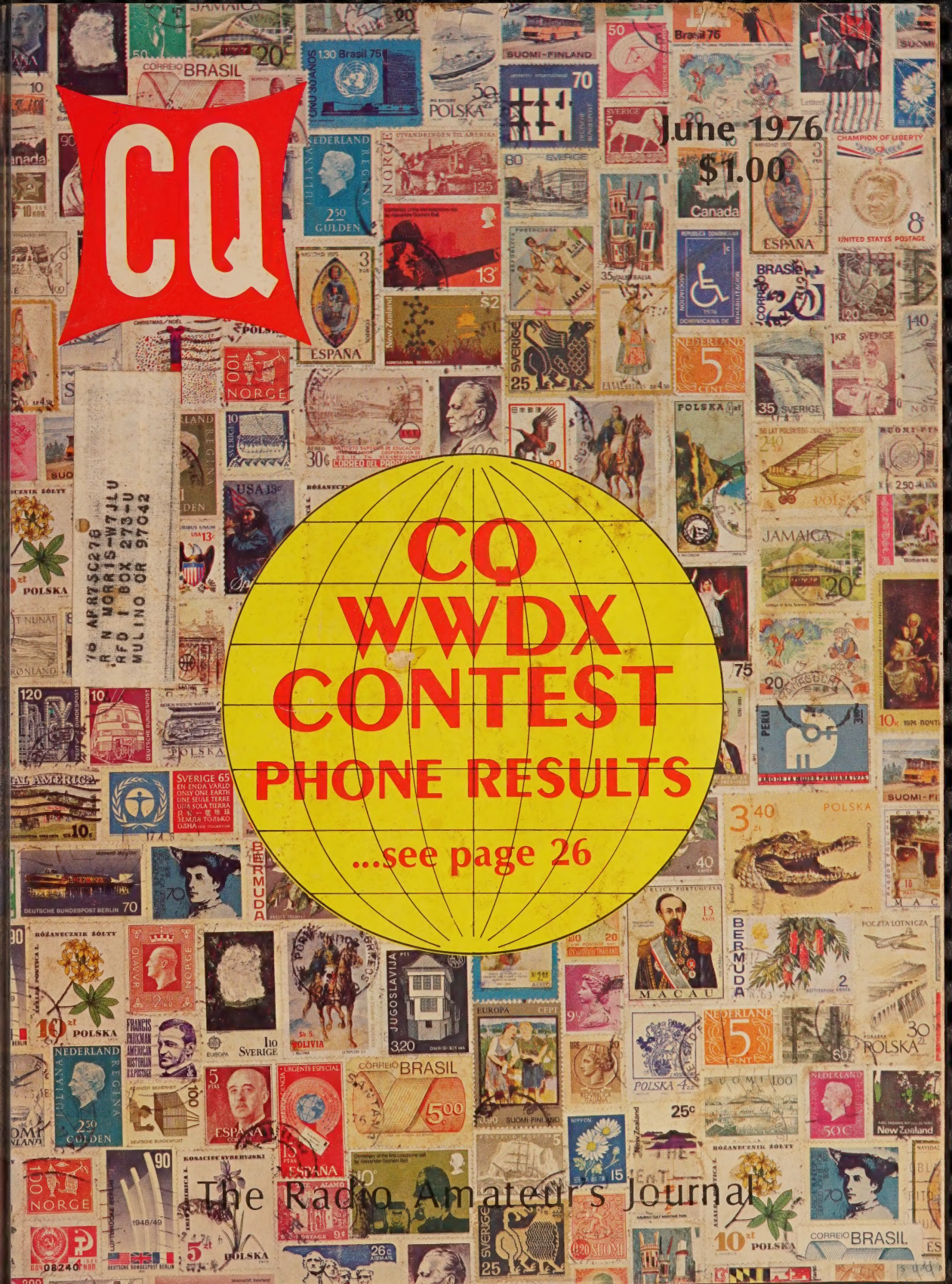
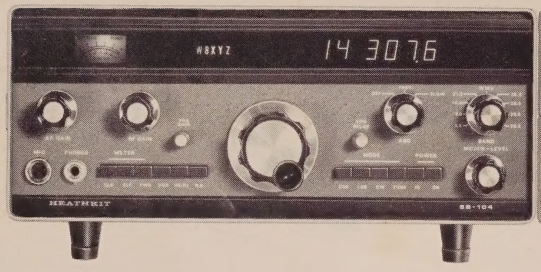
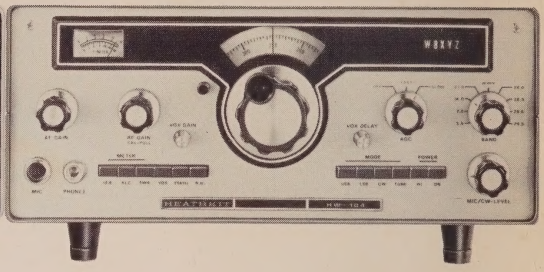

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...see page 26
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# State of the Art...

**Heathkit SB-104**




**Heathkit HW-104**




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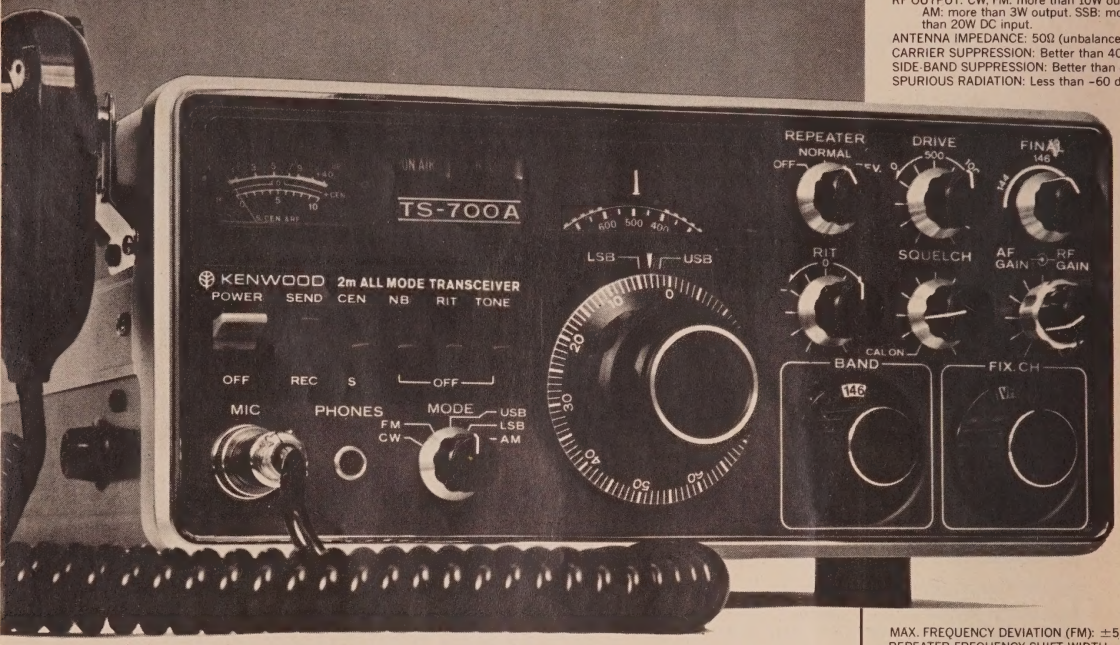
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RF OUTPUT: CW, FM: more than 10W output. AM: more than 3W output. SSB: more than 20W DC input.
ANTENNA IMPEDANCE: 50Ω (unbalanced)
CARRIER SUPPRESSION: Better than 40 dB
SIDE-BAND SUPPRESSION: Better than 40 dB
SPURIOUS RADIATION: Less than −60 db
MAX. FREQUENCY DEVIATION (FM): ±5 kHz
REPEATER FREQUENCY SHIFT WIDTH: 600 kHz
TONE BURST TIME: 0.5-1.0 sec.
MODULATION: Balanced modulation for SSB. Variable reactance frequency shift for FM. Low power modulation for AM.
MICROPHONE: Dynamic microphone, 500Ω
AUDIO FREQUENCY RESPONSE: 400-2600 Hz, within −9 db
RECEIVING SYSTEM: SSB, CW, AM: Single-superheterodyne. FM: Double-superheterodyne.
INTERMEDIATE FREQUENCY: SSB, CW, AM: 10.7 MHz. FM: 1st IF: . . . 10.7 MHz. 2nd IF: . . . 455 kHz.
RECEIVING SENSITIVITY: SSB, CW: S/N = 10 dB or better at 0.25μV. 20 dB noise quieting = Less than 0.4μV. AM: S/N = 10 dB or better at 1μV.
IMAGE RATIO: Better than 60 dB
IF REJECTION: Better than 60dB
PASS-BANDWIDTH: SSB, CW, AM: More than 2.4 kHz at −6 dB. FM: More than 12 kHz at −6 dB.
RECEIVER SELECTIVITY: SSB, CW, AM: Less than 4.8 kHz at −60 dB. FM: Less than 24 kHz at −60 dB.
SQUELCH SENSITIVITY: 0.25μV
AUDIO OUTPUT: More than 2W at 8Ω load (10% distortion)
RECEIVER LOAD IMPEDANCE: 8Ω
FREQUENCY STABILITY: Within ±2 kHz during one hour after one minute of warm-up, and within 150 Hz during any 30 minute period thereafter.
POWER CONSUMPTION: Transmit mode: 95W (AC 120/220V), 4A (DC 13.8V), max. Receive mode (no signal): 45W (AC 120/220V), 0.8A (DC 13.8V).
POWER REQUIREMENTS: AC 120/220V, 50/60 Hz. DC 12-16V (13.8V as reference).
DIMENSIONS: 278 (W) x 124 (H) x 320 (D) mm
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JUNE, 1976 VOL. 32, NO. 6

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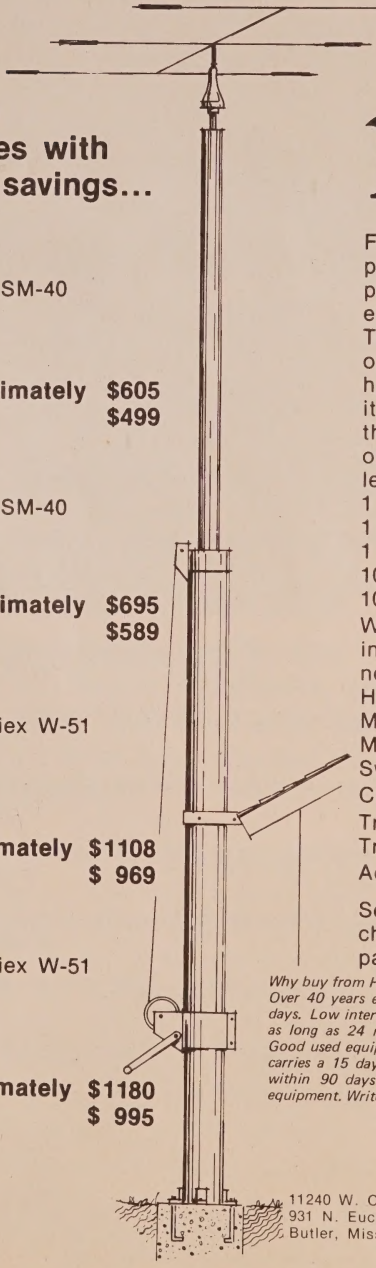
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# Zero Bias

What's amateur radio really all about? It's about a group of people under some general auspices each going their own way pretty much until some specific task or function brings them together. We *can* get together in times of disaster or public need. We *do* act in numerical concert for contests and many other short-range goal-orientated activities. What about the long haul?

What does it take to prompt amateurs as a group to effect change or impliment ideas on matters that are of great concern eventually to all amateurs? Fundamentally the question should be one of "How much say do I have and should I have over my intellectual, psychological and economic investment in amateur radio?"

Amateur radio per se does not drop like manna from the heavens but in fact is a tightly regulated pursuit. It is not and should not be construed as merely a pastime or hobby lest you can demonstrate how photography, stamp collecting or woodworking is politically regulated both nationally and internationally. We are involved with, formed by, and regulated by politics. Politics is not a dirty word or even one that is to be shunned or even a concept and/or abstraction that we amateurs are "above" or can choose to transcend. It is "how things work" and a tool or expedient for getting what you want accomplished.

Amateur radio is also a business. It supports not only the amateurs who work for and including manufacturers, distributors both wholesale and retail, service people, dealers in used equipment, manufacturers surplus, large firms, small firms and basement firms ritht down to the individuals who buy and sell through classified advertising. Money is routinely exchanged in the course of our 'hobby". We also support in various ways four publishing houses expressly devoted to disseminating information and providing additional enjoyment for our "pastime". All four *sell* a product, pay employees and expenses, and hopefully make a profit. We can argue the point with regard to the ARRL as they claim not to separate membership from *QST*. *QST* then is thereby defined as an official organ for their membership. The argument is a bit shaky when you consider that an individual can (and does) enter retail establishments and buy *QST* without being or becoming a member. I cannot envision taking a walk to my local stationary store or even going to an electronic distributor and picking up the latest copy of the *IEEE Journal*.

Another consideration in placing ourselves on the social spectrum is that despite all claims, no one body or organization speaks for amateur radio. There is no spokesperson that can honestly say that they represent 51% of all licensed amateurs on any matter. Every individual from the fledgling Novice to the corporate head of an electronic conglomerate has some vested interest in amateur radio. We all want something even if it's only to be left alone.

Is this situation good, bad, indifferent, or haven't you been personally touched yet by something beyond your immediate control? We are, whether we want to look at it or not, products of this system. I think basically the system is good and workable. It's faults lie within what we choose to see and what we choose to ignore for whatever reason. What and who are we responsible to, and what are we going to do about it?

First we are responsible to ourselves as amateurs and as amateurs we are responsible collectively for each other. We owe it to ourselves and others to use this system politically and economically to get what we want and to protect what we have. It is not un-American or un-amateur to exercise your rights to be heard, on the contrary it is just this fact that we are celebrating next month.

From time to time we receive mail from readers who are for or against something, pro or con League actions, questioning the actions of the FCC, decrying the practises of certain manufacturers and distributors and just wouldn't it be nice if" kind of letters. We at *CQ* cannot be all things to all people nor wave a banner on high for each cause or issue. We can and do publish what you are doing and whatever facts are available in each instance. This enables your fellow amateur (and mine) to find out what's happening out there *for, to,* and *against* his best interests.

One new developement *for* you was conceived recently by Randy Randall, K4EAR, and Carl Commander, W4ZRH, co-founders and interim officers of an organization called ARPAC (Amateur Radio Political Action Committee). This organization potentially can be a direct nation-wide spokesman for amateur radio.

This May I spent 3 days with Randy and Carl in Columbia South Carolina going over the ARPAC concept and attending an organizational meeting with amateurs from all over the state. It wasn't an anti-League meeting or strictly a meeting promoting some pet issue either. It was a group of amateurs who wanted to have some say in what was going on and how to make things better for amateur radio. Later that evening at a Sough Carolina amateur radio week dinner attended by Congressman Floyd Spence and Senator Dooley of South Carolina, Congressman Spence reitterated the basic fact of numbers. He was but one Congressman of many and in order to get things done you need the input of many Congressman. His view was that ARPAC was a step in the right direction to make amateur radio's wants known to the FCC and to the federal government.

Presumably ARPAC's will be set up in each state with representation coming from each Congressional District. This would give input to officials on a local level and provide a strong statewide voice of opinion to all elected officials. Some form of nation wide ARPAC is also being considered. The group will meet again in July at the Charlestown Hamfest (see Announcements column) to elect permanent officers and to get down to specific aims and goals ARPAC's can work towards. Two of the key issues are expected to be RM-499 and Incentive Licensing. The interest is there, and providing South Carolina can organize a sizeable portion of her 2000 amateurs, ARPAC's will be a considerable influence and power in amateur radio.

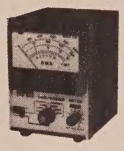
I suggest that if any of you are interested in the possibility of starting your own ARPAC to contact either Randy Randall, K4EAR, 7005 Nursery Road, Columbia South Carolina 29210 or Carl Commander, W4ZRH, Rifle Range Road, Mt. Pleasant, South Carolina 29464. It's an exciting way to get involved in your own destiny.

73, Alan, K2EEK

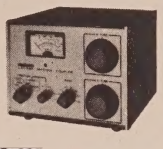
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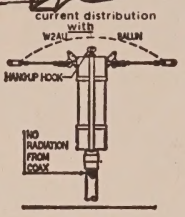
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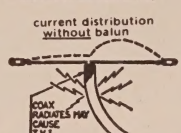



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7. BUILT-IN HANG-UP HOOK. Ideal For Inverted Vees, Multi-Band Antennas, Dipoles, Beam and Quads




NOW BEING USED EXTENSIVELY BY ALL BRANCHES OF THE U.S. ARMED FORCES, FAA, RCA, CIA, CANADIAN DEFENSE DEPT. PLUS THOUSANDS OF HAMS THE WORLD OVER They're built to last

BIG SIGNALS DON'T JUST HAPPEN— GIVE YOUR ANTENNA A BREAK

Comes in 2 models. 1:1 matches 50 or 75 ohm unbalanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

We'll GUARANTEE no other balun, at any price, has all these features.

AVAILABLE AT ALL LEADING DEALERS. IF NOT, ORDER DIRECT

UNADILLA RADIATION PRODUCTS MFRS. OF BALUNS Tel: 607-369-2985 Dept. CQ UNADILLA, N.Y. 13849


# Our Readers Say

### It's All Canadian

Editor, *CQ*:

In WB5OXC's article about the DXCC and Countries List in April *CQ*, he says, on page 19:

". . . . This is shown in Canada where the Yukon Territory and the Northwest Territories lie next to Canada, but they all count for one country."

However, Yukon and N.W.T. are a part of Canada just as much as, for example, Texas is a part of the United States. Perhaps he was confusing the situation with that of the Atlantic Province of Newfoundland: they joined Canada in 1949. That is why they have the VO1 call, and Labrador, the mainland portion of the province, has the VO2 call. Previously, they were colonies. While VE and VO1/2 are one country, we have the French Islands of St. Pierre and Miquelon, FP8, between Nova Scotia and Newfoundland. One thing about Ham Radio: you learn geography.

Ford Warner, VE7DDF
Victoria, B.C. Canada

### Positive Feedback

Editor, *CQ*:

I hope that *CQ* will support my petition to the FCC (RM 2665) that calls for examination reports that will tell the ham applicant the grade he got on the exam. The FAA provides such exam reports to the 750,000 people who have gotten pilot's licenses (and to the failures). The FCC can do the same.

Nickolaus Leggett, WA3YFU
Washington, D.C.

All applicants for Amateur and Commercial radio operator licenses should be given an examination report that shows the grade they got on their license examination. In addition to the numerical score, this report should indicate the general subject areas where the applicant was weak. These subject areas would be such items as Transmitters, Antennas, Regulations, etc.

These reports would help the applicant improve his knowledge and upgrade his license class. This type of report is provided by the Federal Aviation Administration to people who have taken the pilot's written examinations. A similar computerized report could be used by the Commission.

Modern educational theory indicates that detailed feedback is important to learning. Just knowing that one passed or failed the examination is not sufficient.

### Different Strokes

Editor, *CQ*:

Fine new look you're showing! I really don't object as do so many of us

*(Continued on page 79)*

# KENWOOD'S TS-520

*...worth waiting for!*




Why wait any longer for a rig that offers top performance, dependability and versatility . . . the TS-520 has proven itself in the shacks of thousands of discriminating amateurs, in field day sites, in DX and contest stations, and in countless mobile installations.

Superb craftsmanship is evident throughout . . . in its engineering concepts as well as its construction and styling . . . craftsmanship that is a Kenwood hallmark.

Maybe the Kenwood TS-520 is the one you have been waiting for.

Kenwood offers accessories guaranteed to add to the pleasure of owning the TS-520. The TV-502 transverter puts you on 2-meters the easy way. (It's completely compatibile with the TS-520.) Simply plug it in and you're on the air. Two more units designed to match the TS-520 are the VFO-520 external VFO and the model SP-520 external speaker. All with Kenwood quality built in.



## *Specifications* TS-520

MODES: USB, LSB, CW
POWER: 200 watts PEP input on SSB, 160 watts DC input on CW
ANTENNA IMPEDANCE: 50-75 Ohms, unbalanced
CARRIER SUPPRESSION: Better than −45 dB
UNWANTED SIDEBAND SUPPRESSION: Better than −40 dB
HARMONIC RADIATION: Better than −40 dB
AF RESPONSE: 400 to 2600 Hz (−6 dB)
AUDIO INPUT SENSITIVITY: 0.25μV for 10 dB (S+N)/N
SELECTIVITY: SSB 2.4 kHz (−6 dB), 4.4 kHz (−60 dB). CW 0.5 kHz (−6 dB), 1.5 kHz (−60 dB) (with accessory filter)
FREQUENCY STABILITY: 100 Hz per 30 minutes after warmup
IMAGE RATIO: Better than 50 dB
IF REJECTION: Better than 50 dB
TUBE & SEMICONDUCTOR COMPLEMENT: 3 tubes (2 x 6146B, 12BY7A), 1 IC, 18 FET, 44 transistors, 84 diodes
DIMENSIONS: 13.1" W x 5.9" H x 13.2" D
WEIGHT: 35.2 lbs.
SUGGESTED PRICE: $629.00

## VFO-520

Provides high stability with precision gearing. Function switch provides any combination with the TS-520. Both are equipped with VFO indicators showing at a glance which VFO is being used. Connects with a single cable and obtains its power from the TS-520. Suggested price: $115.00.

## SP-520

Although the TS-520 has a built-in speaker, the addition of the SP-520 provides improved tonal quality. A perfect match in both design and performance. Suggested price: $22.95.

## TV-502

TRANSMITTING/RECEIVING FREQUENCY: 144-145.7 MHz. 145.0-146.0 MHz (option).
INPUT/OUTPUT IF FREQUENCY: 28.0-29.7 MHz
TYPE OF EMISSION: SSB (A3J), CW (A1)
RATED OUTPUT: 8W (AC operation)
ANTENNA INPUT/OUTPUT IMPEDANCE: 50Ω
UNWANTED RADIATION: Less than −60 dB
RECEIVING SENSITIVITY: More than 1μV at S/N 10 dB
IMAGE RATIO: More than 60 dB
IF REJECTION: More than 60 dB
FREQUENCY STABILITY: Less than ±2.5 kHz during 1-60 min after power switch is ON and within 150 Hz (per 30 min) thereafter.
POWER CONSUMPTION: AC 220/120V, Transmission 50W max., Reception 12W max. DC 13.8V, Transmission 2A max., Reception 0.4A max.
POWER REQUIREMENT: AC 220/120V, DC 12-16V (standard voltage 13.8V)
SEMI-CONDUCTOR: FET 5, Transistor 15, Diode 10.
DIMENSIONS: 6⅝" W x 6" H x 13¼" D
WEIGHT: 11.5 lbs.
SUGGESTED PRICE: $249.00

**CW-520**
500 Hz CW Crystal Filter: $45.00.

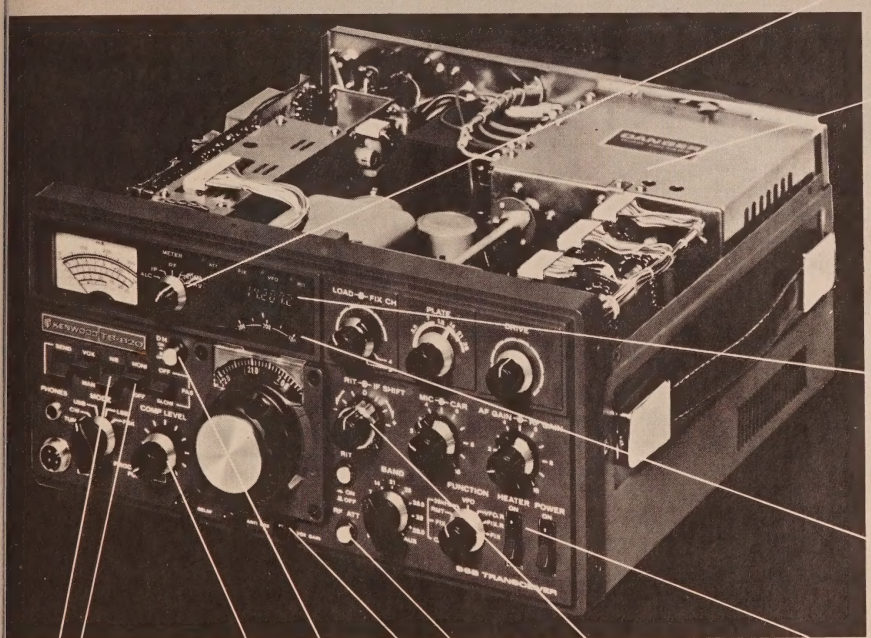
Prices subject to change without notice

# KENWOOD'S TS-820 *the Pacesetter*

LIMITED QUANTITIES AVAILABLE IN JULY

**Kenwood's well deserved reputation for fine craftsmanship and superb performance has never been more evident than in the TS-820. As a result of a host of innovative features being brought together, the 820 offers a degree of versatility, performance and pleasure second to none.**

**The Kenwood TS-820 is destined to be the world's new standard of excellence in amateur radio for years to come . . . a true "Pacesetter".**



## *Features*

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

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

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

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

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

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

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

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

*Also available, the VFO-820 . . . the perfect companion to the TS-820.

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

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

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

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

**SPEECH PROCESSOR** • An HF circuit provides quick time constant compression using a true RF compressor as opposed to an IF 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. This "IF shift" control is located on the front panel and provides excellent unwanted signal reject control or "pass band tuning." The 820 moves the signal across the IF pass band not the pass band across the signal.

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

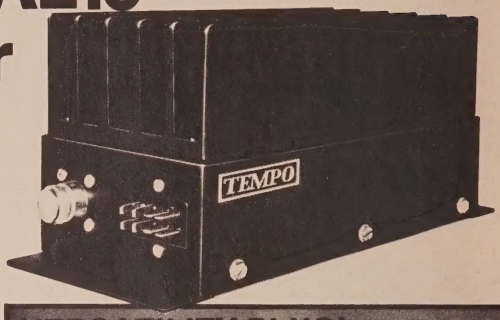
**VOX** • A voice-activated microphone circuit is built into the TS-820 with VOX GAIN, ANTIVOX, and VOX DELAY controls placed on the front panel for convenient adjustment any time.

KENWOOD

*. . . pacesetter in amateur radio*

# If you own a VHF ONE, a TS-700A or an FT-221

# ...Tempo's 100AL10 solid state linear is just what you need




Double your pleasure with the first truly linear solid state power amplifier available. The 100AL10 guarantees increased range and clarity in your VHF communications under all operating conditions. It operates in the frequency range of 144-148 MHz with power output of 100W (nom) with 10W (nom) in.

Modern solid-state technology is used throughout, along with conservatively rated components to assure the highest possible reliability. Microstrip design on glass epoxy circuit boards give added resistance to damage from shock or prolonged vibration.

Simply plugs into any of the above transceivers (an SSB adapter is required with the VHF-ONE) and you're on the air . . . loud and clear.

The 100AL10 (12VDC) ..... $179.00
The PS-1220 (AC power supply) ..... $129.00
The 100-AL10-B (AC power supply and amplifier in one compact package...ready for AC operation) ..... $295.00

**VERSATILITY PLUS! the TEMPO MR-2**

**VHF HIGH BAND MONITOR-PAGING RECEIVER**

The Tempo MR-2 is a shirt pocket size monitor-paging receiver with hundreds of uses. 12 channel capability...more than any competitive receiver and at an economical price. Excellent selectivity and guaranteed sensitivity across a 4 MHz band spread. 140-170MHz range. Plug-in crystals. Ni-cad batteries and accessory charger included.



$79.00
Commercial model ... $89.00

## The Tempo Line, now more than ever...solid value

**Tempo VHF-ONE** Full 2-meter band coverage (144 to 148 MHz for transmit and receive • Full phase lock synthesized (PLL) • Provision for accessory SSB adaptor • 5-digit LED receive frequency display • Automatic repeater split • Solid state • 10 watts output . . $495.00

**Tempo SSB ONE** SSB adaptor for the Tempo VHF-ONE • Selectable upper or lower sideband • Noise blanker built-in • RIT and VXO ..... $225.00

**Tempo/CL-146A** A mobile transceiver for the 2 meter amateur band • Compact and rugged • Solid state • 144 to 148 MHz (any 2 MHz without retuning). 12 channel possible. One channel supplied, two channels of your choice free ..... $239.00

**Tempo CL-220** Same general specs as CL-146A, but operates 220 to 225 MHz (any 2 MHz without returning) ..... $299.00

**Tempo FMH** Two watt VHF/FM hand held • 6 channel capability • Solid state • 144-148 MHz • Includes 1 pair of crystals, built-in charging terminals for ni-cad batteries ..... $199.00

**Tempo 6N2** Power amplifier for 2 and 6 meter operation • 2000 watts PEP input on SSB & 1000 watts input on CW and FM • Solid state power supply ..... $795.00

**Tempo 2002** For 2 meter operation ..... $695.00

**Tempo 2006** For 6 meter operation ..... $695.00

**Tempo VHF/UHF Amplifiers** A wide range of solid state power amplifiers for use in most land mobile applications.

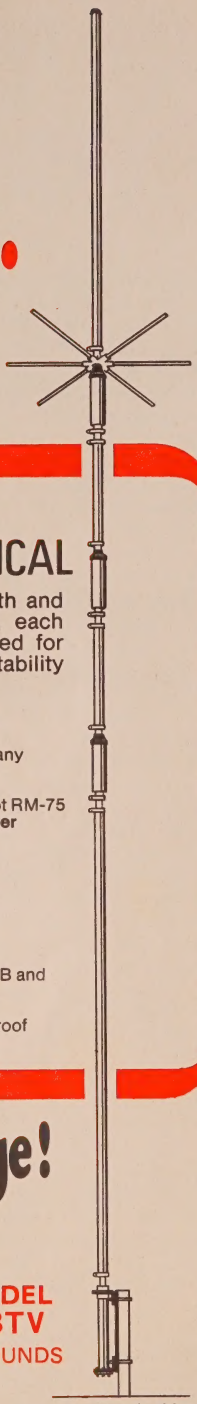
## *New from Tempo*

**Watch for the announcement of Tempo's brand new advanced design digital display transceiver...the Model 2020. 80 through 10 meters, SSB. Another solid value in the Tempo line.**

**Henry Radio**

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931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

# 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

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MODEL 4-BTV
15 POUNDS

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# Announcing

● **Rome, N.Y.** — The Rome Radio Club will hold its 24th annual Ham Family Day on Sunday June 6 at the Beeches Resort Restaurant and Motel. Gate opens at 7 a.m. Features include talks, contests, ladies and childrens programs, flea market, and displays. For additional information write: Rome Radio Club, P.O. Box 721, Rome, N.Y. 13440. or call (315) 337-2622.

● **Shaker Heights, OH** — The Midwest Alliance of Computer Clubs is sponsoring its first annual Computer Convention on June 11-13 at the Stouffer Somerset Inn, 3550 Northfield Rd. in Shaker Heights. Features include: Computer products, displays, Large Flea Market, Technical sessions, Computer demonstrations and games. Tickets are $2.00 at the door, refreshments available. For further information, write: The Midwest Alliance of Computer Clubs P.O. Box 83, Brecksville, Oh. 44141.

● **Black Hills, S.D.** — The Black Hills A.R.C. will be operating a bicentennial special events station (NSØDAK) at Mt. Rushmore National Memorial, in the Black Hills of South Dakota, on July 3rd-5th. SSB and CW on general and advanced portions of 80 thru 10 M and 2 M FM. Special QSL cards will be available. Please QSL with s.a.s.e. to KØCXL at 715 San Marco, Rapid City, S. Dak. 57701.

● **Santa Maria, CA** — The Satellite Amateur Radio Club is sponsoring the Santa Maria Amateur Radio Picnic and Swapfest to be held on Sunday, July 11th, beginning at 12 noon at the Newlove - Union Oil Picnic grounds on Orcutt Hill. Watch for the signs marking the turnoff 1 m South of Clark Ave. on US 101. Talk in will be on 146.52 and 7280 kHz. Santa Maria Style barbecue at 2:30 p.m. All the food you can eat. Door prizee is a Tempo One 80-10 Meter transceiver. Swap tables abailable at $3.00 each. Tickets are $5.00 for adults, $2.50 for under 12 and can be obtained by sending a check made out to Santa Maria Swapfest, Route 1 Box 55A, Santa Maria, Ca. 93454.

● **Palmyra, IL** — The Quad-Co. Amateur Radio Club, Inc., will sponsor the 19th Annual Hamfest of the "Breakfast Club" on July 17 and 18 at Terry Park, 3/4 mile east of Palmyra, 111. Saturday night activities include dancing and movies. Sandwiches and soft drinks available. Mobile talk-in on 3973 Kc. Games, contests golfing and fishing. Bring your swap gear. Camping facilities open from Friday afternoon until Monday morning. Pre-registration is $1.00, $1.50 at gate. Write: "Hamfest", c/o Quad-Co. ARC, Box 81 Chatham, IL 62629.

● **Portage, IN** — The Lake County Amateur Radio Club's 2nd annual hamfest is July 18 at the Issac Walton League. Take I 94 to Ind. 249 exit, then north on Ind. 249 1/2 mile. Tickets $1.50 advance, $2.00 at the gate. Write Herbert S. Brier, W9EGQ, 409 S. 14th St. Chesterton, In. 46304.

● **McKeesport, PA** — The Two Rivers Amateur Radio Club announces its 12th Annual Hamfest on Sunday, July 18th. at the Green Valley Fire Department fair grounds off U.S. Route 30 near East McKeesport. Large Flea market. For more information write: Two Rivers Amateur Radio Club, Inc., McKeesport, PA.

● **Slater, MO,** — Antique Aircraft and Amateur Radio Show Saturday and Sunday, July 24 and 25, at the Slater Memorial Airport. Registration $1.00 in advance: $1.50 at the door. Buffalo burger feed Saturday night and Sunday noon. Talk-in 3963 KHz, 146.94 and 146.28/.88. For additional information and advance tickets write Dale Beilsmith WØKNF, 807 North Broadway, Slater, MO 65349.

● **Crossville, TN** — The Oak Ridge Amateur Radio Club, Inc. Annual Crossville Hamfest will be held on July 24-25 at the Cumberland County Fair Grounds. Technical forums, Banquet, Breeder Reactor Program planned, picnic, flea market, raffle of many valuable prizes, and "eyeballing your friends" at the Fair Grounds. For more information contact: The Oak Ridge Amateur Radio Club, Inc. P.O. Box 291, Oak Ridge, Tn. 37830.

● **Flagstaff, AZ** — The Ft. Tuthill Hamfest is being held July 30-31 and August 1 at Coconino County Fair Ground - Across I-17 from Airport. R-V and Tent camping. Swap meet, Tech sessions, Contests, Prizes, Pot Luck, Exhibits, Talk-in on 146.22/82, 146.34/94, 146.52 and 3992 KHz. For more information contact: Merle Hutton, WA7JCK, 2549 E. Richards Place, Tucson, AZ 85716.

● **Norfolk, VA** — The ARRL Roanoke Division Convention & Tidewater Hamfest will be held on July 31-Aug. 1, at Norfold Scope. Exhibitor Display and Flea Market, completely Indoors and air conditioned. ARRL Banquet. For more information write: Tidewater Radio Conventions, Inc. Box 9371, Norfolk, Va. 23505.

● **Pasadena, CA** — The Jet Propulsion Laboratory Amateur Radio Club (JPL-ARC) will be conducting one of its active participation programs for this year by making contacts with other Amateurs all over the United States and many foreign countries in conjunction with the Bicentennial project of landing on Mars. The JPL-ARC will be "On the Air" during the Mars encounter by the Viking I and Viking II Spacecraft. The JPL-ARC will be using the special call of N6V on the following frequencies, CW, 3530,7030, 14030, 21030, 28030 KHz, SSB, 3810, 3930, 7230, 14225, 14325, 21360, 28630 KHz, Novice CW, 3730, 7130, 21130, 28130 KHz. Approximated dates are: June 18-23, July 3-18, Aug. 6-12, Aug. 31-Sept. 15. For more information write: Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, Ca. 91103.

● **Amherst, MA** — The New England Solar Energy Association announces its first annual conference and exhibition on June 24 and 25, on the campus of the University of Massachusetts. The conference will focus on the unique re-

*(Continued on page 79)*



# Great cost cutting ideas we've rejected for 20 years

**Unplated hardware.** We use a nickel-chrome plating that defies corrosion.
**Cheaper stainless steel.** Our 17-7PH steel whips bend 180° and return to perfect vertical.
**Erratic coil winding.** Tight, precisely wound coils are vital to maximum range.
**Smaller set screws.** Unlike some competitors, ours are rustproof stainless steel that stand up to a wrench.

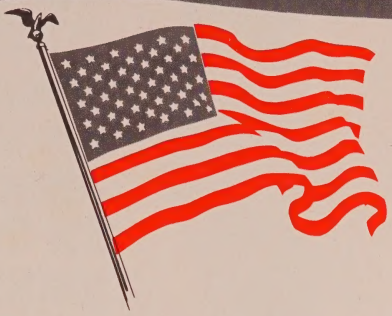
Cost cutting ideas are fine... until they affect quality and performance. Don't settle for second best. Look for the stripes of quality.

"Stripes of Quality"

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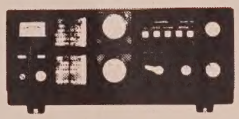
ARRL
ATLANTIC
DIVISION
CONVENTION

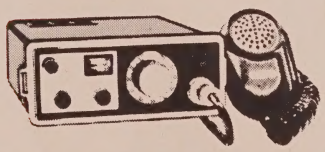
JULY 23, 24, 25
BEN FRANKLIN HOTEL, PHILADELPHIA, PA.

# BICENTENNIAL AMATE

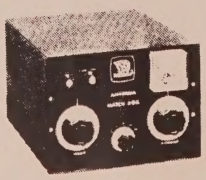
## WILL BE YOUR VISIT TO HAMTRONICS BICENTENN

## $10,000 in Ham









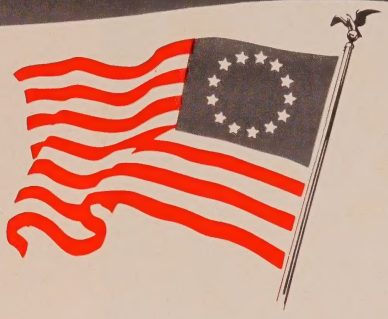
Just register --- you don't have to be present to win! All prizes will be awarded. YAESU 101E, KENWOOD QR666, DRAKE TR-22C, STANDARD SRC-851T, MIDLAND 13-509, HI GAIN H-1 QUAD CUBICAL QUAD, HALLICRAFTERS HA-20, JOHNSON 275 WATT MATCH BOX, ATLAS 210X, GALAXY RV 550, CLEGG HT-146, CDR HAM/II, and many, many more prizes.

- EXTRA --- hourly drawings. More fabulous goodies will be given away at the Hamtronics Show Room every hour on the hour! We'll just keep pulling names until somebody present wins!
- FREE BUS SERVICE from Ben Franklin Hotel to our door --- with a stop for the ladies (if they so desire) at the magnificent, all-enclosed NESHAMINY MALL, just a few minutes away from Hamtronics.
- FREE REFRESHMENTS, FUN, PRIZE AND FREE GIFTS FOR EVERYONE who comes to Hamtronics during our Bicentennial Convention/25th Anniversary Jamboree.

HOURS:

Thursday, July 22, 1976 --- 9 AM to 9 PM
Friday, July 23, 1976 --- 9 AM to 9 PM
Saturday, July 24, 1976 --- 9 AM to 6 PM

# HAMTRONICS



THE HIGHLIGHT OF
YOUR TRIP TO THE

# AIR RADIO CONVENTION

## AL CONVENTION/SILVER ANNIVERSARY JAMBOREE!

## Goodies as Prizes!

- MORE HAM EQUIPMENT than you can see on display anywhere in the world! ($1,000,000 inventory.)
- NO BICENTENNIAL TRIP TO PHILADELPHIA is complete without a trip to Historic Bucks County. (Washington crossed the Delaware to surprise the Hessians at Trenton, from a point nor far from Hamtronics Showroom.)

**WHY ISN'T HAMTRONICS EXHIBITING AT THIS ARRL CONVENTION?**

With our air conditioned showroom only a scant 10 air miles from Center City, we felt it would be easier for you to come to us. After all, we could display only a small fraction of our million dollar inventory on the convention floor. Besides, we are eager for all hams to see our showroom and get acquainted with all of our people.

**HERE'S HOW TO GET TO HAMTRONICS BY AUTOMOBILE**

**FREE PARKING (our lot holds 200 cars)**






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***The challenge and excitement of travel plus the thrill of operating from remote areas can sometimes be satisfied not too far from home.***

# A CANOE, A PM2B, ES QNI QTC QRP$_p$ 9/0

BY RAY SOMMERS, WB9LKC

April 12, 1974: CQ de WN0JDI and my first QRPp contact using a Ten Tec PM2B with a little over one watt input. A ten minute QSO with a whopping RST of 239/QRM/QRN. The QRPp bug had bitten.

Original plans were to use the lil rig on camping trips and ultimately on one of our canoe trips into the Boundary Waters Canoe Area (BWCA) in Northern Minnesota. But would contacts be possible or would the rig turn into excess baggage? No fun portaging extra weight.

### *WB9LKC/4*

With a three week technical session at Oak Ridge, Tennessee coming up in the summer of 1974 a carrying box was constructed for the rig and again the question of whether it was worth taking arose. 68 contacts on Field Day indicated it was. The box contains the rig, two 6 v. alkaline rechargeable batteries, antennas, tuner, s.w.r. bridge, log, paper, candles, etc., etc., and when full weighs 25 pounds. A convenient feature is a jack and switch which allows the rig to be run off the car battery or the internal batteries to be charged from the car. The straight key is permanently mounted on the fold down front which serves as a writing surface.

