but somewhat less intense shower period is expected later in the month. Called *Ursids,* it should take place on December 21 and 22, peaking at about 1 p.m. EST on the 22nd. A meteor rate of about 15 per hour is expected during its peak.

A secondary seasonal peak in sporadic E ionization often occurs during December (the major peak takes place during the summer months). This should result in an occasional short-skip opening on *6* meters, between distances of approximately 800 and 1300 miles. Conditions generally peak during the late afternoon and early evening, but short-skip openings can occur at other times as well. Also check for sporadic E short-skip openings over distance between about 400 and 1300 miles on both the *10* and *15* meter bands.

Some auroral-type v.h.f. ionospheric openings are also likely to occur during December, particularly during periods of ionospheric storminess. Check the "Last Minute Forecast" at the beginning of this column for those days during December that are expected to be BELOW NORMAL or DISTURBED.

The Editor of this column would like to take this opportunity to extend his warmest wishes to everyone, everywhere during this holiday season.

73, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation Index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

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

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

December 15, 1977-February 15, 1978 Time Zone EST (24-Hour Time) EASTERN USA TO:

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

Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	08-10 (1)	08-09 (1) 09-12 (2) 12-13 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	16-18 (1) 18-20 (2) 20-00 (1) 00-02 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*
Northern & Central Europe & European USSR	*Nil*	08-11 (1)	07-08 (1) 08-11 (2) 11-13 (1) 22-00 (1)	17-19 (1) 19-22 (2) 22-01 (1) 19-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-11 (1)	06-09 (1) 09-14 (2) 14-15 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Western Africa	09-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-19 (1) 22-01 (1)	18-21 (1) 21-23 (2) 23-01 (1) 19-22 (1)*
Eastern & Central Africa	10-12 (1)	08-11 (1) 11-13 (2) 13-14 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	19-23 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-13 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	18-19 (1) 19-21 (2) 21-23 (1)
Central & South Asia	*Nil*	18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-08 (1) 19-21 (1)
South-east Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	04-07 (1)
Far East	16-18 (1)	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-07 (1)*

(Continued on page 114)

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

This month's comments will be devoted to making corrections of errors and omissions.

The number one "goof" was the mistaken identity of one of the fellows in the photo in my October column. The chap on my right was listed as Don Reibhoff, CT4AT, which was wrong. Don was in the area but it was Erik Sjolund, SMØAGD who took time out to pose with us.

It was an understandable mistake. Both are par-excellent DXers, both are tall and bearded and both were casually dressed. Don however is the taller of the two. Sorry about that fellows, I caught the error but not before the copy went to the printer.

1977 Results
PACC Contest

N2CW	455	N4MM	25
W9OHH	364	W8VSK	20
K4IEX	351		
W3ARK	144	VE1MX	697
W9QWM	66	VE3EJK	153
WØBMM	48		

See W8IMZ's WPX Contest story in this issue for an authentic photo of Don, CT4AT.

Corrections and additions to the Contest results will be found under a separate addendum. The changing of three Phone Trophy winners was made because 6W8A, 8PØA and VE7BC were previous winners last year (Same stations but using special calls).

We try to keep the record straight whenever an error is made but we are not always successful. Let me know if you have a gripe about contest matters or awards and we will try to have it corrected. However make it in a letter to me, not a note or remark in your contest log. It may be months before I know about it.

That also goes for announcements and other material for publication.

Best wishes for the coming Holidays and a prosperous New Year full of DX goodies.

73 for now, Frank, W1WY

*14 Sherwood Rd., Stamford, Conn. 06905

Calendar of Events

Dec.	2-4	ARRL 160 C.W. Contest
Dec.	3-4	TOPS 80 Meter Contest
Dec.	3-4	Spanish Phone Contest
Dec.	3-5	North Carolina QSO Party
Dec.	10-11	Spanish C.W. Contest
Dec.	10-11	ARRL 10 Meter Contest
Dec.	10-11	Hungarian C.W. Contest
Dec.	17-18	S.O.W.P. QSO Party
Jan.	7-8	YU 80 Meter Contest
Jan.	7-8	ARRL VHF Sweepstakes
Jan.	14-15	DL QRP C.W. Contest
Jan.	27-29	CQ WW 160 DX Contest

North Carolina QSO Party

Starts: 1900 GMT Sat., December 3
Ends: 0100 GMT Mon., December 5

This one is sponsored by the Alamance A.R.C. of Burlington, N.C.

Exchange: RS(T) and QTH. County for N.C. stations; state, province or country for others.

Scoring: One point for each contact. The multiplier for N.C. stations is the sum of states, provinces and DX countries worked. Out-of-state stations use N.C. counties for their multiplier. (max. of 100).

The same station may be worked once on each band and mode, and each county change for mobiles and portables, for QSO points. (Mobiles get credit for an additional multiplier for each country change.)

Frequencies: c.w. — 3560, 7060, 14060, 21060, 28060. s.s.b. — 3900, 7270, 14290, 21390, 28590. Novice— 3720, 7120, 21120, 28120.

Awards: Appropriate awards will be issued to leading scorers.

Include a summary sheet with your log showing the scoring and other essential information and the usual signed declaration.

Mailing deadline is January 10th to: Alamance A.R.C., 2822 Westchester Drive, Burlington, N.C. 27215.

ARRL 160 C.W. Contest

Starts: 2200 GMT Fri., December 2
Ends: 1600 GMT Sun., December 4

This will be the 8th annual Top Band Contest organized by the ARRL. Activity will be between state-side stations, VE's and also DX. However, DX to DX does not count.

Exchange: RST and your ARRL section or country if its a DX station.

Scoring: Contacts between stations in ARRL sections earns 2 points, with other areas 5 points. The multiplier is determined by the number of ARRL sections worked, (74 possible) plus VE8 and each DX country.

Awards: Certificates to top scorers in each section and each country.

Keep the DX Window (1825-1830) clear of state-side operation, that's where you will find the DX stations calling. They will be listening 1800-1805 or on frequencies they specify. Look for KH6's at the top of the band, 1995-2000. They also will be listening down at the low end. (A recent release stated that KH6's are also permitted to operate in the 1800-1810 segment.)

Don't overlook the 1830-1850 portion of the band, activity there is usually much lighter than the bottom 25 kHz. (Check U.S. 160 Regs. for availability and restrictions.)

The usual grounds for disqualification; violation of rules, excessive duplicate contacts etc. will prevail. A large s.a.s.e. to ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no later than Jan. 10th 1978 and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, Conn. 06111.

TOPS 80 Meter C.W. Contest

Starts: 1800 GMT Sat., December 3
Ends: 1800 GMT Sun., December 4

This is the TOPS C.W. Club's annual contest, and as the title indicates the activity will be on 80 meters. For the contest it will be between 3.5 and 3.6 MHz, with DX on the low end.

Entries may be single or multi-operator.

Exchange: RST plus a contact number starting with 001.

Scoring: Contacts within own country, 1 point. With stations on the same continent but a different country, 2 points. With stations on other continents, 5 points. Contacts with HQ stations, GW8WJ or GW6AQ, are worth 25

points. (Each call area in W/K, VE/VO, UA and VK count as separate countries.)

Final Score: Total QSO points multiplied by number of different prefixes worked. (Same as WPX.)

Enclose a s.a.e. and IRC for copy of results.

Mailing deadline for your entry is January 31st to: Peter Lumb, G3IRM, 14 Linton Gardens, Bury Saint Edmunds, Suffolk IP33 2DZ, England.

VHF Space Net Winners

CLASS I
WA2PVV, WB5CHW, WA9MEM
CLASS II
W3CL, WB8RNY, W3ETB
CLASS III
WB5KTC, WB2ELB, W4BAV
CLASS XYL
WB5KTC, WA2SMN, WB8WXZ
CLUBS
Mt. Airy, Foothills, So. Cal.

Addendum to the 1976 CQ DX Contest Results

Phone Trophy Winners

Africa—Single Operator, All Band
EL2T, Charles A. Unglesbee
(Donor: Gordon Marshall, W6RR)
Canada—Single Operator, 14 MHz.
VO1HH, Max Powell, Jr.
(Donor: Gene Krehbiel, VE7KB)
Carib./C.A.—Single Operator, 14 MHz.
KZ5FR, Fred Regennitter
(Donor: Pedro Piza, Jr. KP4AST)

Phone Corrections

G3TJW—82,082 pts.—3rd World High 3.8 MHz.
G3NLY—70,656 pts.—5th World High 3.8 MHz.
YV4CB—155,312 pts.—5th World High 28 MHz.
4J3AM multi single was listed under Asiatic USSR. It should be under European USSR.
W8JGU 14 MHz incorrectly listed as W8JGW

Phone Additions

K5LWL's Band-by-Band breakdown.

80	15
99/18/49	341/26/81
40	10
181/21/47	83/18/46
20	
359/30/92	

C.W. Omissions

The World Single Operator All Band Trophy won by KP4AST, operated by "Chip" Margelli, K7VPF, the name of the donor Larry LeKashman, W2AB, was inadvertently left out.

Ditto for the name of the operator of K4VX, 6th high for the U.S.A. on all bands. It was Phil Allardice, WB4SGV.

Spanish DX Contest

Phone: Dec. 3-4 C.W.: Dec. 10-11
Starts: 2000 GMT Saturday
Ends: 2000 GMT Sunday

It's the world working the Espanoles on phone and c.w. in this one. This year for the first time phone has been included and will be held on a separate week-end.

Only single operator operation is permitted, on all bands 3.5 thru 28 MHz.

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

Scoring: Contacts between EA stations and the Phillipines and Hispano-american countries are worth 3 points. Following prefixes will be considered 3 pointers. DU, CE, CM/CO, CP, CX, HC, HI, HK, HP, HR, KP4, LU, OA, PY, TG, TI, XE/XF, YN, YS, YV, ZP or equivalent prefixes.

Between EA and all other non-Hispano and non-European countries 2 points.

Between EA and Europeans 1 point. (WAE boundries.)

Multiplier: For EA, each DXCC country worked on each band. All others use EA call districts worked on each band.

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Awards: Gold, Silver and Bronze medals to the first 3 place winners, phone and c.w., in Spain and overseas stations. And certificates to first place winners in each country. A minimum of 100 points required to qualify. (K3ZO was the only state-side winner last year.)

Include a summary sheet with your log showing the scoring and other pertinent information, the usual signed declaration that rules and regulations have been observed, and your name and address in Block Letters.

Your entry must be postmarked no later than Feb. 15th to: U.R.E. International Contest, P.O. Box 220, Madrid, Spain.

ARRL 10 Meter Contest

Starts: 1200 GMT Sat., December 10
Ends: 2359 GMT Sun., December 11

This is the 5th annual 10 meter contest organized by the ARRL, and even in this period of low sunspots it has gained wide popularity.

It's a worldwide activity in which DX stations are permitted to work other DX. You are not limited to working W/K's and VE's only. The same station may be worked once on phone and once on c.w. No cross-mode however.

Exchange: Stations in the 50 U.S. states and Canada send RS(T) and their state or province. Others RS(T) and a consecutive contact number

(Continued on page 115)



Front Row—L. to R.—Our Chief, Alan Dorhoffer, K2EEK presenting the Radio Club Venezolano Multi-Operator Multi Transmitter World Plaque to Bill Walker, WB4EYX, president of the North Florida DX Assoc., for their winning effort from VP5M in the 1976 CQ WW Phone Contest. That's me, W1WY next to Bill. In the Back Row are some of the other members of the winning crew, Allen Moore WB4QKE, Dick Hicks K4UTE, Bill Beggs WB4DIU and Bernie Welch W8IMZ. The chap with his head cut off is Allen Harback WA4DRU. He's a tall one, isn't he? All this happened at Dayton last April.

Contest Comments *(from page 41)*

gest thrill was working TN8CC as last QSO of contest . . . K2BA/4X. Band condx vy FB on 20 M-Band . . . JH6EFI. I wish there were c.w. in this contest . . . JA5UBW. I worked a lot of JA stations, Hi . . . JE1FHQ. Very nice contest, many stations QSO with me. I am 13 yrs. old . . . JH4LEL. I was very glad to work 'One Day W.A.C.'! . . . JR1ANA. Participated in this contest the first time and I enjoyed. I want to do it again . . . JJ1IJS. Jackie (FHØBKZ) called me on 15 M during the lull in the European calling . . . KA6YL. How about a QRP category next year? . . . KA6DX. Within an hour of starting the contest, one of my hardest to find stations (JT1AN) called my CQ, My wife is still telling the neighbors my screaming was not from pain . . . KA6DI. The contest was a thrilling experience . . . EL3A. Troublesome damage in transceiver on Saturday morning and by that I lost several hours of operation . . . CT9BK. It sure was interesting to operate with this special call for the WPX test. Hope to get another call next year . . . CPØAT also CP1AT. Hope that there is a beam in my future . . . PY7AZQ. I was PY7VNY and got new prefix the day before contest. I'll work hard next year . . . PT7WA. Would liked to have entered the contest in earnest but the cows kept knocking the temporary antenna down . . . K4LC/PY8. Propagation very bad on Sunday (7 MHz) . . . PY2FUP. Loudest sig: ZL1BKX: 5–9 + 50 on 14 MHz. Biggest thrill: working new country AX4AAU—Lord Howe Is. (I called almost every station in the contest at least once!) . . . CEØAE. Sure would like to have a QRPp Category. XYL is happy contest season is over . . . OA8V. c.w. would be great. There are no big contests in May or June. Why not a *CQ* WPX-C.W. contest beginning next year? . . . 4T4AHA. Fine contest—many PX from Europe . . . YV2AMM. This was my last operation from OE for at least 2 years. Moved to W3. Hope to take part in WPX test from here . . . OE2BZL op.—DK5AD. 40% of the stations I worked with only 2 watt output to override the 2 kw, Hi . . . OE1SBA. I will be more active in the next contest . . . ON8XU Never did intend to have such a round score—my rotator got stuck and I got bored by this fact, so I closed down . . . OK3EA. TNX for the diploma for 1976 test . . . OZ4HW. 155 thousand more points than last year! Only goes to show what a linear, processer and a better antenna can do . . . G4ETK. 21 MHz condx disappointing as compared with earlier in month, particularly to Far East and N. America . . . G3SSO op. G8KG. Running 100 ft. down the garden in the snow showers to turn the beam. C.U. next year . . . G4AHO. I always aim to increase my score each year—which I did this year . . . G4CVZ. My 4th time (74, 75, 76, 77) on 14 MHz single op and also the best. When will you start WPX—C.W.? . . . OI2BA op. OH2BA. Got a special call OG2BH and wanted to make a big score. After first hour the electricity people went on strike and turned a.c. off. The next one can only be better . . . OH2BH. Looking for new countries on 40 M for 5 BDXCC . . . F6BFH. Number 87 and 88 were forgot (I got tired) . . . F6DLM. The log was completely computer-checked . . . DK5WN. I worked all 6 continents for WAC Award . . . DK5VO. About 2/3 of my contacts were Russian stations. Really enjoyed the contest very much . . . DJØMS. US stations should use more of 40 M split frequency to work Europe. The log was completely computer-checked . . . DK5WL. Really enjoyed this contest. Even had pile ups for my "DA1" prefix. Worked 6 new countries on 160 meters. Lets have more contest by prefix . . . DA1PQ. My rotator was broken and I had to go up to the roof several times to rotate the beam by hand . . . I6NOA. After a few hours the linear was broken. I would be very interested in a WPX contest in C.W. . . . I2MQP. Conditions good with USA—not good with Asia, especially JA . . . I1GPK. I hope my PA9 prefix was a good one . . . PA9TK. Between mounting a new kitchen, I got 3 hours free for radio from XYL . . . PAØTO Wonderful weekend, a real ball of a time with conds extra FB on Sunday . . . LA5JS. Very good contest . . . SP5ALP. Almost no VE activity on 40. Europeans and South Americans really active . . . CT4AT. Very pleased to work new prefixes as: CK, CJ, N, OI, OF, etc. . . . YO4AYE. Fine Contest . . . YQ8ATT. Here in the Mediterranean Islands old sun is shining as ever but with far too few spots . . . ISØXXD.

STATION OPERATORS

Multi-Operator, Single-Transmitter

K3RV & K3EST. **K7SV** & K7RSC. **WA4EYR** & K4UTE, W4FDA, W4ZTW, WB4EYX. **W9XR:** WA9PBK, WA9BOW. **WA9JCO** & WA9ZPR, WB9NKH. **WB1AUD** & WA1SQB, WA1QNF, WA1WEM. **WB6JOD:** W6LC, WA6HCL, WA60SQ, WB6CJE, WB6ENB, WB6POE. **W4SME** & W4BSO, W4YPX, WA4CIF, WA4PDN, WB4FAJ. **WA1VCV** & WA1TCO. **WA6DRE** & WA6ADJ, WB6LYZ. **KP4AST** & KP4EAJ, KP4EKI, KP4ES. **VE3AKG** & VE3BVD. **VP2MAQ:** W6KG, W6QL. **VE6HN** & VE6EH, VE6SB, VE6CEQ, Roy. **VB3ZM:** VE3IAT, VE3ICR. **VC9UM:** VE4VV, VE4GV, VE4UO, VE4IY, VE4NU, VE4ABZ. **K2BA/4X** & WB2CMV, 4Z4US, G3KHK, 4Z4TA, WB7EWH. **5B4ES:** Club Group. **JA9YBA:** Club. **JA3YKC:** Club. **JA3YOO:** JR3MIU, JE3SEN, JE3TYR, JF3KFS. **JA1YYB:** JE1NYS, JG1AOU, JG1DUN, JI1MJN. **JA6YFT:** JH6LAF, JH6NAC, JH6OKN, JH6RNJ. **DM2DUK** & DM2AYK, DM2CEK. **IY4FGM:** I4BFY, I4RYC, I4USC, I4VEQ, I4ZSQ. **HG5A:** HA5HO, HA5KO, HA5GF, HA5FN, HA5FM. **OK5CRC:** OK2HZ, OK2RZ, OK2SIR, OK2SFS, OK2SSS, OK2BLI, OK2AOP. **EI1AA:** EI2BB, EI2CL, EI2CN, EI3CP, EI6CW. **SJ9WL:** SMØGMG, SMØGNU. **DLØJK:** DK1DU, DK2XX, DK6FT, DK8ZL, DF2FK, DF7FR. **OH8OS** & OH8UT. **G3WAS:** G3KDB, G3NLY, G3NAS, G3LNS, G3RTY, G4EPN. **PA9TOM** & PAØGRS, PA2161, PA3347. **HA7KLG:** Club. **OH3EW:** OH2BAR, OH2TW, OH2EC, OH2RI, OH3TQ. **IBØCBM:** I2CBM, I7HH, I8JN, I2VGM. **HA9KPU:** 5 Oprs. **G3ZAY** & G3SXE, G4FAM, G4FSZ, G4FUG, BRS32525. **YU4EXA:** YU1OIQ, YU1-225. **SP6PZB:** SP6FAF, SP6FIH. **DLØUE:** DL3LU, DJ4GO, DK4ØV, SWL HAUGRUND, SWL KREMMEICKE. **G8JC:** G3RMF, G3TQD, G3TQZ, G3UDR, G3UMV, G4DXD, G4DXE, G4FAT, G8ASO, G8LAV. **OK1KSO:** OK1AEZ, OK1WT, OK1JCW, OK1SF, OK1JWA, OK1ADH. **SP9KRT:** SP9HMF, SP9HNB. **IA5AT:** I2AT, I2XG, I2BJS, I5FWT, I5WVR, I5WWW. **F6CLQ** & F6DIM. **DLØRCA:** DJ1GX, DJ7SO, DL2QB, DF3KJ. **SP5PWK:** SP5BSV, SP5CIC, SP5DZI. **YU2CTF:** YU2RLD, YU2RTI, YU2RJV, YU2RQQ, YU2RXZ, YU2RUX. **HA6KVB:** 3 Oprs. **OK1KCU/P:** OK1AHV, OK1AVU, OK1JST, OK1AGN. **IC8HTA** & IC8DAG, IC8EGJ, IC8FHC, IC8FHF. **HA4KYH:** HA4YO, HA4YQ. **PA9SMK** & PA9WRR. **HB4FF:** HB9AAA, HB9AAH, HB9AOO. **G3XEP/A:** G3XUD, G4ESS, G3YED, G3KWT, G3ZBA, G4FNG, G4DZI, G4DXA, G4FBB, G4EZX, G3PSM. **HA6KNI:** HA60H, HA6-072, HA6-073. **SP9PDF:** SP9BMQ & Group. **OK2KWI:** Club. **YU1GMN:** YU1NFR, YU1NWO, YU1QEF, YU1-RS-606. **OK3KAP:** OK3CGI & Club. **DM8TU:** DM2BUL, DM2BML, DM3OML. PI1MHN & PA3ABA. **LA4MV** & LA4WV. **OK3KWK:** Club. **OK1KCI:** 3 Oprs. **DM3BJ** & DM3KBJ. **SP9PEZ:** Club. **LH2A:** LA2AD, LA7AH, LA7JO. **OH2AR:** OH1KB, OH2BDL. **SP9KDC:** SP9IFQ, SP9-2291, SP9-3029. **PI1ARS:** PAØHTR & WBØHAT. **DM4NJ:** DM4QNJ, DM4JNJ, DM4VNJ. **OK3KJJ:** OK3CKY, OK3-18657. **PI1-KMA:** 2 Oprs. **SP6AYP/9** & SP6AAT, SP6BPY. **OK2KWL:** OK2BNX, OK2BNG. **OK1KRY/P:** OK1AQG, OK1AQO, OK1DCM. **SK6HA:** SM7FCG, SM6HYE, SM6-HIO. **SP9KCB:** Club. **AX3BHN:** VK3QQ, VK3BFA, VK3BHN. **VK4APS** & VK4-AAP/WO7ZGP. **AY8CW:** LU8CW, CX3BR, LU2AFH, LU8AGC. **LU2DNC** & LU-6EF. **PY1CHP** & PY1BAR, PY1DBE, PT2DCA, PT2CMB. **CE3AOX:** CE3BYL, CE3BNN, CE3BMI, CE3BRA. **4J9B:** UA9AN, UA9ACZ, UA9AEN, UA9-165516, Victor, Valery, Vitaly. **4J6A:** UA6HZ, UW6FZ, UW3HV. **UK9CAE:** UA9CJK, UA9CDU, RA9CGA, UA9-154365. **UK9FER:** UA9FAR, UA9FAL, UA9FAJ, UV9FN, UA9-140005, UA9-140459. **UK7LAH:** UL7LEZ, UL7-026177, UL7-026198. **UK9-UAO:** UA9UGS, UA9UKW, UA9OCE, UA9-130177. **UK8BAJ:** 3 Oprs. **UKØSAJ:** 3 Oprs. **UK7GAL:** 3 Oprs. **UK9OBI:** UA9OO, UA9-145262, UA9-145217. **UK8-BAA:** 3 Oprs. **UK7LAF:** UL7-026203, UL7-026270. **UK9FAA:** UA9FDL, RA9FKJ, UA9-140468. **UK6QAA:** UF601436, UF601467, UF601468. **UKØAAC:** UAØACQ, UAØAAK, UA0-103267. **UK90AD:** UA9ODW, UA9OEU, UA9OFB. **UK9WBD:** Club. **UK9AAQ:** UA9AAT, UA9-165616. **UKØAAB:** UAØAEE, UA0-103259, UA0-103493. **UK6FAF:** Club. **UK3ABB:** UV3CC, UW3FI, UA3ABZ, UV3CO, UA3XAC, UA3-170834, UA3-170888, UA3-170885. **UK6LAZ:** UA6-150262, UA6-150792, UB5-073113, UA6-101152. **UK3SAB:** UA3SAQ, UA3SBX, UA3SBR. **UK3AAC:** UA3HK, UA3AAH, UA3AGX, RA3ACE, UA9-154357. **UK4WAB:** 3 Oprs. **UK5QBE:** 3 Oprs. **UK2WAF:** UC2XW & Group. **UK3DAH:** 4 Oprs. **UK6YAB:** 3 Oprs. **UK5HAA:** UB5HDM, UB5HDX, UB5-071282. **UK6LKP:** UA6LLT, UA6-150330, UA6-150331. **UK5QAV:** 6 Oprs. **UK4WAR:** 7 Oprs. **UK4LAC:** UA4-164175, UA4-164212. **UK3-AAH:** 3 Oprs. **UK5EAQ:** 4 Oprs. **UK5VAA:** 3 Oprs. **UK5ECN:** 3 Oprs. **UK5JAO:** Club. **UK3YAV:** 3 Oprs. **UK2BAG:** 3 Oprs. **UK5IBB:** 3 Oprs. **UK3ABO:** Club. **UK5IAN:** UB5-0731626, UB5-0731732, UB5-0732584. **UK2PAT:** 3 Oprs. **UK2-PAO:** UP2PAQ, UP2BEJ, UP2-038574. **UK2GAB:** 3 Oprs. **UK2IAJ:** 3 Oprs. **UK5VAP:** Club. **UK5MBP:** Club. **UK4WAC:** UA4WAQ, UA4WWV, UA4-095171, UA4-095239. **UK2RAX:** UR2REE & 1 Opr. **UK3DBE:** UV3GD, UA3-142802, UA3-142272. **UK2BAS:** UP2-038609 & Group. **UK3TBT:** 3 Oprs. **UK2GCL:** 3 Oprs. **UK6AJN:** UA6-1011538, UA6-1011659 & 1 Opr. **UK3ABQ:** UA3AEO, UA3DCM. **UK4HAC:** UA4HEJ, UA4HFG. **UK3ACW:** Club. **UK2RAQ:** 3 Oprs. **UK3EAZ:** UA3-EAL, UA3-147127, UA3-147128. **UK3MBH:** 2 Oprs. **UK3DAU:** UA3DKF, UA3-1421153. **UK3ACM:** UA3-137205, UA3-170689, UA3-1701093