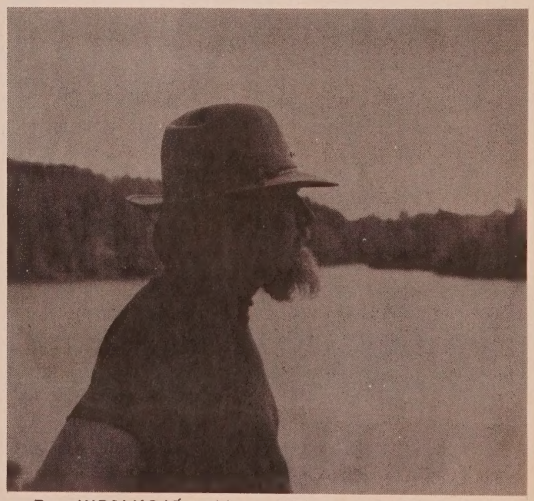
Three weeks of tenting at Cove Lake State Park in Tennessee and spare time operation on 40 meters netted 25 QSO's in 13 states with 529 to 589 reports. A success!

### *WB9LKC/8*

The acquisition of an Argonaut somewhat cur-



*The portable carrying box of WB9LKC.*



*Ray, WB9LKC/Ø making a WX report at Snipe Lake.*

tailed PM2B operation but occasionally the lil rig was fired up to see if it still worked. With a week vacation in late May 1975 plans were made for a short trial canoe trip with the rig. This was the Sylvania Recreation Area in Michigan, just north of Land O' Lakes, Wis. There was only one short portage so the extra weight was acceptable.

Because the antennas would be strung up in the trees new ones were made. 80, 40, and 20 meter dipoles were made using insulated #20 stranded wire and only a center insulator. No end insulators were used so that the wire could be easily pulled through brush and trees. Instead an overhand knot in the wire was used to connect it to the ropes. Well, almost rope. Nylon twine about the thickness of store string was used. The feed line was aluminum coax fitted with alligator clips in order to facilitate the frequent putups and takedowns.

Having become a member of four of the Wisconsin nets (with QRPp) I hoped to send messages to the XYL at the home QTH. The s.s.b. nets were warned of a possible QRPp c.w. BK.

What a place for an antenna—tall maples with almost no underbrush. Using a rubber ball as a weight so it wouldn't clobber someone on a miss, the twine went up and over a limb. It was a miss but went ten feet higher than planned and over a small twig, up about 35 feet or so. Just great! Five days resulted in 15 QNI's on 80 meters, 5 messages sent and 1 received, and 8 other QSO's, 4 being on 40. May 28 was a great day with QNI's in 6 of the 7 Wis. nets. Just couldn't get up for the one at 6:45 a.m. Needless to say some QNI's were relayed in. Boy was K9CPM ever strong and with good reason. I later found that his QTH was only about 20 miles away as the crow flies.

The mosquitoes were ferocious with the result that the operation was conducted on the floor of the tent and more time was spent on the rig than planned. Just try sending when sitting on the floor. kneeling, crosslegged, lying down,—nothing was comfortable. By the time I returned home however, I was so conditioned to it that I could barely operate at my desk.

### *WB9LKC/Ø and the BWCA*

The BWCA is a roadless area and part of the Superior National Forest. It adjoins a similar area in Ontario called the Quetico Provincial Park. The first trip up there was about 25 years ago when we learned the lesson of taking only what you need and that better not weigh too much. No problem when the gear is in the canoe but portaging makes one wish the extra junk was somewhere else. Our sixth trip up there was planned for August 1975 and by now there was little question that the rig would go. Still, would QSO's be possible? The trees in this area are mainly conifers and any place away from the small campsites there is heavy underbrush.



*The kids look forward to dinner beside Snipe Lake.*

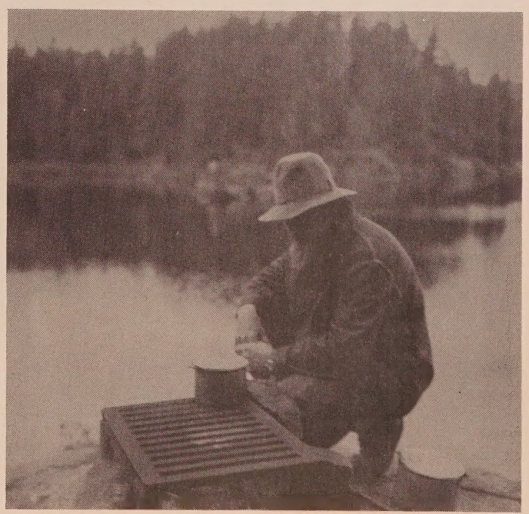
Stringing an antenna would be a real challenge.

The trip would start at Round Lake about 40 miles north of Grand Marais and would last about two weeks. That's about 80 pounds or so of food for myself and 6 children aged 9 through 15 (they eat more than I do as I was to find out). The food was always strung up between trees as far as possible in order to protect it from "things that go bump in the night."

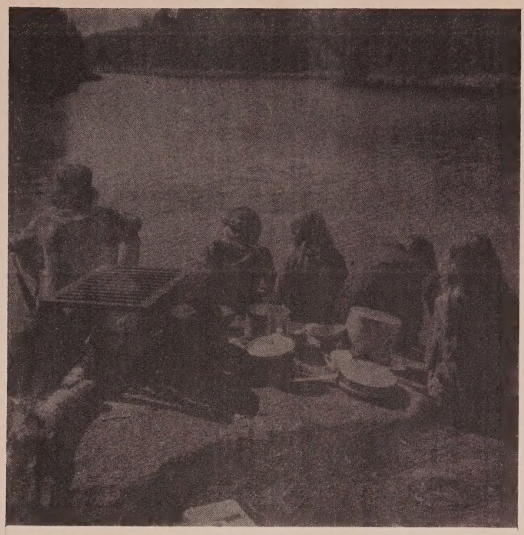
August 11: 12 hours of driving.

August 12: After paddling and portaging, paddling and portaging, four times, we camped on Flying Lake.

August 13, noon: Badger Emergency Net (BEN), BK de WB9LKC/0 . . . W9MMP/0 this is K9CPM



*The chef checks out the fire.*



*Dinnertime at the big rock at Snipe Lake.*

"you've got a c.w. breaker in there." Wow, I made it on the first try—with a little help!

5:30 p.m.: Wis. Sideband Net (WSBN), NR 41 R relayed by K9CPM "ON FLYING LAKE X RAINED AND QUITE WINDY X PORTAGES TOUGH AND AM GETTING OLD X MOVE FRIDAY X LOVE BT RAY" AR

7:00 p.m.: Wis. Intrastate Net Early (WIN E), QNI

10:00 p.m.: WIN(L) by candle light, no one heard me.

The antenna site wasn't too bad here since we were on the south side of a small island. With limited feedline there was just barely room to get the 80 meter dipole up. The center was about 15 feet and the ends about 4 feet off the ground and about 10 feet from the shoreline. Just south across a small stretch of lake was a big mean hill which was to be the next portage when we moved on. Looks like QRPp might make it.

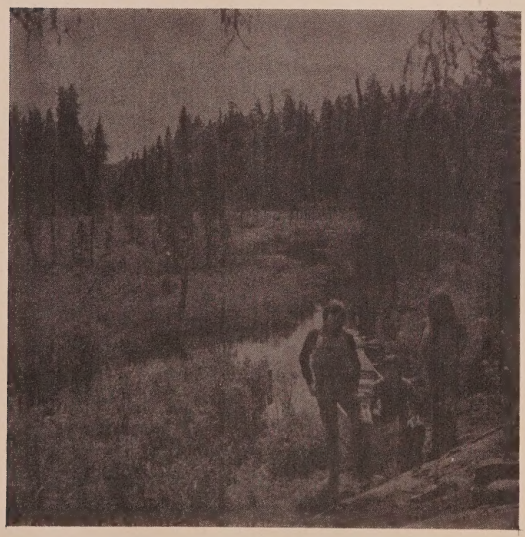
August 14: After breakfast we fed a duck a few minnows the children had caught and then it tried sleeping on a rock balanced on one leg. Enough fooling around, there's work to be done today! We broke camp and were on our way up and down across that hilly portage. The canoes weigh in at about 75 pounds and with a one-man carry they pinch the neck muscles in no time at all. There are occasional canoe rests made from logs by the Forest Service but we made numerous other stops



*Flying Lake at the end of the fourth portage.*

along the way by just resting the tip of the canoe on a tree or limb.

70 rods to Green Lake, 24 to Bat, 30 to Gillis, a windy paddle across, and finally 90 rods to Crooked Lake, our next stop. That 90 rods was a pleasant trip because it was nearly level compared with earlier up and downs over rocks and roots.



*Taking a break on a portage into Flying Lake.*

### *Crooked Lake*

We found a campsite at 5 p.m. and all was secure at 9:15 after eating a bonus of two 20 inch lake trout.

10 p.m. WIN(L) QNI and sent NR 42 R to NCS WA9QVT in Milwaukee with the help of K9LGU. The message was delivered a few days later mainly because the home QTH is in the fone area of only five stations who QNI the various nets. After hearing the

message in the system 3 days later and decision was made to list traffic only if someone was on who could deliver it. No use making a pest of myself. For every message sent two or more were ready but were not sent for this reason.

August 15: Light rain but trout for breakfast started the day off right. Noon BEN QNI QTC Custer —NR 43 R relayed by K9CPM and delivered a few minutes later by W9CFS. Now that's the way it should work! Actually, as I found out later, W9CFS was able to copy the message directly.

WSBN QNI, WIN(E) no luck, WIN(L) QNI QTC but poor conditions so QTA.

Crooked Lake has crystal clear water and our site was about 30 feet above the lake level. At first we didn't like climbing the hill every time to the



*The Flying Lake "feedpoint."*

tent site but the location for the antenna was the best we would have. We were on a point of a large island about a half mile long and could see east, west, and south. The area around the tent was quite clear and I got the antenna up about 25 feet.

August 15, 16, 17, 18, and still here. The loons were spectacular. Crying, laughing, doing gymnastics for us, diving, shaking their wings and walking on the water—what a show. Because of the trouble they have in getting airborne we sometimes saw them go over a quarter of a mile sort of skipping along and using their wings like canoe paddles. It made quite a racket and we would hear them before we'd see them. One loon had a fish about a foot long and it took about 20 minutes until he managed to get it down.

12 QNI's while on Crooked Lake and sent 4 messages. Also had a QSO with WB9ICH after WSBN



*The campsite at Flying Lake with the antenna in the foreground.*

and with WNØPHK/Ø on 40 meters but he had rough copy.

### *Snipe Lake*

August 19: Off again and on a rare calm day when everything is reflected in the mirror surface of the lake. To a canoeist, this must be what Heaven is like. Through Owl, Tuscarora, Howl, Hubbub, Copper, and on to Snipe our new home. But something was funny after that 255 rod portage (0.8 mile) from Tuscarrora. The lake didn't have the right shape for Howl according to the map. It wasn't Howl Lake! The long boardwalk through a swamp was where Howl used to be. Guess the beaver dam



*One operating position in the tent.*



*Morning on Crooked Lake.*

holding the lake back must have given way some years ago. It reminded me of the story about two canoeists getting up one morning to find the lake gone. No one said anything about it for quite some time because each one thought he had gone off his rocker! Anyway we were happy to miss a lake and a portage.

Snipe Lake is a many armed lake and fairly narrow although its long arms give it a nice size. The water was no longer clear but now had the light brown color and taste typical of many rivers. No loons or lake trout here but a 34 inch northern pike provided a good meal.

There are four campsites here but only one had a tent site anywhere near big enough for our 9 × 12 tent. It looked bad for rain because the rain would run off the tent fly onto a very large rock right back to the tent. Maybe the long dry spell would hold a few more days.



*Ray, WB9LKC/Ø listening for DX at Crooked Lake.*

WIN(L) and NR 46 via WA9QVT to W9BCC who delivered it. Normally the net finishes its business by 10:30 p.m. but it took until 11:05 for them to QSL my message. With such effort to handle just a routine message I have no doubt about getting an emergency message through if the need should ever arise.

The antenna site was about the worst possible. We were on the north side of a very large hill right at lake level. Heavy brush and trees limited the center height to only 15 feet.

August20: Two QNI's relayed. Then about 8:30 p.m. the first big rain storm of the summer hit. As suspected we were in a poor spot. About 1 a.m. some rain was seeping into the tent from the floor and one could feel a nice water bed of one to two inches of rain under part of the tent. It took two days before it had seeped away enough for us to use that side of the tent. Damp sleeping bags—ugh.

August 21: heavy QRN and no QNI's.

August 22: Tried loading up the 80 meter dipole on 20 and with the tuner got the s.w.r. to nearly 1:1. CQ de W6MSR . . . W6MSR de WB9LKC/Ø . . . WBLKC/Ø de W6MSR ur RST 449 Sunnyvale... ... SRI OM CAN'T CPY CUZ OF QRM. Wow. Not much of a ragchew but I'm still amazed he even got my call on the first go around. Two more QNI's but conditions too poor for QTC.

August 23: Another heavy downpour and more water in the tent delayed our planned return. Two more QNI's and NR 47 delivered by W9MFG. WIN (E) heavy QRN and no QNI. But after net W9BCC called and asked for any message. We tried for over an hour and were just about to adjourn to 15 minute skeds when an opening came through and "go now." Message passed and delivered to XYL and answer received on WIN(L).

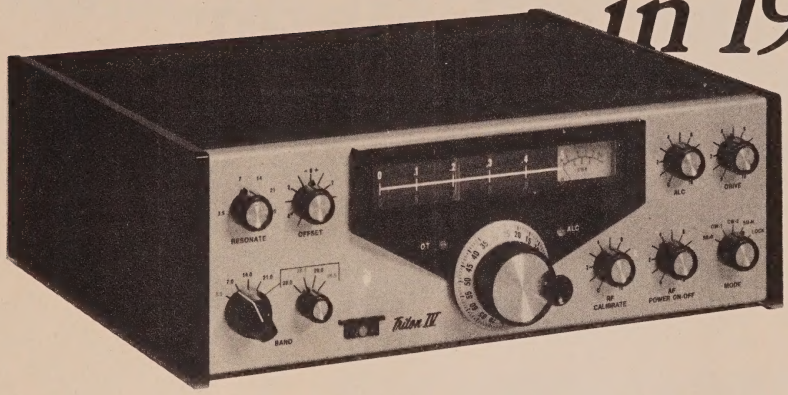
### *Homeward Bound*

August 24: Heavy fog and mist and a tail wind resulted in fast paddling through Crossbay and Ham Lake. After a mile walk to the car and 20 minutes of coaxing a thoroughly soaked engine, we were on our way.

First fog, then lightning, rain, and wind -the worst storm of the summer accompanied us on the 11 hour drive home. 2 a.m. and a half mile to go found the road blocked by a large tree. A detour brought us home to find another tree down in the yard and on top of a shed. Wonder how the tent would have survived this?? Boy those prayers for rain sure ended the drought!

*(Continued on page 68 )*

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# CQ Reviews: The Heathkit HW-2021 Hand-Held 2-Meter Transceiver

BY HUGH R. PAUL, W6POK

Now that Spring has arrived, most amateurs will be spending less time in the shack and more time indulging in outdoor activities. If you are planning some weekend jaunts or the annual vacation trip, you would do well to consider taking your hobby with you in the form of a portable rig.



*The Heathkit HW-2021 hand-held 2-meter transceiver. (Photo by Sandra K. Paul)*

Two meter activity being what it is, a small hand held unit is ideal. Of the many units now on the market, one of the most attractive both for price and features is the Heathkit HW-2021. Weighing just two pounds, this little rig comes complete with a nickel-cadmium battery pack, a.c. charger and rubber duckie antenna. Options include a vinyl carrying case and touch tone encoder for use on repeaters equipped with Auto-Patch.

A single crystal controls both transmit and receive, which results in considerable savings if you buy as many crystals as I do. While provision is made for five channels, you actually have ten. The HW-2021 comes equipped with a —600 kHz offset crystal, which results in two transmit frequencies for each crystal. If you have repeaters in your area with non standard pairing, no problem. Merely change the offset crystal to one that meets your requirements.

Other features include a unique circuit to conserve battery power in the receive/standby mode by about 75% and a transmitter power output of 1 watt to either the standard antenna or an external one thru an auxiliary jack on the side.

### *The Receiver*

The receiver circuitry of the HW-2021 is simple, but effective. Ten transistors and two integrated circuits are employed in a single conversion design. Another eight transistors are used in the receive/standby battery power conservation circuit.

Two dual gate MOSFET r.f. amplifier stages in cascade contribute greatly to the overall sensitivity figure of microvolts for 2 db of quieting.

The local oscillator stage uses fundamental crystals in the 15 MHz range. The output of the oscillator is multiplied thru two tripler stages and then injected into another dual gate MOSFET, which

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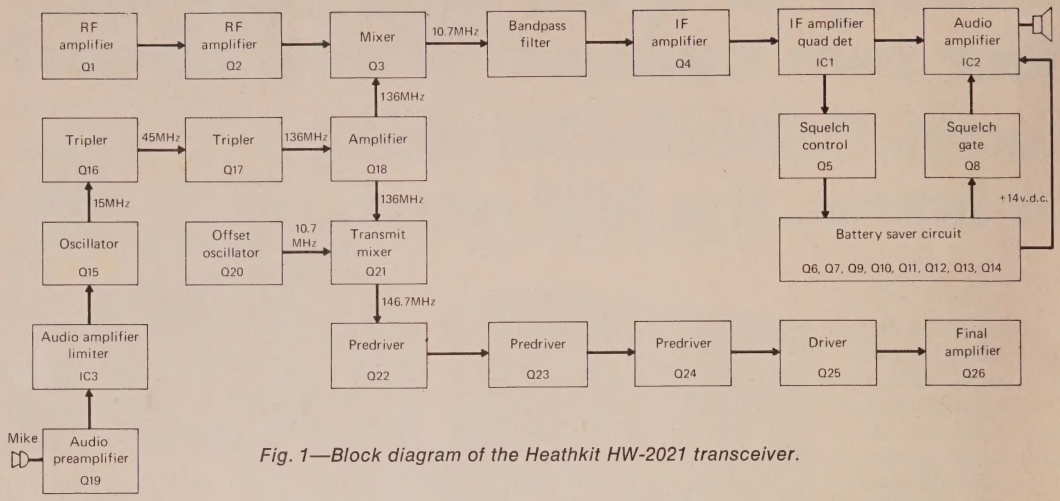


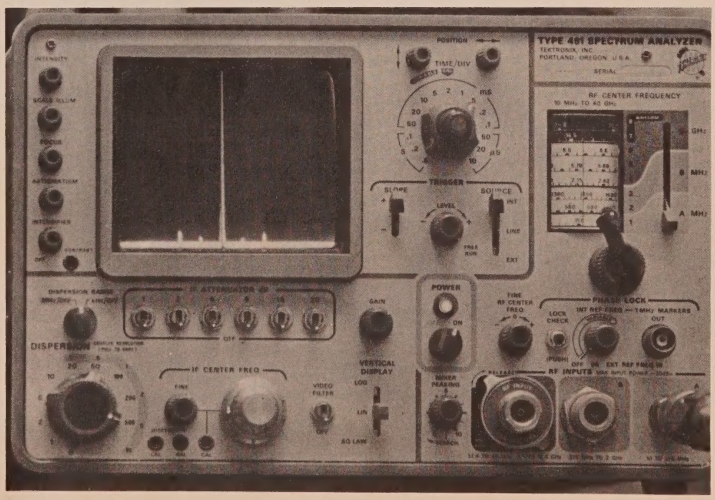

*Fig. 1—Block diagram of the Heathkit HW-2021 transceiver.*

functions as the mixer stage. The resulting 10.7 MHz i.f. signal then passes thru a bandpass filter, consisting of dual two section crystal filters. Bandwidth at the —6 db point is approximately plus and minus 15 kHz. At the —60 db point, the bandwidth is approximately plus and minus 30 kHz.

Intermodulation was experienced only from stations operating 15 kHz removed from the receive frequency. While receiver bandwidth specifications would lead you to believe that intermodulation would be a considerable problem, I found it to be no worse than some other units in the over $300 price class, currently being tested. Audio quality of the receiver is excellent. The IC audio amplifier is rated at .5 watts and is ample under most circumstances. Total harmonic distortion is below the 10% specified by Heathkit.

In recent weeks I have been plagued with a high noise level on the power lines in my neighborhood. In the course of "on the air" testing of various pieces of equipment, I have found that when operating from an a.c. supply this noise can make copy of the weaker repeater stations very difficult. I was pleased to note that the HW-2021 demonstrated greater immunity to this type of interference than some transceivers in the $400 to $500 price class. In mobile use the HW-2021 was a good performer with regard to impulse type ignition noise.

The battery saver circuit is very clever and is reproduced here for those of you who like to pick up on a good idea. With no signal to the receiver and squelch control $R_{26}$ adjusted so that squelch is activated, the squelch control transistor $Q_5$ is conducting heavily, thus lowering the voltage on the




*Spectrum analysis of the HW-2021. Two spurs are visable, one is the 10.1 MHz offset oscillator signal which is 30 db down from the carrier level and the other is a 5 MHz spur 35 db down from the carrier level. (Photo by Sandra K. Paul)*

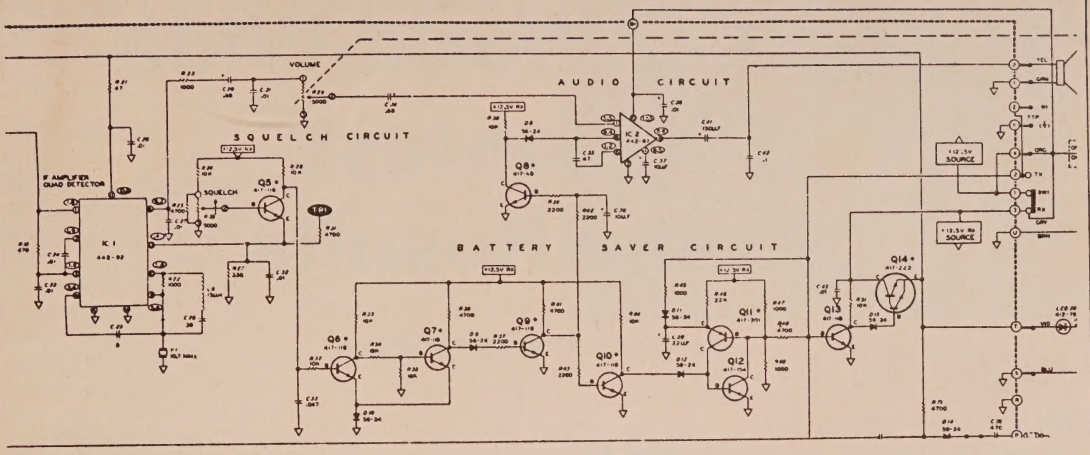



*Fig. 2—Innovative battery saver circuit used in the HW-2021 as reproduced from the manual.*

base of $Q_6$, which along with $Q_7$ functions as a Schmitt trigger. The output of the trigger circuit is low, thus the output from the d.c. amplifier $Q_9$ is high. The output of $Q_9$ is fed to the base of the squelch gate $Q_8$ and to the base of another d.c. amplifier $Q_{10}$, which in turn gates the pulse oscillator, consisting of $Q_{11}$ and $Q_{12}$.

During the squelched condition, collector voltage on $Q_{10}$ is low, thus transistors $Q_{11}$ and $Q_{12}$ produce a pulsed output voltage. Each pulse lasts about 20 ms. The R/C time constant being determined by resistor $R_{45}$ and capacitor $C_{39}$. This pulsed voltage is applied to the base of buffer amplifier $Q_{13}$, then inverted to drive the switching transistor $Q_{14}$. The battery voltage present at the collector of $Q_{14}$ is pulsed to the receiver, thus turning it on and off and conserving battery power in the process. The proper functioning of this circuit is indicated by the small LED on the front panel, just below the base of the rubber duckie antenna. The LED blinks "On" with each pulse of battery voltage.

## The Transmitter

The transmitter employs the same oscillator and associated multiplier stages used in the receiver section. Modulation is direct f.m. achieved by a JFET audio pre-amplifier driving an IC amplifier/limiter, the output of which is applied to a Varicap diode in the 15 MHz oscillator circuit.

The modulated r.f. from the multiplier stages is mixed with the Offset Oscillator output in a dual gate MOSFET mixer stage. Three pre-driver and one driver stage provide about 50 milliwatts of drive to the final amplifier. The latter device being either a 2N5913 or PT8831. Power output with 13.8 volts applied measured 1.72 watt.

The spectrum analysis photograph shows a spur 10.1 MHz removed from the carrier frequency, which is 30 db down from the carrier level. This spur is the 10.1 MHz offset oscillator signal. The 10.7 MHz crystal for simplex operation was switched in and it too measured 30 db down from the carrier level.

Another spur approximately 5 MHz removed from the carrier frequency may be observed in the photograph. This spur is 35 db down from the carrier level and presents somewhat of a mystery to its origination. It appears to be unique to the unit under test. Other HW-2021's exhibit only the 10.7 MHz spur.

Audio quality of the transmitter is excellent. This due in part to the use of a separate microphone element, which is mounted next to the speaker, in the upper left hand corner of the front panel.

The optional touch tone pad was installed on the HW-2021 tested. Its performance is as good as any I have used and I especially like the action of the keys. Output of the pad is capacitivly coupled to the IC audio amplifier in the transmitter section. Waveform of the transmitted tones, as displayed on a scope is very clean.

Those of you interested in a touch tone pad for use with an existing rig would do well to consider this one. Its a very good one for the money.

## Conclusions

There are a lot of components that make up the HW-2021 and they all mount on a single circuit board. Heathkit does not recommend the kit for a first time construction effort but the manual is so well written I personally feel that if you know how to solder and can follow directions you will have no trouble, regardless of your past experience. If you get nervous when wielding a soldering iron in cramped quarters, find a friend who will build it for you. Do it quickly, summer is almost here. ■

# 1975 CQ World-Wide DX Contest Phone Results

BY FREDERICK CAPOSSELA, K6SSS

When contest stations start working over 100 countries on 10 meters, you know it's going to be an extraordinary weekend. And the October Phone Contest sure was.

By the time the dust had settled, we had a new All-Band Champion—6.6 million, FY7AK operated masterfully by F5QQ. After finishing third last year, he vowed he'd be ready this year. Congratulations, Ron!

Two Caribbean DX-peditions came in second and third—VP2G by W5MYA and KV4IJ by K6SDR. Being in N. America, they could only claim 2 points for most contacts. But even mathematically equalizing their QSO points with FY7AK, they still come out about a million behind Ron.

You won't find OA8V's 142K score in the Top Ten, but his effort sure deserves to be there. Because in a world full of 2000-watt linears, Paul did it all running only 2 w. out!

Top USA All Band honors went to 2.2 million W7RM operated by that JA-machine, K7VPF. It was those pages and pages of JA's which provided his half million margin over W1ZM manned by WA2CLQ. Right on his heels thundered competition so tightly bunched that less than 100K separated the 3rd through the 6th place finishers.



*That big smile belongs to Single-op/All-Band champ, F5QQ, pilot of FY7AK. The two tri-banders and a 40m. beam Ron added this year paid off.*

So many things went wrong on the VP2M DX-pedition that they started calling themselves VP2Murphy. Nevertheless, the Western Washington Gang still ran up 5.8 million to take the top Multi-Single spot. In the Multi-Multi category, a near 8-million talkathon by DLØPG outdistanced an all-local gang at PJ1AA.



*Multi-Single winners VP2M, K7JCA, VE7BD, VP2MF, W7EXM, Johnny, VE7SV. They must have used more than that to run up 5.8 million.*

### 13 Records fall

New world marks were set by XJ3BMV on 1.8 MHz. and KV4FZ on 3.5 MHz. And congratulations are also in order to new record holders W8LRL, W1EBC, W3PHL, FY7AK, CV4CR, OH2BH, OH5NW, CN8HD, EA8CR, DLØWU and VP2M.

### Logging 'em As You See 'em

Reading through umpteen thousand pages of contest logs not only tells you who was working whom and when. But you also find out exactly who was thinking what during those 48 hours. No beating around the bush. Like the VK who got up to page 17 then QRT'ed for ½ hour after which he returned and made the following log entry, "hunk of steak and 3 glasses of wine." Or the European who finally worked the KH6 and after his call noted "tin ear." But the prize has to go to the WB4 who slugged his

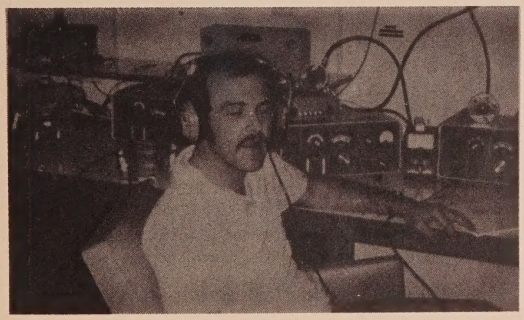
way to page 7 when suddenly he started adding a motto on the top of each page— "Canem devoret canem, Canem devoret canem." Latin for "dog eat dog."

### *Your-Secret-Is-Safe-With-Me Dept.*

Many thanks to the W2 who enclosed a check for $88.20 with his log. Unfortunately it wasn't made out to us, so we had to return it to him. Besides, if you want to tempt me, you've got to go to at least three figures. Equally anonymous will remain the writer of a tiny note that turned up out of nowhere saying crypticly "John: You talk a little too *loud*. Marcella wants to have a rest." It'll have to remain anonymous—the note was unsigned. The same treatment will be accorded the author of a mysterious blank postcard (no address or stamp) with only "please acknowledge receipt" written across it. We hereby acknowledge receipt.

### *The People Who Count*

I'm extremely fortunate to have the help of a group of very dedicated individuals who serve on the Contest Committee. Quite literally, the results could never be done without them. They deserve a very special vote of thanks—our Chairman, Frank Anzalone, W1WY; and members Gene Walsh, K2KUR; Bob Cox, K3EST; Bernie Welch, W8IMZ; Dave Donnelly, WB2SQN; Dick Norton, W6DGH; Larry Weaver, W6JPH; Glen Rattman, W6MAR; Jim Neiger, W6BHY; Phil Goetz, W6DQX; Larry Brockman, WA6EPQ and Fred Laun, W9SZR. And to Kim Smith at *CQ* who made sure all logs got to California to start with. I'd also like to add my personal commendation to Daryl Kiebler, WB8EUN, and his wife, Olga, for their invaluable contributions to the committee. Our deep thanks.



*When he opened his eyes, Mike, W5MYA, found he took 2nd place All-Band DX-peditioning from VP2G.*

That's it for now. Coming up next month, the C.W. Results. And coming up the weekend of October 30 & 31, the 1976 *CQ* WW Phone Contest.

73, Fred, K6SSS



*Up and coming Multi-Single team G4DAA—G4BVH, G4BUE, G3XBN, G3ZQW, G3MXJ, G8OS, G8KMQ, G3FXB. Operation took place from meadow on G8OS's farm.*

### *USA QRM*

"Police dropped by twice to get me to go off the air . . . *W6UFJ*. Having a 2-letter call is a big advantage—being old enough to have one is a big disadvantage . . . *K6QX*. I wish *W2HPF* would change his call, hi! . . . *WA4HPF*. *6W8FP* went off the air after we called him—someone remarked, 'maybe a lion ate him.' . . . *WA6FXM/9*. Worked *CR9AJ* 11 minutes after contest was over . . .*W6KYA*. By-pass capacitor blew up on me and XYL threw me out in rain to get potatoes for evening stew . . . *WB6OMF*. Had debate as to whether or not to claim multi-op as Murphy was my co-pilot . . . *WB6NHF*. Worked over 20 new ones . . . *WB4ZNH*. Was like a kid in a candy store chasing DX—my first contest was a fantastic experience . . . *WA3YGH*. Many contacts thanks to good ears on the other end . . . *WB2HZH*. Gave phonetics as WA3 'Single Sideband.' Reply was 'of course, I'm running Single Sideband—*QRZ*.' . . .

### USA TOP SCORES

| | | | | |
|---|---|---|---|---|
| **Single-Op All Band** | W7RM | 2,208,980 | W3CRE | 1,440,373 |
| | W1ZM | 1,685,125 | K4VX | 1,188,039 |
| | W3LPL | 1,527,750 | W2HMH | 1,161,043 |
| | W6RR | 1,455,772 | W2GXD | 1,118,725 |
| | W7JST | 1,447,016 | W4QCW | 983,060 |
| **Single Op Single Band** | **28 MHz** | | **7 MHz** | |
| | WB5HIH | 13,440 | W3PHL | 110,799 |
| | WA1HFN | 13,052 | K6QW | 110,160 |
| | K4HWW | 11,515 | WA6EPQ | 93,438 |
| | W8IMZ | 11,450 | K8LUU | 44,548 |
| | W6HX | 11,312 | W1FXD | 43,296 |
| | W4OZF | 11,055 | WB4QKE | 34,470 |
| | **21 MHz** | | **3.5 MHz** | |
| | K1JHX | 354,660 | W1EBC | 77,420 |
| | WA6EKL | 293,440 | K8INX | 64,974 |
| | K4PHY | 262,035 | WA2LTQ | 62,504 |
| | W4FDA | 214,608 | W7KW | 52,290 |
| | WB9HAD | 188,625 | WA2EKH | 39,858 |
| | WA4OSM | 182,286 | WB4QNP | 27,972 |
| | **14 MHz** | | **1.8 MHz** | |
| | K9PPY | 314,440 | W8LRL | 2,871 |
| | W9ZRX | 230,298 | K1PBW | 2,828 |
| | WA1NKK | 221,578 | WB4QZT | 1,425 |
| | WA7UWE | 215,380 | W2BP | 760 |
| | WB7ABK | 209,280 | W1BB | 585 |
| | W9IRH/7 | 203,320 | | |
| **Multi-Op Single Xmtr** | W6ONV | 1,660,395 | W6PAA | 1,091,860 |
| | W2HPF | 1,396,747 | WA1NZT | 1,090,800 |
| | K3MNT/7 | 1,299,455 | WA1STN | 1,016,760 |
| **Multi-Op Multi-Xmtr** | W2PV | 6,052,867 | K6SEN | 4,170,084 |
| | W3AU | 5,494,944 | WA8ZDF | 4,108,115 |
| | WA2ZAA | 5,283,540 | W3WJD | 4,082,784 |




*The potent UK5MAF gang and the reasons why. Operators UB5MCD, UY5LK, UB5-059-22, UA6HZ, UB5MDC.*

*WA3SSB.* Suggest a team of judges monitor the contest and make a published report on unsportsmanlike conduct by U.S. ops . . . *WBØFBQ.* Operators on 20 very discourteous! Other bands were great fun . . . *K4KEW/5.* Recommend special class for those stations operated by operators other than licensee. Makes it impossible for moderately-priced stations with average class of contest operators to compete for top award . . . *WB4OXD.* XYL should get award for being cooped up with 2 and 5 yr. olds during rainy weekend . . . *W1MDO.* It sure is easier from the East Coast on 80. Would have lost 2 nights sleep to approach this year's results from the West Coast . . . *W1SD (ex-W6DQ).* First time I've worked Africa on 10 and I did it twice . . . *WB2TLD.* We all could score more points if some stateside ops used their receiver as much as their amplifier . . . *WB2LOF.* Hope next year that credit for Canadians is not given except for country and zone credit—at very least make them count one point . . . *WA2LTQ.* Having a good friend go on PJ8YFQ DXpedition and then working him for last QSO of the contest . . . *WA4HEK.* Would have been on longer, but had to watch the Goodyear Blimp land at our airport . . . *WB9BSH.* First contact on 40 was with *6W8FP*—it sounded like 20 . . . *WB9AJZ.* Working *OJØMA* was a real thrill . . . *K9HKF.* One bit of advice—never try to sell your car the same weekend of a DX contest!!! . . . *WA9JDT.* I know I didn't win, but it was the most fun I've had in years as a ham . . . *WB9IJV.* The use of tape recorders and programmed c.w. senders should not be allowed as this is not a part of operator skill. Maybe there should be a new class called 'Professional amateur radio stations.' . . . *K8INX.* Missed prime times, raking, mowing and fertilizing my yard . . .*W8KOD.* It was fun to a point . . . *W5OSH.* Wait 'til next year . . . *WØEEE.* Thrill to have *EA8CR* show up on 160 unannounced . . . *W2BP.* Murphy never left the shack . . . *WA3VQP.* Due to Penn State-Army game could only work Sunday . . . *WA3UXP.* It's been a long time since I've heard condx on 15 so good . . . *WA5RTG.* Having a General class license is a tremendous disadvantage in a DX contest—especially on 40 and 80 . . . *WB2SJG.* First year I didn't get called all weekend even tho I was on surgery call . . . *K5JZN/3.* Why do stateside stations think 10 is only open during contests? . . . *K3IGA/4.* Surprised when *9J2GJ* and ZD8RW answered my CQ on 10 . . . *WA4JQS.* Missed Rhodes due to city-wide power failure . . . *WAØHFW/4.* QRM extremely bad from XYL . . . *K4SGL.* QRN on 160 was 59 plus 10 until *W8LRL* told me what a beverage antenna was. Put up a 700 foot one in middle of night and QRN reduced to nothing—thanks to *W8LRL* . . . *WB4QZT.* Neighbor's burglar alarm going off and a funeral didn't help matters . . .*W5OSJ.* Utilized all 3 drivers during European opening on 15 as Murphy kept striking

## WORLD TOP SCORES

| | | | | |
|---|---|---|---|---|
| **Single-Op All Band** | FY7AK | 6,636,348 | W7RM | 2,208,980 |
| | VP2G | 4,245,813 | UB5WE | 2,016,483 |
| | KV4IJ | 3,247,986 | W1ZM | 1,685,125 |
| | 6W8FP | 2,596,186 | OK2RZ | 1,531,868 |
| | G3LNS | 2,595,692 | W3LPL | 1,527,750 |
| **Single-Op Single Band** | **28 MHz** | | **7 MHz** | |
| | CV4CR | 668,624 | OH5NW | 167,751 |
| | CR6FW | 279,680 | YZ1BCD | 149,600 |
| | CX8BE | 271,353 | W3PHL | 110,799 |
| | LU8FEU | 166,452 | K6QW | 110,160 |
| | PY3BXW | 125,624 | WA6EPQ | 93,438 |
| | CE4EM | 60,780 | I5FCK | 92,904 |
| | **21 MHz** | | **3.5 MHz** | |
| | G3WJN | 533,943 | KV4FZ | 275,319 |
| | CX3BH | 505,788 | XJ3EDC | 141,726 |
| | VK6CT | 468,309 | CN8HD | 140,651 |
| | EA8JJ | 455,975 | I3MAU | 113,535 |
| | YV4YC | 436,08 | W1EBC | 77,420 |
| | YZØSRJ | 422,816 | OH1XX | 71,640 |
| | **14 MHz** | | **1.8 MHz** | |
| | CW3BR | 1,104,872 | XJ3BMV | 8,640 |
| | OH2BH | 981,815 | PAØHIP | 3,024 |
| | CR6IK | 842,394 | W8LRL | 2,871 |
| | G3XYP | 810,434 | K1PBW | 2,828 |
| | I1GPK | 710,646 | VE3ECP | 2,754 |
| | G3HCT | 704,459 | WB4QZT | 1,425 |
| **Multi Op Single Xmtr** | VP2M | 5,792,750 | DLØWU | 4,208,312 |
| | EA8CR | 4,673,005 | VP5WW | 3,532,797 |
| | UK9AAN | 4,328,390 | FGØMM | 3,035,840 |
| **Multi-Op Multi-Xmtr** | DLØPG | 7,930,918 | W2PV | 6,052,867 |
| | PJ1AA | 6,989,316 | W3AU | 5,494,944 |
| | DK2BI | 6,059,119 | WA2ZAA | 5,283,540 |

## *DX QRM*

"The South Americans and Africans on 80 were about as rare as a *W3AU* QSL card . . . *G3HTA.* Biggest thrill: in the middle of the second night with propagation completely closed, *9N1MM* gave me a call with S9 plus . . . *3A2GX.* Score would have been 5.5 million if in 3-point area only 85 miles away—frustrating . . . *W5MYA* oprr. of *VP2G.* Largest log ever!—2 QSOs . . . *VP8NX.* Without doubt, this contest is one of the most important events for every radio amateur . . . *LU4MBI.* Hard work . . . *ZL1BKX.* Thank you, Henry & Bea . . . *WA7UQV* opr. of *XJ7WJ.* Not a good year for me—had to work on the 25th and lost beam on the 26th . . . *VP9AD.* I'm surprised to hear so many W6 stations using 3.8 MHz. beam antennas! . . . *JA4BKL.* Sure missed my *HS2AIG* call of last year . . . *KA6DX.* Glad to get 10 new countries . . . *JAØTKU.* No band condx for nearly 15 hours; no beer; no bread; otherwise another good contest, hi . . . *CR6IK.* Conditions were *too* good on 10, we weren't prepared for it . . . *DK2BI. VE2AQS/TG9* is a mouthful especially when you have been yelling for 48 hours . . . *VE2AQS/TG9.* Hope to be on 160 and have a beam on 40 to work stations heard . . . *9Y4NP. Greatest handicap was my call sign . . . WB9AJF/6Y5.* Being a new country, we wanted to hand-out maximum contacts, not search out multipliers and our score



*HV3SJ went Multi-Single in a big way. That's JA4CBP, DF2GX and DJ3HJ who joined Brother Ed.*

# BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

**Number groups indicate: QSO's/Zones/Countries on each band.**

WORLD TOP SINGLE OPERATOR – ALL BAND

| Station | 160 | 80 | 40 | 20 | 15 | 10 |
|---|---|---|---|---|---|---|
| FY7AK | 11/5/5 | 320/17/44 | 438/22/66 | 1165/33/112 | 1999/27/89 | 634/22/56 |
| VP2G | | 348/14/39 | 535/19/53 | 970/28/92 | 1629/27/90 | 868/19/48 |
| KV4IJ | 8/3/6 | 518/11/42 | 480/15/39 | 856/25/76 | 1350/22/64 | 905/16/38 |
| 6W8FP | | 12/8/8 | 220/16/25 | 720/32/85 | 959/29/90 | 350/22/74 |
| G3LNS | 3/1/3 | 166/11/34 | 214/17/60 | 1172/25/66 | 1098/28/75 | 23/8/18 |
| W7RM | 15/6/6 | 139/22/40 | 417/23/50 | 484/28/73 | 1019/27/72 | 21/9/9 |
| UB5WE | | 268/10/40 | 169/16/47 | 1061/33/102 | 637/23/73 | 89/12/37 |
| W1ZM | | 225/22/68 | 76/16/40 | 533/29/84 | 493/27/97 | 63/11/31 |
| OK2RZ | | 279/8/34 | 156/13/35 | 729/26/87 | 625/31/87 | 30/11/24 |
| W3LPL | 10/4/5 | 117/20/63 | 106/20/60 | 426/29/84 | 495/25/99 | 52/11/30 |

USA TOP SINGLE OPERATOR – ALL BAND

| Station | 160 | 80 | 40 | 20 | 15 | 10 |
|---|---|---|---|---|---|---|
| W7RM | 15/6/6 | 139/22/40 | 417/23/50 | 484/28/73 | 1019/27/72 | 21/9/9 |
| W1ZM | | 225/22/68 | 76/16/40 | 533/29/84 | 493/27/97 | 63/11/31 |
| W3LPL | 10/4/5 | 117/20/63 | 106/20/60 | 426/29/84 | 495/25/99 | 52/11/30 |
| W6RR | | 49/13/23 | 160/20/48 | 310/27/76 | 849/26/75 | 73/14/31 |
| W7JST | 1/1/1 | 52/18/32 | 295/26/50 | 355/33/83 | 570/30/69 | 46/13/26 |
| W3CRE | 3/2/2 | 100/15/46 | 86/18/53 | 831/33/107 | 177/22/73 | 44/10/26 |
| K4VX | 10/3/6 | 94/14/43 | 63/17/39 | 265/24/71 | 597/27/100 | 77/13/36 |
| W2HMH | | 111/13/48 | 107/17/56 | 392/27/76 | 365/27/83 | 78/15/40 |
| W2GXD | | 77/12/37 | 71/17/43 | 323/25/73 | 547/22/87 | 63/14/35 |
| W4QCW | 8/3/6 | 117/18/56 | 112/19/56 | 275/25/69 | 326/24/77 | 49/13/32 |

WORLD TOP MULTI-OPERATOR – SINGLE TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| VP2M | 39/5/13 | 564/18/52 | 713/22/61 | 1267/32/104 | 1983/27/97 | 779/18/44 |
| EA8CR | 12/3/5 | 486/19/70 | 389/19/59 | 785/30/96 | 1115/27/89 | 240/22/84 |
| UK9AAN | | 340/18/63 | 556/30/84 | 1031/35/126 | 527/28/92 | 320/18/51 |
| DL0WU | 11/2/11 | 191/14/45 | 576/19/72 | 1144/32/104 | 1230/31/101 | 85/13/34 |
| VP5WW | 13/3/5 | 730/12/45 | 453/14/46 | 1627/22/66 | 1678/20/58 | 91/15/27 |
| FG0MM | 2/1/2 | 546/10/29 | 444/17/44 | 1243/28/88 | 1484/19/48 | 686/12/22 |

USA TOP MULTI-OPERATOR – SINGLE TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| W6ONV | | 57/18/30 | 444/25/44 | 285/27/79 | 838/27/77 | 20/8/12 |
| W2HPF | 7/2/4 | 150/19/67 | 82/21/58 | 461/27/83 | 366/24/101 | 43/11/34 |
| K3MNT/7 | 5/3/3 | 73/15/26 | 403/20/35 | 406/30/78 | 645/23/50 | 12/4/6 |
| W6PAA | 4/4/4 | 96/16/28 | 276/22/43 | 380/25/62 | 462/22/56 | 30/11/15 |
| WA1NZT | | 134/17/53 | 84/16/51 | 313/27/81 | 390/23/83 | 62/13/36 |
| WA1STN | 6/3/4 | 94/12/47 | 71/17/42 | 445/28/72 | 307/23/83 | 56/10/29 |

WORLD TOP MULTI-OPERATOR – MULTI-TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| DL0PG | 105/3/14 | 787/21/72 | 975/24/84 | 2600/36/135 | 929/33/132 | 139/17/46 |
| PJ1AA | 14/5/9 | 481/15/54 | 401/18/51 | 1698/32/113 | 1532/25/87 | 929/21/48 |
| DK2BI | 94/2/11 | 454/12/54 | 603/26/81 | 1700/35/116 | 1588/34/122 | 89/14/40 |
| W2PV | 60/11/18 | 654/23/83 | 360/28/92 | 1461/36/130 | 949/32/120 | 94/13/43 |
| W3AU | 35/6/12 | 280/22/74 | 302/27/86 | 1055/37/134 | 1206/32/128 | 177/16/55 |
| WA2ZAA | 32/7/12 | 455/22/81 | 247/23/75 | 1547/35/133 | 801/32/123 | 111/11/42 |

USA TOP MULTI-OPERATOR – MULTI-TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| W2PV | 60/11/18 | 654/23/83 | 360/28/92 | 1461/36/130 | 949/32/120 | 94/13/43 |
| W3AU | 35/6/12 | 280/22/74 | 302/27/86 | 1055/37/134 | 1206/32/128 | 177/16/55 |
| WA2ZAA | 32/7/12 | 455/22/81 | 247/23/75 | 1547/35/133 | 801/32/123 | 111/11/42 |
| K6SEN | 36/7/8 | 261/24/62 | 438/29/72 | 831/36/110 | 1157/31/87 | 132/16/39 |
| WA8ZDF | 51/6/11 | 378/22/69 | 405/28/85 | 1080/36/116 | 651/28/111 | 124/13/40 |
| W3WJD | 23/5/8 | 439/23/80 | 239/27/82 | 844/34/110 | 920/27/112 | 116/14/46 |

shows this . . . *VX9A.* Please find enclosed 4 entries from Greater Peterborough ARC. We hope our acorn will grow to a 54 Megapoint oak in a few years! . . . *G4BBA.* USA cross-band on 3.8 MHz, that was a surprise and 59+ most of them, second shock was *VP5WW* on a CQ . . . *VK3AAO.* Number of improvements paid off this year—shorter callsign; speech processing; beam on 40; 2-hour nap before contest; and hunting multipliers a lot; but major improvement was the YL who kept me company, fed me and kept me going until the end . . . *F5QQ* opr. of *FY7AK.* Worked *9V1SH* more than 12,000 miles away—5,000 miles per watt . . . *OA8V.* SRI to send in such a poor log—but I tried! My own rig failed a week before—not fixed yet. Elec. failed Sat. P.M.; poured (rain) entire weekend; Sat. & Sun. work days in my profession (priest). Finally borrowed rig with bad ant. with 2 hrs. to go; couldn't crack QRM; finally got started & had to QRT for work . . . *CEØAE.* "Europeans don't copy me—believe that they don't have good receivers. Hi . . . *4M4GD.* This is my first contest . . . *YV5YL.* Poor conditions. (Band) only open 11 hours the first day, and 10 hours the second day. In the South Pacific I could only work *5W1AU* . . . *CV4CR. 5J4* was a special prefix used during two weeks by the stations of Medellin, Colombia in commemoration of 300 years foundation of the city. My congratulations for the finest contest in the world. After ten years of not being active in ham radio, I came back and found the contest more interesting than ever . . . *5J4EB.* The antenna stuck east and two local amateurs had to climb up the 65 foot tower . . . *EA8JJ.* Very difficult to work W stations on 20 m. with my vertical antenna . . .*TU2DF.*



*Single Band Million-pointer, CW3BR, had a field day on 20.*

No opening from Morocco to South America on 3.5 . . . *CN8HD.* Nothing *at all* heard on 40 & 80 . . . *VQ9D.* Had good fun. Not enough activity on 21 MHz . . . *ZS6YK.* Very hard to break through the JA wall to the states, otherwise great. Fancy having *BV2B* as a duplicate . . . *VS6AF.* Noticed a bit too late, at the fag end of the contest, that only the rotator was moving & not the Telrex—the lock pin had snapped! . . . *VU2DK.* Beautiful conditions and good European discipline for change, hi . . . *EP2SN.* Biggest thrill was being called in pileup by stations like *3B9DA* and *HV3SJ* . . . *EP2OD.* Picked up 6 new countries for DXCC. Think more should try 28 MHz more often as the band was open most of the daylight hours in the Middle East . . . *EP2EJ.* Unbelievable opening to W6, W7 on 20 meters Saturday night, but since operating single band 21 it didn't matter . . . *WA2KGY/4X.* U.S. Operators very good on 80 & 40 this direction—*very* strong signals this way from W6's. Did

*(Continued on page 69)*

## TROPHY WINNERS

**Single-Operator Single Band**

*Martin Laine, OH2BH (14 MHz)*
**World Phone Trophy**
K1HLB Memorial Trophy (NJDXA)

*R.T. Nash VE3KZ (21 MHz)*
**Canadian Phone Trophy**
Donor: Gene Krehbiel, VE3TP

*Herbert Schoenbohm KV4FZ (3.5 MHz)*
**Carib./C.A. Phone Trophy**
Donor: G. Kouther, HR2GK

*Mario Pablo Rebufello CV4CR (28 MHz)*
**So. American Phone Trophy**
Donors: Brazil DXers

**Single-Operator All Band**

*FY7AK (Opr. Ron Delcourt, F5OO*
**World Phone Trophy**
Donor: Bill Leonard, W2SKI

*W7RM (Opr. Chip Margelli, K7VPF)*
**USA Phone Trophy**
Donor: Potomac Valley Radio Club

*XJ3HUM (Opr. D.W. Dudley, VE3BVD)*
**Canadian Phone Trophy**
Donor: Jack Baldwin, VE3BS

*G. Beasley, G3LNS*
**European Phone Trophy**
Donor: W4BVV Operators

*James R. Perry, TI2WX*
**Carib./C.A. Phone Trophy**
Donor: Harold Fox, W1AA

*Rutilio Ferreira Graca, C9MIZ*
**African Phone Trophy**
Donor: Gordon Marshall, W6RR

*Norm Styer, EP2SN*
**Asian Phone Trophy**
Donor: Japan CQ Magazine

*Katashi Nose, KH6IJ*
**Oceania Phone Trophy**
Donor: Northern California DX Club

**Multi-Operator Single Transmitter**

*VP2M (VE7SV, K7JCA, VE7BD, W7EXM VP2MF)*
**World Phone Trophy**
Donor: John Knight, W4YY

**Multi-Operator Multi-Transmitter**

*DL0PG (DK2OL, DK3BJ, DJ9IE, DJ5KY, DJ9TO, DK1QV, DK1FW, DJ1FC, DK7QC*
**World Phone Trophy**
Donor: Radio Club Venezolano

**Expedition Trophy**

*VP2M (VE7SV, K7JCA, VE7BD W7EXM, VP2MF)*
Donor: Stuart Meyer, W3GHK

**Special CQ Plaque**

*Rafael Ponce de Leon, CW3BR*
*Zal Kabraji, VU2DK*

Number groups after call letters denotes following: Band, (A-all) Final Score, Number of QSTs, Zones and Countries. Certificate winners are listed Bold Face.

## PHONE RESULTS
## SINGLE OPERATOR
## NORTH AMERICA

### United States

**W1ZM A 1,685,125 1390 105 320**
(Opr. WA2CLQ)

W5UDK/1 A 624,102 645 84 270
WA1RHA A 529,878 673 72 210
W1DAL A 340,752 550 59 170
WA1SKV A 286,220 458 57 163
WA1NRF A 207,438 340 62 169
W1BIH A 149,504 223 68 188
W1HWM A 110,188 249 48 115
WA1SQB A 80,730 225 34 96
W1JFL A 76,486 170 54 113
W1WY A 71,868 184 54 105
W1JDE A 52,932 160 38 94
W1GPK A 38,744 130 37 79
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WA1HAA A 4,067 33 17 32
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WB2CKS A 353,073 428 81 220
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W2AX A 148,782 292 47 134
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WB2SJG A 113,386 241 50 128
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W2LYL A 102,660 253 40 105
WB2HZH A 92,002 226 51 106
WA2DLV A 79,946 210 36 106
WB2RKK A 77,312 215 38 90
K2JOC A 76,035 225 31 80
WA2LJM A 73,780 196 41 99
WA2ZWH A 69,978 226 31 78
K2SNG A 66,674 218 31 75
WB2NDR A 57,400 165 42 98
WB2VFT A 54,912 152 41 102
WB2QCF A 52,628 166 37 81
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W2PFQ A 42,356 139 31 85
WA2EAH A 38,313 110 42 87
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W2MB A 27,100 106 29 71
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WA2EJZ A 4,089 35 18 29
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K3ZOL A 210,897 346 61 158
WA3WRD A 209,898 371 57 150
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K3AWZ A 196,650 322 64 166
W3GRS A 196,075 295 69 184
W3KFQ A 154,682 307 49 129
W3KV A 153,153 301 53 134
WA3YGH A 143,234 297 54 128
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WA3NNA A 124,450 242 58 132
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W3GL A 114,270 233 60 135
WA3SZI A 96,850 278 31 99
WA3SSB A 91,377 206 38 105
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W3ZNH A 79,566 168 55 123
W3JPT A 78,150 201 42 108
W3YHR A 54,511 139 43 108
W3GZQ A 49,320 160 39 81
W3CGS A 47,082 142 39 79
W3EVW A 42,572 132 39 77
W3HVM A 39,936 142 27 77
WA3WNU A 32,342 120 32 71
W3ML A 28,200 108 30 70
W3BB A 27,548 135 19 52
W3YFV A 24,395 106 27 58
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WB4OSS A 401,250 471 85 236
K4KZZ A 396,342 508 75 216
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WB4QSN A 354,060 485 76 205
WA4EYR A 341,288 415 84 212
W4QBT A 320,144 445 73 199
WA4WRY A 316,296 447 71 200
K4JWD A 314,662 442 70 192
W4PRO A 289,200 441 60 180
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WB4BVY A 237,669 381 61 166
WB4UYD A 227,470 378 57 158
WB4OXD A 205,110 288 104 161
W4ZTW A 198,720 351 58 158
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WA4GQJ A 173,582 275 69 160
K4CL A 172,380 314 58 146
WB4ZNH A 170,495 309 64 151
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WA4UFW A 152,453 284 61 142
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LU8AGT/WA
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WB4KTR A 115,624 236 55 139
WA4UAZ A 113,740 229 54 134
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W4IQ A 70,704 186 40 104
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WA5WMC A 128,154 247 56 130
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WA5WEY A 48,910 142 45 89
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WA5NDV A 9,135 55 25 38
W5FXQ A 8,607 56 22 35
WB5CJE A 6,136 47 15 37
K5LZJ A 5,824 47 20 32
W5AE A 3,595 52 20 33
W5ONL A 3,008 39 8 24
WB5OOW A 2,040 25 13 21
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**VE3DXV/W6**
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W6EYY A 306,681 718 59 92
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WA6GFY A 153,408 410 51 85
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W6YVK A 107,250 252 58 92
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W6LQC A 90,259 250 44 87
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WA6NBY A 78,592 226 52 76
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WB6QMF A 73,793 236 31 78
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W6ZUM A 52,704 170 48 74
WB6ZHD A 46,494 137 53 73
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(Opr. W6CFM)
W6PRP A 17,658 81 32 49
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WA7OBL A 392,640 855 53 107
WA7NFH A 358,800 580 75 155
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W7LZF A 109,494 307 46 80
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W7OTO A 38,423 181 29 48
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A 12,915 74 26 37
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**W8TWA A 449,755 533 83 224**
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A 263,898 408 68 175
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W3GN/8 A 11,026 67 30 44

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WB8GKG " 100,838 291 27 100
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K8RWL " 52,380 175 24 84
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WB8LZX 14 7,137 64 12 27
**K8LUU 7 44,548 214 22 64**
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**WB9BPG A 838,272 846 91 263**
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WB9CEP A 296,835 442 71 186
WB9LTY A 201,068 413 47 125
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WB9IWN A 175,968 313 56 152
K9OTB A 163,064 294 64 154
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WA9BHH A 121,915 244 57 128
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WB9MDB A 67,050 170 48 102
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K9EGH A 41,800 137 33 77
W9BPU A 28,405 108 25 70
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K9UKM " 30,885 131 21 66
WB9KLB " 25,730 125 23 60
WB9GVW " 25,650 138 20 70
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WB9LHI " 190,209 474 31 110
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K9HKF " 1,975 27 6 19
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WB9NIB " 10,584 84 16 38
WB9AJZ " 6,076 47 15 34

**WA2WMT/ø**
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WAøONL A 516,780 646 88 209
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WøFKE A 217,607 335 74 173
WAøVDX A 197,800 321 71 159
WBøFHH A 132,660 279 53 127
WBøOAZ A 84,106 199 56 106
KøCML A 74,620 168 50 114
WøMIN A 70,692 192 43 94
WøPUD A 49,911 150 34 93
WAøAGN A 48,013 147 46 87
**WBøFZV/ø**
A 42,471 164 30 69
WøOWS A 39,216 121 42 87
WøHUP A 36,720 130 31 71
KøSVW A 35,900 130 29 71
WøLJF A 32,200 121 34 66
WBøHOG A 26,085 87 36 75
WøBWJ A 16,380 75 32 58
WAøBWF A 13,035 93 23 32
WøAZT A 12,714 66 32 46
WøMUH A 10,472 57 24 53
WAøYJL A 9,000 61 23 37
WAøFBQ A 6,018 49 21 30
KøEGA A 957 15 14 15
WAøVUY A 777 13 7 14
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**WBøLLR 21 151,018 524 27 71**
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(Opr. WBøQHV)
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(Opr. WBøNYY)
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KøEQY " 16,225 102 14 41
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**WAøVPN**
**3.8 5,206 60 12 26**
**(Opr. WBøHCH)**

### Alaska

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KL7IDH " 50,875 316 20 35
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KL7GI 14 77,214 677 17 34
KL7IEG " 1,875 58 8 7
KL7JDO 3.8 2,080 56 8 8

**Barbados**

8P6AH 14 522,680 1,534 33 113

**Bermuda**

VP9AD A 59,893 269 36 65
VP9BK A 330 16 5 5

**Canada**

XN1AW A 180,792 411 44 118
VE1EP 21 4,945 46 10 33
VE1AIH 3.5 41,662 249 14 60
VE2AYU A 553,700 969 58 168
VE2WA " 13,728 76 20 46
VE2DVF 14 151,508 614 23 75
XJ3HUM A 927,638 1,282 76 217
(Opr. VE3BVD)
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VE3EZM " 45,101 143 36 83
VE3BBH 28 48 4 2 4
XJ3GCO " 183,980 593 23 99
VE3KZ 21 390,775 984 27 118
VE3CSN " 23,584 122 18 49
VE3CMV " 49,056 206 20 64
VE3DJF " 53,337 261 20 49
XJ3WT 14 390,340 1,002 33 112
VE3BBN " 53,392 360 17 54
VE7BWK/3 "
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XJ3BMV
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VE3ECP "
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VE4RP A 174,582 450 54 105
VE4AE " 13,940 87 25 43
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VE4SN 14 2,697 33 9 20
XJ5RA A 403,788 1,088 54 107
VE5FK " 7,742 68 20 29
VE6WX 3.5 29,450 283 17 33
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VE6APJ " 123,085 485 27 76
XJ7WJ A 734,383 1,452 78 143
(Opr. WA7UQV)
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VE7BC 14 625,645 1,412 36 121
(Opr. VE7LB)
VE7DSR " 150,975 571 29 70
VE7DEW " 96,416 377 24 68

**Canal Zone**

KZ5JM 21 416,500 1,526 25 94

**Costa Rica**

TI2WX A 683,606 1,737 65 128
TI2VC 28 585 58 3 2

**Dominican Republic**

HI8MOG A 534,499 1,154 61 142
HI8XFD " 232,470 1,037 36 69
HI8LC 3.5 19,935 215 10 35

**El Salvador**

HU1DX A 514,206 1,198 62 136
(Opr. YS1MAE)

**Grenada**

VP2G A 4,245,813 4,350 107 322
(Opr. W5MYA)

**Guantanamo Bay**

KG4DS A 300,409 871 55 108

**Guatemala**

VE2AQS/TG9
A 1,045,520 1,727 81 199

**Jamaica**

WB9AJF/6Y5
A 1,215,654 1,417 97 242
WB4SJG/6Y5
" 470,332 1,899 44 80

**Mexico**

XE1LLS A 122,404 387 49 93

**Nicaragua**

YN1FWN A 203,680 696 50 84

**Puerto Rico**

KP4ECH 21 173,460 915 23 61

**St. Lucia**

VP2LAW A 40,868 598 19 15

**St. Pierre Et Miquelon**

FP0MD 21 51,170 251 15 55

**Virgin Islands**

KV4IJ A 3,247,986 4,118 92 265
(Opr. K6SDR)
LU2DC/KV4
14 289,692 1,067 27 90
KV4FZ 3.5 275,319 1,297 23 80

## AFRICA

**Angola**

CR6FW 28 279,680 823 25 90
CR6IK 14 842,394 1,611 39 147

**Ascension Island**

ZD8AA A 1,481,504 1,877 79 193
(Opr. WA4TLB)

**Canary Islands**

EA8JJ 21 455,975 1,327 26 89

**Ivory Coast**

TU2DF A 476,064 722 64 164

**Madeira Islands**

DJ6QT/CT3
A 1,071,360 995 92 280
CT3BD A 217,264 504 53 95
CT3BK A 35,926 174 19 52

**Morocco**

CN8HD 3.5 140,651 663 15 56

**Mozambique**

C9MIZ A 240,609 567 37 102
C9MJO 14 662,028 1,362 37 135

**Rhodesia**

ZE8JD A 143,055 323 55 98

VK6SM/ZE
A 10,122 83 17 25

**Senegal**

6W8FP A
2,596,186 2,261 107 282

**Seychelles**

VQ9D A 27,404 163 29 39

**South Africa**

ZS6RM A 108,360 264 44 96
ZS6YK 21 196,270 697 26 69

## ASIA

**Hong Kong**

VS6AF 14 32,864 236 26 53

**India**

VU2DK A
1,358,093 1,487 84 247

**Iran**

EP2SN A 881,600 1,107 74 216
EP2OD A 175,395 406 49 116
EP2EJ 28 3,666 37 13 26

**Israel**

WA2KGY/4X
21 119,232 501 19 62

**Japan**

JA2HLX A 504,160 1,083 45 115
JE1SSE " 486,366 839 77 129
JA4BKL " 286,832 512 70 127
JA6YDH " 164,934 404 54 93
JA6CNL " 105,963 23 54 89
JA2JAB " 90,579 329 45 64
JA2DLM " 57,885 240 34 51
JA1CFJ " 47,472 184 40 52
JA7CDV " 41,500 157 38 62
JA0AGA " 35,340 130 42 53
JA6AP " 34,560 184 25 39
JA3XRC " 34,320 180 23 43
JA5MDU " 31,406 142 35 47
JA1LVS " 30,261 145 29 48
JE3CID " 26,520 158 23 37
JA7DAH " 24,192 150 25 31
JA8ERG " 21,909 117 26 41
JA1IZ " 21,056 114 26 38
JA4GXS " 19,140 128 22 33
JA8OYC " 17,360 111 24 32
JA3ELU " 17,287 105 23 36
JE3MWB " 15,198 106 20 31
JA0TKU " 14,852 109 22 25
JR2FNL " 14,850 101 20 30
JA1PUK " 14,235 70 32 41
JA3UP " 12,376 94 21 31
JH3AKD " 11,742 72 22 35
JR3MVF " 11,368 76 30 26
JA1BII " 10,863 84 22 29
JA1SGU " 3,536 54 15 11
JF1NCT " 2,700 39 13 14
JE1KDM " 966 25 7 7
JA2DOU " 957 16 13 16
JH3UBF " 902 18 12 10
JH6INJ " 322 9 7 7
JA2DYI 28 10,143 82 19 30
JA6UBK " 9,620 76 20 32
JH7KUP " 9,309 58 21 28
JA0FMB " 1,456 20 11 15
JA7CUK " 273 8 7 6
JG1ECK
21 101,712 439 26 52
JA7AMK " 97,482 444 27 50
JH1AHU " 94,827 444 25 48
JH2MYN " 90,741 396 30 57
JH1XHO " 88,825 360 29 56
JA0URR " 61,390 310 26 45
JH2HFD " 43,884 223 26 43
JA7CXF " 39,760 198 27 43
JA7NK/1 "
36,725 194 24 41
JH2DMY " 31,590 166 22 44
JA8MKZ " 29,400 130 29 55
JA1SHC " 26,244 168 22 32
JH4IFF " 25,760 200 17 39
JF1DYY " 24,336 157 20 32
JA6EFT " 21,783 144 20 33
JA9NGS " 21,024 146 15 33
JA3BUB " 17,501 99 18 25
JH2WMZ " 15,984 118 18 30
JA8BEV " 15,762 142 15 22
JH2IXQ " 13,588 111 16 27
JH2IRH " 13,250 92 20 33
JA0PEZ/1 "
12,236 112 18 20
JH2WIC " 12,150 91 16 29
JG1UMO " 11,704 105 16 22
JH2YJZ " 11,000 90 16 28
JR2JZR " 10,537 92 15 26
JI1NHA " 9,996 98 13 21
JF1QJD " 9,900 81 16 29
JH4DIT " 9,758 100 11 23
JA7JND " 9,686 117 16 13
JH7HKG " 9,361 88 17 20
JA6LCJ " 6,604 127 19 33
JR2PPP " 6,541 73 11 20
JA8FDB " 6,528 68 13 19
JH3SBC " 6,324 102 12 14
JF1LSEK " 6,216 74 12 16
JA7JGD " 5,725 80 13 12
JA2ATE " 5,400 66 14 17
JH4ARN " 5,280 58 12 20
JA1OBW " 4,611 54 14 15
JA9CVY " 4,371 51 14 17
JA9IRH " 4,292 52 13 16
JA1IRQ " 3,384 48 11 13
JH4FRN " 2,910 34 12 18
JR2HDS " 2,295 45 7 10
JA9MMA " 2,160 33 9 15
JA1RLR " 1,717 35 8 9
JF1FTU " 1,475 22 11 14
JR3CVO " 1,296 36 6 6
JA3YJQ " 1,273 23 10 9
JH7BOW " 660 21 6 6
JA5PXG " 504 14 7 7
JE1WIH " 378 15 5 4
JA0UXG " 272 12 4 4
JH4MVB " 270 18 3 3
JH3FYW " 228 7 6 6
JH4MVA " 168 8 3 4
JA3NYD " 90 5 3 3
JI1CMZ " 12 2 1 1
JH1ECG 14 422,675 988 37 108
JA9AG " 290,520 826 33 87
JA1HVS " 85,624 399 26 51
JA1NVF " 74,790 290 30 60
JA1SKE " 71,546 305 27 56
JA0AIE " 45,114 223 25 48
JA1IST " 44,640 174 24 63
JA0SC " 37,765 212 31 41
JA2INS " 35,244 137 20 58
JA7YOJ " 24,090 160 20 35
(Opr. JA7GQB)
JA6CM " 23,800 155 21 35
JH1MTR " 21,240 137 22 38
JH6CAW " 19,504 135 21 32
JG1UNF " 18,928 127 19 33
JA1LDJ " 18,260 125 21 34
JF1RWZ " 18,144 128 23 31
JF1INA " 11,616 105 20 24
JA2BNN " 11,076 121 20 20
JA6UYF " 10,761 79 22 30
JA3AHD " 8,256 66 17 26
JA1AAT " 7,810 61 31 24
JR2BDF " 7,680 74 18 22
JA4ERX " 6,480 66 18 22
JA0CAF " 6,300 65 16 20
JA3BX " 5,888 50 19 27
JA1JLL " 5,236 58 16 18
JH7BRG " 3,072 32 13 19
JH4CQQ " 3,036 42 15 18
JA4EE " 3,016 40 14 12
JA2JOJ " 2,688 34 16 16
JA5AF " 2,464 34 14 18
JE2AIN " 1,683 51 14 19
JA1ALX " 1,508 23 12 14
JE1LES " 1,176 34 7 7
JA2RFG " 1,166 19 9 13
JR2AQP " 1,122 17 9 13
JA7KM " 880 21 8 8
JA1EDH " 780 18 9 6
JA4DZ " 696 29 4 4
JA6YY " 486 18 4 5
JA6EYD " 480 10 8 8
JA0GZ " 400 14 6 4
JA3EQC " 144 8 3 3
JA6JAV " 55 5 3 2
JA2BET 7 83,187 358 27 54
JA1MCU " 21,645 120 23 42
JA4FCR " 6,055 64 17 18
JA2INO " 5,696 67 15 17
JA1JID " 5,017 64 13 16
JA1CWZ " 3,024 48 9 12
JA2AIR " 902 30 6 5
JH4ADF " 896 25 8 6
JA8BKI " 480 33 3 2
JF1AWP " 260 18 3 2
JH3BJN/4 "
28 3 2 2
JA6BSM
3.5 6,882 65 16 21
KA6DX 14 5,148 61 16 23

**Korea**

HL9TB A 293,553 700 86 107

**Republic of China**

BV2B 14 16,360 317 18 22

**Singapore**

9V1SH 28 23,958 175 21 45

**West Malaysia**

9M2FK A 10,944 65 31 41

## USSR

**Armenia**

UG6GAF 14 183,090 668 27 75

**Asiatic U.S.S.R.**

UA9OO A 532,078 984 59 164
UA9ADF A 138,592 410 29 93
UA9YE A 24,318 241 23 40
UW9SG A 16,131 94 14 43
UA9FU A 12,383 71 19 42
UW9TZ A 11,648 73 24 40
UA9WCQ A 6,162 65 15 24
UA9F8M A 5,945 56 13 28
UA9CFC 28 14,214 119 14 32
RA9ODC 28 5,394 79 10 21
RA9CAS 28 4,100 56 7 18
UA9YBY 28 2,057 48 6 11
UA9TS 21 109,434 620 19 59
UW9CL 21 92,560 495 22 58
UA9MDY 21 18,810 261 9 29
UA9HAV 21 4,732 240 7 22
UA9MS 14 329,014 926 87 105
UA9UF 14 120,096 530 34 74
UA9FAJ 14 77,868 334 22 62
UA9IF 14 67,704 345 25 59
UA9FBC 14 10,152 216 15 32
UA9CBW 14 8,029 76 9 28
UA9CAM 14 4,000 45 9 23
UA9MT 14 1,760 23 13 19
UA9VX 14 240 8 5 7
UV9FN 14 168 8 3 4
UA9WS 7 32,400 231 11 39
UA9CBO 7 15,087 117 12 35
UA9AAP 7 8,514 106 7 26
UK9ADT 3.5 40,893 339 8 35
(Opr. UA9ADQ)
UA9NP 3.5 3,198 50 6 20
RA0LFI 28 2,760 68 14 16
UA0CBW 21 24,058 285 16 30
UV0EX 14 189,725 934 27 68
UW0IQ 14 72,157 594 21 38
UA0FBZ 14 18,998 412 11 12
UA0BAC 14 17,864 155 12 32
UA0JAD 14 10,680 169 14 26
UA0CBO 14 994 66 5 9
UA0CAH 14 825 21 6 9
UA0FCK 7 7,068 360 10 9

**Azerbaijan**

UD6DER A 129,000 328 44 106
UD6CN " 17,172 121 14 40
UD6DHW 21 5,148 57 7 26

**Georgia**

UF6DZ A 169,094 508 29 89

**Kazakh**

UL7OAO A 765,408 1,064 71 201
UL7LAW " 411,281 709 62 159
UL7PQ " 17,334 214 30 51
UL7PAT " 14,809 123 21 38
UL7PBY 28 32,945 253 13 42
UL7WI 21 7,072 208 8 26
UL7EAJ 14 113,524 438 26 75
UL7OE " 102,623 429 24 69
UL7YR " 57,316 245 28 64
UL7NAC " 10,535 114 9 26
UL7JAW 7 15,390 223 10 28

**Kirghiz**

UM8FM A 209,919 507 47 120
UM8MAS
3.8 1,287 43 5 8

**Tadzik**

RJ8JBJ 28 2,880 45 12 20
UJ8JJJ 21 21,996 240 9 27
UJ8JGJ 7 23,568 257 11 37

**Turkoman**

UH8BO 21 1,296 20 8 16

**Uzbek**

UI8CD 14 230,496 738 32 80
UI8LAG
3.8 24,354 219 10 31

## EUROPE

**Aland Is.**

OH0NI 14 236,848 1,027 29 84
OH0NJ 7 22,223 137 15 56

**Austria**

OE5CWL A 98,800 470 36 116
OE3WWB A 96,714 246 68 131
OE2RIL " 27,824 201 26 68
OE1SBA A 9,856 64 29 48
OE1ZGA 21 74,632 201 33 119

**Belgium**

ON4XG A 90,013 298 48 119
ON8ZI 21 113,187 507 24 63
ON5KY 14 387,126 1,141 30 104

**Bulgaria**

LZ1QO A 261,970 632 67 163
LZ2IF A 60,630 329 40 89
LZ2KSU " 21,420 179 22 62
LZ1MH " 18,860 211 18 64
LZ7KST " 15,040 128 25 55
LZ1CN " 3,131 51 11 20
LZ2EE 21 263,580 974 28 87
LZ2KSG " 1,450 20 11 14
LZ1TD 14 3,162 82 7 27
LZ1QR 3.5 8,229 206 8 31

**Channel Is. (Jersey)**

GC5AGA A 460,596 836 55 138

**Czechoslovakia**

OK2RZ A
1,531,868 1,819 89 267
OK1AGQ A 714,009 1,161 71 212
OK1ADM " 159,334 264 83 183
OK2KR " 97,745 396 44 129
OK2BIH " 94,106 452 37 94
OK1AGN " 85,065 322 45 114
OK1DA " 70,757 232 49 124
OK1CFH " 36,260 232 22 48
OK2SPS " 30,090 248 25 77
OK1KZ " 28,885 247 26 83
OK2ZU " 26,082 185 26 55
OK2BEF " 14,325 181 15 60
OK2PBG " 12,672 162 16 56
OK2BLG " 11,550 94 24 53
OK1BLC " 3,705 51 19 38
OK1DK " 80 6 4 6
OK1MGW
28 1,449 23 7 16
OK2ABU " 54 6 4 5
OK3EA 21 258,944 741 30 106
OK3WM 21 176,640 531 30 98
OK3CMW "
31,363 155 26 53
OK2SLS " 20,350 125 20 54
OK1MPP " 19,462 99 25 49
OK1ASQ " 16,616 107 20 47
OK1SV " 14,832 72 27 45
OK1AHV " 5,566 51 17 29
OK1AVU
14 105,395 436 25 82
OK1DVK " 18,768 157 20 49
OK1PCL " 9,918 102 15 43
OK1AAA " 3,087 63 10 39
OK1KUR " 1,066 36 7 19
OK1ATE " 1,045 77 18 32
OK1MP 7 13,824 160 15 49
OK2BNK " 1,896 79 9 15
OK1DWA " 495 33 2 13
OK2BIQ
3.5 21,150 363 10 40
OK1IMP " 6,018 168 6 28
OK1KIR " 4,672 147 4 28
OK2HI " 4,230 147 5 25
OK2QX " 3,720 120 5 26
OK1KTA " 3,710 104 6 29
OK2BBJ " 2,158 81 5 21
OK1JVP " 1,122 54 4 18
OK2SBB " 585 40 3 12
OK1MNV " 462 33 2 12
OK2SKU " 425 26 3 14

**Denmark**

OZ3KE A 54,543 219 46 98
OZ3PO " 36,540 124 45 81
OZ7BG " 20,172 103 31 51
OZ7HT " 17,963 92 28 43
OZ6QE " 15,876 107 27 54
OZ5ME " 13,651 103 26 47
OZ8BZ " 10,744 86 26 53
OZ1ZE/P "
9,882 58 32 49
OZ4HW " 9,090 69 27 63
OZ7HX " 1,824 35 15 23
OZ1LO " 1,440 16 5 6
OZ5FK 28 357 13 7 10
OZ2PG 14 315,332 998 32 92
OZ5KF 7 88,740 538 24 63
OZ5EV " 23,851 352 13 48
OZ6XR " 16,695 298 10 43

**England**

G3LNS A
2,595,692 2,676 90 256
G3TXF " 303,438 578 77 232
G3YBH " 156,252 408 49 125
G3NFV " 121,270 346 47 134
G4DJZ " 46,440 212 43 86
G2AJB " 24,750 119 26 73
G4BBA " 20,570 110 33 88
G4DXW " 5,609 56 21 50
G3SGC " 884 20 11 15
G4CQM 28 15,066 181 18 44
G2BOZ " 14,694 163 17 45
G3WJN 21 533,943 1,563 31 92
G3XYP 14 810,434 1,999 37 120
G3HCT " 704,459 1,688 33 124
G4DJC " 390,222 1,294 29 85
G5BEF 14 217,256 786 30 74
G4CVZ " 37,940 371 18 52
G4AMT 7 44,748 291 16 50
G4DKT 3.5 19,581 265 11 50
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G3YMC " 518 38 2 12

**Faroe Is.**

OY1A 14 4,984 79 6 23

**Finland**

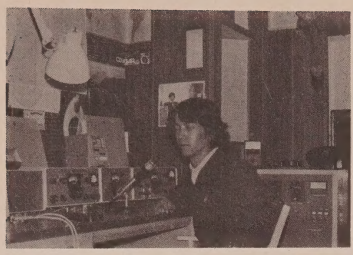
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OH7UE A 120,080 439 46 112
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OH3HS " 10,212 107 23 51
OH2VZ " 8,142 81 21 38
OH2NP " 5,096 36 18 34
OH9TD " 3,111 44 14 37
OH3TY " 2,220 22 15 22
OH2DN " 2,120 29 15 25
OH7NJ " 1,890 39 15 27
OH2BLU " 928 22 11 17
OH2BFX " 216 30 8 18
OH3XZ 28 28,944 271 17 50
OH2BAH " 5,550 62 14 36
OH2OM " 2,613 47 11 28
OH2XA " 2,296 53 7 21
OH7SX " 18 3 3 3
OH2BZ 21 332,920 885 32 113
OH2XF " 67,144 285 29 80
OH1KF " 40,850 222 23 63
(Opr. OH2KE)
OH5PA " 28,560 192 21 59
OH4SL " 18,800 90 26 54
OH5YF " 14,520 99 16 39
OH2BMG " 351 9 5 8
OH2BH 14 981,815 2,098 37 142
OH2LU " 297,720 1,019 29 91
OH1IG " 296,514 1,129 31 83
OH1MA " 119,483 482 26 65
OH6LV " 84,006 504 20 58
OH2BCD " 2,170 37 11 20
OH2BMP " 1,488 22 11 13
OH3ZH/1
" 930 25 7 23
OH8OH " 456 12 8 11
OH1PG " 192 16 3 9
OH2BFS " 84 4 3 4
OH5NW 7 167,751 798 29 80
OH1IJ " 66,033 484 23 64
OH1XX 3.5 71,640 646 20 70
OH2BO 1.8 1,144 91 2 11
OH1VP/3
" 611 53 2 11

**France**

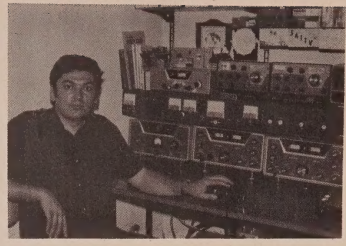
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F6BYR " 44,704 241 33 94
F8TM " 37,524 192 36 82
F3IJ " 12,351 79 31 38
F6DDP " 12,232 148 12 33
F2RO " 8,701 91 22 33
F5RD " 5,382 97 10 36
F6ARC 21 217,566 803 29 73
F6CLM " 2,886 41 12 14
F0BHC 14 6,437 103 13 28

**Germany (DDR)**

DM2AUF A 88,356 184 64 135
DM2DEO " 61,408 300 36 116
DM6TAH " 39,324 301 28 85
DM4SDA " 37,968 265 30 82
DM5YVL " 28,170 189 28 62
DM4YEL " 12,638 117 21 50
DM2FDO " 11,972 103 29 53
DM3EA " 9,588 57 31 37



JH1ECG



I4ZSQ



XJ3BMV

DM3CF " 2,560 48 12 28
DM4BK " 1,428 49 8 20
DM4JN " 441 21 7 14

**DM3XQD**
28 527 25 5 12

**DM2DGO**
21 297,476 936 30 94

**DM3PCK**
14 42,558 310 20 62
**DM4UEE 7 6,006 126 9 33**
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DM2BPB " 1,020 52 3 17