Multi-Operator, Multi-Transmitter

CJ3DCB: VE3BMV, VE3DCB, VE3DSS, VE3EDC, VE3FAC, VE3FFA, VE3IXE, VE3KZ. **OF1AA:** OH1TV, OH1HU, OH1IG, OH1IJ, OH1NH, OH1NK, OH3ZE, OH1LW, OH1MD. **DK3BJ** & DK2QL, DJ4PT, DK1QV, DJ1FC, DK8BH, DK5KY, DK4QT, DK3HA. **YU1BCD:** YU1NZV, YU1ODO, YU1PCF, YU1PFR, YU1QBC, YU1-RS625, YU1-RS626, YU1-RS627, YU1-RS628. **HB9AUS** & HB9DE, HB9LG, HB9NH, HB9AEB, HB9AGC, HB9AJM, HB9ALM, HB9ALX, HB9BAL, HB9MAD, HB9MEH, HB9MPS, + 5 SWL. **VE3DU** & VE1AL, VE2VY, (SH3LV), VE3ABG, VE3BBH, VE3MJ, G4ECD/VE3, (A2CCY). **PY5CIT:** PP5AJ, PY5WB, PY5CFG, PY5CMO, PY5AIM, PP5WAT, PP5AAG, PP5WAQ, PP5WAK, PY5CAX, PP5WAI, PP5WAL, PP5WAS, PP5WBW, PP5WBT. **KL7FBI:** KL7IFC/WB9BPS, KL7IXC/WB9LGG, KL7HAM, WA2AJQ/KL7, N6CQ/KL7. **N7XX** & JA1KSO, JI1HXR, JE1FFW, JA1ETQ, JR1USV, WA7OTT, K7HTZ, K7VPF. **JA3YKB:** JR3-LOO, JE3TNH, JF3GFH. **JA1YXP:** 3 Oprs. **DF3QG:** Group. **W8NGO** & W8CLR. **JAØZAV:** JAØTEN, JAØVHI.

A Bulk Ni-Cad Recharger *(from page 36)*

way the charge rate controls are wired in that the resistance can be completely removed from the circuit. If this is done one will damage the regulator transistor and/or the batteries being recharged. So, if the charger is to be used by someone unfamiliar with it, it would be a good idea to fuse each regulator circuit or to place a small fixed resistor in series with each charge rate control to limit the maximum charge rate.

If one uses the recharger to charge "spare" sets of nic-cads and desires to leave them in the charger for extended periods of time, a trickle charge feature can be easily added by switching a suitable resistor in the emitter lead of the regulator transistors. The resistance can be calculated on the basis of the trickle charge current being 1-2% of the rated ma/hr. rating of the battery type involved. For instance, 5 ma for 500 ma/hr. AA cells. The trickle charge resistors shown in fig. 1 have been calculated on this basis.

The recharger can be relatively inexpensively built in a number of forms and provides a dependable means of properly recharging anyone's growing collection of small size nic-cads. ■

QSK Relay *(from page 49)*

Electronic Instrument and Specialty Corp.
42 Pleasant St., Stoneham, MA 02180
(617) 438-5300

MD1A05—contacts: 1 amp, 100 VDC, 28 watts. coil: 5 VDC, 80 ohms (63 mA), will pick up at 4.0 VDC. operation time: 2 ms.

MS1A05M—contacts (mercury wetted): 1 amp, 250 VDC, 28 watts. coil: 5 VDC, 70 ohms (71 mA), will pick up at 4.0 VDC.

Electronic Application Company
2213 Edwards Ave., South El Monte, CA 91733
(213) 442-3212

SERIES 31A—contacts: 2 amp, 250 VDC. coil: 3 VDC, 100 ohms (30 mA). operation time: ½ ms.

SERIES 51A—contacts: 2 amp, 250 VDC. coil: 5 VDC, 400 ohms (30 mA). operation time: ½ ms.

All of the following have contacts rated 2 amps, 250 VDC, and a switching time of ½ ms.

1A3AH or 1A3AH-X—coil: 3 VDC, 100 ohms (30 mA), pick up at 2.55 VDC.

1A3AHH or 1A3AHH-X—coil: 3 VDC, 250 ohms (12 mA), pick up at 2.55 VDC.

1A5AH or 1A5A-X—coil: 5 VDC, 100 ohms (50 mA), pick up at 3.75 VDC.

1A5AH or 1A5AH-X—coil: 5 VDC, 400 ohms (12.5 mA), pick up at 3.75 VDC.

1A5AHH or 1A5AHH-X—coil: 5 VDC, 700 ohms (7 mA), pick up at 3.75 VDC.

Using Your Tower *(from page 77)*

will make this adjustment (tuning out primary reactance) much more easily accomplished!

The second stage of the tuning procedure involves an element of blind chance. It consists of making a tentative connection to the tower, setting the tap on the inductor to a guessed-at spot, and retuning the tank to resonance. Now you're interested in knowing whether any r.f. power is being extracted from the tank and introduced into the tower. No doubt there're "sophisticated" methods of getting such information, but there's also a crude and effective method. Just put a dial light in series with a single turn of wire and loosely couple it to the tank. If you exert a bit of care, you can avoid burning out the bulb during the early stages of tuning. As you approach the desired stage of power transfer, the bulb will barely glow even when closely coupled to the tank's inductor. Don't doubt its indication. If the transmitter's loading is normal, and if the matching device's tank isn't sizzling from I^2R copper losses or E^2/R dielectric losses, there's no place that r.f. power could have gone but to the antenna/ground system!

To return to procedure steps, the next operations are a series of small adjustments of tap position on the tank inductor followed by a reresonating of the tank and an evaluation of the step's effectiveness in transferring power to the antenna. Then a small change in the position of the tap on the tower, followed by a rerun of the preceding sequence. These steps are continued until the antenna is accepting nearly the full power fed into the matching unit. At that point, the unit's tank resonance will be very broad. Recheck to make sure that feedline still is "seeing" a non-reactive load of something near the characteristic impedance of the transmission line. If it's not exactly the same impedance, don't worry about it. If your transmitter will load readily into that particular load, that's all that's needed. Superstitions about the utter necessity of unity v.s.w.r. ratio are largely "old wives tales" (or, rather, uninformed operators tales). You may be amazed at the amount of tank detuning caused by antenna reactance being coupled into it. You'll agree with the requirement of a tank with capability of being tuned over a wide range of frequencies.

As an afterthought, you may consider the variable capacitor in series with the lead going to the tower as a sort of vernier for small adjustments of the tap on the tank's inductor. It's handier to swing a capacitor's rotor than to change a tap!

Although many words were used to describe the tune-up procedure, it can be done in a short length of time. As mentioned earlier, the help of an assistant really speeds the operation. Even though you've invested a bit of time in the project, the reward is ample. The tower-cum-antenna loads well, radiates well, and fully answers the question of what to do about a Medium Frequency antenna when you have only a moderate size yard. ■

In Focus *(from page 54)*

the U.S. Meantime, several hundred Model 400 scan converters are in use by slow scanners on the amateur bands. At this writing, no model changes are contemplated.