**DM5UFD**
3.5 18,225 357 8 37
DM4XPF " 782 47 4 13
DM3UFJ " 735 35 4 17
DM2CJF " 360 30 2 10
DM5BH " 15 3 2 3

**Germany (FRG)**

**DK3GI A**
1,458,847 1,654 95 288
**DJ4ZR A 764,154 1,095 73 194**
**DL8PC A 743,015 986 98 257**
DJ5JH " 723,520 927 77 227
DJ9MH " 699,125 994 86 243
DJ1ZN " 474,012 596 88 254
DJ2TI " 460,559 746 78 203
DK8EY " 455,598 835 72 162
DK5PR " 445,947 728 75 206
DL8YR " 255,255 522 66 165
DK8MA " 180,774 474 1 115
DL3PN " 160,888 424 57 112
DL7SP " 149,248 362 56 156
DL7RT " 141,702 413 61 148
DFØAFZ " 137,808 385 54 144
(Opr. DL3ZI)
DL1YA " 120,771 346 51 138
DK6PW " 96,990 363 53 130
DL1MD " 89,916 267 48 129
DJ2UU " 75,852 262 51 121
DL7EN " 72,216 173 52 125
DL8AJ " 62,300 255 40 100
DJ8OL " 61,593 221 43 104
DK8KC " 49,536 276 31 97
DK3KD " 38,829 204 35 94
DK9SG " 30,912 168 32 64
DK2WY " 28,764 124 33 69
DK5WQ " 27,405 161 32 73
DK5KJ " 22,700 152 32 68
DF2QA " 21,312 184 26 70
DK9NY " 17,888 147 27 59
DK8KD " 15,340 110 23 42
DJ4AN " 14,062 131 23 66
DF4QM " 5,715 83 19 26
DK6CS " 4,841 63 17 30
DF6QC " 3,960 73 14 31
DJ8QT " 2,160 32 11 19
DL7QG " 1,242 22 11 12
DL3UP " 760 17 7 12
**DL9VS 28 15,594 127 20 49**
DL1ED " 7,049 76 15 38
**DJØXT 21 209,781 691 30 82**
DJ1ZUA " 135,488 434 28 88
DK8FC " 134,264 461 28 76
DJ2QH " 91,001 330 30 71
DK7RR " 81,972 374 26 55
DJ9ZB " 80,878 300 29 80
DL1IP " 32,376 224 22 49
DF3QG " 27,090 180 22 48
DL1RB " 18,282 118 22 44
DL5RF " 6,900 46 24 36
(Opr. DA2RK)
DK8DS " 3,150 43 12 18
**DK4OO 14 523,050 1,331 37 113**
DF1QQ " 91,280 437 23 57
DL3AH " 61,370 278 25 70
DL9SNA " 52,632 226 26 72
DL2JX " 35,420 259 18 59
DL1AMA " 4,108 47 13 39
DJ3BZ " 1,980 47 9 21
DK3OI 14 792 23 9 15
**DJ6LV 7 44,874 406 18 63**
DJ4PI " 28,269 251 20 61
DK7PI " 19,551 299 11 46
DK8BI " 9,160 215 7 33
DK5VO " 7,216 171 7 34

**DK3FB 3.5 52,672 640 15 49**
DK3SN " 42,900 528 12 54
DJ6TK " 20,515 309 10 45

**Greece**

**SVØWJJ 14 118,198 790 32 81**

**Hungary**

**HAØKLU A 188,538 562 54 147**
(Opr. HAOMM)
HA1ZD A 35,280 238 27 78
HAØKLL A 13,608 121 19 44
**HG5EA 28 2,346 57 8 26**
**HA6NP 21 55,710 286 23 67**
**HA9RU 3.5 35,086 550 11 42**
HA5KKO
3.5 22,330 403 9 46

**Iceland**

**TF3HP A 36,176 408 18 58**
TF3IRA A 15,447 181 19 38
(Opr. TF3KB)

**Ireland**

**EI2BB** A 220,802 549 46 180
**EI2CA 14 233,696 1,134 24 85**

**Isle of Man**

**GD5DZ A 66,700 431 22 36**

**Italy**

**I4BNR A**
1,386,000 1590 91 239
**IV3VLS A**
1,260,345 1492 98 267
(Opr. I3PRK)
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1,210,788 1599 92 241
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1,136,850 1487 90 240
I1DOZ A
1,031,484 1467 67 191
I3LDP A 271,237 600 57 142
IC8EGO A 216,972 703 47 149
I3GRX A 123,620 382 43 97
I4CSP A 45,426 245 41 93
**I3DAB 28 47,304 249 27 81**
**I2TTL 21 239,682 712 33 96**
**IØOU 21 223,500 707 28 97**
I4DVT 21 167,400 598 26 81
I2AT 21 134,232 503 26 76
I4PZP 21 125,048 517 28 70
I3BYT 21 105,800 458 25 67
IØGFT 21 79,800 329 27 73
I3BBZ 21 64,770 265 28 74
I3OSM 21 30,500 220 18 43
I8ZLW 21 28,840 251 17 49
IØNSA 21 5,203 56 17 26
**I1GPK 14 710,646 1664 37 129**
I5WCN 14 123,703 623 25 78
I5FCK 7 92,904 408 22 76
I3MAU 3.5 113,535 778 18 69
I2FUD 3.5 8,000 195 6 34

**Luxembourg**

**LX1BW A 460,350 957 46 140**
LX1MK A 14,112 125 19 53

**Malta**

**9H1CH 28 22,050 208 17 53**

**Market Reef**

**OJØMA A 487,795 1274 61 184**

**Monaco**

**3A2GX 14 384,252 2343 34 130**

**Netherlands**

**PA9TOM A 583,968 1178 59 205**
**PAØAGA A 583,943 1167 61 180**
PAØTAU A 400,488 674 74 190
PAØJR A 6,111 57 20 43
**PAØEHF 21 35,217 162 24 67**
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PAØJR 14 7,314 57 23 30
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PAØTO 14 2,940 55 8 27
PA7GBY 14 1,196 20 11 12
**PAØHIP 1.8 3,024 149 3 15**

**Norway**

**LA2DR A 112,320 346 51 129**
LA4TG A 90,768 393 31 93
LA3RP A 64,239 323 37 96
LA5JS A 58,293 267 37 90
LA2YT A 21,420 199 25 77
LA4LN A 17,136 93 29 39
LA1R A 15,975 124 24 51
(Opr. LA9RT)
LA2IE A 13,362 107 22 29
LA5QK A 6,466 76 21 40
LA8LT A 4,875 109 8 31
LA7KK A 3,060 42 16 18
LA1YS A 1,092 30 7 19
**LA6HL 21 34,290 256 13 32**
LA9TI 21 10,985 69 20 45
LA5SH 21 4,240 36 20 33
LA7FJ 21 1,742 63 5 21
**LA4AT 14 50,025 331 18 57**
LA7FD 14 17,748 100 20 67
LA3UQ 14 1,288 25 9 14
LA1KQ 14 580 23 7 13

**Poland**

**SP9AI A 610,878 1063 81 237**
SP9CTW A 314,426 649 64 195
SP5XM A 222,835 646 52 153
SP5BB A 103,840 397 44 132
SP8ECV A 70,832 393 33 119
SP9BLF A 68,160 359 34 108
SP6AYP/9
A 29,268 219 28 80
SP9EWM A 23,600 201 23 77
SP5BT A 20,056 95 36 56
SP9HWT A 17,255 181 20 65
SP6DB A 15,744 116 29 67
SP3CDQ A 12,474 130 22 55
SP9BDQ A 11,537 111 23 60
SP9AVZ A 9,593 170 11 42
SP3AGE A 7,316 44 21 38
SP9BBH A 6,867 107 13 50
SP3FRF A 3,237 78 11 28
SP3DGT A 2,847 39 14 25
SP1EOI A 2,380 65 8 27
SP6FJG A 1,720 47 8 12
SP7FQI A 1,107 35 9 18
**SP3JOI 28 11,968 87 20 48**
SP5DDJ 28 945 34 5 16
SP9ZD 28 42 4 3 4
**SP1AS 21 76,255 399 25 76**
SP4CMY 21 45,756 290 23 53
SP3GEM 21 38,480 184 23 57
SP5BAK 21 36,640 203 23 57
SP8AWL 21 8,183 94 14 35
SP6CPM 21 2,492 47 9 19
SP5GKN 21 558 13 8 10
SP5CUK 21 375 13 6 13
**SP7HT 14 115,128 479 30 93**
SP8ARY 14 98,200 557 24 76
SP4CLX 14 90,882 530 26 73
SP5EAQ 14 49,980 399 23 61
SP9EVP 14 40,180 190 25 73
SP5ENM 14 38,700 261 25 65
SP9KGC 14 28,342 251 19 55
SP9FLY 14 27,258 214 24 53
SP2BSX 14 27,280 161 20 40
SP7ETG 14 18,660 198 14 46
SP6ECA 14 11,088 155 14 42
SP5GOP 14 6,390 155 9 21
SP8HXN 14 3,096 85 7 29
SP7ASZ 14 1,550 31 9 22
**SP9ABU 7 3,596 118 5 24**
SP6AGD 7 1,150 51 4 19
SP2FAP 7 442 29 4 13
SP2GUB 7 36 7 2 4
**SP5ELA/5**
3.5 29,892 402 11 42
SP6KAJ 3.5 12,628 303 8 33
SP2BBD 3.5 11,395 192 8 35
SP6AFO 3.5 9,065 277 5 30
SP3IBS 3.5 5,510 193 4 25
SP9AKD 3.5 2,670 90 5 25
SP1EIC 3.5 1,176 59 4 17
SP4EXN 3.5 800 48 4 12
SP8RJ 3.5 459 28 4 13

**Portugal**

**CT1DW A 111,134 393 46 135**
**CT1AV 14 96,163 512 23 90**
CT1QZ 14 86,580 504 19 59

**Romania**

**YO6KAF A 170,482 517 48 110**
**YO5BQ A 165,212 536 51 155**
YO6EX A 81,305 281 48 113
YO3RF A 40,424 172 41 83
YO9KAG A 28,188 221 24 84
YO6MD A 26,386 234 21 58
YO7APM A 24,440 211 31 63
YO3QK A 24,030 144 27 62
YO8AKA A 22,923 253 20 61
YO7NA A 15,836 151 16 58
YO3AC A 7,065 65 16 29
YO7KAJ A 1,950 39 13 26
YO3ZP A 540 11 9 11
YO2BIW A 475 26 6 13
YO7IY A 380 19 6 13
**YO4AYE 14 16,936 209 10 48**
YO3GK 14 4,698 50 12 42
**YO4UJ 7 8,148 160 8 34**
**YO3JW 3.5 43,072 586 13 51**
YO6VZ " 1,804 82 4 18

**Scotland**

**GM3BCL A 113,393 342 52 115**
GM4ENN A 6,240 114 9 31
**GM4CHX 14 13,072 211 12 31**
GM3SSB 14 12,264 139 14 42
**GM3YOR 1.8 1,358 102 2 12**

**Shetland Islands**

**GM3RFR 21 10,191 114 13 30**

**Sicily**

**IT9MPR A 128,464 508 41 71**
**IT9WGI 28 22,847 241 19 48**

**Spain**

**EA7CP A 45,120 201 38 82**
**EA3NA 21 74,690 371 27 83**
EA3OJ 21 38,675 296 22 63
**EA2IA 14 1,938 46 6 13**

**Svalbard**

**JW5NM A 169,510 527 37 97**

**Sweden**

**SM3BIZ A 455,270 814 69 196**
SMØAJU A 256,855 542 64 171
SM5EEP A 193,380 604 50 115
SM5CAK A 103,005 287 47 88
SM2DMU A 38,016 128 55 121
SM7TV A 37,840 199 36 74
SMØBSC A 21,082 167 28 55
SM5RE A 15,957 135 27 54
SM7BYP A 12,285 77 24 39
SM7BGF A 11,564 128 20 39
SMØCGO A 9,196 95 24 52
SL7DM A 6,328 73 16 40
SM4AZD A 5,000 53 17 33
**SM7BBV A 1,080 15 5 4**
SM5DUS
28 1,560 37 9 17
**SM5BRW**
**21 54,900 260 25 75**
SM6ID 21 2,668 41 11 18
SMØKV/Ø''
2,013 29 10 23
**SM5BNZ**
**14 390,128 1,169 33 115**
SM7DMN
14 235,094 912 28 94
SM3DSP
14 167,827 637 30 91
SM2DHG
14 7,650 88 14 36
SM5GA 14 4,958 73 10 27
SM7FYM
14 2,912 37 13 19
SM6CNX
14 1,710 32 9 10
SM7CUY 14 875 19 9 16
SM5DLR
14 98 8 3 4
SM6DVZ
14 35 5 3 4
**SM4CAN 7 50,743 466 21 56**
SMØTW 7 16,128 253 13 43
**SM5GZ 3.5 47,068 436 18 64**

**Switzerland**

**HB9ZE A 284,096 666 47 146**
HB9UD A 6,758 80 24 38
**HB9DX 21 28,975 113 25 70**

**Wales**

GW3MUZ/M
A 2,232 44 10 21
**GW4CYD 28 12,084 146 16 41**
**GW3NNF 21 206,240 796 24 71**
**GW3SLA 14 13,630 145 15 43**

**Yugoslavia**

**YZ2OB A 609,900 1,097 77 208**
YZ1INO A 298,552 863 56 212
YZ3CM A 155,414 448 58 180
YZ1UM A 131,157 468 60 117
YZ1NZW A 80,032 311 46 118
YZ1NPG A 64,902 201 50 124
YZ1US A 23,716 137 38 39
YZ3TFB A 21,049 103 34 63
YZ3RMS A 8,308 85 21 41
YZ1AAO A 2,178 58 8 25
YZ1SF A 399 15 7 14
**YZ2CBE 28 10,244 148 13 39**
YZØSRJ 21 422,816 1,192 34 112
YZ1OBA 21 91,500 561 23 52
YZ2RLK 21 41,850 207 20 70
YZ1OFT 21 6,642 134 12 29
**YZ2RNE 14 662,004 1,924 35 113**
YZ4EBL 14 399,938 1,234 36 118
(Opr. YZ4VFF)
**YZ1BCD 7 149,600 756 28 82**
YZ3TPM 7 88,954 641 19 60
**YZ3TKT**
**3.5 26,975 366 12 53**
YZ3TCQ
3.5 6,422 166 6 32

## USSR

**Byelo Russia**

**UC2ICJ A 76,250 402 31 94**
UC2IJ " 72,884 445 32 107
UG2BF 21 24 2 2 2
**UC2WP 21 3,048 97 6 18**
**UC2AAX**
**3.8 7,378 232 5 29**

**Estonia**

**UR2QI A 707,808 1,263 71 221**
UK2RIL " 80,600 483 31 93
UR2LH " 8,600 80 16 27
**UR2TAX**
**28 15,860 179 16 49**
**UR2MG 21 204,402 815 29 85**
UR2REZ " 20,732 153 21 52
**UR2GD 14 423,654 1,441 32 99**
UR2EG " 105 7 3 4
**UR2TAU**
**3.8 6,534 196 5 28**
UR2CR " 551 30 4 15

**Latvia**

**UQ2DV A 47,600 232 43 97**
**UQ2GA 28 7,266 113 13 29**
**UQ2HO 14 34,128 327 18 54**
**UQ2CR 7 4,114 113 6 28**
UQ2GW " 1,944 43 8 28
**UQ2GCN**
**3.8 15,750 327 8 34**
UQ2GDQ " 7,955 207 6 31

**Lithuania**

**UP2NK A**
**1,316,484 1,718 90 258**
**UP2OU " 524,250 1,308 72 191**
UP2SA " 405,809 882 70 193
UP2BAR " 245,937 851 56 163
UP2CY " 188,870 621 53 149
UP2OM " 118,800 514 36 96
UP2NO " 11,304 119 52 157
**RP2PEJ**
**28 4,860 107 11 25**
UP2ND " 2,403 82 7 20
UP2AS " 1,978 76 6 17
RP2PEC " 280 23 4 6
**UP2PAP**
**21 42,080 230 22 58**
**UP2BAS 7 2,781 99 5 22**
UP2PAX " 2,376 101 3 21
**UP2PBW**
**3.8 18,084 374 7 37**
**UP2BAA " 15,120 319 8 32**
UP2BAT " 9,282 226 6 33
UP2PCH " 540 30 4 14
UP2BCJ " 495 31 4 11

**Kaliningrad**

**UA2FC A 201,593 555 59 158**

**Moldavia**

**UO5OWK A 64,768 250 37 91**
**UO5OGE**
**28 34,360 359 17 41**

(Continued on page 70)

***Taking Some Of The Mystery Out Of What's Going On Even Though Nothing Lights Up***

# Making IC Projects Work

BY LEONARD M. BUTSCH, JR., K4CNP

### *Foreward*

*A few rules govern the probability of success or failure of home grown solid state projects. They include (1) understanding generally what the electronic system is supposed to do, (2) what function(s) each of its' sub-systems or building blocks is supposed to perform, (3) that all components are operable and are in fact operating in the system within their specifications, (4) that construction errors are avoided to the extent possible during the building operation, and when or if found corrected and (5) a systematic debugging procedure is developed and used. These rules may appear overwhelming for medium and large intergrated circuit and/or solid state projects, but in fact are only sizeable rather than awesome when taken one at a time and broken down into bite size chunks. This is the purpose of this discussion. In addition, a suspicious nature on the part of the builder can be an asset, nothing being error proof, including the printed word. In fact, authors and editors will be the first to acknowledge that almost inevitably errors do creep into the final printed article for that new solid state project that the reader decides to build. Components are not always as labeled, wires accidentally go to the wrong places in schematic diagrams and a host of like gremlins manage to find their way into print. After the reader has built his solid state system an entire new set of possible errors that may cause failure arises such as cold-solder joints, solder bridges, connecting polarized components backward and plugging integrated circuits in backward to name a few.*

*It is hoped that this article will provide some guidance for the builder of solid state projects of medium to large size, such as those referenced[1] in the article and of great interest to many amateurs both of the "do it yourself" class and the "of interest" only class. Each of the rules listed above will be discussed and analyzed to "de-bunk", I hope, the air of mystery attached to making large IC systems work as they should. This is the first part of a two part paper that covers the organization, construction and debugging of IC projects that are currently of interest to amateurs with the emphasis on How To Make It Work.*

There is an increasing emphasis of the use of solid state electronic hardware in amateur radio equipment due to a combination of circumstances such as low equipment or parts cost for IC's and transistors, a desire to make amateur equipment compact, low power requirements for the function accomplished, long product life, ready availability of printed circuit boards for advanced amateur gear, and not the least, a scientific desire to accomplish amateur missions with "state of the art" hardware. Perhaps one prime reason for advanced solid state amateur equipment rests in the very low cost of surplus IC's, transistors, and various special devices such as rectifiers, thyristors and other available solid state items coupled with their high degree of reliability—once the basic system is completed successfully. The use of integrated circuits, especially, permits the evolution of large sophisticated hardware systems, even approaching data processing systems in the commercial field. Some examples of such amateur systems now in operation are SSTV monitors, scan converters, fast to slow, slow to fast and a combination of both capabilities with additional frills such as frame-grab capability, automatic gray scale generation and image reversal. In addition, RTTY, micro-computer applications to amateur radio, auto-correlation methods for noise reduction and a host of addenda for the ham shack have evolved or are evolving directly as a result of the availability of surplus inexpensive solid state hardware items.

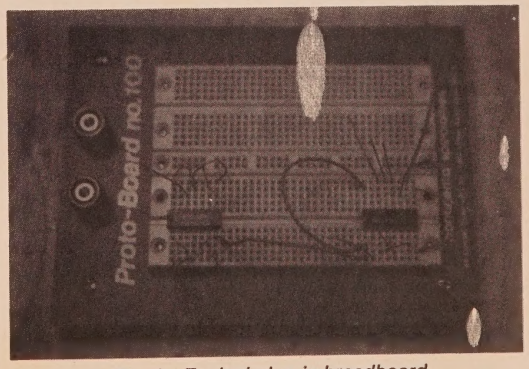



*Fig. 1—Typical plug-in breadboard.*

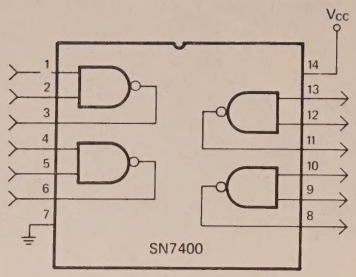



*Fig. 2—The SN7400.*

One of the big hurdles encountered in developing new advanced amateur gear and test equipment or measuring equipment is the attempt of amateurs to apply these surplus solid state items to designs without knowing for sure that the items are all working as they should. Many a project has come to grief simply because the hardware employed didn't work as specified in the manuals or specification sheets for such items, or perhaps the amateur designer didn't operate the solid state items well enough within specified tolerances. The obvious answer to this problem is to assure that all IC's, transistors and other such items are made to operate within acceptable limits. Devices such as transistors, rectifiers, diodes and single function solid state items are relatively easy to test for satisfactory operation, as are passive devices such as capacitors, resistors, inductors switches and like items, and the test of such items will not be discussed herein.

With regard to building hardware systems using solid state devices, rule number one should be to determine that every component is operable. As stated earlier, testing one function devices of a simple nature has been covered at length in the literature and test equipment for such items is inexpensive and easy to obtain. This is not the case for integrated circuit test equipment, and the new amateur systems are rapidly going in the direction of almost complete integrated circuit hardware. With many systems requiring literally hundreds of complex devices as exemplified by IC's, often complete failure of the system to "go" can depend on the operation of just one IC or solid state device. Thus it is imperative that the builder know at the very least that each one of the solid state devices operates within the specifications for which it is to be used. This leaves the builder two choices. He can either go to a solid state device outlet that is completely reliable (and that's asking a lot) or he can design methods to test the various components he intends to employ in his system. The first approach is expensive and still does not absolutely guarantee perfect hardware, thus the second approach is really the only viable method to assure satisfactory results. This second method has the added value that in addition to assuring the builder that each item of solid state hardware is operable, it can also be a good learning experience. It has the capability to show the builder all of the various capabilities of the IC items he tests himself in addition to the one use for which he may be testing the IC.

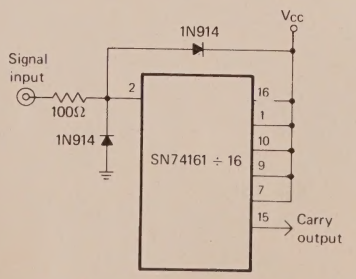



*Fig. 3—Test circuit for ÷ 16 plug carry in a 74161.*

This idea of IC testers and test devices for other complex pieces of solid state hardware generally stops most individuals in their tracks. For those brave enough to ask about the cost of IC test equipment, the answer from manufacturers is generally conclusively negative from a cost viewpoint. The point overlooked by those brave enough to ask about IC test equipment as an example, is that the quote they obtain from manufacturers of such gear is for test gear capable of testing IC's by the thousands and *not* one at a time. IC test equipment for testing one IC at a time hasn't been built by industry as it is not economically profitable to do so; however, a bit of further study by the enterprising amateur will show that almost any IC made can in fact be tested with a minimum of equipment, plus a little ingenuity. The best approach I have found to solving this problem of "does it work" involves a combination of test equipment and methodology, with less involvement with test equipment and more involvement with regard to "how to do it". The secret to testing any complex IC or similar device can be found in the specification sheet(s) for the device. Such data from the IC manufacturer often has included a method or circuit for testing the device.

### *Assure Component Reliability*

With that introduction, the balance of this paper will be directed toward the use of specification sheets plus a limited amount of test equipment that the average amateur who enjoys building equipment has available or can obtain for a small sum of money. This assumes the possession of a v.o.m. (20,000 ohms/volt or better), a signal generator and small oscilloscope plus the usual small assembly tools. I recommend highly that any amateur who wishes to test his own IC's get one of the currently available IC circuit design plug-in boards[2]. The referenced type of plug in circuit board permits all of the wiring

and hardware for the experimental design circuits to be plugged into small sockets, so that a complete circuit for the test of a complex solid state circuit can be "hooked up" with nothing more than the components required, the IC or other piece of hardware to be tested, and interconnection wires. I have found that the ends cut from resistors and capacitors when mounting them on p. c. boards make almost ideal interconnecting wiring on plug-in test circuit boards. In addition, these ends from electronic components come in very handy as "jumpers" for one sided p. c. boards. Where longer wires or insulated wires are desirable, I find ordinary solid tinned hookup wire of between size 22 and 26 about right. Fig. 1 shows a typical test board for a rather simple IC with components and wires plugged into the board as required. A strip is provided on the board I happen to have for a power buss and is quite handy. Thus a simple five volt power supply and a volt meter is sufficient to test such an IC as a SN7400 as shown in fig. 2. A look at the spec sheet for a 7400 indicates that the output of each of the four NAND gates should be low (about ½ volts) when and only when both inputs to that gate are high (about 3½ to 4 volts), and if either gate input is grounded, the output should go to high as indicated by a voltage of about 3½ to 4 volts. Furthermore the output should remain at the high or 4 volt level as long as either input is held at ground potential. For example, in fig. 2, with power applied as shown, pin 3 should be high only when pins 1 and 2 are low. Thus with no more than a few clip leads, a five volt supply, a volt-meter and a base for mounting the 7400, each of the four gates may be tested statically in sequence for correct operation. If the static tests show that both a high or low output can be obtained from each gate when the correct inputs for the output are applied, it can be determined with a fair degree of certainty that the 7400 will operate satisfactorily within the speed ranges set in the specification sheet. It takes about 30 seconds to check a 7400 in this manner and that simple test can go a long way toward avoiding the agony of finding a bad 7400 in a large array of IC's. More sophisticated IC's may be tested, some even more simply, in a similar manner. Fig. 3 shows a means of connecting a 74161, taken from the specification sheet again, so that it can be readily checked out. This particular checkout is facilitated with the use of a simple oscilloscope and a signal generator. Even a sine-wave generator capable of delivering about five volts RMS output can be used to operate the counter. The two 1N914's and resistor are used to limit the input signal to a safe level for the 74161 and to assure that it does not exceed the recommended input voltage levels for the 7400 series TTL IC's. The 74161 can be tested rather completely by inserting a signal to the input indicated, which is the clock input for the 74161, and observing the output (carry output, pin 15). If a pulse is observed it is

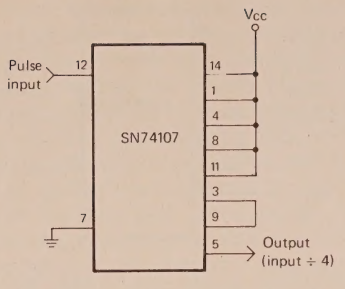



*Fig. 4—A SN74107 divide by four counter.*

established that the four flipflops in the device have operated correctly and provided a carry output. If it is possible with an oscilloscope, the carry count should be one sixteenth of the input counts. That assures that all counters are working within the 74161. For complete testing, each of the outputs, divide by two, four, eight and sixteen should be checked with the scope for outputs also. Generally only a check of the carry output will asure that the 74161 is operating as it should. It should be mentioned that once a test setup for an IC is made, all of the IC's on hand of the same type should be tested sequentially before rearranging the test circuit for another type of IC. It is well to add that the tests described herein only demonstrate that the IC being tested operate within the speed of the input pulses used and the voltage level employed. It is possible that an IC may pass these tests and not operate correctly if used at or near the upper limits of it's specified operation. The final test is in fact that the IC will perform the function desired in the circuit for which it is to be used. The elementary tests described herein generally will weed out the obviously bad IC's and go a very long way toward assuring successful system operation.

Much of the balance of this article will be devoted to representative test circuits for various IC's most often found in current published articles involving the assembly, debugging and operation of advanced electronics hardware from the average amateurs viewpoint[1]. A combination of different types of devices are frequently used in the above referenced

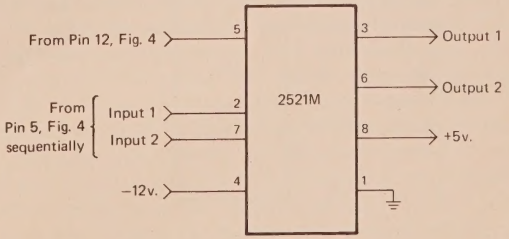



*Fig. 5—A 2521 shift register test circuit used with the ÷ 4 circuit of fig. 4.*

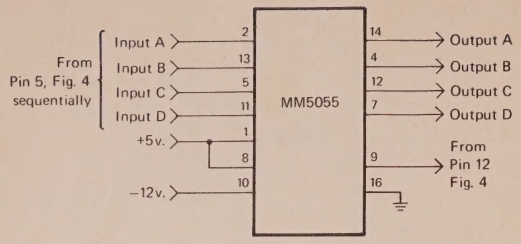



*Fig. 6—A test circuit for MM 5055 s.r. used with the ÷ 4 circuit of fig. 4.*

systems, the most common being the combination of compatible TTL and MOS IC's. MOS IC's require more sophisticated methods for testing than do TTL IC's generally, thus it is well to begin with TTL test circuits and show how those very circuits can be applied to testing the more complex MOS IC's. As an example of the build-up of test circuitry from one rather straight-forward circuit to a more complex one, and at the same time permit adequate tests for each of the IC's as they are added, consider the eventual dynamic testing of a MOS shift register by use of TTL flip flops. Fig. 4 shows such a beginning circuit in which a 74107 dual J K flip flop is connected to assure that it is operating and also dividing by four. This circuit then can be employed to provide the clock circuit and the dynamic data input for a MOS shift register. The input signal to the 74107, which is jumper wired as a divide by four flip flop from the specification sheet, can be employed as the clock driver for a 2521M, as in fig. 5, or a MM5055, as in fig. 6. Both of these devices are multi-channel 128 bit shift registers. The input signal to the 74107, or the divide by two output from the 74107 may be used as the clock driver for the 2521 or 5055 and the divide by four output from the 74107 then used as the data input to the various shift registers of the two MOS IC's and the outputs of each of the registers examined with an oscilloscope to determine that the alternate "1" 's and "0" 's are being cycled through the shift registers. In the case of the 2521 there are two registers in each IC and in the 5055 there are

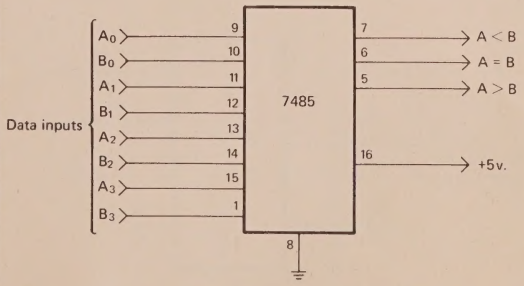



*Fig. 7—The SN7485 4 bit magnitude comparitor.*

four parallel registers to be examined. It may be noted as an aside that in those cases where one of the parallel registers in a multi-register IC does not perform, that IC can be so marked and used in cases where all of the parallel registers are not required. I do not recommend this practice although the subject registers are rather expensive and one may exchange shift registers at a later date and run into trouble with the inoperable register. A further test of the MOS IC's which is very useful is to vary the negative voltage input from it's assigned value of —12 volts to a lesser value and observe when the MOS device begins to become erratic in performance. Often it will be observed that some MOS devices will operate only at the specified voltage levels, while others may operate at much lower levels. In the case of dynamic shift registers such as 1404's, the less the negative drive voltage they require (clock drive) the less power they dissipate. This becomes important when such devices are run at or near their upper limit of operation, as many MOS units will be found to be heat sensitive and begin to operate erratically or even fail if drive voltages are too high. MOS devices have been encountered by the author which operate only at unspecified voltage levels. Needless to say, such devices should not be employed in IC systems. There are cases[3] where the author of an article will specify a voltage level different from that specified in the literature for an IC. It is noted that the author may have good reason for such deviation, such as low power operation of the MOS devices used to reduce heating. Generally, such changes in voltage levels to the IC's will be accompanied by reduced frequency requirements or some other parameter that permits the reduction of power to the IC. In some cases it is found that an IC does not operate as the author states with the voltage levels specified, and the IC(s) is known to be good, a note to the author may well be in order to clarify the problem.

A word as to basic needs for testing TTL and MOS IC's is in order. I strongly recommend to the amateur who is dedicated to building his own solid state equipment that he either build or buy a small laboratory power supply having outputs of plus and minus five volts and twelve volts. In addition, one variable voltage output can be very valuable in testing IC's. Regulated power supplies of such a nature are elementary to construct with the new three terminal regulators available and numerous circuits in almost any reference book. For the amateur unfamiliar with such regulators, check the LM309K, LM320 series and LM340 series. There are readily obtainable from electronic surplus suppliers at very low cost and along with a power transformer, rectifier network and filter capacitors, can provide voltage levels of plus or minus 5, 12, 15 and 24 volts at up to an ampere of current or better. With regard to the use of power supplies in testing IC's, I have found it

costly not to double check the power connections to the IC test circuit I am using. Generally, a wrong voltage too high or negative rather than positive on an IC under test means an IC for the waste basket.

To continue with examples of IC's that appear difficult to check, but in fact are not if the right methods are used, fig. 7 shows a means for checking a 7485 which compares four binary bits from one source with four such bits from a second source and will indicate whether the two sources provided an identical binary signal, one greater than the other or vice versa. As can be seen from fig. 7, all that is really required is a single power supply, some jumper wires and checking the correct output terminals when the input terminals are connected as stated in the truth table[4] of the specification sheet. With regard to the 7485 and it's spec sheet, if $A_3$ $B_3$, pin five is high and six and seven are low. If all A's and B's are equal pin six is high and pins five and seven are low. The spec sheet has all possibilities for comparing four binary bits with a second set of four binary bits. Further two sets of eight binary bits may be compared for A B, A=B and A B by using two 7485's and larger sets compared by cascading 7485's as shown in the spec sheets. In a like manner a 74157 multiplexer can readily be tested as shown in fig. 8. Either static testing or dynamic testing may be performed. Generally a static test, which does not require an oscilloscope or counter, indicates that the device will perform satisfactorily dynamically. Referring to fig. 8, when pin 1 of the 74157 is grounded a low signal on the four A inputs would result in a low signal on the output terminals corresponding to the four input terminals. In like manner a high signal in the four A input terminals will result in a high output on their corresponding output terminals. When pin 1 in connected to plus five volts, or in the high position, signal inputs to the A terminals should have no effect on the output terminals, but the four B input signals should be faithfully registered on the output terminals just as one would expect with a four pole double throw switch, which in fact is what the 74157 represents electronically. As an additional example consider the 7430 eight input NAND gate. In order for a low output to occur, all eight input terminals must be held in the high position. (Caution, TTL IC gates may give apparently wrong outputs if any of the unused input gates are left unconnected. As in the case of the 7430, if a five input gate were required, it is advisable to connect the three unused gates to the plus five volt level through a resistor to assure that they are held in the high state). Thus in the case of the 7430, if any one gate input is brought to the low level (ground) the output should go to the high level. If all of the input terminals are not connected to either ground or plus five volts, it is very probable that the output will go to the low level as long as no input is grounded. Unused or unneeded extra inputs to TTL gates are often left "floating" with no bad effect, but the procedure is not recommended by the manufacturers and should be avoided, even if published circuits do not provide such returns for unused inputs. A recommended rule of thumb is to tie all unused gate inputs back to plus five volts through a 1000 ohm resistor. As stated in almost all specification sheets it is very unwise to exceed the maximum voltages recommended for use with IC's, but in testing them it is a good practice to operate the IC's at a reduced volt age if convenient and observe if they perform correctly, especially if being tested dynamically. When testing TTL IC's at reduced $V_{cc}$ it is well to be certain that unused input terminals are tied back to the reduced $V_{cc}$ and not to plus five volts or the normal specified $V_{cc}$.

MOS devices can be readily checked as indicated in the previous examples, however, there are different types of such devices and care should be taken that specified instructions are followed. Many MOS devices in use currently require complex clock

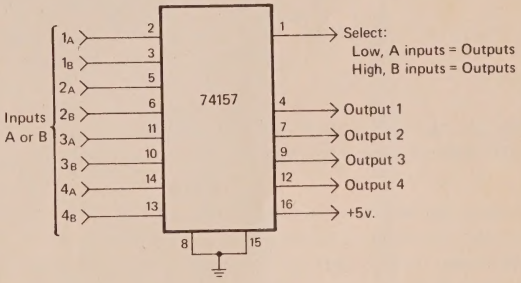



*Fig. 8—The SN74157 test circuit.*

drive systems. As an example the 1402, 1403, 1404, 2502, 2503 and 2504 families of dynamic shift registers require a two phase clock. Other MOS devices require three and higher phase clocks. In order to test such registers the correct clock system must first be assembled. We will devote attention to the two-phase clock primarily since most of the multiphase clocked MOS IC's of interest to amateurs currently use only two-phase drivers. As with building up test assemblies for TTL/MOS combinations discussed before, the two-phase clock system drivers can easily be assembled from relatively simple TTL hardware and transistors or a combination of TTL hardware and special two phase clock drivers for MOS drive applications. One such clock driver is shown in fig. 9. If desired a MH0026CN or similar two-phase clock driver can be used in place of the transistor/R/C network.[5] The two phase clock driver shown in fig. 9 can be constructed from TTL IC's and ordinary transistors, diodes and passive components. If it is desired to employ two-phase clock drivers such as the MH0026C family, fig. 9 (a) shows

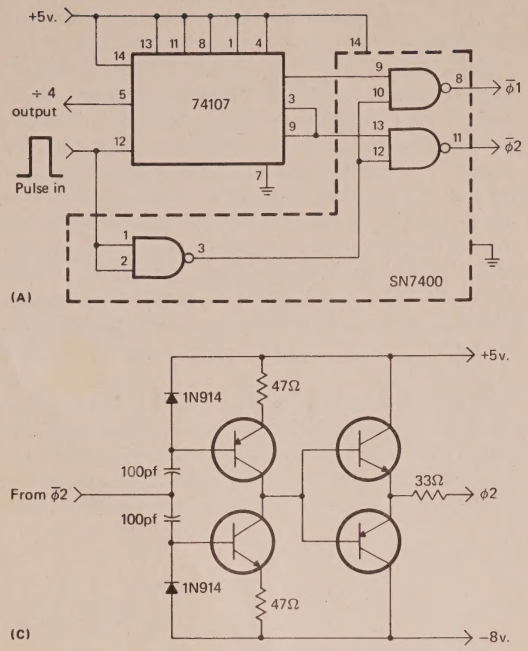



*Fig. 9—Two phase clock driver for 1404, 2504 and other MOS shift registers requiring and two phase clock drive.*

*(D) Test circuit for MH0026CN Used with 74107, 7400 portion of fig. 9.*

how to replace the transistor network with the clock driver. Once the two-phase clock driver assembly has been constructed and used to test the IC's employed in it, the assembly is ready to now test the families of shift registers listed above including the 1404. Fig. 10 shows how to connect the clock driver to the 1404 and a data signal derived from the 74107 of fig. 9. The shift register can then be tested dynamically with the use of a pulse source and an oscilloscope to observe the output of the shift register.

The above examples are a small sample of the vast number of simple test setups that can be quickly assembled using one of the currently available plug in boards, or a home built vector board array. It is hoped that the above examples demonstrate that the business of testing IC's is not the problem many think and it is most assuring to be certain that all of the IC's used in a large solid state system are in operating order when system debugging begins. I have had the experience that the big problem involved in making a system "go" only begins when the hardware assembly phase is finished, unless it is a well proved and debugged system such as kits sold by the Heath Co. or other well known kit suppliers. The preceeding information is not aimed at making such proved systems operate but those that are new state of the art systems as listed in the bibliography, for which there are no "in case of trouble" sections written.

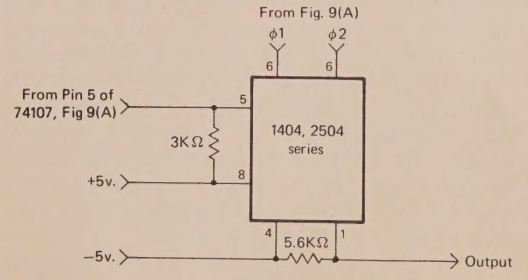



*Fig. 10—Test circuit for dynamic MOS shift registers 1404, 2504, etc.*

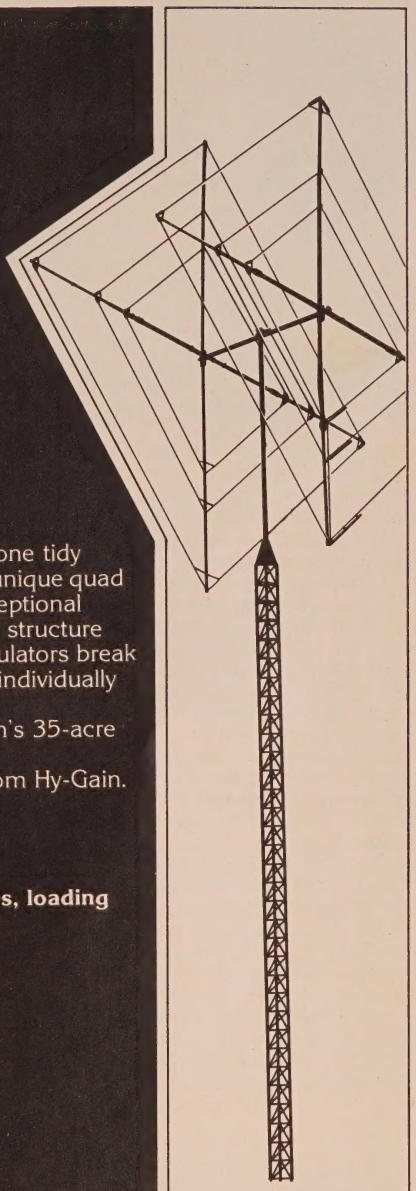
## *Possible Printed Errors*

Having assured oneself that the hardware to be employed in a new solid state system is good is the first step toward attaining that goal of having a working system. As stated earlier, there is much between having working parts and making them work as one wishes. To repeat, it is well to be suspicious of everything! Large IC systems cost a great deal of money and time and care must be taken at each of the several steps in realizing such hardware systems. If one is handwiring a device from a schematic in one of the amateur radio magazines it is recommended that

*(continued on page 68)*

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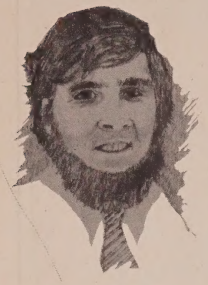
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ADRIAN WEISS, K8EEG, ON

# QRP

Being a "wandering scholar" does have its drawbacks when it comes to enjoying amateur radio operation. It seems that everytime I get a decent antenna up, I've got to pull it down and move elsewhere. This time, I thought, I'd beat the problem by getting one of those miniaturized beams that can be broken down into a six foot box for easy transportation, and then easily erected at a new QTH. All the oldtimers warned me that such an antenna couldn't do the job of a full-sized one, but I paid them no heed. Woe was me as a result. After about 15 hours tuning the miniature yagi for a decent f/b ratio and some forward gain, both field strength measurements and S-meter reports over thousand mile paths confirmed the wisdom of the oldtimers. The miniature beam was 2db *below* a reference dipole. Imagine, then, gentle reader, in what frustration and despair the following antenna was conceived.