Final-Final

Please keep the pictures and letters coming my way, your friends want to see what you are doing! Next month there will be an interesting review of Cop Macdonald's early efforts with pictures and data from his original prize-winning paper describing SSTV! Best regards, 73, Bill, W2DD

QRP *(from page 92)*

marily by the C3-C4 voltage divider and the C2 coupling capacitor. An oscillator is basically a self-excited amplifier, and C3-C4 provide the feedback required to sustain oscillation at some given operating level. Theoretically, such a stage should increase its gain indefinitely, but limitations of the transistor itself impede this increase. The ratio of C3-C4 can be varied to control the gain and operating level of the oscillator. However, operating the transistor at its limits is undesirable in a v.f.o. circuit, as it can result in signal impurities and instability. D1 serves the purpose of limiting Q1 gain once the optimum C3-C4 ratio has been found experimentally. Without D1, Q1 will operate at maximum gain and considerably larger r.f. current will flow across the gate-source diode than without it. In this case, the bias which limits stage gain would have to be developed across the FET gate-source diode, with a resulting increase in harmonics as well as increased loading of the frequency determining L1/$C1_{a-d}$ circuit. A degradation of stability would be the likely result, although not inevitable. If conditions are optimum, an unclipped circuit will exhibit a steady rate of drift up and down a narrow bandwidth indefinitely, as well as intermittent jumps as the internally developed bias moves through thresholds. Such drift makes even short QSO's difficult. With D1 in the circuit, Q1 gain is limited to a stable level determined by the diode as it clips the positive excursions of the gate r.f. voltage swing. D1 wiill usually have a pronounced effect upon v.f.o. output, causing a considerable drop if the circuit is optimum. For example, in the units tested, a D1 vs. no-D1 comparison produced a 4.8 Vrms vs. 1.33 Vrms reading at the Q1 gate, and a 3.2 Vrms vs. 0.87 Vrms reading at the Q1 source. Output from Q3 likewise shows the D1 effect, with a 1.65 Vrms vs. 0.51 Vrms reading (into a 1000 ohm load).

Mechanical Stability

Mechanical stability is essential in any v.f.o. circuit. Since all r.f. bearing, frequency-sensitive leads are located only on the p.c. board in this circuit, most of the usual sources of mechanical instability are eliminated. However, several precautions can be taken. Oscillator circuit components should be placed firmly against the p.c. board before soldering, and leads should be as short as possible. Any vibration of the oscillator circuit components will produce microphonics as well as frequency jumps. Once the oscillator calibration is completed, RFC2, L1, and associated capacitors can be epoxied to the p.c. board. The slug in L1 can be stabilized by the rather simple expedient of pouring wax from a melted birthday candle (a soldering iron will do the melting job) into L1 so that the slug is completely encased in wax. Likewise, wax can be flowed over the L1 winding immediately after it is completed. In the units tested, these simple precautions produced oscillators which showed no effects of bumping, dropping, or knocking on the table.

Assembly

The p.c. board for the 7 MHz v.f.o. is shown in fig. 2. Double-sided p.c. board is used in order to facilitate construction of the enclosure shown in the photo. The underside foil is etched away from under the oscillator components. This is done to avert the problems that can be caused by the capacitances formed between circuit pads and underside foil. Board preparation can follow either procedure outlined in the first part of this article using addres labels or marking pen.

Once the board is completed, assembly can proceed with the mounting of Q1 components and the B+ regulation line across the top of the board. Oscillator operation can be verified by hooking up the B+ and reading the r.f. voltages at Q1. Initial frequency alignment can be attempted by listening for the v.f.o. signal in the station receiver while adjusting the L1 slug until it appears in the 40 meter band. Assembly of the remaining sections of the v.f.o. can then proceed. Finally, mount VR1 and the tuning potentiometer, and adjust L1 for the proper frequency setting.

In the past, this writer has put hours of hard work into constructing v.f.o. enclosures from aluminum stock. The result was always a box that only remotely resembled those professional jobs that can be had at Radio Shack. This time, an hour of experimentation produced a professional-quality enclosure with perfectly-straight edges—the trick is using double-sided p.c. board and soldering the thing together! See photo. A very stable enclosure indeed, with a very good heat insulation factor to boot!

Once the v.f.o. is assembled and aligned, output should measure around 0.5 Vrms into a 1000 ohm load. About 200 Hz jump in frequency should be the limit when going from open-to-short circuit across the output. The v.f.o. can be hooked up to the exciter discussed earlier, and key-down conditions should produce about 75 Hz "pull" at most on 20 meters. 200 Hz is acceptable.

Performance

The v.f.o.-exciter combination has performed excellently on the air in tests. The oscillator stabilizes in about ten minutes, and will remain within about 50 Hz of a crystal standard thereafter in a normally changing room temperature environment. Keying is sharp and clean. The only drawback was encountered when the vertical radiator developed difficulty in some undetermined contact which produced a large jump in impedance. This wind-caused jump produced a small "pull" on the oscillator frequency, and although QSO's were still completed, the jump was nonetheless annoying. Otherwise, the exciter-v.f.o. combination produces good QSO's to both coasts on both 40 and 20 meters, despite its 1 watt output. It would be wise to use a low-pass filter between the rig and antenna to avoid possible TVI complications in fringe areas. In short, the combo can be enjoyed while work proceeds on the final amplifier, which we will discuss in the next part of this article

Parts Sources

FB-43-801 "jumbo beads" from Amidon Associates. 12033 Otsego St., No. Hollywood, CA 91607.

Circuit Specialists Co., PO BOX 3047, Scottsdale, AZ 85257, is a good source for the following parts which may be difficult to find: L1 slug-tuned form, J. W. Miller #23A014-3 (green dot) ($1.21 ea.); VR1, R2502/MV2105 ($1.10); 1N914 D1 ($1.00/16); D2 6V or 9V zener (1N753/1N757) ($1.00/3); MPS6514 ($0.55 ea); MPF102 (0.50 ea).

Digi-Key Corp., PO BOX 677, Thief River Falls, MN 56701, for polystyrene capacitors, 0.15 ea. (order 460pf for C3, 91pf instead of 100pf, 280pf instead of 270pf—stock depleted).

Antennas *(from page 95)*

"That's easy," I replied. "The sunspot cycle is coming to life and there's going to be a lot more interest in 10 meter DX operation. A lot of amateurs

are going to put up 10 meter antennas as they are small, inexpensive and easy to get going. Some smart hams are going to take advantage of the cheap CB beam antennas and cut them down for 10 meter work. The 11 meter Yagis and Quads are not expensive and there's no problem getting most of them to work on 10 meters. So my prediction is: watch 10 meters during 1978. That's where the action is going to be!"

* * *

Note: For information on 10 meter beams of all kinds, the *Beam Antenna Handbook* ($4.95) and *All About Cubical Quad Antennas* ($4.75) are recommended. They can be ordered from Radio Publications, Inc., Box 149, Wilton, CT 06897. Include 50c per book with order for postage and handling.

Math's Notes *(from page 96)*

graph to the face of the cathode ray tube if one is not already provided. Transparent graph paper is available from some of the larger stationery stores, but in a pinch, a suitable face plate can be made from a thin sheet of plexiglass, ruled with a sharp scribe. As in the case of the signal generator, the binding posts of the vertical input should be replaced with BNC connectors when frequencies above 20-30 kHz are to be measured. Coaxial plugs should also be used on all probes. It is also advisable to regulate the scopes low voltage power supply in order to stabilize the horizontal sweep and the gain of the amplifiers. Since exceptionally high voltages are employed in oscilloscopes, always observe caution when working on one with the power on and/or the cabinet opened.

Preventative Maintenance Techniques and Intervals

The preventative maintenance techniques described in the following paragraphs are all used in one form or another by industry as well as the military. They are tried and proven and are used whenever the utmost in reliability and life are demanded in a piece of test equipment.

1. Obtain schematic diagrams for all pieces of test equipment on hand and mark on these diagrams, various important voltages or waveshapes encountered in normal operation. This will greatly simplify servicing when a device fails.

2. Correct all defects no matter how slight as soon as they are discovered. Waiting or putting off such corrections can cause major costly breakdowns later, even if the operation of the unit is not hampered at first.

3. Overheated resistors, leaking capacitors, or other components that do not seem to be in good condition should be replaced with ones of higher ratings and qualities even if the manufacturer did not use them originally. This, incidentally, is not an uncommon fault—especially with imported instruments.

4. All dust accumulated inside the equipment, especially in hard to get to recesses, between variable capacitor plates, and between contacts should be cleaned at regular intervals.

5. Screws, nuts, bolts and particularly set-screws in knobs and dials should be checked and tightened if necessary at least twice per year. All missing screws should of course be replaced. Remember 10 screws weren't put into your signal generator because the manufacturer had some extras lying around. They were put there to help keep the case r.f. tight.

6. The following, is a brief chart which summarizes the suggested maintenance schedule for all types of test equipment that undergo moderate use. If you use equipment very frequently, the time between performing various steps should of course be shortened.

	Daily	Weekly	Monthly	Semi-Annually	Annually
Exterior Inspection					
Interior Inspection					
General Screws, Set Screws, Nuts, Etc.					
Lubrication of Moving Parts					
Cleaning of Contacts and Terminals					
Calibration Spot-Checks					
Major Re-Calibration Complete					
Testing of Vacuum Tubes					
Complete Cleaning of Chassis, Tubes, Cabinet, Etc.					

When the above maintenance is performed on a piece of test equipment a surface gummed label should be affixed to the equipment giving the date performed and the date due for the next inspection period.

By observing the above, the experimenter will be able to get much more performance from his equipment. The frustration of having to repair the test equipment when making that "last measurement" before turning on a new piece of gear will be a thing of the past.

73, Irwin, WA2NDM

Novice *(from page 99)*

radio station for Novice use have covered station location, plus advantages and disadvantages of building and buying, new and used gear, solid state and tube equipment, low and high power, and transceivers versus transmitter and receiver combinations. This month's column also covered major factors to be considered regarding transmitters and next month's column does the same thing in regard to receivers.

The following stations were worked recently on the Novice bands: WA1YAU, George Wellesley, Mass.; WB2MAI, Bill — Alpine, N.J.; WB3GEN, Chris—Crofton, Md.; WD4AVJ, Karen — Largo, Fla.; WD5BQP, Katie — O'Donnell, Texas; WB6PTC, John — Los Angeles, Ca.; WB7PZR, Scotty—Boise, Idaho; WD8KXQ, Harry—Detroit, Michigan; WB9VCI, Paul—Monroeville, Ind.; and WDØCCK, Ed — Sioux City, Iowa.

Remember that no code sending test is administered at FCC offices. This portion of amateur licensing examinations was dropped in August 1977. Eliminating the code sending test made it possible for FCC examiners with no code capability to conduct code tests; they simply check the applicant's answers to the code comprehension receiving test questions. It is reasonable to assume that any applicant who passes a code receiving test will also be able to send code at least as fast as he can receive it. I have never known a student who could not send faster than he receives code. Unfortunately, everyone who can send code cannot send good code. Dropping the code sending test at the FCC offices may be a good move for the FCC but it will not benefit the quality of code sending heard on the amateur bands. Fortunately, the code sending test is still required as part of any FCC amateur radio licensing examination conducted by a volunteer examiner.

I would be glad to receive good definition black-and-white pictures of several Novices at their operating positions. If you send a picture, it might appear in a future Novice column. Please send an SASE if your photograph must be returned.