Taking survey of available materials that were at my disposal, the following criteria emerged as project goals for the antenna: it had to be cheap, easy to toss together, easy to tune, durable enough to take South Dakota winter gales, light enough to turn with a standard TV antenna rotor, and provide good gain and f/b ratio. The antenna that was born in desperation has turned out to be a joy indeed when fed with my puny 700 milliwatt signal. Read on.

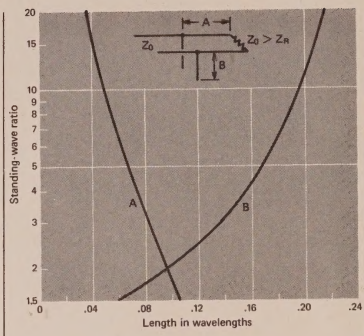



*Fig. 1 — Comparitive graph of element position and length of the open stub as a function of s.w.r.*

## Design Theory

A bit of research into the antenna handbooks led to the conclusion that a close-spaced two element yagi with parasitic element tuned as a director would allow for maximum performance. The decision to use the parasitic element as a director—in contrast to current practice of using it as a reflector—stemmed from several factors. First, the relationship of element spacing, attainable f/b ratio, and feedpoint to the physical sizes of the corresponding types of tuning suggested the use of a director. Optimum spacing for a two element yagi using a director is about 0.1 wavelength it is about 0.16 wavelength for a reflector. In practical terms, this comes out to approximately 6.5 feet and 10 feet, respectively. The torque resulting from wind-loading is easily twice the amount for the 10 foot spacing as for the 6 foot spacing — an important consideration when contemplating the use of a standard TV rotor. Secondly, the director case has some advantage in terms of attainable f/b ratio. With the closer spacing, there is greater interaction between driven and parasitic element and this results in greater cancelation off the back of the antenna. This also results in higher-Q which in practice can mean a decrease in the effective bandwidth over which the close-spaced yagi will allow a match below a certain specific s.w.r. This had me worried a bit, but the finished product, with open stub matching to the feedline, exhibits less than 1.5:1 s.w.r. over the entire band. Thirdly, the input resistance of such an array is in the neighborhood of 30 ohms, a not unreasonable match to 50 ohm line. And finally, since we are dealing with a full-sized yagi, design and construction is straight forward with no tricks needed.

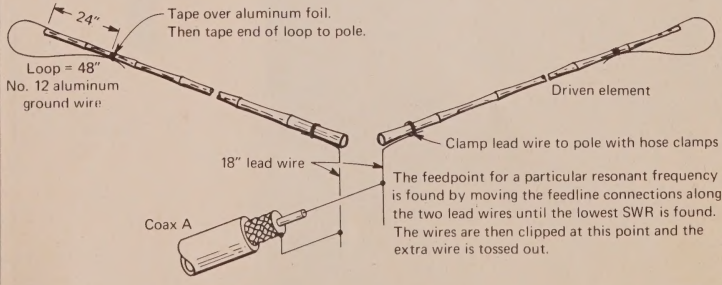



*Fig. 2—Mechanical details for the economical 14 MHz two element yagi. The director tuning is done the same with a shorting bar that is moved up and down until the greatest f/b ratio is achieved.*

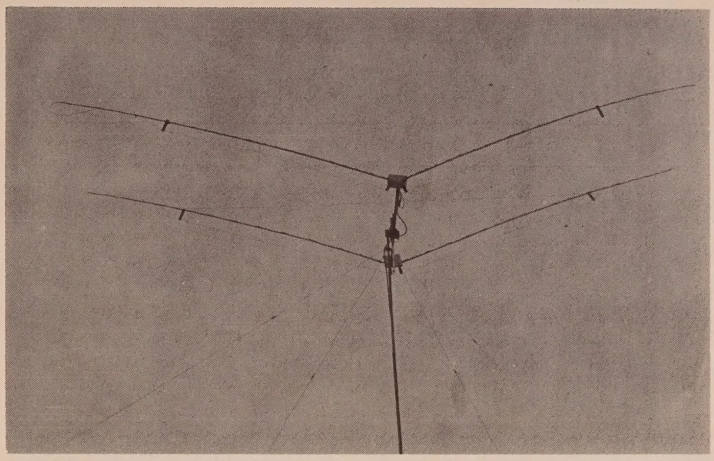
## Construction Approach

The next problem was arriving at a physical form of construction that would allow us to reach our cost, weight, and durability requirements. Aluminum tubing was out of the question because of price; weight-wise, it seemed acceptable. But it simply wasn't available hereabouts. I

discovered that the local hardware store carried bamboo poles for 82¢ each, and this seemed to offer some promise. The original idea was to use bamboo poles to support wire elements, but after more research, this appeared undesireable, since the effectiveness of a yagi is related in part to the diameter of its elements. An old trick occurred to me at this point. Some years back, I had used a bamboo pole wrapped with aluminum foil as a ground-plane element—after two years in the sky, the pole was remarkably well-preserved. I decided to try this approach. So far, the antenna cost me $5.28 for the poles and four boxes of cut-rate 25 ft. aluminum foil, 12 inches wide. Next, the question of the actual physical configuration was tackled. There was something unwholesome about the way the bamboo poles acted in a wind when held horizontally. It seemed that the only way to simply hold the elements in their respective planes was to mount them in a wide-angle upright "V" with a piece of nylon string strung from the ends of the elements to form a triangle. The logical way of mounting the elements was ¾ inch exterior plywood, which is much stronger than pine or other cheap woods. This could be easily done with pipe strap brackets clamping the elements to the plywood templates. After a couple of false starts, we struck upon the right method of attaching elements and templates to the boom, which was cut from an old TV mast laying around here. Four ninety-degree angle brackets could be bolted first to the boom, and then screwed to the element templates. A plywood template similarly could be used to attach the boom to the mounting mast.

### *Assembly*

The actual time to put this all together was about five hours, not counting false starts. When purchasing the bamboo poles, the correct way to evaluate a pole is to check the diameter of its small end — the larger the better. If you can get 18 ft. poles, use two for the driven element instead of a 16 footer with wire loading loops at the ends. Assembly follows this procedure. Varnish each of the bamboo poles with a heavy coat of exterior varnish—paint could be used also. By the time the fourth pole is done, the first pole will have dried to a "tacky" consistency. Roll out one of the 25 ft. boxes of aluminum foil on a sidewalk or other flat surface, cut it at the proper length, and lay a pole along its edge.



*When it was up I had the most beautiful antenna I'd ever seen winging its way to DX.*

Next, press the edge of the foil to the pole from one end to the other, and then simply roll the foil onto the pole. Then, beginning from the large end of the pole, twist-tighten the foil in the same direction as it is wound; leave about 6 inches of foil loose on each end so that the end loop of the driven element and the 18 inch feedline connecting wires can be inserted between two layers of foil. Insert the feedline wires and loops, twist-tighten the foil and clamp tightly with regular hose clamps. At the outer ends of the driven element, insert one end of a 48 inch piece of aluminum guy-wire, tape securely, and loop back 24 inches. Wrap the tin foil with tape for insulation, and then tape the end of the loop wire to the pole at that point. The elements are completed by wrapping plastic tape helically the entire length of the pole, with a pitch of about one turn per foot. This tape will keep the foil from peeling back during high winds. The completed elements are then mounted on the plywood templates with pipe straps, as shown in the photo. Use 1" × #10 woodscrews to hold the pipe straps in place, and make sure that the pole is held very firmly to the template. The elements are ready to mount on the boom.

To prepare the boom, cut it to the right length (6 foot in my case) and clamp four ninety-degree brackets to each end of the boom using standard muffler clamps (1½ inch dia. in the case of the typical TV mast used for the boom). After very carefully lining up the angle brackets with the edges of the boom, drill through the holes in the brackets, through the boom, and out the holes in the bracket on the opposite side of the boom. Then insert ¼ inch bolts and secure firmly. Tighten the muffler clamp all the way. Next, cut out the plywood template for mounting the boom to the mast, and pipe strap it to the boom with #10 woodscrews. Do the same for the mast. In order to avoid rotation of the mast relative to the antenna, drill a hole through the mast and template, and insert another 3 inch ¼ inch bolt and secure (once the antenna is complete and the elements are aligned with respect to horizontal, a similar hole is drilled through the boom and template, and bolted).

The yagi is ready for attachment of the elements to the boom. A suggestion here. With the element laying on the ground, place the boom on the template and use 1×12 woodscrews to secure the angle brackets to the template; before attaching the director element to the boom, resonate the driven element at about 13050 kHz (for a later resonance at about 14100 kHz). This can be done by hooking up the driven element to

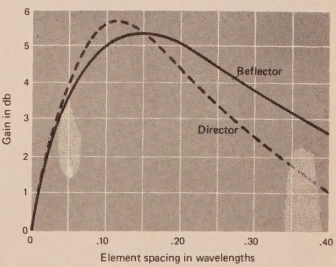
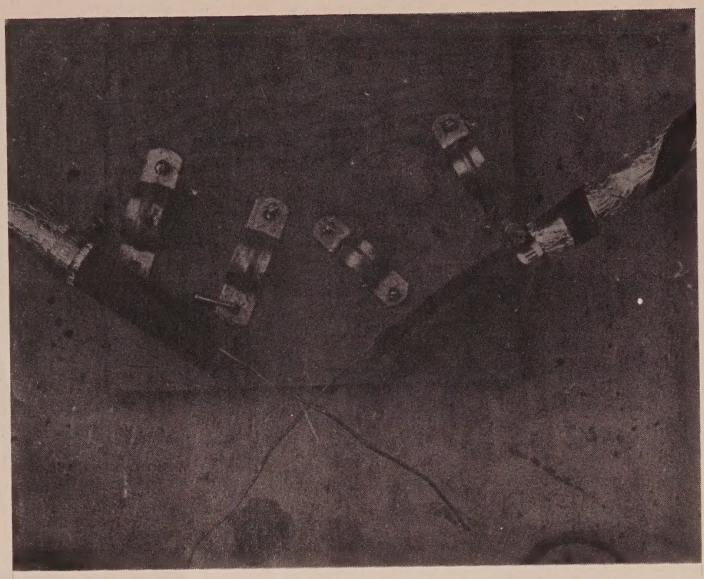



*Fig. 3—The optimum theoretical gain of a parasitic element over a half-wave antenna. This assumes no inherent losses.*

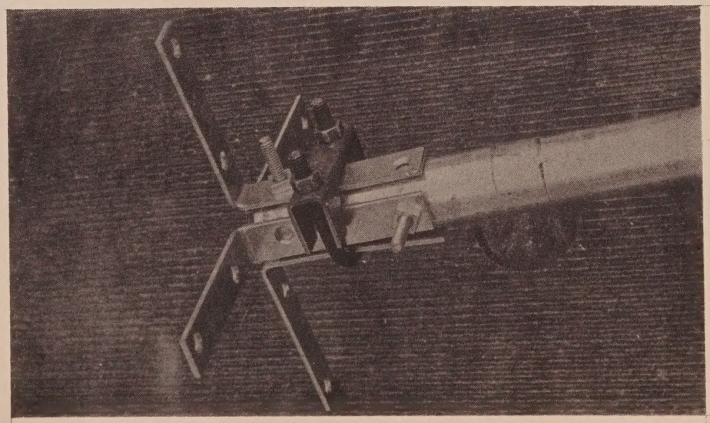


*The template for the element mounts and the pipe straps used to screw the elements to the template. The wire leads are taped to the ends of the elements and secured firmly with hose clamps.*

the transmitter, and tuning for a low s.w.r. at the low end of the band. The resonant frequency of the driven element is varied by moving the feedline along the feedline wires until the proper position is reached. Then the other element can be mounted on the boom in the same way. I mounted my director element with the rest of the antenna mounted on the mast, but this procedure can be done by having someone hold the driven element up while the boom is placed upon the director element as it lays on the ground. In any event, take care to align the elements so that they share the same planes. Once the director is attached to the boom, the beam can be tuned.

### *Tuning*

Two methods are viable for tuning the beam. First, you can mount a field strength meter a couple of wavelengths from the antenna, and hook the transmitter to the antenna. A pickup antenna for the field strength meter should be sufficient to give full scale reading on the meter. It is best to tune for maximum f/b ratio, so point the beam in the direction opposite the field strength meter. Then the sliding short on the director wire leads is moved back and forth until the field strength meter gives the lowest reading off the back of the beam. Once this point is found, you can swing the beam around and see if you get a great increase in field strength reading. You should. The other approach is to tune the antenna in its receiving capacity (law of reciprocality here—it does the same on receive as on transmit). In this case, the transmitter feeds an antenna a couple of wavelengths away from the yagi, and the field strength meter is coupled to the driven element (feedline should be connected to the antenna, but unterminated at other end). Again the director tuning lead short is adjusted for minimum signal off the back end of the yagi. And that's it—it's tuned up. The actual adjustment should take about ten minutes.



*Close-up of the mounting brackets and the boom end. The muffler clamp is shown in place.*

### *Matching*

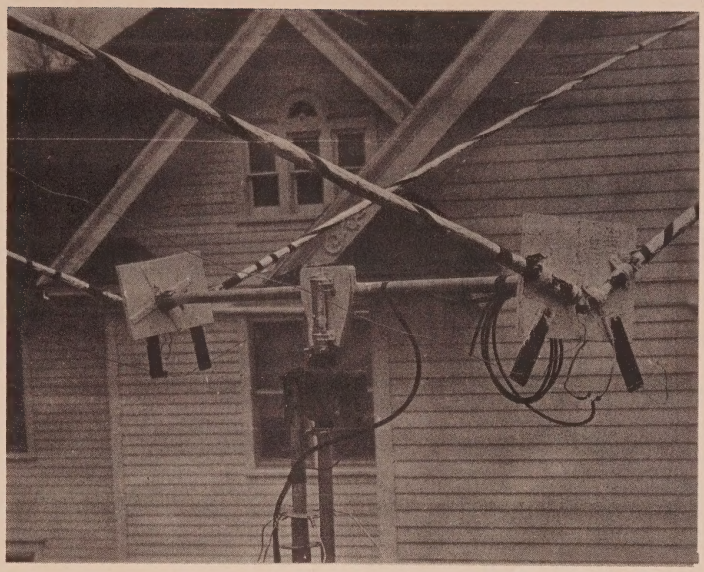
After this procedure has been completed, hook the transmitter to the antenna through a quarter wave *electrical length* (44.5 ft.—one wavelength approximately for RG-58U and RG-8U) and load up. You will notice that the s.w.r. is somewhere around 2:1 to 3:1. This is normal because of the interaction of the driven and director elements. Don't attempt to "touch up" the driven element for lower s.w.r.—it isn't the cause of it. Explanation: when you tuned the driven element for resonance without the director in place, the input resistance of the driven element (actually a half-wave dipole) presented a close match to the 52 ohm coax, hence the low s.w.r. at resonance. When the director was mounted and tuned, however, the input resistance dropped by as much as one-half and perhaps more. What we have then is a problem involving the mismatch between the input resistance of the driven element and the impedance of the coax. We can solve this problem with an open line matching stub. Some antenna basics in this respect. In order to achieve an efficient transfer of power from feedline to antenna, the ideal case is one in which the impedance of the coax equals that of the antenna input resistance: hence, a 50 ohm input resistance fed with 52 ohm coax will exhibit a 1:1 s.w.r. anywhere along the coax feedline. However, when the input resistance and coax impedance are considerably different, a "mismatch" occurs that makes the feedline behave differently. Looking at the feedline from the transmitter

end, the resistive impedance of the antenna will be "seen" by the transmitter at points one-half electrical wavelength, and multiples thereof, from the antenna. At all other points on the feedline, a different impedance will be "seen" consisting of a resistive component and a reactive component. What this means, then, is that if we can find a place on the half-wave feedline at which the resistive component is the same as our feedline, say 52 ohms, we can insert our 52 ohm feedline at that point and a proper resistive match will result. But we also have to take care of the reactive component present at that point in the feedline. To take care of this reactive component, we simply shunt the feedline with a reactance of the opposite sign—capacitive, or open end stub line, inductive, or short-ended stub line. What results, then, is a matched feedline which has no standing waves along its length, regardless of length.[1] That is the principle of the matching stub that is used here. Fortunately, there is no need to fool with complex formulas in practice: since the mismatch relates directly to s.w.r., we simply measure the s.w.r. at the transmitter end of a half wavelength feedline, and then refer to Chart I for the proper *electrical* length of matching line and stub line. For final adjustment of the match, however, the s.w.r. bridge should be inserted right at the insertion point in the match-stub line. So, when you cut the match-stub line from Chart I, leave a couple inches extra for final pruning at the antenna. Simply feed the antenna through the experimental match-stub line, and cut-off or add on pieces of coax until the s.w.r. between feedline and matching point is as close to 1:1 as possible. The s.w.r. should be 1:1 down in the shack too after this adjustment. In my case, the antenna is fed with about 100 feet of RG-8U, and the match-stub lines came out to A = 52″ and B = 70 inches, see fig. 2. The antenna is ready to hoist into the wild blue yonder for its DX-chasing.

The antenna described here achieves all design objectives, and appears to approach the theoretical gain and f/b ratio given by antenna handbooks for a two element yagi. Conservatively rated, the f/b ratio is 15db, with about 25db cancellation

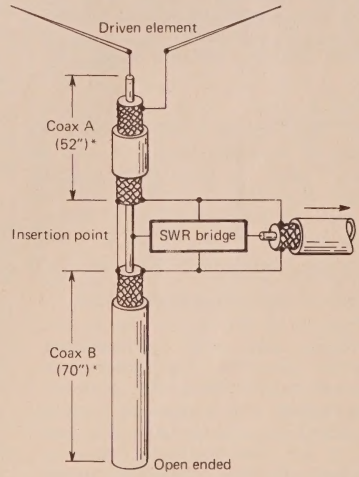
*(Continued on page 71)*

[1] *R. H. Fransen VE6TW, "Antenna Theory in Practice," CQ, Vol XXIV-#9 (September, 1968), pp. 67-71).*



*Details of the boom assembly on the completed antenna.*

*Fig. 4—Antenna stub set-up and tuning procedure. See fig. 1 for proper A and B lengths relating to the s.w.r. that you measure either at the antenna or back in the shack through a multiple B of ½ electrical wavelength of coax. The dimensions A and B shown are my dimensions for my antenna and feedline. The final tuning set-up is shown with the s.w.r. bridge between the feedline (any length) and feedpoint; after the s.w.r. is down to 1:1 nominally, remove the bridge and connect the feedline at the insertion point. A coax "T" connector could be used at the junction of coax B but it is easier to solder the feedline directly to the stubs. Use the same feedline coax for matching stub for the main feedline.*



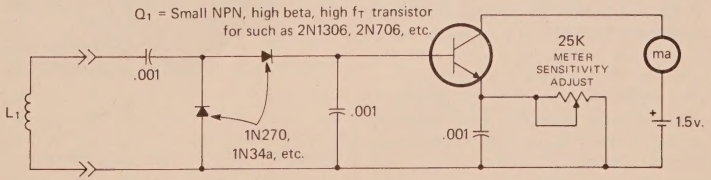
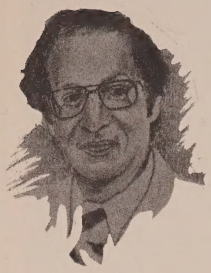




*Fig. 5—A sensitive field strength meter. L1 can be anything from a single loop to at most several turns loosely wound around the driven element feedlin connecting wires sufficient to give an adequate meter deflector. The feedline should be connected at the feedpoint and unterminated at the far end (just left unconnected). This cicircuit was developed by W4EZW and published in The Milliwatt, August 1971, p. 4.*



# Math's Notes

BY IRWIN MATH, WA2NDM

Last month we discussed converting basic moving-coil meter movements to voltmeters, ammeters, and milliameters for use in various applications in home construction. At that time however, we only covered d.c. considerations. This month, we continue the discussion with a.c. reading instruments and conclude with special applications of panel meters.

### *A.C. Voltmeters*

The most common way to convert a d.c. type movement to a.c. is by simply adding a suitable bridge rectifier in series with the multiplier resistor and across the movement as discussed last month. Fig. 1 shows this hookup. The bridge rectifies the incoming a.c. and converts it to pulsating d.c. and the meter indicates the average value of the d.c. flowing through it.

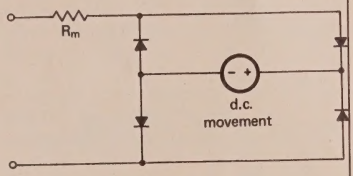



*Fig. 1—Basic a.c. voltmeter circuit.*

There are three very important properties of this type of circuit that must be considered. One is that such a meter indicates the *average* value of an a.c. wave form and not the r.m.s. (or equivalent d.c.) value. One *can* calibrate this type of meter in r.m.s. voltage however, and it will be accurate *as long as the wave shape doesn't change.* In other words, calibrate it by means of a sine-wave voltage and use it only to measure sine-wave voltages, not such non-sinusoidal sources as the output of SCR's TRIAC's, etc.

The second consideration is that

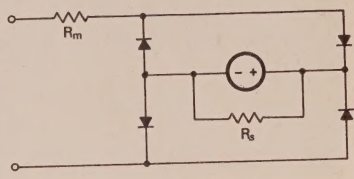



*Fig. 2—Basic a.c. voltmeter with improved linearity.*

solid state diodes are not perfect rectifiers and exhibit a non-linearity when very small currents flow through them. This will usually result in a non-linear meter scale. One way to minimize this problem is to shunt the meter with a resistor to increase the current flow to a point sufficiently beyond the non-linear point to minimize this effect. Fig. 2 shows a properly shunted circuit. A typical minimum full scale desirable current for such a basic movement is ½ milliampere.

Once the meter is shunted, the value of the dropping resistor, $R_m$, is of course now dependent on the new total current necessary for full scale deflection.

The final consideration is temperature. Diodes are temperature sensitive and the entire meter will only remain reasonably accurate if it is kept within a few degrees of the calibrating temperature. When used over a wide temperature range, steps must be taken to somehow isolate the meter from this variation.

In the interest of economy and simplicity in regard to a.c. voltmeter calculations, let us refer to fig. 3. This is a simple, a.c. meter circuit that can be easily customized by a user and one that employs the same 0-50 μA, 1000 ohm meter movement we used in our examples last month. Alternately, d.c. movements of up to 200 microamperes or so can be used.

In this circuit $D_1$ rectifies the incoming positive half cycles and applies them to the meter. The other diode, $D_2$, shunts the undesired negative half cycles from the meter as they would cause some slight leakage current to flow through $D_1$. The shunt resistor, $R_s$ is chosen so

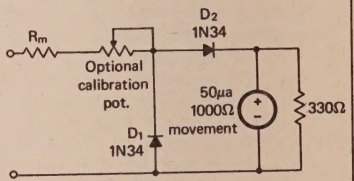



*Fig. 3—Basic a.c. voltmeter recommended in text.*

that about .25 to .5 milliampere is required for full scale deflection which gives a fairly linear scale. In addition, germanium diodes are used instead of silicon because of their low forward dropping voltages.

After building the basic circuit (without $R_m$) one should hook up a low voltage calibration source as shown in fig. 4. Alternately, the same transformer, driven by a variac could be used without the 100 ohm pot.

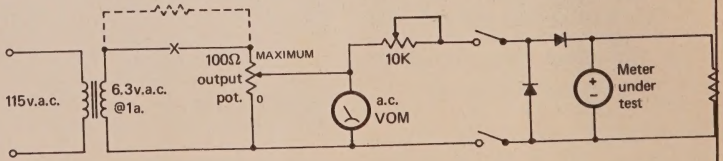



*Fig. 4—Simple calibration setup for the a.c. voltmeter discussed in text.*

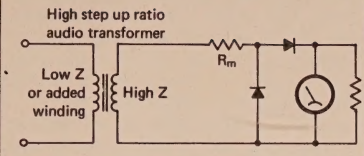



*Fig. 5— A.c. ammeter circuit discussed in text. The transformer acts as an a.c. shunt.*

Now, with the output set to 0, and the 10K pot set to zero, hook up the basic circuit and slowly raise the output until the meter reads full scale, if this is too "touchy" add 100 ohms—1K in series with point "X" in the diagram as necessary to make it easier. Note the reading on the v.o.m. Now increase the resistance of the 10K pot until the meter reads half scale. Turn off the power, disconnect and measure the resistance of the 10K pot. This is the approximate "internal resistance" of the meter-rectifier-shunt combination.

Now, calculate the rough value of $R_m$ by realizing that 2 × the basic voltage as read on the v.o.m. is necessary for full scale deflection when a value of $R_m$ equal to the "internal resistance" is used. For example:

If the v.o.m. voltage reading was .1 volt and the internal resistance 100 ohms, then 100 ohms would be required for every .1 volts you would want to measure. A 0-10 volt meter (100 × .1 volts) would then require 100 × 100 ohms or 10K for $R_m$.

When you have the value of $R_m$ approximated, connect a temporary carbon resistor as close to that value as possible and, using the test setup (changing the transformer and pot if necessary) see how close you are. You can then vary the final value of $R_m$ so that you are "right on" or add a pot in series with run as a final calibration control. It will then be necessary to reduce the value of input voltage in order to check on the linearity and calibration of the scale.

If the preceeding seems complicated to you, I would like to add that the variations in diodes, and meters available to experimenters from all types of sources make any other method too uncertain and more

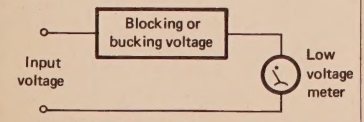



*Fig. 6—Basic method of making an expanded scale meter.*

formal calculations a bit too complex for this presentation.

### A.C. Ammeters

Due to the drops in diodes and basic insensitivity of the a.c. voltmeters just mentioned, the most suitable technique for measuring a.c. currents with those meters, by means of a current transformer. This is nothing more than a simple step up transformer that can be easily implemented by a simple modification of a common audio transformer.

Fig. 5 shows a typical a.c. current setup. The secondary of $T_1$, a common audio output transformer, is connected in series with the a.c. line to be measured. The high impedance primary is connected to an a.c. voltmeter circuit similar to the one we just covered. A.c. current flowing through the primary generates an a.c. voltage drop across the primary and the transformer step it up to a level that can be read by the meter.

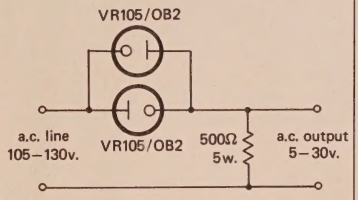



*Fig. 7—Expanded scale converter for use with an external a.c. voltmeter.*

In this circuit it is important that the secondary be able to withstand the maximum current that will flow and if it is too fragile (wound with very fine wire) it should be replaced by 5-10 turns of suitable gauge wire for the job to be done. This wire, in most cases, can be easily snaked between the existing wire bundle of the transformer and the frame.

Since the readout is still wave shape sensitive, as is the transformer, the same considerations as that of the voltmeter apply. To produce various ranges, you can change the sensitivity of the a.c. voltmeter section, or the turns ratio between primary and secondary.

Due to the vast differences in components on hand, this is a true experimenters delight. One word of caution however, be certain to always check the linearity of the readings when using this method—never assume it is perfect.

### Expanded Scale Meters

Often, it is desirable to read only a small portion of voltage out of a

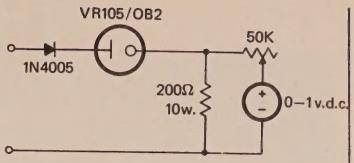



*Fig. 8—Simplified a.c. line voltage meter.*

much higher voltage such as the nominal ±10 volt variation in the normal 115 volt a.c. line. An expanded scale meter is just the ticket for this sort of application.

Fig. 6 shows the basic concept for building expanded scale meters. All that is needed is a method of blocking the amount of voltage not important and measuring the balance. For this purpose, the zener diode or Voltage Regulator tube is perfect.

In fig. 7 we have a circuit for measuring the a.c. line. Two 105 volt VR tubes are connected in parallel (one for each half cycle of the a.c. line) and in series with a fixed resistor. The tubes will be dropped across the 500 ohm resistor. A 0-30 volt a.c. meter connected across the 500 ohm resistor will now indicate "0" at 105 volts and "30" at 135 volts making a very useful expanded scale voltmeter.

A simplified version of the line voltage meter is given in fig. 8. Here, a single VR 105, a silicon diode, and a d.c. movement are used to make an expanded scale voltmeter. Operation is similar to the previous circuit in that the VR tube drops the bulk of the voltage. The diode assures only half cycle operation and the 200 ohm resistor acts as a load for the diode. To calibrate simply apply 130 volts, and adjust the 50K pot for full scale reading. They lower the voltage in steps to calibrate the scale.

For our final example, let us refer to fig. 9. Here a zener is simply connected in series with a d.c. voltmeter. As in the past examples, the zener blocks all voltages up to its approximate zener point, and allows all additional voltage to pass. In this circuit, there may be some nonlinearity around the zener point.

73, Irwin, WA2NDM

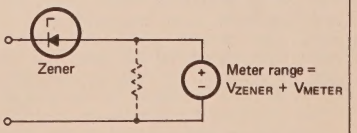



*Fig. 9—Expanded scale d.c. meter. The optional shunt resistor is used when the basic meter does not draw enough current to assure proper zener action.*



WILLIAM I. ORR, W6SAI, ON

# Antennas

"Welcome back," cried Pendergast. "How was your vacation in Hawaii?"

"Great!", I admitted. "Lots of beach weather . . . watching the *Wahinis* in their Bikinis . . . that good *Primo* beer . . . Maui potato chips . . . and a little DX to boot."

"I know about the *Wahinis* and *Primo*," said Pendergast, as he settled comfortably down into my operating chair. "Now tell me about the DX."

"Well, it really wasn't that good," I replied. "I got on the air at the start of the *CQ* WPX Contest, right in the middle of the big solar radio blackout! That was a hairy experience.

"The Thursday (March 25) night before the contest started 20 meters was wide open. The VKs and ZLs were very loud, and they had a flutter on them. The signals sounded just like aurora propagation. It sounded like 6 meters, not 20 meters. Also, a lot of deep Asian DX and European DX was coming through with the same flutter.

"What about Friday and Saturday when the contest started?" asked my friend.

"Saturday morning, 20 meters was absolutely flat! Not a signal, except one from South Africa! the ZS6 was the *only signal* on the band, except for one or two locals. Odd that he should come through. Except that he was at the antipodal point on the globe from Hawaii. Possibly his signals were arriving on a north-south path. After he QRT, the band was completely dead for several hours. It began to come back about noon. I talked to Pete, 5W1AZ, in Samoa, and the band came back to life quicker there than it did in Hawaii.

"The first signals I heard from the States were W7s in Washington, VE7s in British Columbia and W6s in the San Diego area. The whole middle section of the West Coast—from Oregon to Los Angeles—was blacked out. Then, slowly, the blacked out area shrank. I began to hear Los Angeles and Oregon. Then stations in central California. The last area to come through was around San Francisco. I didn't hear anything from the San Francisco-San Jose area until about four in the afternoon."

"That's weird," pronounced Pendergast.

"I agree. We are still victims of the ionosphere, for better or worse. And that's what makes DXing a lot of fun . . . the unpredictability of it."

"George Jacob's *Mail-A-Prop* hit it right on the nose," said Pendergast. "He predicted the disturbance, stating the radio storm would begin on March 25th, and said "the bands would be in pretty bad shape." That was the understatement of the year."

"*Mail-A-Prop* is a very handy operating aid for the DXer," I replied. "It saves a lot of wear and tear on the nervous system."

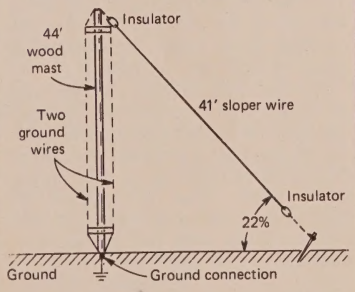



*Fig. 1—Inexpensive 80 meter sloper antenna of K6UB. A 44 foot wood mast is used. Two ground wires are brought down from the top of the mast. The 50 ohm transmission line runs up the mast, with the shield grounded to the ground wires. The center conductor is attached to the sloper wire. Length of the wire and the base angle were adjusted to provide the lowest value of s.w.r. at 3800 kHz. A similar antenna is used at WA6PLW.*

Pendergast sighed, relaxed, and placed his feet atop the polished surface of my operating table. He pushed the electronic key aside with the toe of his boot.

"What's in the mail today?" he asked.

"Well," I replied, "There's still a lot of interest in the 80 meter sloper antenna. That's the quarter-wave wire that uses the supporting tower as a return ground (fig. 1). A lot of fellows are using it, and it seems to be working well for them. As far as I know, W6NLZ was the originator of the antenna.

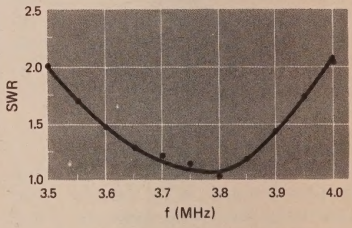



*Fig. 2—The s.w.r. curve of the 80 meter sloper used at K6UB.*

"I received a nice note from Hu, K6UB, who says, 'For years I've been trying various versions of 80 meter antennas all with disappointing or mediocre results . . . birdcages, fans, bowties, coaxial, folded dipoles, etc., etc. with never more than 400 kHz bandwidth, and usually less.

'Recently I tried out a sloper at WA6PLW. I had to trim the wire to 48 feet to resonate about 3750 kHz. The s.w.r. was 1.4-to-1 at resonance and about 2-to-1 at the band edges. On the air tests brought good reports.

'This encouraged me to try it at my own QTH. I have a 44 foot wooden mast, so I hoisted the sloper to the top and brought down two ground wires in lieu of the metal tower. I grounded the two wires to separate

ground rods and also grounded the coax braid at this point and connected the whole works to the irrigation pipes in the sprinkling system and to a low, woven wire fence!

'To get best bandwidth, and to hit resonance at 3800 kHz, I trimmed the sloper wire to 41 feet and set the angle at about 22 degrees (fig. 2). On the air reports were excellent and the whole 80 meter band is covered with an s.w.r. of 2-to-1, or less, across the whole band. Thanks for a great idea!'

"No credit to you," observed Pendergast archly.

I ignored the thrust, and continued. "Here's a second note about the W6NLZ sloper from Bob, WB4-DPG/5. His sloper is pictured in fig. 3. He says the effect of guy wires on the sloper is worthy of interest, as he has achieved directivity by the proper placement of tower guys. He also says that the feedline should run down the tower to the ground, and then take off to the shack. If the feedline is taken off the tower at a point above the ground, or is brought off at an angle to the antenna, there's a good chance the shack will be full of r.f., with the attendant feedback problems. This holds true for other feedlines to any antennas on the same tower as the sloper. They should be brought to the bottom of the tower, near the ground, before they take off to the shack.

"Bob says that he can tune his sloper on 40, 20 and 15 meters using a Drake MN-4 Transmatch with very little trouble. He's sure the s.w.r. on the line is quite high using this stunt, but he's only running about 200 watts and nothing gets hot, or gives any problems."

"Very interesting" remarked Pendergast. "Obviously the sloper antenna is an unusual one, and we haven't learned all the tricks about it yet."

"Anyone can play," I replied. "The ground rules are simple. The wire is about a quarter wavelength long, or less. The height of the feedpoint above ground, the included angle and the height of the end of the antenna above ground are the variable factors, none of which seem very critical. One or more of these dimensions is adjusted to provide the lowest s.w.r. at the desired operating frequency and the best bandwidth. S.w.r. at resonance seems to run in the range of 1.2-to-1 to 1.5-to-1. The base of the supporting tower should be grounded and all other wires and cables on the tower should be brought off near ground. And, finally, supporting guys on the tower

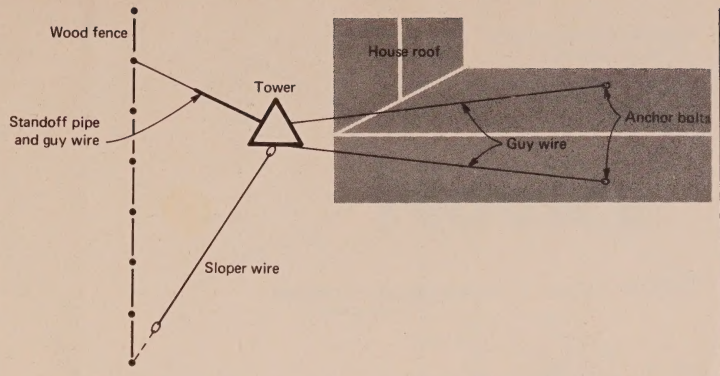



*Fig. 3—The 80 meter sloper of WB4-DPG/5. The sloper acts as one guy for the metal tower. Two guys run to anchor bolts in the house roof. The fourth guy is run from the tower top to a standoff pipe on the tower and then down to the base of the fence. This is done to keep the guy wire on the property. Using an antenna tuner, the sloper works well on 80 thru 15 meters. The guy wires are not broken with insulators and tend to act as reflectors for the sloper antenna.*

should be broken up with strain insulators, otherwise they impart a directive effect to the sloper. You can take it from there."

"Has anybody used the sloper on 160 meters?" queried my friend.

"Not that I know about, but one cut to that band should work OK, I would think." I paused and sorted through a stack of letters.

"Here's an interesting note from Rick, W6TAT. He's using a short, loaded dipole on 160 meters, which gets away from the radial and ground problems (fig. 4). The compact dipole is only 80 feet long, with 20 foot end sections. The feed system is the balanced counterpart of the popular tapped-coil match used for mobile whip antennas. The operational bandwidth is about 100 kHz between the 2-to-1 s.w.r. points.

"The adjustment procedure is simple. Before the feedline is attached, the antenna is resonated to the center of the operating range by pruning the center coil, while grid-dipping it. Next, the braid of the coaxial line is attached to the center of the coil and the center conductor of the coax is tapped at a point on the coil which provides a 50 ohm match. This adjustment can be done with a Noise Bridge or an s.w.r. meter. If adjustments are done with the antenna low enough to reach the center coil, it may be readjusted by trimming the end tips once it is hoisted into final position."

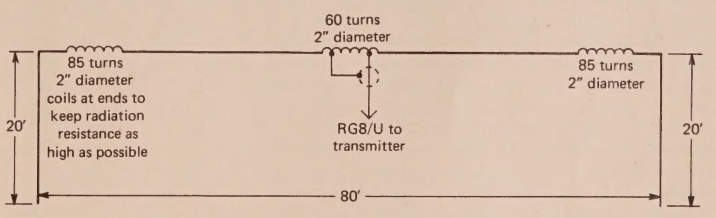



*Fig. 4—The W6TAT compact dipole for 160 meters.*

"I like that antenna," said Pendergast. "Most fellows have problems on 160 meters because they use some sort of vertical, or Marconi, and run into huge ground losses." He scanned the letter, "Rick says that this mini-dipole provides reports equal to his vertical antenna and he gets excellent signal reports with his schedules, which run out to about 400 miles."

"It should be good for a lot better DX than that," I remarked with a smile.

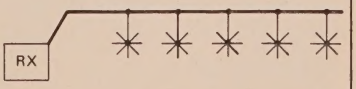
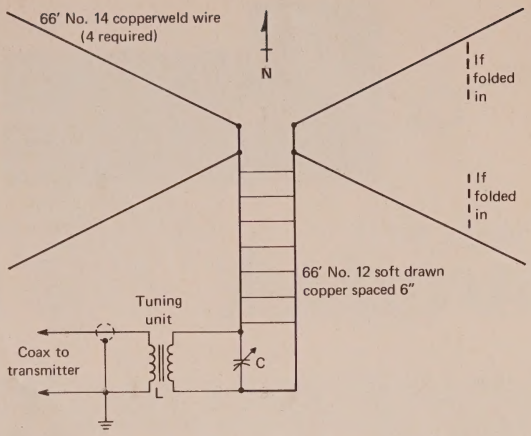
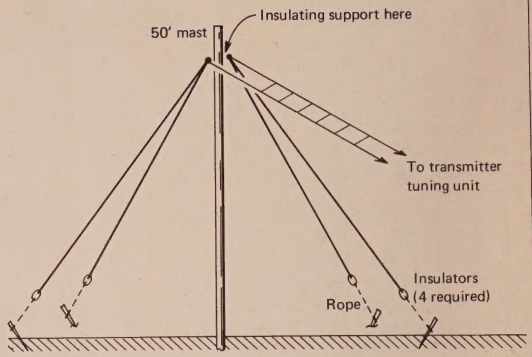



*Fig. 5—The old timer's "cat whisker" receiving antenna of the "twenties" remembered by WA4LCO (ex-W8LCN).*




(A) TOP VIEW




(B) SIDE VIEW

*Fig. 6—The WA4LCO multiband antenna. This center-fed, double inverted V antenna works 80 through 10 meters. It is supported on a 50 foot push-up TV mast. A 66 foot long, spaced feeder system is used in conjunction with a simple antenna tuner. The L-C combination tunes to the band in use. WA4LCO has made 5-band DXCC with this simple antenna.*

"Before we leave low frequency antennas, you might be interested in the letter from Ken, WA4LCO. Ken says, 'My earliest recollections of radio were the days when everybody built their own equipment (BC as well as amateur). My father assembled his own variable capacitors and my uncle made his own audio transformers by taking a bundle of iron wires, winding primary and secondary around the middle of the bundle, then bending the ends of the bundle around the windings to interleave outside the windings and complete the magnetic path.

'My uncle also had his favorite receiving antenna (fig. 5) which he called a "catwhisker aerial." Every so often a short piece of wire was soldered to the antenna wire and at the end of the wire, six or eight shorter pieces were soldered and stuck out in various directions. This was in the early twenties. I guess the idea was to get as much copper in the air as possible.'

"Wild," said Pendergast.