DX *(from page 103)*

at 0035. SU1CR was heard on 14244 at 0135 GMT. In addition, activity from the Sudan has been supplied by ST2SA on 10 and 20 meter s.s.b., STØRK on 10 and 15 meter s.s.b. and STØRM on 20 meter c.w. DL9PL/ST has been heard on 14296 at 1615 GMT.

QSL Information

At the request of several readers, we have been listing the complete address for each QSL Manager rather than simply showing the callsign. The advantage of this system is obvious, the disadvantage is that it reduces the number of listings per issue. Please let us know which you prefer, fewer listings with complete addresses or more listings with only the call of the QSL Manager.

A2CSD—Via P.O. Box 70, Orapa, Botswana
A7XZZ—To HB9MTJ, W. Hutter, Rosenbergstrasse 67, CH-8304 Wallisellen, Switzerland
ex-A9XD—c/o K6DQD, R. J. Fleming, 1921 Grant Ave., Redondo Beach, CA 90278
A9XS—Via WB3QHQ, C. E. Maier, 1660 Hone Ave., Bronx, N.Y. 10461
AP2TN—c/o Bert Moroz, W8QFR, 9106 Fulton, Detroit, MI 48209
CG1CR—To VE1ABM, S.I. Harrison, 91 Harbourview Drive, Sydney, Nova Scotia B1S 2A8 Canada
CK2AUF—c/o VE2AUF, M. Bedard, 265 St. Emile, Chicoutimi North, Quebec G7G 2L1 Canada
DL7HU/IC8—Via DL7HU, W. Preusse, Falkentaler Steig 70, D-1000 Berlin 28, Germany
FØBAK—To PAØTO, A. J. Dijkshoorn, Jan van Gelderdreef 11, 2253 VH Voorschoten, The Netherlands
FHØOM & FHØYL—c/o DJ1TC, O. Blankenhorn, Dreisamstrasse 13, D-7530 Pforzheim, West Germany
FK8CD—Via W7LLC, John F. Wojtkiewicz, 10316 Aztec Drive, Sun City, AZ 85831
FM7WW—To WB5SFS, W. Stein, III., 734 Crystal St., New Orleans, LA 70124
HC6FC—c/o P.O. Box 502, Ambato, Ecuador
K4IIF/C6A—To W4KA, 1044 Southeast 43rd St., Cape Coral FL 33904
KG6RE—Via K7ZA, Jon Zabel, 20711 238th S.E. Maple Valley, WA 98038
KZ5FR—To WD8CPU, J. F. Limbach, 6600 Pine Ridge Dr., Enon, Ohio 45323
K4SQT/SU—c/o M. J. Broe, Sinai Field Station, Box 10, FPO, New York, N.Y. 09527
TF2SS—Via I.R.A., P.O. Box 1058, Reykjavik, Iceland
TU2EF—To WA6CEB, J. F. Neville, Box 1698, Altadena, CA 91001
VE6BCY/4X4—c/o VE1 Bureau, Box 663, Halifax, Nova Scotia B3J 2T3 Canada
VP2MGB—To Ruby G. Bramble, Bethel Post Office, Montserrat, West Indies
VP2MH—Via K8MFO, D. A. Karvonen, 4433 14th St., N.W., Canton, OH 44708
VP2MNR—To WA6VNR, J. F. Hypnarowski, 3785 Mount Blackburn Ave., San Diego, CA 92111
VR4DB—c/o D. Newman, P.O. Box 81, Honiara, Guadalcanal, Solomon Islands
VS5AM—Via P.O. Box 969, Brunei
VS6DO—To K4CIA, W. G. McDowell, 3709 Huntleigh Drive, Raleigh, N.C. 27604
WA5KKG/YB7—c/o C. L. Mansfield, Box 92, Queen St., Singapore 7, Singapore
WB5SGZ/DU2—Via M. A. Burke, PSC-1 Box 812, APO San Francisco, CA 98286
WA6YOU/DU2—To R. C. Payne, RRF, PSC-2 Box 18596, APO San Francisco, CA 96311
WT1AAG—c/o J. Hill, P.O. Box 491, Lewiston, Maine 04240
XE1VOZ—Via P.O. Box 7-1222, Mexico City, D.F., Mexico
YV4CB—To W3HNK, Joe Arcure, Jr., P.O. Box 73, Edgemont, PA 19028
XT2AE—c/o DJ9KR, U. Bihimayer, Gartenstrasse 14, D-7400 Tuebingen 9, W. Germany
YB6ACV—Via H. G. Arasz, PTF ARUN, P.O. Box 4, Lho Seumawe, N. Sumatra, Indonesia
ZB2TA—To G3MZE, J. Jones, 107 Bronte Paths, Stevenage, Herts. SG2 OPL England
ZK1DR—c/o WAØWCR, T. R. Lindgren, 1260 13th Ave., Marion, Iowa 52302
ZL4LR/A—Via ZL4NH, P. McRodden, 18 Fraser St., Sawyers Bay, Dunedin, New Zealand
ZM7AT—To WB6DXL, W. E. Ellison, 16630 Lawnwood, Valinda, CA 91744
ZM7MM—c/o W6FWX, R. J. Alfaro, II., 1812 Webster St., San Francisco, CA 94115
ZS5WV/A2—Via ZS5WV, J. W. Webster, 120 Anieno Rd., Montclair, Durban 4001, Natal
3A2CX—To F6CWA, H. Cornic, 13 Rue Missilien, F-29000 Quimper, France
3AØFY—c/o F9UW, C. Baziliou, 221 Ave. A, Briand, F-06190 Roquebrune-Cap-Martin, France
ex-5A3TX—Via W3HNK, Joe Arcure, Jr., P.O. Box 73, Edgemont, PA 19028
5W1AT—To WBDXL, W. E. Ellison, 16630 Lawnwood, Valinda, CA 91744
5W1BH—c/o R.J. Alfaro, II., 1812 Webster St., San Francisco, CA 94115
8P6FU—Via W3HNK, P.O. Box 73, Edgemont, PA 19028
9J2TJ and 9J2SJ—To N8JW, John M. White, 3629 Delta River Drive, Lansing, Michigan 48906

73, John, K4IIF

Awards *(from page 105)*

1. Work and confirm one amateur station in each of the ten U.S.A. districts.
2. No time limit.
3. Submit QSLs with $1.00 plus postage for return of your QSLs.
4. The card from the 6th district must be a member of P.A.R.C.
5. Send to: Poinsettia Amateur Radio Club, P.O. Box 268, Ventura, CA. 93001.

Notes

Many thanks to Bertha, WA4BMC, I'm now flooded with nice data for "Stories". Oh yes, when you write to Bertha for information on County Hunter Nets, addresses, or other County Hunting data, be sure to send a self-addressed stamped envelope, but larger than 10 x 4 and put 35c postage on it—you will receive a LOT of good data. Send to: Bertha Eggert, WA4BMC, P.O. Box 6811 Southboro Station, West Palm Beach, Florida 33405. Bertha is the MARAC information center.

Have requests for data on "Worked All Confederate States", any help would be appreciated.

Also many thanks to Bill Nash, WØOWY for sending along some fine fotos of those at the Annual MARAC Convention, hope to show them with some data next month.

Hope you all had a wonderful 1977, and I hope 1978 will be even better. In the meantime, have wonderful Christmas Holidays and remember to write and tell me—How was your month? 73, Ed., W2GT.

Propagation *(from page 107)*

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

Time Zone PST (24-Hour Time) WESTERN USA TO:

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

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

Contest Calendar *(from page 109)*

starting with 001. (KP4, KV4, KZ5, KG6 and etc. use a contact number) Stations not land-based give their ITU region.

Scoring: Each completed QSO is worth 2 points, 4 points if its with a Novice or Technician. The multiplier is determined by the U.S. states, VE call areas, DXCC countries and ITU regions worked. (non-landbased stations.) (U.S. and Canada not counted as a country.)

Frequencies: C.W.—28000-28100. Novice—28100-28150. S.S.B.—28500-28600. A.M.—28800-29000. Oscar contacts also permitted.

Awards: Certificates to the highest scoring single operator entry in each ARRL section, VE call area and DX country. Multi-operator and Novice awards will be given if three or more entries in a section are received.

As with all ARRL activities it is recommended that you send a large s.a.s.e. for appropriate log forms and instruction sheets.

Mailing deadline for entries is January 19th. ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, Conn. 06111

Hungarian C.W. Contest

Starts: 1600 GMT Sat., December 10
Ends: 1600 GMT Sun., December 11

It's the world looking for HA's on all bands, 3.5 thru 28 MHz. on c.w. in this one.

Operation will be in three classes: Single operator, single band and all band, and multi-operator all band. (Club stations are considered as multi-operator.)

Exchange: RST plus a contact number starting with 001. In addition the HA's will send two letters to identify their county.

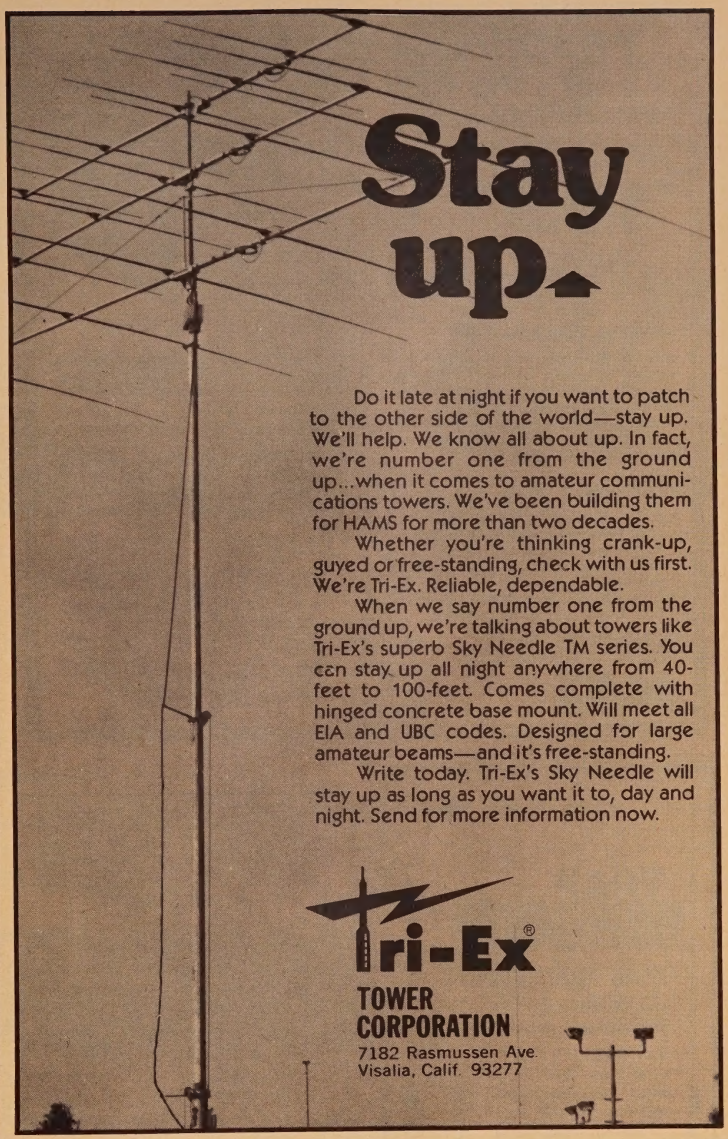
HA counties: BA, BP, BE, BN, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA, (Total 20 on each band)

Scoring: One point for each HA contact. And a multiplier of one for each different HA county worked on each band. (Same station may be worked once on each band.)

Final Score: Total QSO points from all bands times the sum of the county multiplier from each band.

Awards: Certificates to the first place winners in each country and in each class.

Include a summary sheet with your log and the usual signed declaration. Send within six weeks after the contest (approx. Jan. 21st) to: Radio Amateur League of Budapest, P.O. Box 2, H-1553 Budapest, Hungary.



S.O.W.P. C.W. QSO Party

Starts: 0000 GMT Sat., December 17
Ends: 2400 GMT Sun., December 18

The Society of Wireless Pioneers will be holding their annual winter QSO party and this year have gone back to their traditional c.w. mode.

There will be no set exchange or any scoring system. It's just a social "get-together" to exchange Holiday greetings.

Activity will be found in the General portion of each band, about 55 kHz up from the low edge of the band.

Since there is no scoring and no awards are being made no logs are requested.

Listen for the S.O.W.P. Net at 1500 GMT on 14125 MHz c.w. each Thursday for more details.

CQ WW 160 C.W. DX Contest

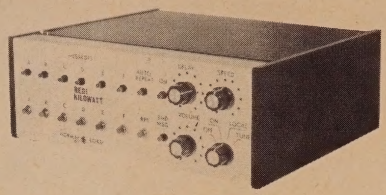
Starts: 2200 GMT Fri., January 27
Ends: 1600 GMT Sun., January 29

The rules are the same as in previous years. However, there will be more emphasis on penalties and disqualification criteria this year.

This is a c.w. only contest, c.w. to phone contacts are not permitted.

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45 (CZ) Old School Lane
Milton, Cambridge, U.K.

Exchange: RST plus a three figure QSO number starting with 001, and your state or province. It is not necessary for DX stations to send their QTH, their call will identify them.

Scoring: For W/VE/VO, 2 points per QSO with other W/VE/VO stations. All DX contacts are worth 10 points. (DXCC country list less W/K and VE/VO).

For all other countries, 2 points per QSO with stations in same country, 5 points with stations in other countries. Except for QSOs with W/VE/VO which count 10 points.

Multiplier: For all stations. One (1) for each U.S. state, VE province and DX country worked. (KH6 and KL7 considered DX, the District of Columbia same as Maryland. VE1 is divided into 3 provinces, New Brunswick, Nova Scotia and Prince Edward Island.)

Final Score: Total QSO points multiplied by the sum of the multiplier.

Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of the contest, or unsportsmanship conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification.

Penalties: Three additional contacts will be deleted from the score for each duplicate, false or unverifiable contact removed from the log.

A second multiplier will be deleted for each one lost by the above action.

Disqualification can result, if in the opinion of the Committee the penalty total is considered excessive. Disqualified stations and operators may also be barred from competition in all CQ contests for a period of up to three years.

Awards: Certificates to the top scorers in each State, VE Province and DX Country. Additional awards if the score or participation warrants.

In addition the following Plaques will be awarded:

World—Top single operator. Donated by Gene Sykes, W4OO.

U.S.A.—Top single operator—Donated by The West Gulf A.R.C.

Europe—Top single operator—Donated by The West Gulf A.R.C.

The same plaque may be won only once by the same station within a three year period.

Log and summary sheets and U.S. Regulations for 160 may be obtained from CQ by sending a large s.a.s.e. with sufficient postage or IRC's to cover your request.

Mailing deadline for contest entries is February 28th to: CQ 160 Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

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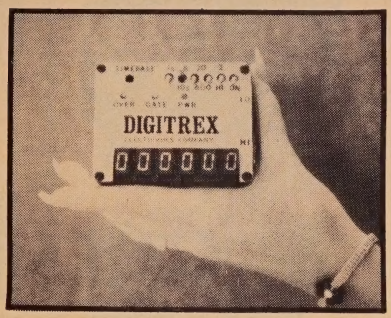
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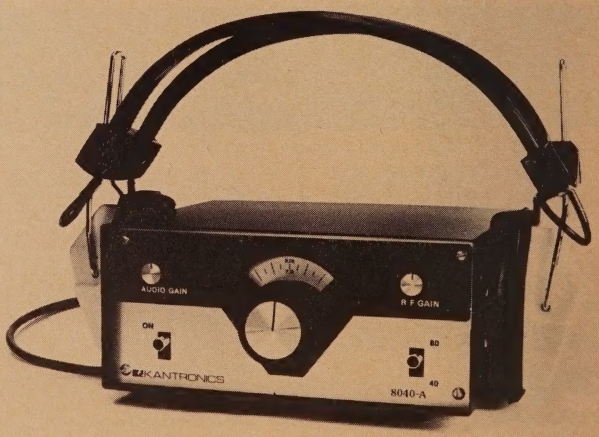
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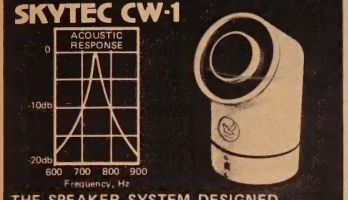


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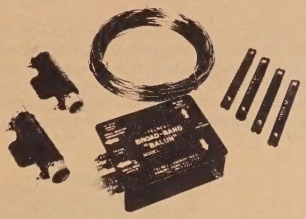
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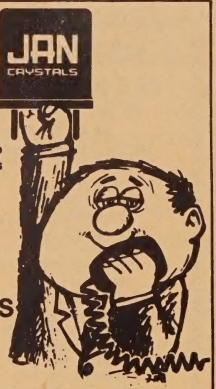
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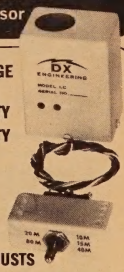
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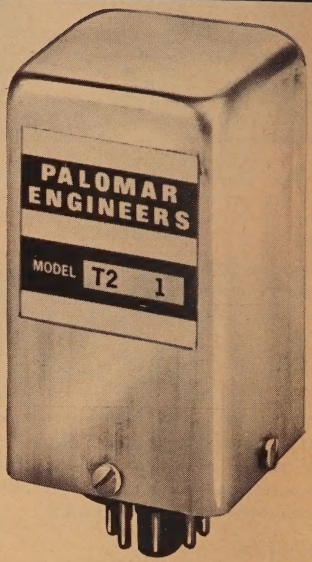
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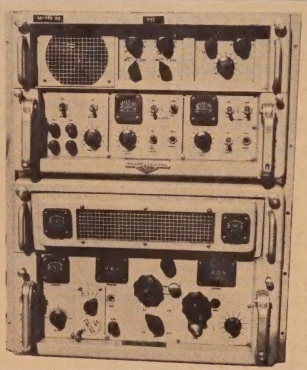
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Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.

THE BEVERAGE ANTENNA HANDBOOK: Full theory and construction details for a 160-80-40 meter Beverage with steerable null and direction switching. $5.00 postpaid. Published by Vic Misek, W1WCR, 142 Wason Rd., Hudson, NH 03051.

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FREE Catalog. Solar Cells, Nicads, Kits, Calculators, Digital Watch Modules, Ultrasonics, Strobes, LEDS, Transistors, IC's, Unique Components. Chaney's, Box 27038, Denver, CO 80227.

WANTED: Two infantry telegraph sets model TG5A-B. Paul Amber, 18999 Capitol Street, Southfield, MI 48075.

SELL: R-391 $450.00, SRR-13A $150.00, URM-25D $160.00, TS-323 $50.00, USM-105 scope $175.00, RG-58A/U coax 20 ft. length 10 pcs for $1.00. Stamp for catalog. E. French, 10 Afton, Aurora, IL 60538.

WANTED!!! Johnson SSB adapter (any condition) for Johnson Viking Valiant transmitter and Technical Materials Corporation SSB adapter-model GSB-1. Call 201-477-4096 or 201-363-2853.

SELL: ROBOT 70A monitor, 61 viewfinder, 80A camera with 25mm 1.4 lens, 8 and 15 foot camera cables. Original cartons and instruction books. Recently factory calibrated. $500. Gordon Buckner, W0VZK, Box 721, Marshall, MO 65340.

HAM SUPPLIES, Quality kits, test equipment, tools, books, IC's, components, hobbyist services, newsletter, over 7000 schematics and plans. $1.00 (refundable) brings big value-packed catalog. Bargains! Tek-Devices, Box 19154B, Honolulu, HI 96817.

YOUR CALL SIGN OR NAME OR INITIALS: Engraved on distinctive clear lucite key ring. Great holiday gift. Two styles: 1" x 2-3/4" 8 character max $4.50; 1-1/2" x 5" 14 character max $5.50. Action Products, Box 89, Reisterstown, MD 21136.

WYOMING RANCH LAND. 10 acres-$35 down, $35 month. (Offer void in California). Owner-Mike Gauthier, WB7QGR, 9550-Q-Gallatin, Downey, CA 90240.

NAME BADGES: 2 lines $1.50, 3 lines $2.00. Tom Baustert/W2HEO, 6664C Bishopp Road, Rome, NY 13440.

ELIMINATE QRM and QRN problems with our superior CW and SSB Filters. Also CW Keyers, speech compressors, power supplies, and multiband antennas assembled or in kits. Dealer discounts. Dynamic Electronics, Box 896, Hartselle, AL 35640. (205) 773-2758.

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COUNTRY LIST: Beam Headings, distances, time differences, computed individually for Your QHT. Seventeen page print-out lists over 700 locations worldwide. Send $12 and your station location to DEI, Box 2370-C, La-Habra, CA 90631. Distances in miles unless kilometers requested.

FOR SALE: QST's 1925-1977, CQ's 1947-1971 and others. S.A.S.E. to WA8RCN, 4650 Friar Rd., Stow, OH 44224.

ASCII & BAUDOT Picture Tapes. Hundreds available, various lengths, subjects. Chad, no lid. 73 wide max. Perfect for teletype Model 15, 28, 33, Telex, etc. Catalog for 14 cents stamp. 8-level Intro-Pack (8 pik), $10.00. 5-level Intro-Pack (10 pix), $6.00. Teleprinter Art, Ltd., 601 S. Dodson, Urbana, IL 61801.

TECH MANUALS for Govt. surplus gear—$6.50 each: SP-600JX, URM-25D, OS-8A/U. Thousands more available. Send 50 cents (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

MERRY XMAS and HAPPY NEW YEAR, from W0CVU. Now Using: KENWOOD TS-820-S, DRAKE L-4B and TELREX Xmas Tree. Chas. W. Boegel, Jr., W0CVU, 1500 Center Point Road., N.E., Cedar Radips, IA

SELLING: 75A-4 beautiful condition. 500 cycle filter. Matching speaker. Vernier Dial. Spare set new tubes. Clean manual. Complete, $399. Ed Gleason, W8DVY, 7096 Pickway Drive, Cincinnati, OH 45238.