"The antenna that WA4LCO uses has a lot of copper in the air, too (fig. 6). It is a center-fed, double inverted V, using tuned feeders and a *Matchbox* tuner. Ken has 5BDXCC with it. Not bad! He says the antenna works well 80 thru 10 meters and does not seem to show any directional effects. Only one support is required, and he uses a 50 foot telescoping TV mast. Two antenna ends are tied to a fence and are only about 5 feet above the ground. The other two ends would normally land in the front yard, but he didn't want them there, so they are bent back and run along the edge of the roof. Ken says the whole thing is fairly inconspicuous and several neighbors have asked him when he was going to get his TV antenna mounted on the mast! Ho, ho."

"That's a nice antenna that can disguise itself as a TV mast," remarked Pendergast. "A TV antenna could go at the top, and the feedline could come down inside the mast, if that shielded 300 ohm line was used!"

"Pretty sneaky," I replied. "But sometimes subterfuge works wonders in an up-tight neighborhood!"

Pendergast's attention seemed to stray, and he did not reply. Instead he rose out of the chair and in one gesture reached up on the shelf and clutched a small object.

"What's this gadget?" he demanded, examining it closely. (Fig. 7).

"It's a mini-s.w.r. meter," I replied. "In this age of rising costs, it is the *Buy of the Month.* About ten dollars."

"A bargain," remarked my friend. "What's inside the case?"

*(Continued on page 72)*

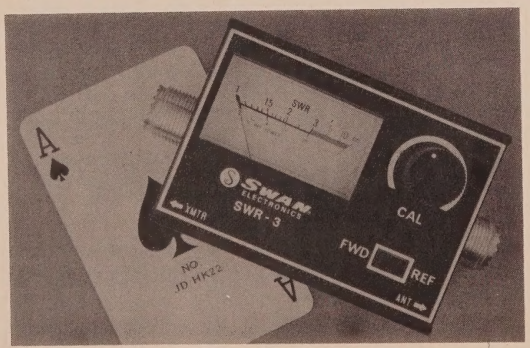



*Fig. 7—The new Swan miniature s.w.r. meter sells for about ten dollars. Just the thing for portable or Field Day use. It is rated to 1 kilowatt up to 21 MHz and 500 watts up to 30 MHz.*

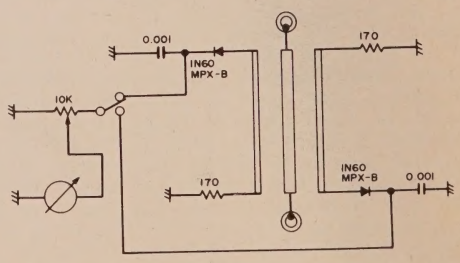



*Fig. 8—Schematic of the miniature s.w.r. meter. Components are mounted on a compact printed circuit board.*

# Novice

BY HERBERT S. BRIER, W9EGQ

One of the most frustrating experiences of a radio amateur is to hear other operators working stations the signals from which are covered up by man-made noise in his receiver. The sources of the noises are automobile ignition systems, electrical power lines, television receivers, elevators, sewing machines, neon signs, digital clocks, electric blankets, X-ray machines—virtually any device carrying or utilizing electrical power. The causes are sudden and repetitious change of current. Spark plugs fire, a motor armature interrupts current many times a second, a tree branch rubs against a power line, the contacts in a thermostat do not break cleanly; all these happenings can generate a series of highly-distorted electromagnetic fields to a conductor connected to the device. The conductor, in turn, acts as an antenna to radiate these noise fields into space. When the noise fields are weak and the conductors are short, the noise travels only a short distance, but when the fields are strong and the conductors are long—such as a power line—the interference can travel a mile or more.

U.S. Representative Vanek and Senator Goldwater are sponsoring bills to force manufacturers of electrical and electronic equipment to curtail the amount of radio frequency interference (RFI) it emits. Even if the bills ultimately become law, they will have no immediate effect on the noise in your receiver; so reducing it is up to you.

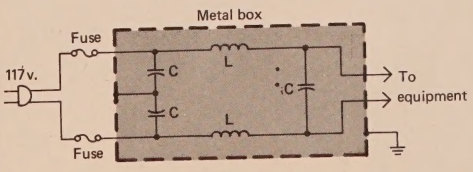
Before the days of s.s.b. phone, all communications receivers had a diode noise limiter between their second detector and first audio stages. It did a fair job of knocking the peaks off of automobile ignition interference when receiving conventional a.m. phone but was ineffective when receiving s.s.b. and c.w. signals: consequently it was quietly dropped from modern amateur receivers about ten years ago. However, back in the 30's James Lamb invented the much-more complicated "Noise Silencer." The silencer amplifies and rectifies the noise pulses picked up by the receiver and feeds them to a "noise gate" at the input of the receiver's first i.f. amplifier. When a noise pulse hits the gate, the receiver is disabled for its duration. On sharp impulse-type noises, like automobile ignition interference, in which each pulse has very high amplitude but is very short in duration, a good noise silencer or noise blanker can transform a signal that can barely be distinguished under the noise into a fully readable signal accompanied by a little noise in the background. On other types of noise, the blanker can totally or partially ineffective, depending on the duration and repetition rate of each noise pulse. As a result, noise blankers are invaluable for mobile operation, quite useful for locations near busy streets and highways, and of variable usefulness in other locations.

### *Locating Noise Sources*

The first step in tracking down noise sources is to remove the antenna from the receiver temporarily to establish that the noise is actually getting into the receiver via that path. If it is getting into the receiver via the power line, it may be reduced with a filter in the power line of the receiver or of the offending device. A filter may take many forms. A suitable receiver filter may consist of two 150-turn coils of No-18 enamelled wire close wound on 5" × ¾" phenolic or plastic forms, one in each conductor of the power line. Connect a .01-uμ, 1600-volt (or higher) capacitor from the line end of each coil to the shield box and another .01-μf 1600-volt or higher capacitor across the other ends. Connect the metal box to the receiver cabinet and to a good low-resistance ground.

Use the best receiving antenna available. Most amateurs do this automatically by using their transmitting antennas for receiving, also. However, if the transmitting antenna is vertical, it will probably pick up more noise than a horizontal receiving antenna would. Locally-generated noise signals are vertically polarized and originate from sources close to the ground, which are usually closer to a vertical antenna than to a high horizontal antenna. Whether the antenna is vertical or horizontal, feed it with coaxial or low-impedance twin-conductor cables for minimum noise pickup, because they do not pick up additional noise even when passing through heavy noise fields.

Start looking for noise sources in your own home by unplugging each appliance from its wall socket while listening to the noise from the receiver loudspeaker. Do not just turn




LEGEND:
C = .005μf – .1μf, 1600volts.
L = 150 turns, ½" to 1" dia., close wound.

*Fig. 1—General schematic diagram of RFI filter to be inserted in power line of receiver or interfering equipment. Bond metal case to the equipment case for safety and maximum effectiveness.*

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the appliance switch off: the problem may be caused by a defective switch. Also, many TV receivers are not really off when the switch says "off." Their tubes are still partially energized for quick warm up when turned on. Thermostats of electric blankets (some people never turn them off), frost-free refrigerators, aquariums, and other automatic switches are frequent sources of RFI, because their contacts do not always break cleanly and arc lightly.

You do not need a great deal of elaborate equipment to search for noise outside your home. Cruise up and down the streets and alleys near your station in an automobile while listening to the radio tuned to no station for noise. We found a "power leak" in a maze of overhead wires at a corner four blocks north and two blocks east of our new location within five minutes after starting the search. It took the power company longer to correct the problem, but it was done in a few weeks. A transistor portable radio is also a good noise snooper. If it tunes a couple of shortwave bands in addition to the BC band, fine, but not really necessary. When the noise is intermittent, it is sometimes helpful to record it on a tape recorder for the information of the power company representative.

When the noise source is suspected to be in someone's house, the quickest way to test the suspicion is to pull the entrance power switch while monitoring the noise. If the noise goes off with the power, you are on the way to success. For example, Steve, WA9EZJ, was plagued with a 24-hour-a-day "BZZT-BZZT" racket finally tracked down to a home on another street. The homeowner had put an electric blanket in her cat's box to keep the new kittens warm and had forgotten it. It had a defective thermostat.

### *News And Views*

Hopefully, **Lou K8IQB,** 202 Howard St., Bellevue, Ohio 44811, will benefit from this month's column. He is plagued by buzzing, rasping, on-again-off-again noises that interferes with working DX on 20 and 15 meters and working Novices on 15 meters. He would like to arrange with any interested amateur to organize a noise hunt; so he can start working the stations that he hears just under the noise . . . In the light of the present FCC rules that the log of an amateur station need only include the call sign of the station, the signature of the station licensee, the dates on which fixed operation of the station is initiated and the primary call sign of duty control operator, the following remarks of **Dave "Mid" Middleton, W7ZC,** are appropos: The FCC rules changes about logging have not reduced the necessity of keeping an accurate log in an efficient amateur station. I have used every log scheme under the sun, but 45 log books ago, I settled on the ARRL standard-size logbook, because of its uniformity and universal availability from amateur radio suppliers or from ARRL by mail. It contains 39 log pages of 29 lines, plus GMT to local time charts, RST report data, the ICAO phonetic alphabet, and a list of useful Q signals, as well as other material. I suggest numbering each of your QSO's consecutively, and follow the lead of W6ULS/K6DC by logging all of your non-USA contacts in red. Use GMT or UCT, rather than local time, to log all contacts. A digital clock set to Universal Time, makes this easy to do, and is essential if you hope to work much foreign DX. Remember you will be an amateur for a long time, and your logbooks are the history of your station.

**Tom Gannon, WN4HHJ,** 291 S. Lorraine Drive, Mary Esther, Fla. 32569, started to become a radio amateur in 1935 at the age of 15, but one thing and another prevented him from achieving his goal then. But 40 years later as a retired USAF and Airlines navigator, Tom become WN4-HHJ. He has earned WAS (Worked All States), WAC (Worked All Continents), and the WPNX (*CQ* Novice Prefix Award) using a Heathkit HW-16 transceiver and HG-10 v.f.o. in conjunction with a homebrew, 3-element beam. Tom is waiting for his General class license and still studying code and theory. He plans to stick mostly to c.w. until he is ready for the Extra class license . . . **"Kroppy," VE6UP,** Lethbridge, Alberta, Canada, corrects a misunderstanding that the optional use of the prefix "XJ" by Canadian Amateurs during 1976 is in commemoration the Canadian Bicentennial. Rather, it is in recognition of the Summer Olympic Games in Quebec this summer. We have been informed that a special amateur station will be operated from the Olympic grounds during the games, but we do not get its schedule in time to include in this column.

### *New License Study Guides*

In late March, the FCC released new study guides for Element 2

*(Continued on page 72)*

# In Focus



BY BILL DEWITT, W2DD

### 'Twas The Night Before Dayton—

Writing copy for the June issue in Early April with the Dayton Hamvention/SSTV Seminar about three weeks hence, is like writing a story on mid-century caterpillar migrations when you know that a practical solar-powered automobile is going to be announced tomorrow! I'm sure that slow scan innovations will run rampant at Dayton, so stand by for more info in the July issue. "In Focus" will bring you news of all the "goodies" and what they'll do.

### G3IAD Makes It 100 Countries On 2×SSTV!

Neville Jackson, G3IAD, of Nottingham has acquired the distinction of being England's first slow scanner to ring up a century score. I believe he's the first in all Europe and third in the World too.

It's tough enough to work Turkey on other modes, but it was TA2MM that Neville hooked for number 100. Congratulations Neville! (TA2MM's name is Fred, and his QSL manager is DJ0RR.)

### More News From England

G2BAR and G3KFN have received the first two Robot 300s to arrive in England. G2BAR and G3WW received permission to operate with a 256 line picture and had the first two-way 256 line SSTV QSO in the UK on 80 meters back in March.

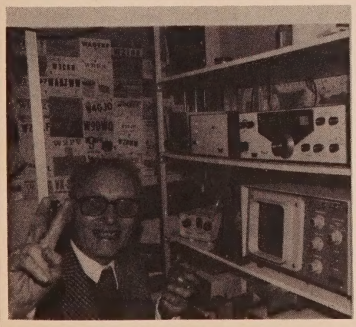


*Fig. 1—Jean Nicolas, F6BDJ gives the signal for stereo SSTV transmissions.*

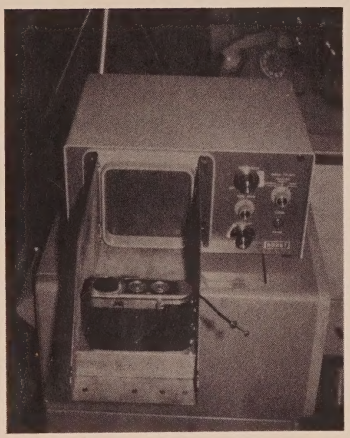


*Fig. 2—"Drop-On" camera mount used by W2DD to photograph slow scan screen.*

G3WW's WB9LVI type scan converter is now functioning very well with a 625 line fast scan output. Richard (G3WW) reports that the last few remaining bugs are being cleaned up and he is delighted with the pictures he's getting.

### QRP SSTV By F6BDJ

W4MS reports receiving stereo pictures of Jean Nicolas, F6BDJ, of Grenoble in a recent QSO. Jean, shown giving the V for Victory sign in the accompanying photo, does everything with style — his stereo transmission to W4MS was with **one watt** output! Jean now sports two complete stations, a Triton 2 and a Heathkit SB-104. I'll have more on F6BDJ and how he's handling slide transparencies for slow scan transmission in an early issue.

### New Countries On SSTV

In addition to some of the above items from England and France, my far flung correspondent, Eddie Collins, W4MS, the pride of Pensacola also reports that 5B4HS and M1I will be on SSTV very soon. Seems like the old days of s.s.b., with a few new countries every week.

### Non-Ham But Very Interesting

*Functional Photography Magazine's* March 1976 issue carries an abstract of a *New Scientist* (Brit.) *Magazine* article reporting a new kind of glass that may find important applications in the TV camera field.

Photochromic glass is glass that darkens when light falls on it. Sun glasses employing this kind of glass have been available for some time. However, a very rapid acting photochromic glass has now been developed that responds within 100 nano-seconds to reach an absorption of 99 per cent! Full recovery is slower, taking one or two seconds.

As pointed out in the *Functional Photography* article, the extremely fast response of the glass to high light levels suggests its usefulness for simplified exposure control systems and as a protective device to prevent vidicon damage when press photographers point their flash cameras directly into the TV camera. I suspect that Warren Weldon, W5DFU, who has done much in the televising

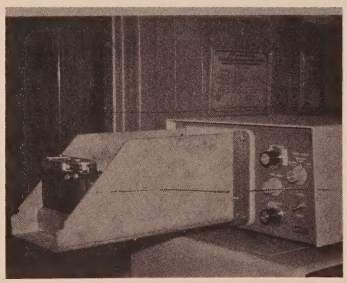


*Fig. 3—Another view of W2DD's camera mount showing spacer under camera to align optical axis of camera with CRT screen.*

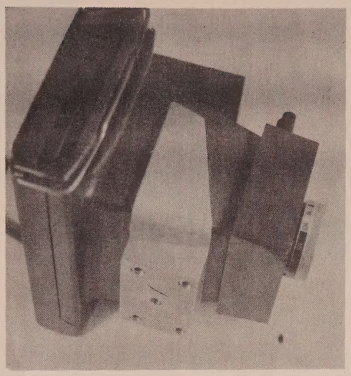


*Fig. 4—Aluminum yoke cemented to the body of a Polaroid Square Shooter camera provides a rather elegant tripod mount.*

of lightning flashes will be angling for a test sample of this British made product before long!

### *Very Low Light Level, Low Bloom CCTV Camera Announced*

Another non-ham item worth hearing about is RCA's newly announced TC1030/H camera which gives useful pictures from quarter moonlight (!) to full sunlight without highlight bloom.

Equipped with a new low-bloom RCA Silicon Intensifier Target (SIT) vidicon, the camera's high sensitivity can give useful pictures in light levels as low as .00015 foot candles. Its dynamic range of 100 million to one with auto iris lens gives it around-the-clock utility. Low bloom means bright scene highlights won't obscure useful picture information.

The user price of the new camera varies from $6490 to $8850 depending upon lens option, but some of you industrial types may well have a use that justifies that kind of money!

### *Photographing SSTV Images*

During the past few months I have received several inquiries in regard to photographing SSTV images. There seems to be a long-standing bugaboo about any kind of close-up photography—and it applies to amateurs who would like to take pictures of their SSTV images, but are somehow reluctant to try!

It really is fun to be able to send an off-the-screen photo of received pictures back to your friends at the other end of the line. It's also advantageous when discussing SSTV with your non-ham friends to be able to show them a picture of what you are talking about.

During the past six years, I have photographed SSTV images with Kodachrome-X, Ektachrome-X, Kodacolor-X, Hi Speed Ektachrome, and the Polacolor products. In black and white films, I have used Kodak Panatomic-X, Tri-X, and Polaroid's 87, 105, and 107 films. Cameras used include a Kodak Signet-40, a Retina Reflex IV, two Speed Graphics, and several Polaroid cameras. What's the message here? That Bill DeWitt is a great photographer? NO! The message is that you can use almost any camera or film to photograph your SSTV images. It isn't all that special!

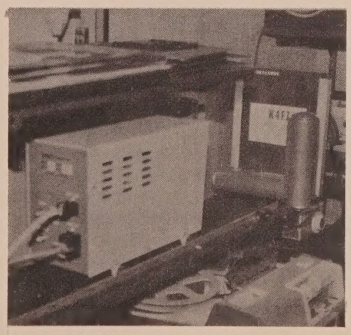


*Fig. 6—Nicely engineered camera track and flat copy set-up used by K4FZ.*

### *Getting Down To Fundamentals*

The principal requirements for SSTV film photography are a solid support for your camera and a close-up attachment for its lens. Another obvious need is a means of controlling the shutter so that 8 second exposures can be made.

### *Supporting The Camera*

There are several ways to support your camera. You can use a pedestal type mount, a tripod, or a monitor-mounted frame. Figures 2 and 3 show two views of a simple camera mount that I have used for some time. Two right angle brackets are mounted permanently on the monitor front. (I found it necessary to get some slightly longer screws.) A small screw is inserted near the top of the protruding edge of each bracket. The screw body provides sort of a hanger to match a cut out area on the U shaped camera holder. In this way, the camera bracket assembly can be dropped on or removed from the monitor in seconds.

Having determined the camera to screen distance as described below, the camera is left attached to the U shaped bracket except for film loading/unloading operations.

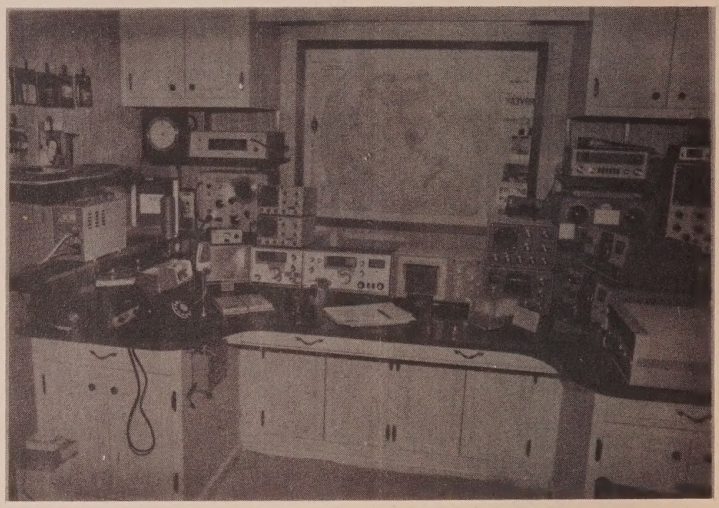


*Fig. 5—Beautifully equipped shack of K4FZ.*

Venus Scientific sells a Polaroid Square Shooter camera mount that snaps onto their monitors, very neat.

A little ingenuity can help if your camera doesn't have a tripod mounting fixture. Fig. 4 shows a rather elegant way of solving the problem, but you can do a lot with a block of wood and some epoxy cement!

### *About Close-Up Attachments*

So far as close-up attachments are concerned, here's a suggestion; The next time you remove the film from your camera for processing, take a moment to see how large the SSTV image is at the minimum focus distance on the camera. And check to see what effect a close-up attachment has on the image size. How can you do this?

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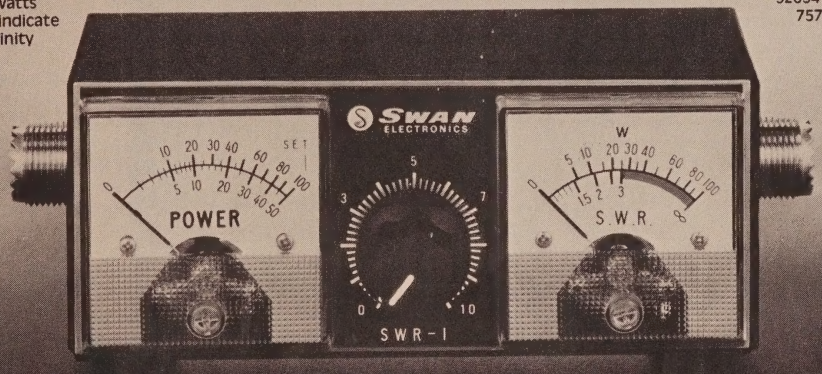
Our little dual meter SWR bridge indicates relative forward power and SWR simultaneously.

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To make the image at the film plane in the camera visible, you will need a piece of ground glass or some similarly translucent material. Scotch tape this material in place where the film would ordinarily be. Set the lens diaphragm wide open, and you're ready to find out how things look.

Neat trick: To make it much easier to see what you're doing, cut out a piece of newspaper or magazine advertisement the exact size of your screen. Scotch tape it to the screen UPSIDE DOWN. Now, when you look at the image displayed at the film plane of your camera, you will see a right side up image for focusing and size evaluation purposes.

Once you have everything all lined up in this respect, remove the paper from the monitor screen and you are ready for picture taking.

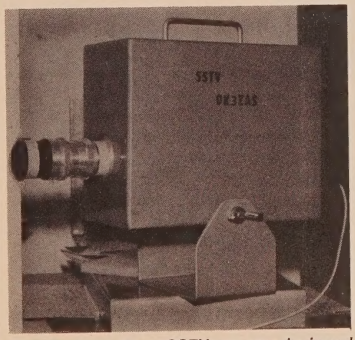



*Fig. 7—Homebrew SSTV camera designed and built by OK3ZAS.*

### *Single Lens Reflex Cameras Simplify Things Terrificly!*

If you happen to be the owner of a single lens reflex camera, life is much simpler. You can snap on a close up lens, take a peek through the viewer, see what you're getting and make adjustments accordingly. Same goes for any camera with a ground glass viewing screen.

### *Watch Out For Reflections*

Reflections of bright objects in your shack may show up on the CRT screen (and in any photo of course), so check that point out before you push the shutter control. A dark cloth over the top of the camera mounting is sometimes needed.

### *How To Defeat A Photoelectrically Controlled Shutter*

It's easy. Just stick some black tape over the photo-cell, hold the shutter open by pushing down on the control, and let up at the end of the eight second frame, but don't jiggle the camera during the exposure!

### *What Lens Setting Do I Use?*

A lens diaphragm setting of about f8 or f11 is a good starting point for exposures made using films having an ASA rating of 75 to 125. (Kodak Plus X, Kodacolor II, Polaroid 88 color film, and Polaroid Negative-Positive 105 film, for example.)

The cheaper cameras like the Polaroid Square Shooter or Zip models have a lens aperture of approximately f11, so don't worry about

*(Continued on page 73)*




*Fig. 8—OZ4IP claims this is a picture of his mobile station!*

# Four great ways to get the most from 10, 15 and 20 meters.

**The Hy-Gain Thunderbirds.** Hy-Gain Thunderbirds are mechanically and electrically superior to all other designs. They are developed on our own 35-acre, antenna test range and engineered for brilliant, DX performance on 10, 15, and 20 meters using phone or CW.

**TH6DXX.** This is the super Thunderbird, the undisputed 6-element king of the tri-banders. It utilizes separate Hy-Q traps with extra large coils and exceptional L/C ratios for each band. These superb Hy-Gain traps offer long term stability and exceptional band isolation. Hy-Gain traps come factory pre-tuned for peak performance and can be adjusted according to factory supplied charts for optimum results.

The TH6DXX has Hy-Gain's exclusive Beta Match for optimum matching and positive DC grounding to eliminate most precipitation static. Impedance is 50 ohms. Of the 6 elements, 3 are active on 20 and 15 meters and 4 are active on 10. VSWR is 1.5:1 at resonance and the TH6DXX is rated for maximum legal power.

All construction is of heavy gauge, taper swaged, slotted aircraft quality aluminum tubing for light weight and easy adjustment. Mechanically and electrically superior full circumference compression clamps are used throughout. The TH6DXX is supplied with a heavy duty, cast aluminum boom-to-mast bracket that accomodates masts from 1-1/4" to 2-1/2" and provides mast feed-through for antenna stacking. Extra heavy gauge, machine formed, boom-to-element brackets are used, with plastic inserts for insulation only. The high strength boom is 24', the longest in the industry.

Without a doubt, the Hy-Gain TH6DXX is the ultimate tri-band antenna, head and shoulders above all the rest. **Order No. 389**

**TH3MK3.** The 3-element Thunderbird, offering outstanding performance on all three bands. Lighter and smaller than the TH6DXX, yet it has Beta Match, separate traps, DC grounding, taper swaged tubing and cast mast bracket. Takes maximum legal power. **Order No. 388**

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**TH2MK3.** This is the popular, light-weight, and low cost 2-element Thunderbird. Again, an ideal choice for cramped locations, rooftop or light tower installation. Has separate traps, Beta Match, DC ground, taper swaged tubing and a high strength, formed aluminum mast bracket. Maximum legal power rated. **Order No. 390**

## THUNDERBIRD SPECS.

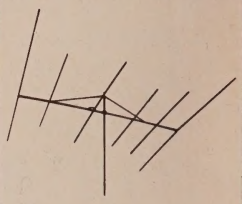
| Electrical | TH6DXX | TH3MK3 | TH3JR | TH2MK3 |
|---|---|---|---|---|
| Gain | 8.7 dB | 8 dB | 8 dB | 5.5 dB |
| Front-to-back ratio | 25 dB | 25 dB | 25 dB | 15-20 dB |
| Maximum power input | 1 kW AM, 2 kW PEP | 1 kW AM, 2 kW PEP | 300 watts AM, 600 watts PEP | 1 kW AM, 2 kW PEP |
| VSWR (at resonance) | 1.5:1 | Less than 2:1 | Less than 2:1 | Less than 2:1 |
| Impedance | 50 ohms | 50 ohms | 50 ohms | 50 ohms |
| **Mechanical** | | | | |
| Longest element | 31.1' | 27' | 24.2' | 27.3' |
| Boom Length | 24' | 14' | 12' | 6' |
| Turning radius | 20' | 15.7' | 14.3' | 14.3' |
| Wind load at 80 MPH | 156 lbs. | 103.7 lbs. | 87 lbs. | 96 lbs. |
| Maximum wind survival | 100 MPH | 100 MPH | 80 MPH | 100 MPH |
| Net weight | 61.5 lbs. | 36 lbs. | 21 lbs. | 22 lbs. |
| Mast diameter accepted | 1-1/4" to 2-1/2" | 1-1/4" to 2-1/2" | 1-1/4" to 1-5/8" | 1-5/8" |
| Surface area | 6.1 sq. ft. | 4.03 sq. ft. | 3.4 sq. ft. | 3.75 sq. ft. |

**Note:** For best results, always use a Hy-Gain BN-86 Balun.

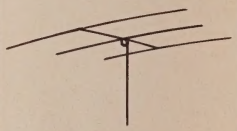
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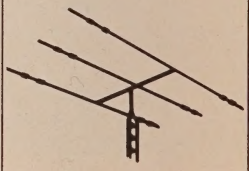
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TH6DXX



TH3MK3



TH3JR



TH2MK3



JOHN A. ATTAWAY, K4IIF, ON

# DX

**1976**—The Bicentennial Year—is the year of the prefix chaser. The U.S.A. Bicentennial prefixes, coupled with a rash of new contest and special prefixes worldwide, has generated an enormous surge of interest in the prefix game. Last year, a normal month would yield 8-10 new applications for the WPX Award, but last month we had 19 new applicants and this month's count soared all the way to 29.

Hugh Cassidy, WA6AUD, our Assistant DX Editor, manages the WPX Awards as one of the responsibilities of his position. In a recent letter Hugh indicated that interest in WPX endorsement stickers had also increased dramatically. Over 100 DXers have applied for stickers over the 1000 prefix level which 10 years ago we considered unattainable. W4LRN is actually approaching the 1600 point and ranks as the world's prefix king.

Hugh also advises that some stations on the WPX Honor Rolls have not updated their totals recently. To keep the Honor Roll within manageable limits these calls will be dropped. Honor Roll totals should be updated at least annually, keeping in mind that Honor Roll scores may be less than total scores as inactive or discontinued prefixes can be dropped from Honor Roll eligibility at the discretion of the DX Department.

WA6AUD is also in charge of the *CQ* C.W. and S.S.B. DX Awards, and is considering whether to drop stations from those Honor Rolls who have not updated recently. Check your standings, these years sure do rush by in a hurry.

If you plan to apply for WPX or for the c.w. or s.s.b. DX Awards, or to update your Honor Roll status you can contact Hugh at the following address:

Mr. Hugh Cassidy, WA6AUD
Assistant DX Editor, *CQ Magazine*
P.O. Box 3388
San Rafael, CA 94901

Please enclose a self-addressed, stamped envelope for applications and rule sheets.



*Here is the winner of 20 Meter Phone, Single Band WAZ #19, K. Takao, JA3BQE, and his lovely XYL JA3VRK. Listen for both of them on 20 and 15 meters.*

### The WAZ Program

#### Single Band WAZ

#### 20 Meter Phone

25...JA8JN

#### 20 Meter C.W.

10...YU1BCD

#### S.S.B. WAZ

1306...JA6TTO
1307...KA2AS
1308...DM2FGN
1309...JA7CDV
1310...JA7WS
1311...JA7GIF
1312...WB4OXD

#### C.W.-Phone WAZ

3943...WA2BRI
3944...PAØGF
3945...SP7ATA
3946...W6IUV
3947...LZITD
3948...GI5UR
3949...W5HIC
3950...LA4LE
3951...I3BCB

#### Phone WAZ

516...SP5XM
517...WA4EYR

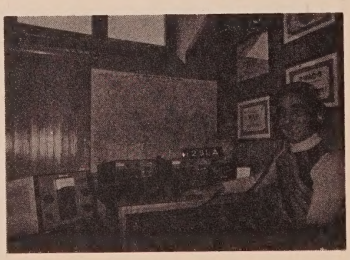
Complete rules for both the Single Band and regular WAZ Programs appeared in the May, 1976 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

### *Rare Prefix News*

The big story this month is the continued cooperation of DXers and licensing authorities worldwide in issuing and using new calls for the *CQ* Worldwide WPX Contest which took place the last weekend in March. Coupled with the U.S. Bicentennial prefixes, the new DX prefixes made this a very interesting contest despite the poor propagation conditions.

Brazil came through in its usual outstanding fashion with sets of ZW, ZY and ZZ prefixes corresponding to their regular PY calls. For example, ZZ6SL would be PY6SL. Similarly, Venezuelan amateurs had the option of using a YW prefix or 4M prefix in place of the usual YV. The 4M has been used heavily in past contests but YW was a newcomer to the scene and was in great demand. YV5ECY was active as YW-5ECY and had enormous pileups, as did YV5EUX operating 4M5EUX.

If you worked some of the 4J stations during the 'Test, these are special Soviet prefixes and your QSLs should go to P.O. Box 88, Moscow, the address of the Central Radio Club which handles incoming cards for the UA, UW contingent. YQ and YR prefixes were assigned for the event by the Romanian authorities and correspond to the YO calls.



*Frank Sala, I2SLA, recently joined the ranks of premier world DXers when he qualified for single band WAZ #20 on twenty meter phone. Frank's regular WAZ certificate can be seen high on the wall above his Drake twins.*



*Left to right are Bill Wittgruber, W8QDD, and Wolfgang Homuth, OE1GHC, during Bill's visit to Vienna last year. (Photo courtesy W8QDD)*

For example, YQ1AA would be YO-1AA.

Finnish amateurs activated their OG prefix series. OH1VR was very active as OG1VR. The special Equador assignment, HD in place of HC, was also widely used. One example being HD2TV by HC2TV. CT6 was Portugal's contribution to the festivities, with CT1DW active as CT6DW.

Despite the low sunspot numbers there were flashes of good propagation during the Test. Driving to the postoffice on Saturday morning, K4-IIF/mobile was able to work UK2BBB from the car which isn't bad with 100 watts to a bumper mounted vertical during contest and weekend QRM.

### *Those Hard to Work Zones*

If you are working toward Single Band WAZ on either 40 or 80 meters, the low sunspot number can be a blessing in disguise. The maximum usable frequency is much lower than normal and DX activity is concentrated on 80 and 40 when 20 meters fades out after sundown. Rare zone 19 has been activated regularly by UAØFCE whose c.w. signals can be heard on 80 meters at 3505 kHz at the sunrise peak. Other tough zones heard around this same time and frequency include Zone 27 by DU6BG, DU6UFC, and KG6JFY and Zone 24 by VS6DO. Other 80 meter goodies are EL7F on 3806 s.s.b. around his sunrise peak at 0625 GMT for Zone 35, hard to get Zone 21 by HZ1AB on 3799 s.s.b. at 2330 GMT, Zone 36 by ZD7FT on 3794 kHz s.s.b. as 0005 GMT, Zone 32 by ZK1DX on 3799 s.s.b., and Zone 28 by 9M2DW heard on 3789 at just after sunrise. Remember, the plaque for the first Single Band WAZ Award on 80 meter c.w. is still outstanding, as is the plaque for 40 meter c.w.

And if 40 meter c.w. is your bag there have been a lot of active Zones. JTØOAQ has made it possible to snare the rarest of the rare, Zone 23, with his activity around 7002 kHz just before and after U.S. sunrise. Zone 17 has also been available thru the auspices of UA9FAG, but 0230-0300 has been the best time stateside. Other good ones on 7 MHZ c.w., with GMT times shown in parentheses are Zone 20 by SV1DO (2115) 4Z4HT (0030), and TA1ZB (0020), Zone 22 by VU2LZ(0120) and VU2DX(1240), Zone 27 by KG6JAR (0110), Zone 31 by KX6LA(1200), Zone 32 by ZL3LN/C(1230), Zone 35 by EL2FT(0205), TU2GI(2350), and 5T5ZR(0745), Zone 38 by A2ONN (0310), ZE1CU(0350), ZS1ANT(0250), and ZS6SM(0430), and Zone 39 by FR7BB(0335).

On the other hand if you've a tribander or 20 meter monobander and c.w. DXing is your bag there is a wealth of opportunity even with the poor propagation conditions. Rare Zone 18 has been activated recently by several top c.w. stations including UAØBBN and UAØBBC from Cape Chelyuskin, UAØKAH on Dickson Island, UKØSAL from Irkutsk, UK9-OAD from Novosibirsk and UK9HAC from Tomsk. These stations generally can be heard in the USA between 14030 and 14050 from 0000-0200 GMT and again between 1300 and 1400 GMT. UAØVF in the Chita region was recently copied on 21022 kHz at 1755 GMT. Zone 19 stations have not been quite so prevalent, but UKØZAF has been confirming the zone for many c.w. buffs evenings from 0130 to 0200 GMT near 14055.




*Bob L. Th. Bergé, ON4QX, is one of the world's top prefix hunters and is on the WPX Honor Roll. Bob earned the first WPX Maritime Mobile and has made WAZ on phone, c.w. and s.s.b. His countries score for the CQ DX Award is 315. He has been a radio buff for 40 years and has made several DXpeditions.*

We're also pleased to hear Zone 23 well represented on 14 MHz c.w. JT1AO stays busy around 14029 whenever he comes on, with 20 minutes after midnight GMT usually giving a peak signal. JT1KAA, the club station, is likewise dependable. We last heard their signal on 14038 at 0145 GMT. JT1BE has been caught on 14039 during USA morning hours 1120 GMT.



*Wolfgang Homuth, OE1GHC, has been an enthusiastic participant in the CQ Awards Program for many years. He lives in downtown Vienna with a quad up 100 ft. above his building. Wolf is retired and devotes much of his time to amateur radio. (Photo courtesy W8QDD)*

**The CQ DX Award Program**

| SSB | C.W. |
|---|---|
| 434...EA4LH | 198...DJ6VK |
| | 199...G3JZG |

**Endorsements**

275...DJ2AA

Complete rules and application forms for the CQ DX Awards program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to: "CQ DX/WPX Awards," Box 3388, San Rafael, Calif. 94902

## The WPX Program

### Mixed

520...VE1RQ 521...K5JBC

### SSB

894...WB4TIN 897...OK2BIH
895...UA3ERD 898...K8YRV
896...OK1AGN 899...WAØLRQ
900...JA2AH

### C.W.

1460...UR2CU 1467...JH6VDL
1461...UA3QAQ 1468...K5JBC
1462...UK6AAJ 1469...LZ1TD
1463...UK1QAD 1470...SP5AWV
1464...UA3CDZ 1471...SP5SIP
1465...UI8FAS 1472...SP9EEE
1466...JA1VZ 1473...OK1APS
1474...OK3EQ

### WPNX

87...WNØQBT 88...WN1TVB
89...WN5MBS

### VPX

103...Frank Muller DM-3367/L

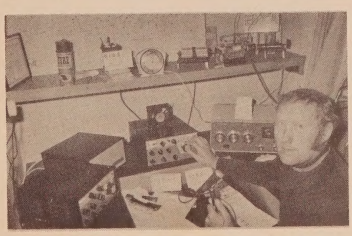
### Endorsements

SSB: 950 WB2NYM; 900 WB2NYM, YU1BCD; 850 WB2NYM, YU1BCD; 800 W2EHB, WA5VDH; 700 WA1KYW; 650 WA1KYW, WA2CCP; 600 WA2CCP, PA-1555; 550 WA2CEP, PA-1555; 500 WA2CCP, PA-1555; 450 WA2CCP, PA-1555; 400 PA-1555; 350 PA-1555.
CW: 950 YU1BCD; 900 WA2AIW; 800 K2AAC; 750 W5MCO; 700 VE1MF; 650 K9UIY, VK3RJ; 600 DJ3LR, UA4LM; 550 W6CLM; 500 SP6BAA; 450 SP6BAA, 400 WA4EPM.
Mixed: 1575 W4LRN; 1225 K3PVZ, W4BQY; 1200 YU1BCD; 1100 WA2EAH; 950 K2AAC; 750 W6EYY; 600 K9HLW, UY5OQ; 550 UY5OQ; 500 OK1DVK, WBØBQG; 450 K8YQW; 400 VE1RQ; 350 VE1RQ.
80 Meters: DJ3LR, W3ARK
40 Meters: DJ3LR
20 Meters: DJ3LR, UA4AY, UB5VK
15 Meters: DJ3LR, VK3RJ
Africa: W2EHB
Europe: UA4AY, WA2CCP, HE-9ILN, K3EH
North America: VE1MF, WA2CCP, WA4EPM, HE-9ILN, K3EH
Oceania: VK3RJ

Complete rules for WPX may be found in the May, 1976 issue of *CQ* Magazine. Application forms may be obtained by sending a business size envelope, self-addressed and stamped, to "CQ DX/WPX Awards," Box 3388, San Rafael, Calif. 94902

Other goodies on 20 c.w. are BV2A and VS6BL, representing Zone 24, and Zone 24 representatives 4S7NE and 4S7DA. The latter is Awards Committee Chairman for the Radio Society of Ceylon and checks cards for *CQ* awards in that part of the world.

S.s.b. Zone hunters can find sustenance in the Zone 23 activity of UA9VH/JT1 evenings near 14230, and dependable ST2SA, 14206 at 2000 GMT from Zone 34. There has been a lot of help also with Zone 18 where UKØSAJ in Irkutsk and UKØBAH on Dickson Island have passed out many contacts in early evening and early morning hours along the U.S. east coast, and Zone 19 activity has been even more prevalent on s.s.b. than on c.w. UAØFCK, UKØFAJ and UVØEX have all been on from Sakhalin Island and UWØMF from Ussuriisk.



*George McClarey, EI6S, of County Cavan, Ireland is one of the "emerald isle's" top DXers, recently qualifying for CQ's WAZ award using Drake Line equipment. Bob is a tractor and machinery specialist.*



*Tony, M1C, took part in the first activity via satellite, Oscar 6 and 7, from San Marino with I5TDJ and M1I. (Photo via Ed, W3JZJ)*

Additional s.s.b. activity from hard Zones has included VS6BL, VS6EG, VS6DO, VS6DR and CR9AJ from Zone 24, VU2GDG, VU2GGT, VU2DK, and VU7ANI from Zone 22 plus a number of YB, 9M2 and 9VI stations from Zone 28. Zone 24 has been peaking at about 1230-1300 GMT and Zone 22 at times between 1500 and 1730 GMT depending on your location.