LINEAR Builders send s.a.s.e. for new list of Hi Power goodies. Roger Mace, 8600 Skyline Dr., Hollywood, CA 90046.

WANTED: HG10 or HG10B VFO for Heath HW16 transceiver. Roger Marty, R.R. 1, Darlington, WI 53530.

WANTED: QSL cards and DX cards. Will send one for one. Charles R. Gerra, 179 Ivy Lane, Whitinsville, MA 01588.

BOOKS WANTED: Radio boys, radio girls, Ocean wireless boys, other juvenile radio fiction. Maxwell, W6CF, P.O. Box 473, Redwood Estates, CA 95044.

WANTED: VFO for 2NT trans. Heath HG10B or Hallicrafters HA-5. Have one you think will work, write me. Randy J. Kinser, WD9FOC, 8245 Cory Lane, Bloomington, IN 47401.

WANTED: 455 KC. I.F. xmfr. Hammarlund part no. K38229-2, for model HQ-110 communications receiver. Dale W. McMindes, PJ4DM, Box 37, Bonaire, Neth. Antilles.

VACUUM PUMP: Diffusion pump, pirani gauge for mp terminal, transceiver, receiver or whatever. VE3GQN, Box 1499, Deep River, Ontario, Canada K0J 1P0.

WANTED: Heath SB-620 scanalyzer with manual. Bert Collins, RR 3, Suite 4, Box 56, Sudbury, Ontario Canada P3E 4N1, (705) 522-2158.

SELL: Heath HW16, 80, 40 and 20 meters with VFO and selectivity filter. $130. R.E. Dorn, WB7RHG, 645 West "C" St., Burns, OR 97720.

YAESU FT-101 with fan, manuals, factory installed rcvr improvement and 160m mods. $450 including mailing. Jack Corson, N1DX, Box 25913, APO San Fransisco, CA 96230.

BEGINNING: Homebrewed needs 325 pF var. and 3 sect. var. 400 pF/sect. Jay Phillips, WD4BPE, 207 Oakmount Lane, Signal Mt., TN 37377.

FOR SALE: Heath DX60 xmtr. Excellent working condition, runs 90 watts AM/CW 10-80 meters, $100. Lafayette HA350 rcvr. with matching speaker and manual, $125. Take pair for $200. Will ship. D.J. Brownell, 16 Cook St., Worcester, NY 12197.

RF SIGNAL GENERATOR: Heathkit, 100 KHz to 220 MHz in 5 ranges, external or internal midulated. Excellent condx with manual. $45 or best offer. Will ship. Edward Abrams, 83 Stevens Ave., West Haven, CT 06516, (203) 933-2662.

FOR SALE: Regency 8-channel UHF police scanner. Like new. Used one year. $90.00 or best offer. Marilyn Hickman, 173 Riverwoods Lane, Burnsville, MN 55337.

WANTED: Power transformer Heathkit part no. 5426 for model M-0-10 oscilloscope. M. Narey, 14948 Bringard, Detroit, MI 48205.

FOR SALE: Bearcat-101 programable scanner almost new-make offer-contact: R. Abernathy, 75 Barker St., Mount Kisco, NY 10549.

SELL: Heath 2 meter HW-2036 and micoder 285, also Heath HD1410 keyer, $45. R. Gobrick, WA6ERB, 451 Via Casitas, Greenbrae, CA 94904, (415) 461-3209.

ANTENNA NOISE BRIDGE: Model TE7-01, $20. Don, N6IC, 4447 Atoll Ave., Sherman Oaks, CA 91423.

ELECTRONICS WORLD MAGAZINE: Practically complete 1955-1970. Best offer plus shipping, or FREE to tax deduction eligible institution for shipping. Dr. Albert Coonin, 7381 S.W. 115th St., Miami, FL 33156.

WANTED: Schematic for Knight T60 xmtr. Buy or borrow. Wayne Hubbard, WB1CBT, Box 123, Short Beach, Branford, CT 06405.

SELL: BC-779 receiver as per may article in August 73 Magazine, $200. Charles Klawitter, W9VZR, 4627 N. Bartlett Ave., Milwaukee, WI 53211.

WANTED: Antenna tuner, Johnson kw matchbox with meter or similar for W2LXT, 254-17 Morgan St., 40th Ave., Little Neck, NY 11363, (212) 229-2962.

WANTED: Heath SB-401 transmitter. Call Curt, (303) 928-3493.

WANTED: Manual and schematic for radio shack "Realistic" dual trace scope model 102 will copy and return. Richard Drum, P.O. Box 208 Metuchen, NJ 08840.

SELL: Hal ST-6 RTTY Tu. 850/170 shift AK2 AFSK oscillator assembled with 30 day guarentee. Will trade for new SB-614 or $200. Kenneth J. Dada, W0RLM, 4821 E. Riverside, Spt. 141, Austin, TX 78741.

WANTED: Yaesu FL-101 or Drake T4-XC 160-40 meter tramsmitters. Send desired price and description of condx to: Neal Feldman, WB1CSA, 250 Forest St., Hamden, CT 06518.

DIAL FACE for Hallicrafters S-41G and band spread dial for Hallicrafters skybuddy needed. R.W. Randall, K6ARE, 1263 LaKehurst Rd., Livermore, CA 94550.

LAFAYETTE HA 350 ham band rx all crystals, maual very good, $95. Bernard Pollock, WA2IBE, Box 215, Ironia, NJ 07845.

CONTEST and DX station extras for sale. s.a.s.e. brings list. Vic Shields, K9UIY, 1909 West Revere, Freeport, IL 61032.

FOR SALE OR TRADE: Surplus Stewart-Warner T-282 transmitter. 225-400 MHz AM 3X-4CX150 outputs. Will trade for used 2m rig. Fred Van Pala, 70-64 45th Ave., Woodside, NY 11377, (212) 478-8310.

WANTED: Any old publications (books) from ARRL, 73, CQ, E. & E., or otherr editors. Must be in good condx. Send list and price to: Jacques Blais, 1698 9e Ave., Charny, Quebec, Canada G6W 4H2.

USED 40-80 meter Cliff Dwellantenna control box and manual, $20. You pick-up! Bill T. Roff, WA4AEB, P.O. Box 1246, Tryon, NC 28782.

SLOW SCAN TV ROBOT CAMERA & Monitor, with factory improvements, Viewfinder, new accessories, reasonable. List other gear SASE. W4API, Box 4095, Arlington, VA 22204.

WANTED I am a soon to be ham and I am in need of a HG-10B and SB600. You help appreciated. Dan, 501 N.W. 7th St., Atkins, AR 72823. (501) 641-2489.

WANTED: Early radio magazines, books, old radio receivers, catalogs, handbooks and call books. Will pay cash or trade receivers, tubes, wireless parts, etc. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, CA 94062.

SELL: Barker & Williamson audio phase shift network. Model 350 type 204, new, $5.00 postpaid. J.A. Worcester, R.D. 1, Frankfort, NY 13340.

CLEGG FM27B with P/S, $300. Standard 146A, tt pad, rem mike, desk and wall chargers, $290. WA1TRH, 2 Memory Lane, Ridgefield, CT 06877.

TRANSCEIVER: Two Meter, Comcraft CTR-144, FM & AM with VFO and crystals. 145.80 146.16, .19, .28, .31, .52, .94; portable or base with built in AC & DC. $325. Mint Cond. Geo. E. Clark, M.D. (W6GAW), 1741 La Coronilla Dr., Santa Barbara, CA 93109.

SELL: Heath HW 101 Brand new $300 w/pwr supply, spk & xtal fil. align. needed. Mike Spohn, WB6WVZ, 311 Zinfandel Dr., Ukiah, CA 95482.

WANTED: HG-10B or other VFO for use with my HW-16. Pse state terms. Marty Young, WB4OAR, P.O. Box 1133, Jupiter, FL 33458.

ROHN 25 TOWER 80' all guywires, anchors, base plate, rotor shelf, guy wire insulators. $595.00 Bee Walton, WA3WRD, 7 Long Lane, RD 2 Hummelstown, PA 17036. (717) 566-6098.

ONLY TWO LEFT . . . Drake SSR-1 General Cov. receiver. Sealed Box - Brand new $350 -List -your cost $275.00 &$3.00 Shpg. (215) 271-8898. Send money order or cashiers check. K3UKW, Anthony Musero, 1609 S. Iseminger St., Philadelphia, PA 19148.

WANTED: Yaesu Receiver model FR-50B. Joe Bratz, 324 Bruce Ave., Stratford, CT 06497.

FOR SWAP: Clegg "Venus" 6 mtr. transceiver with pwr supply A-1 cond. Want Top Line Receiver Hallicrafters - Hammerlund - Collins, SX88-SX73-HQ180-75A-2-3-4-390 etc. Ph. (313) 547-5765. After 5PM exc. Sunday.

BOAT FOR CHARTER. 34 Ft. sailing auxiliary with Diesel engine. Sleep aboard. Sail Carribean Islands. $450 per week. Phone 309-343-1455.

PLEASE HELP: have Johnson Viking II Catalog No. 240-102, S.N. 11385 and would like to borrow or buy instruction manual. Would also like to buy Vibroplex. Marvin C. Marlin, P.O. Box 501, Wynne, AR 72396. 1-501-238-8305 (Nites).

SELL: R-392 with AC Supply and speaker, A-1, you pay shipping $195. Charles Klawitter, W9VZR, 4627 N. Bartlett Ave., Milwaukee, WI 53211.

MAKE AN OFFER I CAN'T REFUSE: Heath HW-16 & HG-10B VFO or Heath HR-10 rcvr. WB1BXM, Box 431, Avon, CT 06001.

SELL: Johnson Kilowat Matchbox with SWR meter, $150. Also frequency counter. Paul Loafman, 2101 S. Rankin, Edmond, OK 73034.

WANTED: Heathkit MR-1 Mobile Receiver 1959 , Buy or trade. Allied A-2515 Receiver 10-80 meters. David Wilcox, 70 Trowbridge St., Lockport, NY 14094.

CASH for your clean ham gear. Beacon Communications-used equipment specialists, 879 Beacon St., Boston, Mass. 02215. (617) 267-1975.

FOR SALE: Yaesu FT-101B transceiver. Excellent condition. Has 160 meter crystal and cooling fan. $525. M. Godwin, W4WFL, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Antique glass—looking for old milkglass, purple, slag, carmel, and greetown. Tell me what you have. I pay the highest prices. Write: Jack Schneider, 14 Vanderventer Ave., Port Washington, NY 11050.

TRI-EX 40' tower, 15, 20m monobanders, Ham M rotator, cables, guys, $275. 2m FM Sonar, AC P/S, $175. HW-32A spare tubes $65. George Pataki, WB2AQC, 34-24 76th St., Jackson Hgts., NY 11372.

SAEL: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake, $40. Schultz, Box "L", FPO, NY 09544.

SELL: 4-1000 A used, $30; Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch, $16; UTC S-50 kv c.t. 300 ma, new, pick-up only, $75; small (2 kw), $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

WANTED: Heathkit HA-14 linear & AC supply and/or SB200, SB-220, NCL-2000, or any other well known amplifier with power supplies & manuals. Crank-up tower, must be self supporting and about 40' in local W1 area for pick-up. Joe Leal, WA1VJZ, Tel. (203) 347-2407 after 6 pm weekdays est.