### *De Extra*

*Those S.A.S.E.'s. They're Very Important:* Riding along "copying the

## The WPX HONOR ROLL

The WPX Honor Roll is based on confirmed *current* prefixes, which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

### Mixed

| | | | | |
|---|---|---|---|---|
| W4LRN ....1575 | DJ7CX ....1157 | I6SF .....946 | W6ISQ .....847 | WØSFU .....750 |
| WA6MWG ..1378 | PAØSNG ...1146 | DL1MD .....940 | WAØKDI ....824 | CT1LN .....749 |
| W6TCQ .....1325 | WA2EAH ...1100 | WØAUB .....929 | W6NJU .....811 | WA5LOB ....749 |
| F9RM .....1283 | WB4KZG ...1100 | K2AAC .....913 | W9WHM ....811 | PY4AP .....735 |
| W2NUT ....1258 | ON4QX ....1088 | WB4SIJ .....910 | W9ZTD .....807 | KØBLT .....733 |
| W9DWQ ...1253 | WA6GLD ...1075 | SM6TV .....905 | WA1JMP ....806 | K7NHG .....719 |
| W4CRW ...1251 | W3GJY ....1052 | YU2OB .....881 | WA6TAX ....805 | WA6EPQ ...713 |
| VE3GCO ...1233 | W9FD .....1035 | W4WSF .....877 | IØJX .....803 | PAØVB .....706 |
| W3PVZ ....1231 | WA5VDH ...1025 | WA6JVD ....875 | SM6DHU ....803 | WAØCPX ....693 |
| W8LY .....1220 | YU2DX .....995 | DL1CF .....872 | K6ZDL .....802 | |
| W4BQY ....1188 | YU1AG .....992 | W3YHR .....861 | IT9AGA .....791 | |
| W8ROC ....1181 | K6SDR .....977 | K4KQB .....853 | K2ZRO .....782 | |
| WB2FMK ..1180 | W4IC .....950 | G3DO .....849 | K8UDJ .....750 | |

### SSB

| | | | | |
|---|---|---|---|---|
| W4NJF ....1331 | HP1JC .....954 | WØYDB .....884 | W3DJZ .....818 | OK1MP .....763 |
| F9RM .....1223 | I4ZSQ .....952 | K2POA .....883 | PY3BXW ....808 | YU1AG .....752 |
| IØAMU .....1156 | WB2NYM ...941 | ZL3NS .....874 | WB4SIJ ....803 | W2EHB .....750 |
| W6TCQ ....1155 | YU1BCD ....940 | DL1MD .....858 | W4IC .....800 | WA5LOB ....747 |
| W9DWQ ...1011 | CT1PK .....923 | WA6TAX ....855 | WB4KZG ...800 | W6YMV .....720 |
| WA6MWG ..1090 | PAØSNG ....908 | WA2EAH ....850 | DJ7CX .....800 | CX2CN .....702 |
| IØZV .....1067 | DK2BI .....907 | W3YHR .....836 | WA5VDH ....790 | WB2FMK ...659 |
| I8KDB .....1058 | F2MO .....904 | IT9JT .....833 | OE2EGL ....780 | I4LCK .....608 |
| DL9OH .....954 | I8YRK .....900 | W6RKP .....822 | G3DO .....765 | |

### C.W.

| | | | | |
|---|---|---|---|---|
| W8LY .....1205 | W6TCQ .....931 | K7ABV .....812 | WA2HZR ...732 | K2ZRO .....649 |
| W8KPL ....1203 | I4ZSQ .....922 | VK3AHQ ....809 | I6SF .....726 | K1LWI .....629 |
| WB2FMK ..1040 | ON4QX .....920 | WA6JVD ....803 | SM5BNX ....706 | VE4QX .....600 |
| WA6MWG ..1039 | W3ARK .....910 | YU1AG .....796 | WA2EAH ....700 | OK2QX .....600 |
| DL1QT ....1030 | G2GM .....890 | K2AAC .....776 | VO1KE .....700 | |
| W2AIW .....972 | DJ7CX .....887 | WA5VDH ...772 | K6ZDL .....699 | |
| YU1BCD ....962 | W2HO .....885 | W4BYU .....768 | OK2DB .....693 | |
| W9FD .....944 | VO1AW .....873 | W4IC .....754 | W6ISQ .....685 | |




*Prefix hunters will find this map illustrating the Hungarian call areas of interest. The second letter from the end of the call sign indicates the region within a call area, for example, HA2KRB and HG2-RD are in the Veszprem region. The cities shown are regional centres. (Photo via G2BVN)*

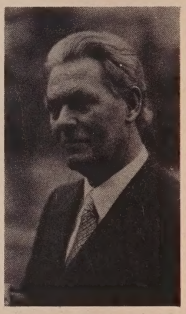
mail" recently on 20 meter s.s.b., K4IIF/Mobile has the opportunity to listen to a long discourse by a U.S. amateur offended because a DX station had requested a self-addressed, stamped envelope (s.a.s.e.) as a prerequisite to a QSL card. The complainer felt that in the great brotherhood (and sisterhood) of amateur radio, each of us were equal participants and the DX station should be just as happy to receive his beautiful, 3-color QSL as he was to receive the DX QSL.

Despite the occasional bickering over who called CQ right on top of whose QSO, De Extra agrees that amateur radio is a foremost international brotherhood of equal participants. Except in a few extreme cases it transcends doctrine, politics, social or economic position or any other pecking order. Over the air the private may be on a first name basis with a general or the lab technician with the chairman of the board of his company. However, there are certain simple practicalities which one must recognize and accept, and if you're going to play the DX game the *s.a.s.e.* is one of them. Without it, stations in rare countries simply couldn't afford the time and expense to send QSL cards. Neither could their QSL Managers in most cases. Considering the amount of work involved just in making out the cards, I'm delighted that the rare stations will QSL even upon receipt of an *s.a.s.e.*

Let's cite a simple example of a station close to home who even has the benefit of the same postal system. The Virgin Islands are not dreadfully rare as DX countries go, but because of the new bicentennial prefixes our old friend Dick Spenceley, KV4AA, is swamped with requests for his new AJ3AA card. As of April 7, just over a third of the way through the year, Dick had made 7,700 contacts using his AJ3 call. By the end of the year he will receive at a bare minimum 10,000 QSL cards from amateurs all over the world who will want an AJ3 card. If he mailed this many cards at the 9¢ postcard rate his bill for postage alone would be $900, to say nothing of printing costs and the enormous amount of time to check the logs and *address* the cards. Of course if he put each card in an envelope he would have to buy 10,000 envelopes and pay $1300. postage.

Unfortunately this is just the "simple" job of answering U.S. requests. Supposing a few thousand of them are from overseas amateurs, the postage costs then become absolutely astronomical. Postcards and letters sent the slow route by ship would be 12c and 18c respectively. By air they would be 21¢ and up to 31¢, respectively. Obviously Dick would have to send his cards to the Bureaus, but did you know that there are almost 150 QSL Bureaus in the world today.

By this time it is pretty obvious that the DX station and the home station, while equal as amateurs are very unequal in the magnitude of their QSL choses. Over the years K4IIF has used several nice cards but there has never been a deluge of folks insisting they had to have one up on their wall. I for one am very thankful that there are amateurs in the world who will take the time and effort to lookup my contact in the log and send me a card if I will just send them an addressed and stamped envelope to use in mailing it to me. Always send an *s.a.s.e.* to rare DX stations or to their QSL Managers. Its the easiest way of saying thanks to those guys and gals for just being there when you need them.



*Hans, DL6TQ, recently qualified for WAZ using only a vertical and a dipole. He indicates that there is a beam in his future. Hans started in amateur radio in 1936, but "due to well known interruptive circumstances" was off the air for the years prior to 1951. He is age 57, a patent attorney by profession and a member of FOC, TOPS and HSC.*




*The Department of State Amateur Radio Club is using the above QSL to celebrate World Telecommunication Day, May 17, 1976 with an operation as N3ITU from May 1-May 31. QSL to W3DOS. (Photo courtesy K3KWJ)*

### QSL Information

**A2CAB**—Via WA2LOR
**A6XN**—To DJ9ZB
**A6XP**—c/o DK3NK
**A35NN**—Via Bill Rindone, WB7ABK, 3049 Doris Ct., Lake Oswego, OR 97034
**A51PN**—For QSO's up to Sept. 1, 1974, QSL to W1JFL.
**AH3DV/AG2**—c/o KS6DV
**C9MJO**—Via W8CNL
**C21NI**—To YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
**C31ME**—c/o W1YRC
**DK6NJ/HB0**—Via DK6NJ
**DJ0IP/HB0**—To WA4ZSB
**D2ASW**—c/o K4UTE
**DU6BG**—Via WA7RFH
**EL8O**—To OE6WMG
**FG7AR/FS7**—c/o K1LPA
**FG0BKZ**—Via F6BBJ
**FK8BG**—To W7OK for contacts *after* Jan. 1, 1976
**FK0KG**—c/o YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
**FP8DX**—Via K9OTB
**FY7AN**—To WB4VUP
**HZ1AB**—c/o DJ9BZ or WA6AHF
**JX3WU**—Via P.O. Box 3101, Bergen N5009, Norway
**JX4GN**—To LA4GN
**JX6DS**—c/o I2CBM
**JY9EK**—Via WA5LMG
**KG6JBX**—To KH6IDL
**KG6SW**—c/o W7YBX
**KM6CV**—Via WA6ZMN
**LH2A**—To LA2AD
**LU1XY**—c/o Juan Cortez, Communications Base Aeronaval, Ushuaia, Argentina
**PJ8CO**—Via W1YE

*(Continued on page 74)*

# FIRST

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The GTX-1 gives the high quality performance that compares with Motorola, GE, RCA or any other hand-helds that sell for $700 or more.

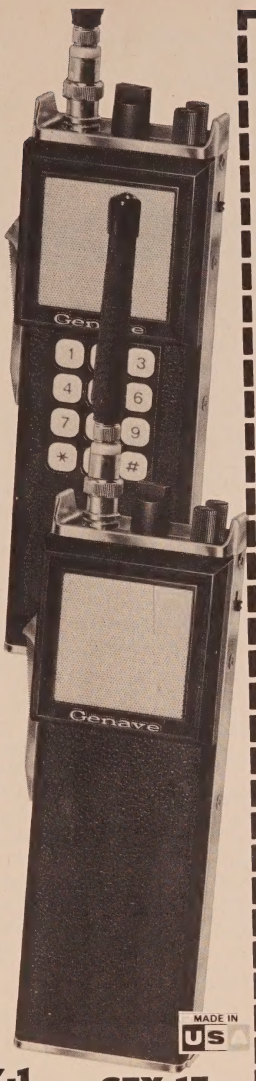
# THEN

**Check these features:**

**Small:** only 8"x2.6"x1.28"... **Appearance:** slim silhouette all black metal . . . **Serviceable:** easy access to separate receive and transmit circuit boards . . . **PLUS:** 6 pole xtal filter for superlative receiver operation . . . **and:** trimmers on receive and transmit xtals: standard 10.7 MHz 1st IF.

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**GTX-1**
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☐ **GTX-I**
2-meter FM, 6-channel, 3.5 watts Hand-Held
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☐ **GTX-IT**
Same as GTX-1, plus Factory Installed Tone Encoder
Operate Auto Patch
**$299.95** (Bat. not incl.)



☐ **Ringo Ranger ARX-2 6 db 2-M Base Antenna** @ $29.95 $_____

☐ **Lambda/4 2-M and 6-M Trunk Antenna** @ $29.95 $_____



☐ **TE-I Tone Encoder Pad** for plug-in installation on most amateur transceivers @ $59.95 $_____

☐ **TE-II Tone Encoder Pad** for installation on most Hand-Helds @ $49.95 $_____

☐ **PS-1 AC Power Supply** for use with all makes of transceivers 14 VDC-6 amps @ $69.95 $_____

and the following **standard** crystals @ $4.50 each $_____
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**ACCESSORIES FOR GTX-1 and GTX-1T**

☐ **PSI-18** Optional Nicad battery pack $29.95 $_____
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Add $4 per Radio for Shipping, Handling, and Crystal Netting.

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☐ Master Charge #_____ Expires _____
☐ Interbank #_____ Expires _____

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CLIP OUT AND ORDER NOW — CLIP OUT AND ORDER NOW



# Contest Calendar

BY FRANK ANZALONE, W1WY

The success of a QSO Party in no small way depends on picking a good week-end. Scheduling it on the same dates used by a major contest however can hardly be considered good planning, as was the case with this year's Tennessee QSO Party.

Advising them that the week-end they picked was the same one used by the CQ WPX SSB Contest got the response, "it was the only open date in March." This didn't make much sense since we have had the WPX Contest on the last week-end in March for some years now.

Then it dawned on me that the poor chap who planned the event probably only reads that one magazine. And we all know that *QST* never lists *CQ Contests.* (Correction, lately they have listed our World Wide contest in the Fall.)

Moral of the story, check other publications to get a complete picture of contest schedules.

As an added suggestion, *QST* would better serve the contest minded fraternity by listing all major events.

I don't know how the Tennessee boys made out but we had a good one in spite of below normal propagation.

How about those conniving characters at the home office. (Page 63 April issue) I never know what to expect come April each year. Dick conned me into taking all those snapshots on the pretense that he wanted an update image to head the Column. Well now he's got 12 of them. There's one consolation, now that they have booted him upstairs, I have only Al to contend with. (I'm only kidding fellows, congratulations to both of you.)

73 for now, Frank, W1WY

### *QRP Activity C.W. Contest*

Starts: 1500 GMT Saturday, July 3
Ends: 1500 GMT Sunday, July 4

The DL Activity Group runs two of these QRP contests each year, in January and July.

Power input is limited to 10 watts or less, single operator and c.w. only. QRO stations may participate but only contacts with QRP staions are valid. Limit your operating to 15 hours. The 9 hours of rest may be taken in two parts. Contacts may be made on any five bands in the 1.8-28 MHz group.

**Exchange:** RST plus QSO no. and power input. Add "x" if crystal controlled. (579001/8x) Stations using more than 10 watts indicate QRO instead of power number.

**Scoring:** Contacts with stations in same country 1 point, other countries same continent 2 points. DX on other continents 3 points. If QSO is with another QRP station add 3 more points. (4 to 6 pts. possible) Stations using 3.5 watts or less get credit for 1 handicap point, another handicap point if rig is crystal controlled. Double the above if both stations meet above handicap requirements. (8 to 12 final points possible).

*(That's the way I figure it. Much too complicated, should be simplified. Ed.)*

**Multiplier:** Each DXCC country worked, 1 if on own continent, 2 if on another continent. Plus call areas of JA, PY, VE, VK, W/K and ZS.

**Final Score:** Total QSO points times the multiplier from each band. (Scoring for QRO stations same)

Include a summary sheet showing the scoring and equipment description, and the usual signed declaration.

Mailing deadline is July 31st to: Hartmut Weber, DJ7ST, D-3201 Holle, Kleine Ohe 5, West Germany.

### *County Hunters C.W. Contest*

Starts: 0000 GMT Saturday, July 17
Ends: 0600 GMT Monday, July 19

The County Hunters Net encourages and invites mobile and portable operation from the less active counties during this contest.

The same station may be worked on each band for QSO points. Portable and mobiles changing counties may also have repeat QSOs. Stations on county lines exchange only one number but each county is counted as a multiplier.

**Exchange:** QSO no., category, (F—fixed, P—portable, M—mobile) RST, state, province or country, and county for US stations.

**Scoring:** QSO's with a fixed station 1 point, 3 points if its a portable or mobile. Multiply total QSO points by number of US counties worked. Mobile and portables calculate their score for contacts made within a state.

**Frequencies:** 3575, 7055, 14070, 21070, 28070.

### Calendar of Events

| | | |
|---|---|---|
| * June | 5 | 6 Meter "SMIRK" Party |
| * June | 5-6 | SOWP Bicentennial C.W. |
| * June | 5-6 | Minnesota QSO Party |
| * June | 4-7 | CHC/FHC/HTH Party |
| June | 12-13 | ARRL VHF QSO Party |
| * June | 12-13 | RSGB National Field Day |
| * June | 12-14 | West Virginia QSO Party |
| † June | 19-20 | All Asian Phone Contest |
| June | 26-27 | ARRL Field Day |
| July | 3-4 | QRP Activity Contest |
| * July | 3-4 | Venezuelan Phone Contest |
| * July | 3-25 | Space Net VHF Contest |
| July | 17-19 | County Hunters C.W. |
| † July | 17-18 | Colombian Contest |
| July | 24-25 | ARRL Bicentennial |
| July | 31- Aug. -1 | Venezuelan C.W. Contest |
| July | 31- Aug. -1 | Illinois QSO Party |
| Aug. | 7-8 | 10-10 Net Summer QSO Party |
| Aug. | 14-15 | European C.W. Contest |
| Aug. | 21-22 | Big 15 QSO Party |
| † Aug. | 21-22 | All Asian C.W. Contest |
| Aug. | 21-23 | New Jersey QSO Party |
| Aug. | 21-23 | QRP ARCI Contest |
| Sept. | 11-12 | European Phone Contest |
| Sept. | 18-19 | Scandinavian C.W. Contest |
| Sept. | 25-26 | Scandinavian Phone Contest |
| Sept. | 25-27 | Delta QSO Party |

* Covered in last month's Calendar
† Not official

**Awards:** Certificates in three categories.

F — Top fixed or fixed portable in each state, province or country, 1000 or more points.

P — Top score in each state by a portable operating from a county other than its normal location, 1000 or more points.

M — Top scoring mobile in each state operating from 3 or more counties, with a minimum of 15 QSOs from each county.

There are Trophies for the Top single operator Portable and Mobile in the United States.

Stations with 100 or more QSOs *must* include a check sheet of counties worked.

Mailing deadline is Sept. 1st to: C.W. County Hunters Net, c/o Jeffrey P. Bechner, W9MSE, 673 Bruce Street, Fond de Lac, Wisc. 54935.

### *Colombian Contest*

Starts: 0001 GMT Saturday, July 17
Ends: 2359 GMT Sunday, July 18

This year's contest commemorates the 166th Anniversary of Colombia's Independence. Exchange will be on a world wide basis.

All bands, 3.5 thru 28 MHz, phone and c.w. Three classes, single operator, single band and all band; multi-operator single transmitter.

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

**Scoring:** QSOs with HK's 5 points, with stations in North America 3 points, other countries 2 points, and with same country 1 point. The multiplier is determined by the sum of DX countries worked on each band.

**Final Score:** Sum of QSO points from all bands multiplied by the sum of different countries worked on each band.

Awards: A silver cup to the world winner. There are nine plaques, six to the continental winners and three to the top scoring station in each category. Certificates will be issued to the top scoring station in each country.

A minimum of 50 QSOs must be shown by all awards winners.

Use a separate log sheet for each band, indicate the country only the first time it is worked and include a summary sheet showing the scoring, a signed declaration and etc. The usual rules of disqualification will be observed.

Mailing deadline is September 30th to: L.C.R.A. Concurso Independencia, Apartado Postal 584, Bogota, Colombia.

### *ARRL Bi-Centennial Celebration*

Starts: 0000 GMT Saturday, July 24
Ends: 2359 GMT Sunday, July 25

This is a one time only activity which offers an excellent opportunity to complete your ARRL WAS Bicentennial and also the *CQ* "USA WPX '76" Award.

Amateurs in the 50 U.S. states will work stations outside the country as well as other U.S. amateurs. Out-of-country amateurs will work only stations in the 50 U.S. states.

Any mode or band may be used, however operating time is limited to 36 out of the 48 hour activity period. Limit your "time-outs" to eight with a minimum of at least 15 minutes.

**Classification:** Single operator only for U.S. entries. Single operator and multi-operator for others, but no multi transmitter.

**Exchange:** Signal report, state and state entry number into the Union. (see list in *QST*) Non-U.S. stations, signal report and QSO serial number starting with 001.

**Scoring:** Total number of contacts is your final score, there is no multiplier.

**Awards:** There are several awards, making 1776 QSOs, 200 QSOs, 50 QSOs on 50 MHz and above, WAS, section high, country high and a few others.

Better check March issue of *QST* for more details. Special summary and log sheets are available by sending a request and s.a.s.e. to ARRL.

Entries must be postmarked no later than September 1st to: ARRL Bicentennial Celebration, Newington, Conn. 06111.

### *Illinois QSO Party*

Two Periods (GMT)
1800 Sat. July 31 to 0500 Sun. Aug. 1
1200 Sun. Aug. 1 to 2300 Sun. Aug. 1

This is the 14th annual party sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and mode. Ill. stations may work other in-state stations.

**Exchange:** RS(T) and QTH. County for Ill., state, province or country for others.

**Scoring:** *For Illinois:* Total QSOs × (Ill. counties + states + VE provinces + DXCC countries) *For all others:* Total Ill. QSOs × Ill. counties worked. (max. of 102)

Ill. mobiles add 200 to score for each county operation from which 10 or more contacts were made. For non-Ill. stations there is a bonus multiplier of one for each group of 8 contacts with the same county.

Look for K9CJU/9 operating from *USS Silversides,* famed WW II submarine, each contact worth 5 points.

**Frequencies:** 60 kHz from low end of each c.w. band. 25 kHz from high end of each phone band. (also 21375 and 28675) And 25 kHz from low end of Novice bands on the half hour.

**Awards:** Certificates to the top stations in each category in each state, VE province, DX country and first 3 places in Illinois. Categories: single operator, multi-operator, mobile and Novice entries.

Mailing deadline is Sept. 15th to: RAMA, K9CJU, 3620 N. Oleander Ave., Chicago, Ill. 60634. Include large s.a.s.e. for results.

### *Ten-Ten Net QSO Party*

Starts: 0000 GMT Saturday, August 7
Ends: 2400 GMT Sunday, August 8

This is the summer edition of the Ten-Ten International Net of Southern California QSO Party. Activity is on 10 meters only but using any mode. Its open to all amateurs but non-members are not eligible for awards. They are however encouraged to submit a list of stations worked and apply for membership.

**Exchange:** Name, QTH and 10-10 membership number for Net members.

**Scoring:** Score 1 point per contact, add an additional point if its with a 10-10 member. (max. of 2 points) Total QSO points is your score, there is no multiplier. Indicate name of your chapter on your log.

**Awards:** 1st and 2nd place certificates in each U.S. call area, KH6, KL7, and each VE province. And to 11 continental and sub-continental areas over the world.

Mailing deadline for logs is Sept. 30th to: Grace Dunlap, K5MRU/Ø, P.O. Box 13, Rand, Colo. 80473

### *European DX Contest*

C.W.: Aug. 14-15
Phone: Sept.: 11-12
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 22nd annual contest sponsored by the DARC. The activity will be between the European countries and the rest of the world.

Use all bands 3.5 thru 28 MHz. There are two classes, Single operator, All Band, and Multi-operator, Single Transmitter.

Only 36 hours out of the 48 hour contest period may be used by single operator stations. The 12 hour rest period may be taken in one but not more than three periods any time in the contest.

**Exchange:** RS(T) plus a QSO number starting with 001.

*(Continued on page 74)*



GEORGE JACOBS, W3ASK, ON

# Propagation

The Swiss Federal Observatory at Zurich reports a mean sunspot number of 23 for March, 1976. Solar activity varied considerably during the month, ranging from a low to zero between March 1st and 5th, to a high of 51 on the 19th and 20th.

Solar activity during March resulted in a smoothed sunspot number of 14.5, centered on September, 1975. The cycle is expected to continue its very slow decline towards a minimum value, and a smoothed sunspot number of approximately 7 is forecast for June.

### *June Propagation*

*Twenty* meters looks like it should be the best band for DX propagation during June. Expect it to open just after sunrise, and to remain open for a few hours in almost all directions. When conditions are LOW NORMAL or better, chances are good for openings to Europe, Central and South America, the South Pacific, Australasia and the Far East, before noontime absorption sets in. A second, and usually stronger peak is expected during the late afternoon, when good openings should be possible towards Europe, Africa, Central and South America and the Middle East. After sunset, and until Midnight, look for good openings to South America, Antarctica, the South Pacific, Australasia and the Far East. When conditions are HIGH NORMAL or better, there may also be post-sundown openings on *20* meters to Europe, Africa and the Middle East.

Not too much DX expected on *15* meters this month, but some should be possible. When conditions are at least LOW NORMAL, expect fairly good openings towards Central and South America as early as 9 a.m. Best time for these openings, however, should be during the afternoon hours and possibly as late as the sundown period. The band may also open occasionally from the eastern half of the United States towards Africa, and from the western half towards the South Pacific, Australasia and the Far East. Best time to check for these openings are during the afternoon hours, especially when conditions are HIGH NORMAL, or better.

Few, if any DX openings are expected on *10* meters, except to those areas of the Caribbean and Central America within a 1300-mile range of short-skip sporadic-E openings from the USA. An occasional longer opening into South America may be possible during the late afternoon hours, when conditions are HIGH NORMAL, or better.

Longer hours of daylight and seasonally higher levels of static should reduce considerably the chances for DX openings on *40, 80* and *160* meters. Some fairly good openings, however, are forecast to several areas of the world for *40* meters during the hours of darkness and the sunrise period. Somewhat fewer, but often good openings should also be possible on *80* meters during much of the same time period.

Plenty of good short-skip openings are expected on the h.f. bands during June. For distances less than 250 miles try *80* meters during the day, *160* meters at night. For openings between 250 and 750 miles, *40* meters should be best during the day and *80* meters at night. For openings beyond 750 miles, *20* meters should be optimum during the day and *40* meters at night. Frequent short-skip, sporadic-E type openings are also expected on *10* and *15* meters over distances between approximately 600 and 1300 miles.

### *V.H.F. Ionospheric Openings*

Expect a considerable increase in sporadic-E propagation during June and the summer months. This should result in fairly frequent 6 meter openings over a range of approximately 1000 to 1400 miles. During periods of geographically widespread ionization, two-hop *6* meter openings may occasionally be possible up to about 2300 miles. An occasional *2* meter short-skip opening, between approximately 1200 and 1400 miles, may also be possible during periods of intense sporadic-E ionization. Short-skip openings are most likely to occur between 10 a.m. and 2 p.m. and again between 6 and 10 p.m., local daylight time, although they can occur at other times as well.

Look for some meteor activity between June 7 and 9, which could increase the possibility for meteor-scatter type openings on the vhf bands.

Check the "Last Minute Forecast"

**LAST MINUTE FORECAST—JUNE**

*Day-to-Day Conditions Expected For June 1976*

| | *Expected Signal Quality* | | | |
|---|---|---|---|---|
| *Propagation Index* ..... | (4) | (3) | (2) | (1) |
| *Date* | | | | |
| Above Normal: 9, 13 | A | A | B | C |
| High Normal: 8, 10-12 | B | B | C | D |
| Low Normal: 3-7, 14, 18-19, 25-27, 29-30 | B | C | D | E |
| Below Normal: 1-2, 15, 17, 20, 22-24, 28 | C | D | E | E |
| Disturbed: 16, 21 | D-E | E | E | E |

Where *expected signal quality is:*

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

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

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

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, a path shown in the Charts with a propagation index of (3) will open *poorly* on June 1-2; will be *fair* on June 3-7, (C) and *good* on June 8 (B), etc.

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

at the beginning of this column for those days during June that are expected to be BELOW NORMAL or DISTURBED on the h.f. bands. These are the days on which auroral and other types of ionospheric propagation may be possible on the vhf bands.

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1976. Short-Skip Charts for June, for openings between 50 and 2300 miles, and from Hawaii and Alaska, appeared in last month's column.

73, George, W3ASK

## June 15-August 15, 1976
## Time Zone: EDT (24-Hour Time)
## EASTERN USA TO:

| | *15 Meters* | *20 Meters* | *40 Meters* | *80 Meters* |
|---|---|---|---|---|
| Western & Central Europe & North Africa | 13-18 (1) | 06-07 (1)<br>07-09 (2)<br>09-14 (1)<br>14-16 (2)<br>16-17 (3)<br>17-18 (4)<br>18-19 (3)<br>19-20 (2)<br>20-22 (1) | 19-21 (1)<br>21-22 (2)<br>22-00 (3)<br>00-01 (2)<br>01-02 (1) | 21-22 (1)<br>22-00 (2)<br>00-01 (1)<br>22-00 (1)* |
| Northern Europe & European USSR | *Nil* | 06-07 (1)<br>07-09 (2)<br>09-15 (1)<br>15-18 (2)<br>18-19 (3)<br>19-22 (2)<br>22-00 (1) | 20-21 (1)<br>21-23 (2)<br>23-00 (1) | 21-23 (1) |
| Eastern Mediterranean & Middle East | 11-13 (1)<br>16-17 (1) | 13-15 (1)<br>15-17 (2)<br>17-19 (3)<br>19-20 (2)<br>20-22 (1)<br>22-00 (2)<br>00-06 (1)<br>06-08 (2)<br>08-09 (1) | 20-22 (1)<br>22-00 (2)<br>00-01 (1) | 22-00 (1) |
| Western Africa | 11-14 (1)<br>14-17 (2)<br>17-18 (1) | 05-06 (1)<br>06-07 (2)<br>07-15 (1)<br>15-17 (2)<br>17-18 (3)<br>18-20 (4)<br>20-21 (3)<br>21-23 (2)<br>23-01 (1) | 20-22 (1)<br>22-01 (2)<br>01-02 (1) | 21-01 (1) |
| Eastern & Central Africa | 11-16 (1) | 16-18 (1)<br>18-20 (2)<br>20-21 (1) | 22-00 (1) | 22-00 (1) |
| Southern Africa | 11-13 (1) | 01-03 (1)<br>05-07 (1)<br>15-16 (1)<br>16-18 (2)<br>18-19 (1) | 20-21 (1)<br>21-01 (2)<br>01-02 (1) | 22-01 (1)*<br>23-01 (1)* |
| Central & South Asia | *Nil* | 07-10 (1)<br>20-23 (1) | 05-07 (1)<br>20-22 (1) | *Nil* |
| Southeast Asia | *Nil* | 07-10 (1)<br>19-23 (1) | *Nil* | *Nil* |
| Far East | *Nil* | 07-08 (1)<br>08-10 (2)<br>10-12 (1)<br>20-23 (1) | 04-06 (1) | *Nil* |
| South Pacific & New Zealand | 19-22 (1) | 19-21 (1)<br>21-01 (2)<br>01-07 (1)<br>07-10 (2)<br>10-12 (1) | 02-03 (1)<br>03-06 (2)<br>06-07 (1) | 03-06 (1)<br>03-05 (1)* |
| Australasia | 19-22 (1) | 06-08 (1)<br>08-09 (2)<br>09-12 (1)<br>17-19 (1)<br>21-23 (1)<br>23-01 (2)<br>01-04 (1) | 03-04 (1)<br>04-06 (2)<br>06-07 (1) | 03-06 (1) |
| Caribbean, Central America & Northern Countries of South America | 15-17 (1)**<br>09-12 (1)<br>12-15 (2)<br>15-18 (3)<br>18-20 (2)<br>20-21 (1) | 06-07 (1)<br>07-08 (2)<br>08-10 (4)<br>10-12 (3)<br>12-16 (2)<br>16-18 (3)<br>18-21 (4)<br>21-23 (3)<br>23-00 (2)<br>00-02 (1) | 20-22 (1)<br>22-23 (2)<br>23-03 (3)<br>03-05 (2)<br>05-07 (1) | 22-00 (1)<br>00-04 (2)<br>04-06 (1)<br>02-05 (1)* |
| Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay | 14-17 (1)**<br>09-12 (1)<br>12-15 (2)<br>15-17 (3)<br>17-19 (2)<br>19-20 (1) | 06-08 (1)<br>08-09 (2)<br>09-15 (1)<br>15-17 (2)<br>17-19 (3)<br>19-20 (4)<br>20-22 (3)<br>22-00 (2)<br>00-04 (1) | 21-23 (1)<br>23-03 (2)<br>03-06 (1) | 00-05 (1)<br>01-04 (1)* |
| McMurdo Sound, Antarctica | *Nil* | 20-22 (1)<br>22-00 (2)<br>00-02 (1) | 00-03 (1)<br>03-06 (2)<br>06-07 (1) | 03-06 (1) |

## June 15-August 15, 1976
## Time Zones: CDT & MDT
## (24-Hour Time)
## CENTRAL USA TO:

| | *15 Meters* | *20 Meters* | *40 Meters* | *80 Meters* |
|---|---|---|---|---|
| Western & Southern Europe & North Africa | 13-17 (1) | 06-07 (1)<br>07-09 (2)<br>09-14 (1)<br>14-16 (2)<br>16-18 (3)<br>18-19 (2)<br>19-21 (1) | 20-22 (1)<br>22-00 (2)<br>00-02 (1) | 21-00 (1) |

### 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.

| | | | | |
|---|---|---|---|---|
| Northern Europe & European USSR | *Nil* | 06-07 (1)<br>07-09 (2)<br>09-14 (1)<br>14-17 (2)<br>17-20 (1)<br>20-22 (2)<br>22-23 (1) | 20-23 (1) | 21-23 (1) |
| Eastern Mediterranean & Middle East | *Nil* | 07-09 (1)<br>14-15 (1)<br>15-17 (2)<br>17-19 (1)<br>19-21 (2)<br>21-22 (1) | 20-23 (1) | *Nil* |
| Western Africa | 14-16 (1) | 06-08 (1)<br>13-15 (1)<br>15-17 (2)<br>17-18 (3)<br>18-19 (2)<br>19-21 (1) | 20-00 (1) | 21-23 (1) |
| Eastern & Central Africa | *Nil* | 16-18 (1)<br>18-20 (2)<br>20-21 (1) | 20-23 (1) | *Nil* |

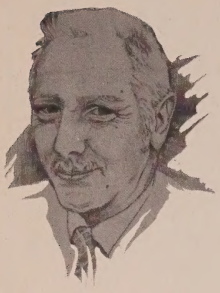
*Indicates best time for 160 Meter opening.
**Indicates best time for 10 Meter opening.

| | | | | |
|---|---|---|---|---|
| Southern Africa | 10-12 (1) | 05-07 (1)<br>14-15 (1)<br>15-17 (2)<br>17-18 (1)<br>22-00 (1) | 21-23 (1)<br>23-00 (2)<br>00-01 (1) | 22-00 (1) |
| Central & South Asia | *Nil* | 09-11 (1)<br>18-20 (1)<br>20-22 (2)<br>22-00 (1) | 05-07 (1)<br>19-21 (1) | *Nil* |
| Southeast Asia | 19-21 (1) | 08-10 (1)<br>20-21 (1)<br>21-23 (2)<br>23-00 (1) | 05-07 (1) | *Nil* |
| Far East | 20-22 (1) | 07-08 (1)<br>08-11 (2)<br>11-21 (1)<br>21-23 (2)<br>23-01 (1) | 04-07 (1) | 04-06 (1) |
| South Pacific & New Zealand | 15-19 (1)<br>19-21 (2)<br>21-22 (1) | 17-19 (1)<br>19-22 (2)<br>22-00 (3)<br>00-02 (2)<br>02-07 (1)<br>07-10 (2)<br>10-14 (1) | 01-03 (1)<br>03-04 (2)<br>04-06 (3)<br>06-07 (2)<br>07-08 (1) | 01-04 (1)<br>04-05 (2)<br>05-06 (1)<br>03-05 (1)* |
| Australasia | 16-18 (1)<br>20-22 (1) | 06-07 (1)<br>07-09 (2)<br>09-11 (1)<br>15-17 (1)<br>20-22 (1)<br>22-00 (3)<br>00-02 (2)<br>02-04 (1) | 01-03 (1)<br>03-06 (2)<br>06-07 (1) | 03-06 (1) |
| Caribbean, Central America & Northern Countries of South America | 15-18 (1)**<br>09-13 (1)<br>13-15 (2)<br>15-18 (3)<br>18-19 (2)<br>19-20 (1) | 06-07 (1)<br>07-08 (3)<br>08-10 (4)<br>10-12 (3)<br>12-16 (2)<br>16-18 (3)<br>18-20 (4)<br>20-22 (3)<br>22-00 (2)<br>00-02 (1) | 20-22 (1)<br>22-23 (2)<br>23-03 (3)<br>03-05 (2)<br>05-06 (1) | 22-00 (1)<br>00-04 (2)<br>04-05 (1)<br>00-04 (1)* |
| Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay | 14-17 (1)**<br>09-12 (1)<br>12-14 (2)<br>14-17 (3)<br>17-18 (2)<br>18-19 (1) | 06-07 (1)<br>07-09 (2)<br>09-15 (1)<br>15-17 (2)<br>17-18 (3)<br>18-20 (4)<br>20-21 (3)<br>21-23 (2)<br>23-02 (1) | 21-23 (1)<br>23-03 (2)<br>03-05 (1) | 22-04 (1)<br>00-03 (1)* |
| McMurdo Sound, Antarctica | *Nil* | 18-21 (1)<br>21-23 (2)<br>23-01 (1) | 22-04 (1)<br>04-06 (2)<br>06-07 (1) | 04-06 (1) |

## June 15-August 15, 1976
## Time Zone: PDT (24-Hour Time)
## WESTERN USA TO:

| | *15 Meters* | *20 Meters* | *40 Meters* | *80 Meters* |
|---|---|---|---|---|
| Western & Southern Europe & North Africa | *Nil* | 06-07 (1)<br>07-08 (2)<br>08-14 (1)<br>14-17 (2)<br>17-19 (1)<br>22-00 (1) | 20-23 (1) | *Nil* |
| Central & Northern Europe & European USSR | *Nil* | 06-07 (1)<br>07-09 (2)<br>09-14 (1)<br>14-16 (2)<br>16-18 (1)<br>21-23 (1) | 20-22 (1) | *Nil* |
| Eastern Mediterranean & Middle East | *Nil* | 06-08 (1)<br>14-16 (1)<br>19-20 (1)<br>20-21 (2)<br>21-22 (1) | 20-22 (1) | *Nil* |
| Western Africa | 10-14 (1) | 07-09 (1)<br>14-16 (1)<br>16-17 (2)<br>17-19 (3)<br>19-20 (2)<br>20-21 (1) | 20-23 (1) | *Nil* |
| Eastern & Central Africa | *Nil* | 14-16 (1)<br>16-18 (2)<br>18-19 (1)<br>06-08 (1) | *Nil* | *Nil* |
| Southern Africa | *Nil* | 06-08 (1)<br>13-16 (1)<br>22-00 (1) | 20-21 (1)<br>21-22 (2)<br>22-23 (1) | 20-22 (1) |
| Central & South Asia | *Nil* | 07-08 (1)<br>08-10 (2)<br>10-11 (1)<br>18-20 (1)<br>20-22 (2)<br>22-23 (1) | 05-07 (1)<br>18-20 (1) | *Nil* |
| Southeast Asia | 19-23 (1) | 07-09 (1)<br>09-11 (2)<br>11-12 (1)<br>21-23 (1)<br>23-01 (2)<br>01-03 (1) | 03-05 (1)<br>05-06 (2)<br>06-07 (1) | 04-06 (1) |

*(Continued on page 74)*



A. EDWARD HOPPER, W2GT, ON

# Awards

The June, "Story of the Month", as told by Dean is:

***Dean W. Laughlin, K7JWZ***
All Counties #89, 12-1-72.

"Born May 14, 1929 in Boise, Idaho, the majority of my life has been spent in the upper Snake River Valley of South East Idaho. A period of time was spent at the University of Idaho, then a tour of duty with the U.S. Navy followed by employment in northern Idaho with a Lumber Company. Employment since late 1957 has been with Westinghouse Electric Corp. at the Idaho A.E.C. site as a chemistry technician on the prototypes of a nuclear powered aircraft carrier and nuclear submarine.

"My exposure to amateur radio started in early 1959 from a Navy man (Herb Spencer, K7GVY) stationed at the aircraft carrier prototype. After several months of trying to distinguish between dah's and dit's, electronic theory and FCC regulations, plus weeks watching the mail box, the call KN1JWZ finally arrived.

"The first equipment was a DX-40 transmitter and 14-AVS vertical antenna purchased from Spence, K7-GVY, and a Heathkit AR-22 receiver that I was able to build. My first 2½ years of operation were not exciting. Then in January 1962 Kaye and I were married and as Kaye has stated, 'Just looking at the log entries, you can tell when a better piece of gear was acquired'. Probably my sincere feeling for amateur radio would not be what it is today, had it not been for Kaye. She has always encouraged it, whether it be a new piece of gear (if we could afford it) or any other aspect.



*Dean, K7JWZ in Billings Montana.*

**Special Honor Roll**
**(All Counties)**
#142 Howard E. Perkins, K8EUX 2-17-76
#143 Doug. Bowles, VE4QZ 3-12-76

"The first mobile rig was the Heathkit Cheyenne with a Webster bandspanner. Then came a Drake TR-3 and Hustler antenna which we still use after many thousands of miles and hours of operation.

"My introduction to County Hunting came in early 1965 on the CHC net. Then on 3-21-65 came the first of many mobile trips. That first trip was only one day covering Bonneville, Jefferson, Madison, Fremont, and Teton Counties in Idaho. Teton County was especially popular, as at that time no one had worked all 3079. K9EAB, WØMCX (WØBK), WØ-JWD (WØBL), K4VOF, and WA9AJF were just a few of those worked that first day. After a time all counties in Idaho had been given out with the exception of Boundary which is about 500 miles from the home QTH. A trip was made thru the Northwestern Montana and into Northern Idaho, but the closer we got, the worse conditions became. Upon reaching Boundary County there were absolutely no signals on 20, 40 or 75 meters. After much frustration tearing the rig and antenna apart, we had to leave without giving out the County. It wasn't until the next day at the QTH of Doc, K7LDK and Fran, K7MRX in Moscow, Idaho we learned there had been a complete radio blackout due to *Aurora Borealis*. Another trip at a later date was more successful. Since then, nearly all counties in the 7th call area have been given out, some of them many times. Since Kaye and I enjoy traveling around the country, counties have been given out in the 5, 6, 7, 9, 0 call areas of the U.S., plus 3 districts in Alaska and also VE3, VE4, VE6, VE7 and VE8 in Canada. During the years I was working for all counties, Kaye and I have had the pleasure of meeting many of the County Hunters. Some at our QTH and many on our frequent travels around the country.

"After several years, with many meals in the ham shack as a county was coming up that I didn't want to miss, the last county was worked at 1744 GMT 11-12-72. The last county, Marshall, Iowa, was worked from my good friend George, WAØLPA.

"As so many others have said, it is impossible to list everyone who made the magic number possible, so thanks to all the net controls, base stations and especially the mobiles for making it possible. We hope that through the years we have been able to help many obtain needed counties and in the future, as time permits, may we continue to do so. Good hunting."

### *Awards Issued*

Howard Perkins, K8EUX hit that magic number of *All Counties*. See Story/Photograph *CQ* December 1967.

Doug. Bowles, VE4QZ also made them *All* and became #7 outside USA, #3 to VE, and #1 to VE4.

Tom Storm, DDS, WAØYJL added USA-CA-3000 to his collection.

Keith Harlow, WA7RKN did his paper work and got USA-CA-500 through USA-CA-2500 endorsed All S.S.B.