The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June '76. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., N.W., Albuquerque, NM 87114. Please enclose $1 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

TS-820S $925. Standard HK $190. Jerry Holmes, 17 Highfield Lane, Madison, CT 06443.

VACUUM CAPS: 20KV Jennings fixed. 50 pfd $5; 100 pfd $10; 150 pfd $15. ppd. Stephens, 2386 Queenston, Cleveland, OH 44118.

SCOTT Marine radio model slrm. Receiver covers 0.54 to 18.6 megacycles. Collectors gem 50 lbs. $150. N4LX, Foy Coble, 251 Collier Ave., Nashville, TN 37211.

WANTED: 4th edition ARRL Radio Amateur's Handbook. W9DDL, 5006 N. Second St., Loves Park, IL 61111.

WANTED: Pre-war issues of Short Wave Craft magazine. Bill Orr, Eiamc, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Collins 51-R receiver (VHF). Boll Orr, Eimac, 301 Industrial Way, San Carlos, CA 94070.

SSTV AND PHOTOGRAPHERS: Make offer, 1 each, like new, Fujitar lenses, 135 mm, f 4.5, telephoto 35 mm, f 3.5, wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

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

SELL: Siltronix 90-5 VFO, mint condition. $150. Randy Cantrell, Box 18015, Baton Royge, LA 70893.

WANTED: Good 4-400 A or 4-250 A and 811 A's. Walt Willmert, W9FIM, Rte. 1, Box 40, Plainfield, WI 54966.

QSL: Guaranteed 100 percent QSL. Worldwide QSL. Send QSL to Rusty Fletcher, Rt. 2, Box 146, McKenzie, AL 36456.

WANTED: Early radios, xmtrs, srystal sets, spark equipment, related tubes, parts, literature for historic collection. Troe, 111 Skyline Dr., Morristown, NJ 07960.

SELL: Argonaut 405 final model 261 supply with voxr speaker. Rock bottom $300. Oick up only. George W. Moran, W2DGZ, 8059 88th Ave., Woodhaven, NY 11421.

SELL: Johnson messenger 250 base 23 ch. $95. Cobra 21 as is $35. C. Duval, 33727 Brownlea, Sterling Hgts., MI 48077, (1-313-268-2467).

LOOKING FOR old Lionel trains. Interested only in "O" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050, or call (516) 883-6200.

FOR SALE: Johnson 6-2 VFO (new) $50.00; Pop. Ele. receiver, 27 MHz up $20.00; 3 sta. innercom new $25; Regency HR2; HQ 129x; Ten-Tec QRP; Realistic 150 receiver; Swan 240, old. Dr. J.L. Hall, K4HIG, 216 W. Dibber Rd., Melbourne, FL 32901.

FOR SALE: Spectra Physics 137P2 mw laser tube brand new never used $80. G.R. 572B 1 KHz Hummer $15. Irwin Math, 320 Northern Blvd., Great Neck, NY 11021.

WANTED: SBA-301-2 optional 400 Hz crystal filter and SB-600 speaker/cabinet for Heath SB-303 receiver in new or mint condition. M. Godwin, W4WFL, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

FOR SALE: Old issues of Ham Radio, 73, CQ, QST. Some complete runs. Send s.a.s.e. for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

CAN ANYONE HELP? Need a 3RP1A CRT to repair my scope. Schultz, W4FA, US Consulate, Box "L", FPO, NY 09544.

HW-202 w/built-in Sandlin scanner, crystals; ITC Multi-2000; Bearcat 101 scanner. All good condition. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

BOOK WANTED: "My Father Marconi" by his daughter D. Marconi, VE2ZK, Lizee, 29 Lamarche, Apt. 5, Delson, Quebec, Canada J0L 1G0.

MINICOMPUTER: Floppy disks. $3.00 each. Swan VX2 VOX, $35.00. 12v ps for Swan. Gabriel F. Gargiulo, 17 Whitney St., E. Hartford, CT 06118.

QSL SERVICE: DX operators in need of stateside QSL Manager write: QSL Express, 30 Lockwood Lane, West Chester, PA 19380.

NEED: Grip-to-talk mike stand for Astatic D-104 mike. Edward H. Nadolny, W9BM, 888 E. Schirra Dr., Palatine, IL 60067.

SELL: 1-KW Johnson Matchbox, Hallicrafter SX101 receiver, Johnson Navigator, good condx. Best offer. John Colmar, 1614 Oak Tree Dr., Roseville, CA 95678.

WANTED: Magnum six speech processor for Drake T4XC. WA6AHF, 17494 Via Alamitos, San Lorenzo, CA 94580.

FOR SALE: Conar 25" colon T.V. kit. Complete w/wood console cabinet, $400 plus shipping. Gerald Myens, WB7AVO, 4417 E. Ash Ave., Las Vegas, NV 89110.

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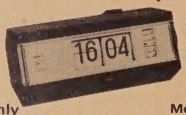


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CERTIFICATES FOR PROVEN TWO-WAY RADIO CONTACTS with Amateurs in all ten USA call areas. Award suitable to frame and proven achievements added on request. SASE brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

WANTED: DX-60B and HG-10B VFO & Dow Key relay plus what have you? Morris Cayer, 1131 Woodruff Ave., Apt-6, Jacksonville, FL 32205. (904) 389-4657.

FOR SALE: One progressive edu-kit electronics course. Over 200 radio and electronic circuits. Only one circuit completed. Complete with extra tools. Reg. $80 for only $50 P.P. Wayne Pedersen, Box 1030, Claresholm, Aita. Canada T0L 0T0.

160 Meter linear with built-in tuner, 4/400A in PiNet 2 roller inductors, solid power, $245. R. MAce, W6RW, 8600 Skyline Dr., Los Angeles, CA 90046.

SELL: Drake 2-NT, Drake 2-C, Drake 2-CQ, Perfect. All cables, manuals. Several crystals. Phone (704) 667-8730. E.E. DeGroat, WA4SST, Rt. 3, Box 119-A, Candler, NC 28715.

SWR Bridge, Heathkit model AM2 with manual, $16 postpaid. Also RP electronics speech compressor model RFC-3C with manual, $16 postpaid. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

SELL: Argonaut with Ten-Tec microphone and outboard CW filter. Radio Shack Power Supply. Good condition. FOB, $230. K7BD, 103 E. Bartlett Ave., Selah, WA 98942.

SB-12B with power supply, Spectrum Analyzer, $500 or trade for KWM-2 or? Stanley Clemmons, 115 Yorkshire, Victoria, TX 77901.

SELL: Drake TR-3 xcvr and AC-3 power supply, $340. Jonnie Hutchison, WB5WRG, P.O. Box 23, Concord, AR 72523. (501) 668-3061.

VIBROPLEX std vibro-keyer wanted. Exc condx only. State price including shipping. All letters answered. VE3CGU, Box 231, Goderich, Ontario Canada N7A 3Z2.

FOR SALE: Drake TR-4 CW with all acciesories $820. Also scanner Bearcat 210 $215. Joe Schilling, 1409 S.W. 66th St., Oklahoma City, OK 73159.

SELL: Hallicrafters SX-115 rcvr, mint. CW mans dream. 500 cycle filter, notch calibrator, super stable, WWV, 80-10m, $325. J. Pluth, 7720 W. 162nd Pl., Tinley Park, IL 60477.

SELL OR TRADE: Motorola HT220 slimline walkie-talkie on 2 meters, charger, cases, cucky antenna. Mrs. L. H. Gregory, W4VWW, 111 Coleman Ct., Greenville, SC 29609. (803) 232-5206.

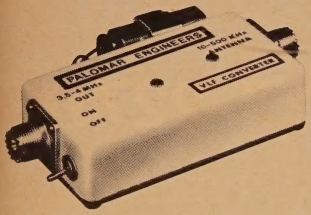
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New Reader Service System

To speed information to you on products shown in CQ advertising, a new computerized Reader Service System has been designed. For additional information on a particular ad in this issue, tear out the Reader Service postcard bound between pages 72 and 73, and circle the numbers on the card which correspond with the Reader Service numbers listed in the advertiser's index below. DON'T CIRCLE THE PAGE NUMBERS! Fill in your name and address, and mail. We'll have your information on the way in short order.

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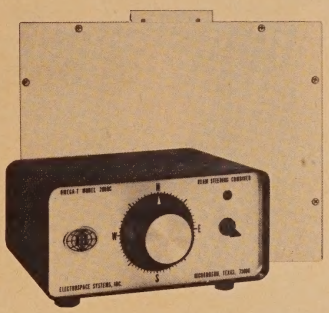
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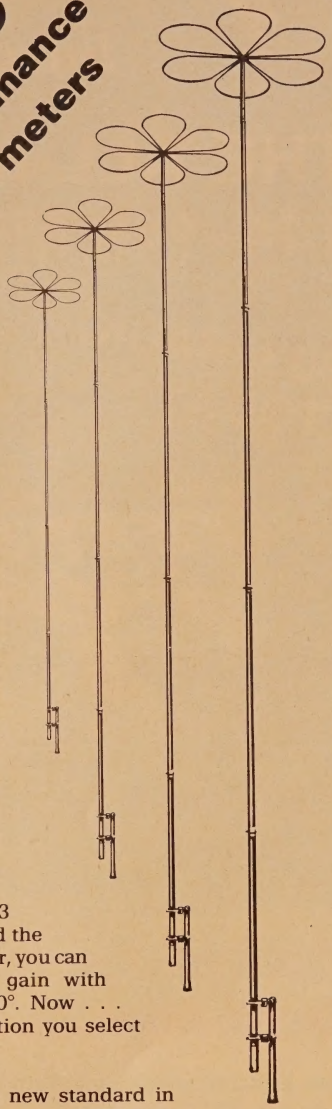
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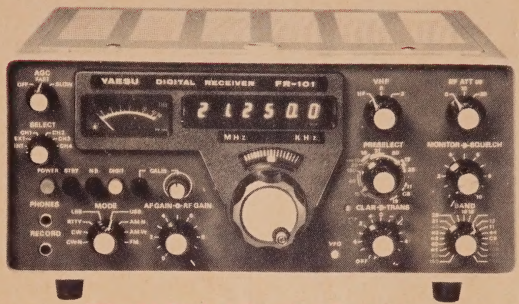
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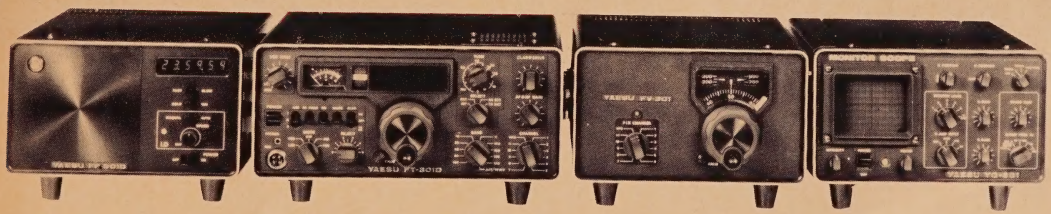
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