Arthur Nelsen, WAØBMO gained USA-CA-2000 endorsed All S.S.B., All 80.

Cesar Santos, CT1UE was issued USA-CA-500 endorsed All S.S.B., #4 to Portugal and USA-CA-1000 endorsed All S.S.B., #2 to Portugal.

Henry Thel, VE7WJ (was VE7AHD until December 1969—also VA7WJ in '73 & '74 as well as 3C7AHD and XJ7WJ) acquired USA-CA-500.

Bob Kemp, WA4CHI obtained USA-CA-500 endorsed All S.S.B., All Mobiles, All 80, All 20.

### *Awards*

**New Jersey Bicentennial Award 1976:** This Award is sponsored by the Moorestown Astronomy Association to commemorate the U.S.A. Bicentennial by contacting amateurs in New Jersey. To receive this Award you must send G.C.R. List and $1.00 to Moorestown Amateur Astronomy Assn. C/O Gene Bond, WB2UVR, 15 East Camden Avenue, Moorestown, N.J. 08057. AOM/B endorsements free when you apply for them with regular Award, if not they cost 10¢ each plus an s.a.s.e. Required QSOs are:

| | | |
|---|---|---|
| *New Jersey Stations:* | Class AA | 500 |
| | Class A | 100 |
| | Class B | 75 |
| | Class C | 50 |
| | Class D | 25 |
| *Other U.S. Stations:* | Class AA | 200 |
| | Class A | 100 |
| | Class B | 75 |
| | Class C | 50 |
| | Class D | 25 |
| *V.H.F. Stations* in N.J., N.Y., PA, DE. & MD.: | Class AA | 200 |
| | Class A | 100 |
| | Class B | 75 |
| | Class C | 50 |
| | Class D | 25 |
| *DX and other V.H.F. Stns.:* | Class AA | 75 |
| | Class A | 50 |
| | Class B | 25 |
| | Class C | 15 |
| | Class D | 7 |

**Brazilian YL Award-BRYLA:** Available to all amateurs after two-way QSOs with:

DX—12 YL stations from different countries (3 continents)
8 YL stations from Brazil.
PY—20 YL stations from Brazil.
5 YL stations from different countries (3 continents)

Contacts must be made from the same QTH, in any band or mode and in accordance with international regulations on amateur radio.

Applicants must submit log data including stations worked, date, time, mode, report and band certified by a recognized amateur radio association. Be sure to send one of your QSLs for BRYLA files and 10 IRCs to: BRYLA, C/O PY1FI, P.O. Box 58, 20.000 Rio, RJ, Brasil, South America. Most active stations are: Phone —PY1BQ, BQI, DNU, DVQ, ETA, EGJ, EN, FI, MEN, OM, 2BEE, JY, PE, 3AVE, 4AKL, DY, MS, VL, 5ACW, BZN, CCY, CFO, IB, XM, 6ACL, ARI, 6BQ, CG, OZ, WZ, 7AL, AVN, BDL, 8JO, NH, 9FJ, LQ. PT2EQI, PT2HQ. On C.W.—PY1DUJ, EUL, SJ, 2ATL, DHP, 5ACW, XM, 7CGV, 9UC/2, PT-2SV.

**Texas YL Round-Up YL-OM Certificate:** This YL-OM Certificate is awarded for confirmed contacts with stations operated by licensed women amateur radio operators who are full members of the Texas YL Round-Up Net. The certificates are issued under the following rules:

1. Two-way communications must be established on one of the amateur bands with 10 licensed women amateur radio operators who are full members of the Texas YL Round-Up Net. A full member is defined as a licensed YL who has a Certificate of Membership and has paid her dues.

**USA-CA Honor Roll**

| 3000 | 2000 | 1000 |
|---|---|---|
| WAØYJL .164 | WA7RKN 244 | CT1UE .388 |
| VE4QZ .165 | WAØBMO 245 | WA7RKN 389 |
| **2500** | **1500** | **500** |
| WA7RKN 205 | WA7RKN 293 | CT1UE .1093 |
| | | VE7WJ .1094 |
| | | WA4CHI 1095 |
| | | WA7RKN 1096 |

2. All contacts must be made from the same location, or locations, providing the same call is used and the YL was a full member of the net at the time of the contact.

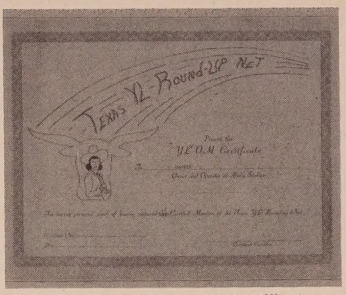
3. Each member of the net has received a Texas YL Round-Up Net Member Certificate on which there is a number and a date of issuance. The 10 QSLs for the necessary two-way contacts must show the member's Certificate numbers to qualify.

4. Contacts made with members during any regular net meeting will NOT be counted valid for this award.

5. QSLs must be sent to the Custodian by first class mail. They must be accompanied by a list of claimed contacts, arranged alphabetically by call, including call and full name of the operator, certificate number, date, time and band of QSO. Sufficient postage must be enclosed to finance the return of the cards by first class mail, plus 25¢ to cover mailing cost of the award. The Texas YL Round-Up Net will not be responsible for any loss or damage to an applicant's QSL cards.

6. Decisions of the YL-OM Certificate Custodian regarding interpretations of these rules as here stated, or later amended, shall be final.

7. Send applications and confirmations, etc., to: Bernell Johnson, K5-GBX, 1822 S.W. 3rd Street, Grand Prairie, Texas 75050.




*Texas YL Round-Up Net Certificate.*

### *Notes*

If anything seems a bit strange about my April column, it is because my February column got lost/mislaid but found and now is in April. *CQ.*

Here is the promised data on my ole friend, Henry "Hank" Baarens, with whom I had my first QSO back in 1921 in Hawthorne, N.J. Hank still remembers our first QSO when I said, "Tell Elmore (my cousin) to come home for lunch."

Hank moved in 1923, got the call 2FG, but we lost track of each other until he started to read this column. By that time he had moved from Clifton, to Morristown and now spends summers in Barnegat, N.J. and winters in Homestead, Florida.

He lost interest in amateur radio and lost his 2FG call but a few years after retiring from Bell Labs in 1966, he got the call K2AL. (As I write this, Bob, W2LV, informs me that the present holder of W2FG just became a silent key).

Last year I had the great pleasure of working Hank on 80 on his 73rd birthday. He insists it was one of the nicest birthday presents he has received. We (Helenmae and I) had the pleasure of a wonderful visit with Hank and Margaret last October, just before they left for Florida for the winter. By the time you read this, I hope that Hank and I will resume regular weekly schedules from Barnegat, N.J.

Reliable/documented information has surfaced that make the alleged Mobile trips of WB6CKU a mirage, so no credits can be issued for these trips for USA-CA.

How was your month?

73, Ed., W2GT

# Surplus Sidelights

**BY GORDON ELIOT WHITE**

Last month I described the AN/ARC-38, a Navy high-frequency transceiver, built by Collins, which has been appearing on surplus sales lists. The ARC-38A model is an updated version for sideband use. Both versions cover the frequencies from 2 to 25 MHz with excellent stability and sensitivity.

This month I will describe alignment of the ARC-38, a rather complex job that the Navy accomplished with a raft of test gear. The service used a AN/ARM-29 test bench harness, a MK-380/ARM accessory kit, AN/ARM-26 radio test set, AN/USM-26 frequency meter, AN/TRM-1 radio test set, a dummy load (Bird 82A for example) rated at 51.5 ohms, 500 watts, the TS-505D/U vacuum tube voltmeter, ME-6D/U a.c. v.t.v.m., and a TS-585C/U audio output meter.

More commonly available instruments may be substituted for some of the military test sets, and the operational cables and control head may be used instead of the test harness. The ARM-26 is the most desirable of the military sets, and it would be nice to pick one up along with the ARC-38 if you could find one.

If you don't have all the original test equipment, you can still do an alignment, though perhaps not as quickly as the Navy could. You will need a good frequency meter, a v.t.v.m., dummy load, and a meter suitable for reading audio output level. The latter does not need to be very accurate, as you can adjust for a peak. The absolute readings, unless the set is really in bad shape, are less important.

Using the standard control head, adjust the power input exactly to 25.2 volts and set the frequency selectors to:

**A**—7000
**B**—0
**C**—0
**D**—0

After the autopositioner cycles, check the set itself to see that the stabilized master oscillator (SMO) dial reads:

**A**—7
**B**—0
**C**—0
**D**—0

(If the intermittent gear assembly is removed (see last month's column) the reading at **A** will be meaningless.)

Set the SMO correcting capacitor, C-2199, to one-half capacity, using a small screwdriver in the slotted shaft. Check the SMO output frequency. It should be 1,750 kHz, plus or minus 1 kHz. If it requires adjustment, loosen the oscillator coupler with a bristol set-screw wrench. Disengage the oscillator gear by sliding it forward on its shaft and temporarily retighten the set-screw.

Adjust the oscillator by manually rotating the oscillator gear to obtain a frequency of 1,750 kHz, as checked against the frequency meter. Carefully slide the gear back into its normal position, tighten, and re-cycle the autopositioner, checking to see that now the output of the SMO *is* within plus or minus 1,750 kHz.

Now manually adjust C-2199 to bring the SMO output to exactly 1,750 kHz, plus or minus 150 Hz.

Set the controls to:

**A**—13000
**B**—900
**C**—90
**D**—9.5

After the autopositioner cycles, check to see that readings are:

**A**—13
**B**— 9
**C**— 9
**D**— 9.5

Now adjust the trimmer coil on the SMO (L-2100) to obtain an output frequency of 3,499.875, plus or minus 150 Hz. Return the frequency selector to 1,750.000 and recheck.

The a.c. voltage at terminal 2 of Z-2207 should be greater than three volts at both ends of the frequency range. Lower voltage indicates need for adjustment of the entire tuning rack, a procedure too complex to go into here. If you can find the manual *(NavAer 16-30ARC38-502)* it gives that data.

Accuracy of the 500 kHz oscillator must be set very closely. Re-check the SMO at 1,750 kHz, then set the unit to 7,099.5 kHz, giving an SMO output of 1,774.875 kHz. That frequency should be accurate within 35 Hz, or should be re-set with an insulated screwdriver in the discriminator trimmer.

(It may be necessary to loosen the discriminator shaft coupler, as was done with the oscillator gear, to get the correct discriminator output at the indicated point.)

The 500 kHz oscillator may be checked by attaching a frequency meter at J-2001 and adjusting the crystal trimmer to exactly 500.000 kHz.

Finally, check the SMO output as follows:

Channel 10 — 1,750.00 kHz
Channel 11 — 2,000.00 kHz
Channel 12 — 2,500.00 kHz
Channel 13 — 3,000.00 kHz
Channel 14 — 3,499.875 kHz

The tuner discriminator check requires use of a gauge block (MK-380/ARM) which may be difficult to locate. It is slipped under the tuning rack assembly when the set is tuned to 2 MHz, and the slug of T-1001 is adjusted to allow the rack to just allow the block to be slipped into position. Using a machinists' dial gauge, the rack should rise to 0.798 inches at 3.7495 MHz, 0.570 inches at 3.25 MHz, 0.342 at 2.75 MHz, and 0.114 at 2.25 MHz.

### *Transmitter Alignment*

Connect the dummy load to the antenna jack and set the controls to 2.0 MHz. With an r.f. probe on the v.t.v.m. attached to the antenna jack via a "T" fitting (UG-107/U) key the transmitter and adjust the following coils for maximum output:

Z-1002
Z-1003
Z-1004
Z-1005
Z-1014
Z-1018
Z-1022

Switch off the transmitter and select 3.7495 MHz and re-align the coils. Switch off again, retune to 7.25 MHz and adjust the slugs of:

Z-1006
Z-1007
Z-1016
Z-1020
Z-1024

Select 14.2495 MHz and re-align the coils a third time.

Tune to 3.75 MHz and adjust for maximum output by tuning slugs in:

Z-1015
Z-1019
Z-1023

Now tune for maximum with C-1114 (bottom of tuner assembly) while the set is cycled to 7.2495 MHz. Select 14.25 MHz and tune slugs:

Z-1008
Z-1009
Z-1017
Z-1021
Z-1025

Select 24.99 MHz and re-tune the same coils to maximum output.

### *Receiver Antenna Coils*

With signal generator input of 2 MHz, 30% modulation, and an audio meter attached to the receiver output, adjust the input to give a mid-range reading on the audio meter. Tune the set, of course, to 2.0 MHz.

Connect a d.c. voltage test lead (v.t.v.m.) to test point J-901 (a.v.c. voltage). About 30 volts positive should be present with no signal applied.

Adjust the slug in Z-1010 for maximum reading at J-901 with r.f. signal applied (about 10-15 volts at J-901).

Select 3.7495 and reset the receiver and frequency meter. Adjust the trimmer capacitor on Z-1010 for maximum output.

At 3.75 MHz, adjust the slug on Z-1011, and adjust the capacitor on Z-1011 at 7.2495 MHz. At 7.25 MHz, adjust the Z-1012 slug for maximum, and adjust the Z-1012 capacitor at 14.2495 MHz.

At 14.25 MHz, adjust the Z-1013 slug, and at 25.0 MHz, trim the Z-1013 capacitor for maximum.

The 250 kHz i.f. amplifier generally does not require re-alignment unless it has been damaged; refer to the manual if necessary. ■


# STEP UP TO TELREX

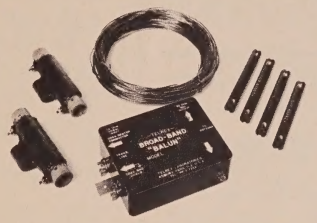
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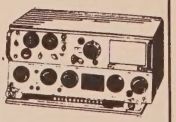
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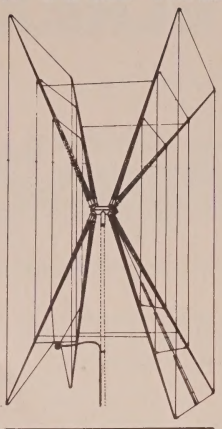
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..... 4/$5.00
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### A Canoe And PM-28 DXpedition *(from page 20)*

#### *The Beginning*

Two weeks use and the batteries still put out 240 ma through a 50 ohm resistor compared to 250 when fully charged. Guess we could have stayed a month or so!

QRPp will be along on future trips and not as EXTRA weight—no more worry about emergencies with such dedicated operators in the net system.

As WA1FCM said about emergency communications in the Sept. *QST*, "Flea power is more effective than no power."

Try it. With a little patience you'll have a ball! ■

### Making IC Projects Work *(from page 38)*

great care be taken to check and double check the schematic diagram for any possible errors. Such drawing errors seem to creep into even the most carefully edited writeups. If anything appears doubtful it is often time and money saving to write the author about those doubts. I have had the good fortune to receive many kind and considerate replies whenever I've written asking for advice or questioning a schematic. Usually, the author is far ahead of the builder and has an errata sheet already made out that will help in the successful completion of the project.

This is the first part of "How To Make IC Projects Work". I will discuss some additional problems facing the builder in a following article having to do with making the hardware work. Generally the problems involved in the follow on phases of work include finding and correcting wiring errors, cold solder joints and solder bridges and other mechanical problems, establishing a methodology or scheme for tracing through a hardware solid state system to find out what went wrong where, seeking out actual mistakes in the drawings and schematics originally used and not the least important, establishing the criteria that should exist even before the power switch is turned on and how to sequentially check each part of the system so as not to damage assembled hardware by moving too fast in turning on the switch to "see what happens". Believe me it usually will.

It is my hope that this article will help the amateur system builder have the courage to get started on a large and for an amateur usually costly IC project. I have found out from my experience that if a problem can be broken down into small usable parts that it doesn't appear as difficult to handle.

*(To be continued)*

#### *References*


1. (a) WØLMD, Keyboard for SSTV, *CQ* magazine, Sept. 1974
   (b) WØLMD, Fast to Slow Scan Converter, *73* magazine, August 1974

(c) W9LUO, SSTV Monitor Mk I, *QST* March 1972, Mk II *QST*, March 1973
(d) WB9LVI, Slow to Fast Scan Converter, *QST* March 1975, May 1975

2. (a) Protoboard 100 series, Continental Specialties Corp. P.O. Box 1942, New Haven, Ct. 06509
(b) Micro-Vector plugboards, Vector Electronics Co., Inc. 12460 Gladstone Ave., Sylmar, Ca. 91342
(c) *Electronics* magazine, February 19, 1976, Special issue on "Breadboards".
3. WB9LVI, Slow to Fast Scan Converters, *QST*, May 1975 page 30, figure 11.
The 2521 MOS shift registers are returned to —8 volts.
4. Signetics Data Book, C1974 pg. 2-87.
5. Fairchild Manual "MOS Integrated Circuits," C1974 pg. 5-17.

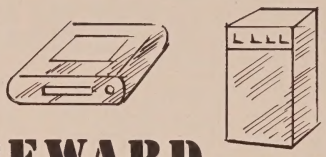
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**Phone Contest Story** *(from page 29)*

*anyone* work zones 34, 35, 36? . . . *HL9TB*. It was very hard to break through the JA "radio wall" to the Stateside; on the other hand, JA gave me lots of QSO points . . . *BV2B*. Finally got my 10 meter opening to Europe. 21 new countries! . . . *9V1SH*. Really enjoyed the contest, my first CQ WW DX Phone. Could have done better If I got my 3 el beam up, but beam was on the ground due to bad weather and storm out here. So have to try on the 19-year old folded dipole. Great difficulty copying during the daytime due to very bad splatter from a nearby B'cast station (less than ¼ mile away radiating 100 KW on 7250 kHz. I hope to try my best in the CQ CW 'test with my beam up . . . *9M2FK*. I hope my income tax is easier to complete than this log!! . . . *WA6LRG/KB6*. Pleased to QSO Paraguay after 35 years. Always a wonderful contest to take part in. One of the supreme joys of ham radio . . . *VK5MF*. Fantastic condx. Wrk 3 new ones. *VX9A* ans. my CQ . . . *VE3ECP*. Terrible line noise up to 10 over 9—stopped just B4 end of contest . . . *XJ3BMV*. Just dabbled for new countries this year. Last yr. operated from Fiji as *3D2DD*. Some difference! . . . *VE3EZM*. What happened to 40 m? . . . *VE2AYU*. No fun at all to get the logs to you in time with the mail strike in Canada. Trying to locate a friendly U.S.-bound stewardess to mail my logs from Boston . . . *VE1AIH*. Good contest as always—sure wish 10 m. had been open . . . *KL7IDH. 7P8AC* called me in one of my pileups. Africa tough from here . . . *KL7HCN*. Too big a pile-up on 21MHz. U.S. East coast stations breaking every moment when I tried to pick-up a W6 or W7 . . . *LX1BW*. One QSO every 5 minutes from *8R1G* operator, because there were 1000 calls everytime he called, Hi . . . *HB9ZE*. Operating from a temporary position in the living room with the kids playing around did not bring in a high score . . . *PAØTO*. 160 meter activity way down compared to last year. I think 160m should get a special multiplier to stimulate activity . . . *PAØHIP*. My first go at the phone contest . . . *9H1CH*. The special callsign increased my usual number of QSO's, but it was hard to understand by the people working me . . . *IV3VLS* (Opr. *I3PRK*). QRM, QRM, QRM on 80!!! . . . *I4ZSQ*. It's always the best contest . . . *I2TTL*. Fantastic discipline of JA's enabled HL, VR1, VS6 and DU stations through the pile-ups . . . *VZ0SRJ*. Big surprise when a YB in Indonesia came through 59 on 10 meters—an otherwise dead band . . . *LA5JS*. The USA Boys are very good operators . . . *SM7TV*. S 7 to 8 noise level from leaky insulator—fixed 2 days after contest . . . *VE4SN*. Very good condx. from Central Canada . . . never thought the bands could be so crowded. Like good old times . . . *VE4RP*. Rotator problems—rotobrake broke—pulled coax from balun—had to butcher balun from 40 m and install on TH6DXX—*3A0HF, FR8AH, VR1AA, JW5NM, 9H1DZ, HBØLL, 5B4ES*, all answered *my* CQ's . . . *XJ3GCO*. Lots of competition in VE3 (XJ3??) this yr. A pleasure to use long yagi for first time. My first contest since the ant farm was leveled in the Bermuda Contest . . . *VE3KZ*. Condx to Europe this year were unsurpassed. *VE7BWK/3* was wiping me out into Europe so I spent lot of time with W/K to make up . . . *XJ3EDC*. I am very glad, I could QSO 4 new countries . . . *JA2HLX*. May these good condx continue forever!! . . . *JR2FNL*. I wonder how many JA's send their results of the contest to you? I hear more than 300 stations in the contest every year . . . *JA1BII*. Cndx very poor on 28 MHz but we could QSO with *OH3X2* and *K6SEN* . . . *JH7KUP*. The propagation was especially beautiful to Europe. EU's coming through all the afternoon until the sunset. I appreciate this contest . . . *JH2IXQ*. This is my very first experience and felt interest! . . . *JR2HDS*. I am happy to play contest. *JA5PXG*. It seems that the propogation was very good compared with last year . . . *JG1UNF*. I am certainly pleasantly surprised that my peanut whistle is getting out much points for me . . . *JR1RWZ*. Happy New Year . . . *PY3CFP*. Tremendous operating experience . . . *PY2DOF*. I had no plans to work the contest but worked quite a lot of stations . . . after contest, I asked a friend to tell me how to do the log and where to send it . . . *PY2JY*. Although having worked with a limited schedule . . . I was lucky enough to work a few new prefixes & countries . . . *PY1FI*. In the midst of the contest had to relay emergency traffic (accident) where were the Europeans? QSO's on 1.8, 3.5 & 7 MHz ought to be worth more than 3 points . . . *CP1AT*. It's a great contest. Sleepiness overcame my willpower after 2400 GMT . . . *LU1ADI*. Had sked with *HL9TB* on 80 hrd him 5/7 but I had to transmit on a different freq . . . worked VK6 at the last minute but someone said 'Your watch is 3 mins. slow' . . . *LU2AFH*. Poor operating caused my low score—condx were fantastic. *KV4FZ* was a great help. During my stay at St. Croix next yr. it'll be different . . . *LU2DC/KV4*. Propagation very poor for long periods during contest, particularly Oct. 25. . . . *VK3ARY*. Last run into Europe just like JA's generally are . . . *VK5SM*. Thanks for a fine contest, but lucky condx were good that weekend. The two following weekends were very flat from here . . . *VK2CW*. Best October weekend and I had to miss it for your flaming Contest. At least I can count to ten in Japanese! . . .


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## Phone Contest Results
*(from page 32)*

**UO5OAK**
14 40,256 283 22 52
UO5GR 7 3,230 73 6 28

**Eu. Russia**
**UA3VAQ A 596,097 995 84 237**
**UA3DFK " 568,013 1,214 63 188**
**UA4NAA " 421,776 971 58 144**
UV3DN " 251,475 659 59 156
UW1AE " 190,082 494 59 143
UW3EQ " 156,023 423 58 159
UA6GL " 78,585 369 38 117
UA6JAD " 77,172 426 36 82
UA3TN " 72,048 324 43 115
UA3FT " 63,360 144 36 108
UA6LWI " 57,582 379 31 95
UA3ST " 52,644 308 31 76
UA4ZA " 49,005 271 37 84
UW6LC " 48,120 222 37 83
UV3FD " 45,150 261 39 66
UK3ABX " 32,554 224 19 63
UK3DBT " 30,096 216 23 65
UA3VCC " 17,794 201 15 47
UA3XAW " 14,910 170 16 55
UA3IAM " 13,860 81 27 43
UA3LAB " 13,350 86 25 50
UA4CO " 9,906 75 26 52
UV3CS " 9,513 101 21 42
UA4DL " 8,670 99 15 36
UA3DDF " 6,426 99 15 39
UW3RR " 5,704 65 20 42
UA6AJG " 4,200 62 13 37
UA3WZ " 520 23 7 13
**UA6LBC**
28 20,661 190 19 52
UA4WPF " 6,084 114 10 29
UA3TCH " 4,708 71 12 32
RA3DQP " 4,640 92 11 29
RA4HDE " 3,312 75 9 27
RA3AKX " 1,815 40 10 23
UA3DDV " 476 26 4 13
**UA1CS 21 205,683 739 31 80**
**UW3EH " 91,300 610 21 62**
UA3ERD " 52,614 323 22 57
UA36BU " 52,416 402 21 57
UA6BV " 42,240 378 21 59
UA6HBU " 33,418 252 19 43
UW6CV " 16,688 206 19 37
UA1QBE " 8,702 167 9 29
UW3TP " 4,104 66 12 24
**UA6DL 14 455,796 1,749 33 99**
UA3GM " 65,312 253 29 75
UA3GEA " 11,468 188 8 39
UW1AX " 1,856 34 12 20
UA3AAK " 1,352 44 7 19
UW3IN " 572 12 9 15
UA6RB " 486 12 8 10
**UA4UAZ**
3.8 10,879 219 9 33
UA6CQ " 4,544 119 6 26

**Ukraine**
**UB5WF A**
**2,016,483 2,224 94 299**
**UY5EG " 748,322 1,277 83 210**
UY5OO " 496,016 1,033 65 167
UB5AAF " 384,076 850 76 225
UB5VBY " 43,587 427 21 66
UB5LU " 41,736 249 31 80
UB5PS " 9,585 107 52 135
UB5ABJ " 6,708 113 14 38
UB5VAL " 3,713 43 16 31
UB5LAY " 1,820 35 10 25
UB5WAD " 1,080 39 7 20
**UB5VAZ**
28 14,310 216 15 38
UB5VAF " 7,788 171 11 33
UB5ABK " 4,752 108 10 26
UB5MET " 2,040 54 10 20
UB5DAE " 476 18 6 11
RB5IOV " 2 1 1 1
**UK5JAA**
21 143,350 633 33 89
UY5OQ " 51,340 431 18 50
UB5SJ " 30,450 248 19 56
UB5GBD " 18,531 134 21 50
UY5HF " 13,334 119 18 41
**UB5EC 14 400,862 1,175 36 118**
UK5WBG " 154,562 776 30 79
UY5HV " 72,150 410 29 82
UB5XY " 34,800 348 18 57
UB5OD " 23,184 151 23 61
UT5LY " 12,000 203 8 42
UK5AAA " 384 19 6 10
**UB5YAR**
3.8 9,576 245 7 31
UB5YBC " 6,016 176 6 26
UB5UBJ " 4,488 111 8 25
UK5YAR " 3,164 102 6 22
UB5CAT " 288 19 4 12

## OCEANIA

**American Phoenix Islands**
**WA6LRG/KB6**
**14 299,556 1,012 33 73**

**Australia**
**VK4UR A 242,951 672 40 87**
**VK4FH A 183,300 630 37 63**
VK5MF A 159,063 489 39 72
VK3ARY A 123,541 355 43 78
VK3SM A 42,016 141 35 66
VK2OW A 24,024 106 33 55
VK4PJ A 18,522 101 24 39
VK3VQ A 11,346 65 25 37
VK4UU A 7,943 57 16 31
VK6CT 21 468,309 1,427 29 82
VK4DO 14 18,428 104 24 44
VK5BS 14 3,900 38 13 26
VK5WO 14 2,352 30 11 17
**VK4LX 7 22,412 153 20 32**
**VK3XB 3.5 8,379 145 10 11**

**Gilbert Islands**
**VR1AA A 261,052 522 76 111**

**Guam. Mariana Islands**
**KG6JFY A 392,730 1,169 54 60**
KG6JAR 14 462 16 5 6

**Hawaii**
**KH6IJ A**
**1,334,236 2,395 76 112**
KH6ABF A 30,720 162 29 35
KH6IPY A 13,284 139 16 20
**KH6AHZ**
28 18,336 134 16 32
**KH6CKJ**
21 112,280 926 16 24
**KH6IJA 21 109,872 665 19 37**
**KH6IAC 14 328,776 1,355 29 55**
**KH6BZF 14 226,009 955 26 57**
**KH6GQW**
3.5 36,050 364 13 22

**Indonesia**
**YB0ABV A 212,984 464 55 103**

**Marshall Islands**
**KX6LQ A 126,854 380 47 72**

**New Hebrides**
**YJ8AN A 177,572 630 39 64**

**New Zealand**
**ZL1BKX A**
**1,074,674 1,453 80 174**
ZL1AGO A 402,270 856 61 104
ZL1TB A 8,478 59 19 35
**ZL2BCO 21 30,899 200 17 36**
ZL1AMM
21 17,346 145 13 29
**ZL1AAS 14 189,960 541 31 89**
**ZL1AMO**
3.5 48,384 295 21 35

## SOUTH AMERICA

**Argentina**
**LU2AFH A 771,390 1,009 88 182**
**LU7MAY " 725,109 1,103 81 150**
**LU8FEU 28 166,452 715 21 57**
LU7MAO
28 12 2 2 2
**LU4MBI 21 39,300 332 17 33**
LU8PM 21 25,772 259 13 21
LUIADI 14 3,218 48 17 17

**Bolivia**
**CP1AT A 150,824 431 55 81**

**Brazil**
**PY7AZO A 132,912 321 41 101**
PY2GNR A 85,085 228 46 97
PY1BAR " 67,973 239 30 71
PY1CHP " 67,322 283 32 50
PT2JB " 56,250 262 26 49
PY1FI " 52,593 171 46 95
PY2JY " 36,900 169 29 46
PY2OB " 23,650 89 35 51
PY2FXU " 10,045 75 22 27
PY1BOL " 2,059 25 12 17
**PY3BXW**
28 125,624 516 24 58
PY3CFP " 38,280 218 21 39
PY1NEW " 4,031 53 12 17
**PY2FMP 21 103,314 523 17 50**
**PY4BOC " 179,452 551 30 86**
PY2DLG 14 1,760 22 10 20
**PY2ELZ 7 20,592 145 18 34**
PY2DOF 7 2,884 42 12 16

**Chile**
**CE3EZ A 18,620 100 34 36**
**CE4EM 28 60,780 355 20 40**
**CE2MZ 14 39,900 247 21 49**

**Colombia**
**5J4AOY A 605,085 1,419 49 96**
HK6BRK " 16,259 84 29 42
**HK1CMX**
14 194,208 681 22 74
**5J4EB 1.8 460 16 5 5**

**Easter Island**
CEØAE 14 140 8 5 5

**Ecuador**
**K4ERO/HC1**
3.5 6,851 135 7 10

**Falkland Islands**
**VP8ON A 24,480 124 38 58**
VP8NX " 2 2 1 2

**French Guiana**
**FY7AK A**
**6,636,348 4,568 126 372**
(Opr. F5QQ)

**Peru**
**OA8V A 142,785 305 53 118**
**OA4VR 7 28,478 178 18 40**

**Trinidad & Tobago**
**9Y4NP A**
**1,000,692 1,530 58 170**

**Uruguay**
**CW3BR 14**
**1,104,872 2,285 37 130**
**CV4CR 28 668,624 1,745 30 101**
CX8BE " 271,353 1,063 22 65
**CX3BH 21 505,788 1,528 25 88**

**Venezuela**
**YV5ENI A 247,270 530 45 113**
YV5YL " 31,714 125 40 61
**YV4YC 21 436,008 1,339 25 86**
**YV2AMM**
14 608,069 1,404 35 114
YV1EJ " 25,263 151 20 43
YV5AK " 17,263 101 19 42
**4M4GD 7 55,704 209 19 47**
YV4EI " 27,652 160 18 44

## Multi-Operator Single Transmitter UNITED STATES

**WA1NZT 1,090,800 983 96 304**
**WA1STN 1,016,760 979 93 277**
W1MX 760,377 811 77 262
WA1QNF 156,800 300 54 146
**W2HPF 1,396,747 1109 104 347**
K2BMI 809,600 811 97 255
K2FL 461,760 553 81 231
W2YD 405,285 685 58 147
W2UI 185,730 341 65 140
K2GXT 59,782 268 46 96
**K3GJD 852,110 824 95 275**
W9SZR/3 685,308 814 70 229
K3BW 468,963 577 73 224
W3NX 317,746 420 71 215
K3AVT 308,264 448 69 179
K3RLE 238,005 414 62 153
**WA4LZR 1,004,350 940 95 284**
**W4YWX 907,060 795 99 319**
WA4BTC 809,756 771 99 289
WA4CTC 563,500 637 80 242
K4WAR 389,160 524 70 206
K4EBY 198,660 348 59 151
WB5EPY 323,323 470 73 174
WB5HVY 187,200 319 68 157
W5RRR 43,896 134 39 85
**W6ONV 1,660,390 1644 105 242**
W6PAA 1,091,860 1248 100 208
WB6KBK 706,260 807 99 217
WB6GFJ 464,196 791 67 135
W6KG 329,406 615 72 114
W6UA 256,080 350 78 186
**K3MNT/7 1,299,455 1543 95 198**
W7VRO 758,580 949 89 193
**K8YZW 628,140 764 79 211**
WB8LDH 252,216 389 74 174
WB8IAY 243,100 348 80 195
WB8QJL 53,500 170 30 89
**W9LT 997,040 859 109 331**
WA9PBK 621,112 669 90 253
WB9BWU 613,558 665 90 244
WA9IVL 478,629 573 79 232
K9KWK 73,899 173 52 109
**W0MYN 664,083 744 87 236**
WBØNHG 540,000 676 91 197
WØEEE 248,976 381 73 179
WØCIV 30,780 208 33 62

**Antigua**
**VP2A 1,521,036 2828 74 179**

**Bermuda**
**W4EV/VP9 860,034 1668 65 169**

**Canada**
**XJ3FFA 791,821 1285 64 178**
CY6AO 577,600 1600 55 105

**Guadeloupe**
**FGØMM 3,035,840 4405 87 233**

**Mexico**
**6D2MX 404,135 1347 53 78**

**Montserrat**
**VP2M 5,792,750 5344 122 371**

**Puerto Rico**
**KP4AXM 522,236 1471 56 110**

**St. Martin**
**PJ8YFQ 1,784,518 2482 79 223**

**Turks & Caicos**
**VP5WW 3,532,797 4592 86 247**

## AFRICA

**Canary Islands**
**EA8CR 4,673,005 3027 120 403**

**Liberia**
**5L2A 2,404,974 2843 84 202**

**South Africa**
ZS6ERB 65,448 304 23 49

## ASIA

**Japan**
**JA2YAB 1,225,708 1330 112 201**
JA9YBA 568,960 925 82 142
KA6YL 278,656 556 68 117
JA6YAP 101,053 263 57 82
JA1ZLO 54,000 182 48 60
JA3YCZ 40,356 195 34 42
JA2ZAP 10,972 80 27 25

**U.S.S.R.**
**UK9AAN 4,328,390 2774 129 416**
UK9QAA 352,152 713 53 148
UK9OAP 15,438 102 19 43
UK9CCE 2,516 29 12 22
**UKØAAB 1,064,887 1598 70 193**
UKØFAA 393,578 1287 59 99
UKØSAA 127,210 671 30 65
UKØCBE 88,666 582 31 55

## EUROPE

**Austria**
**OE7UU 754,570 1282 77 228**

**Belgium**
**ON5MP 558,782 1167 65 174**

**Bulgaria**
**LZ2KKZ 617,865 1722 61 182**
LZ1KDP 45,080 368 25 73
LZØBFR 8,928 166 9 39

**Czechoslovakia**
**OK3KAP 494,426 1004 63 170**
OK1KSO/P 441,090 873 74 160
OK1KCP 65,250 331 32 55
OK1KSL 38,864 303 27 85
OK1KRQ 7,638 132 13 44
OK3KFO 276 26 3 9

**England**
**G4DAA 2,728,028 2639 103 285**
**G3WYX 2,488,990 2579 98 272**
G3RCV 1,400,888 1776 85 243
G3RAC 1,108,978 1359 94 244
G8JC 838,662 1291 78 213
G5YC 718,788 1265 67 191
G3KMI 648,456 1306 69 177
G3UNU 90,147 388 40 111
G3EBH 76,024 277 36 100

**Federal Republic of Germany**
**DLØWU 4,208,312 3237 111 367**
DLØJK 1,449,249 1848 82 221
DLØKL 1,083,032 1359 88 243
DJØEK 926,590 1268 83 222
DLØUE 881,782 1292 82 216
DL8HA 789,225 1236 66 189
DL0IB 734,112 1046 79 209
DK9RM 411,215 968 53 154
DLØBW 131,250 472 49 126
DF5GV 21,567 166 22 69

**Finland**
**OH2BM 1,875,477 2085 111 290**
**OH6DX 1,731,840 1798 105 305**
OH4RH 1,155,736 1700 79 213
OH3EW 287,106 633 65 153

**France**
F6DWY 60,672 341 46 82

**German Democratic Republic**
**DM2DUK 2,632,372 2980 104 294**

**Hungary**
**HA3KMA 936,730 1527 82 249**
**HA5KFN/5 916,344 1387 78 234**
HA5KKV/7 542,912 1070 68 204
HAØKLE 469,504 1012 69 193
HA5KDQ 460,288 867 69 163
HA4KYH 327,096 730 61 137
HA9KOL 292,600 805 50 140
HA6KNI 246,480 675 52 156
HAØKDA 172,935 540 54 129
HA2KRB 150,060 443 53 152
HA3KHC 132,300 521 46 134
HA6KVB 89,509 483 30 103
HA9KOV 82,304 398 36 92

**Italy**
**I1DSG 1,914,525 2188 88 247**
I1KN 792,077 1106 86 233
I2VTB 527,250 901 67 183
I4JEK 375,550 1033 50 125
I4XZC 197,268 435 62 142

**I.U.**
**4UITU 525,770 1008 75 184**

**The Netherlands**
PI1PT 27,264 201 28 68

**Poland**
**SP6PZB 1,410,941 1729 89 264**
SP9KRT 298,960 917 49 153
SP6KDA 122,915 515 38 117
SP3GEM 1,479 17 8 21
SP2DVH 980 35 5 23
SP9KOT 966 46 5 16
SP3GUA 576 34 4 12

**Portugal**
**CT1OY 1,246,250 1758 80 212**

**Romania**
**YO8KAN 280,136 901 48 146**
**YO4KBJ 267,240 923 48 156**

**Scotland**
GM3ZRC 63,427 387 25 66

**Sweden**
**SM5AOE 1,575,798 1880 96 261**
**SK6AB 1,433,700 1990 88 236**
SK2AU 724,980 1137 75 206
SM5AZU 84,480 279 48 117

**Vatican**
**HV3SJ 1,836,590 2276 92 309**

**Yugoslavia**
**YZ3TDX 1,499,757 1938 89 268**
YZ1ABF 378,658 845 60 199
YU4EXA 221,628 574 61 192
YZ1FJK 27,264 180 28 68
YZ2CBM 16,544 118 31 57

**Wales**
**GW4ENT 1,450,086 2424 71 183**
GW3XNS 145,920 510 39 121

## OCEANIA

**New Zealand**
ZL1AA 30,208 190 26 38

## SOUTH AMERICA

**Brazil**
**PY1EMM 2,873,068 2916 93 241**
PY3AHS 1,172,037 1310 94 215

**Venezuela**
**4M7AA 243,815 597 51 92**

## U.S.S.R.

**Byelo Russia**
**UK2AAB 131,196 518 42 114**
UK2OAA 11,242 138 19 54

**Estonia**
**UK2RBA 325,972 916 56 171**
UK2TAB 4,788 89 12 26

**Georgia**
**UK6FAA 56,146 307 16 51**

**Kazakh**
**UK7LAH 1,034,556 1434 76 216**
UK7AAF 96,921 347 24 75
UK7LAF 43,688 173 26 60
UK7FAP 6,665 61 13 30

**Latvia**
**UK2GKW 729,652 1623 51 155**
UK2GAG 618,552 1217 63 179
UK2GJB 59,455 449 26 89

**Lithuania**
**UK2BAS 1,293,394 1648 85 264**
UK2PAF 835,068 1277 79 224
UK2PAT 171,444 709 45 137
UK2BAV 168,889 725 36 125
UK2PBK 60,536 503 23 77
UK2BAB 14,910 141 22 48

**Eu. Russia**
**UK6APA 3,705,171 3476 106 311**
**UK3AAO 2,998,526 2492 115 343**
**UK3ABB 2,654,520 2111 105 335**
UK3SAB 1,539,532 1979 87 241
UK6LAZ 1,485,306 1762 95 292
UK3AAC 1,316,658 1962 84 248
UK3ABO 557,514 1016 73 209
UK3QAA 502,250 1127 62 183
UK3QAE 397,404 1044 62 166
UK3WAC 354,960 1030 57 175
UK4WAB 333,465 825 57 158
UK3TBF 307,572 756 59 169
UK3AAI 252,150 667 60 145
UK3YAI 246,776 743 54 164
UK3ACM 221,774 591 55 162
UK3MAA 125,818 477 42 112
UK3EAA 81,871 410 38 101
UK4LAC 73,815 701 31 90
UK3DBA 70,087 463 29 80
UK1WAA 42,904 327 30 94
UK4AAA 35,552 227 30 71
UK6YAB 25,608 286 18 48
UK6LKP 24,929 210 22 75
UK6AAJ 23,680 247 23 57
UK4PAE 21,330 172 28 62
UK4YAN 20,075 194 21 63
UK3DCC 18,605 245 13 48
UK4PNZ 3,650 55 17 30

**Ukraine**
**UK5MAF 2,249,896 2480 108 299**
UK5IAA 818,059 1372 88 253
UK5QBE 414,932 1077 52 151
UK5MAG 290,304 1136 70 190
UK5WAZ 285,584 800 51 208
UK5EDB 221,364 752 38 118
UK5VAD 201,970 648 50 140
UK5IAI 108,378 322 54 108
UK5ZAK 64,260 416 31 88
UK5VAH 48,675 364 22 53
UK5EDQ 19,491 202 19 54
UK5LAS 11,872 169 17 39

## Multi-Op., Multi-Xmtr

## NORTH AMERICA

**W2PV 6,052,867 3578 143 486**
**W3AU 5,494,944 3055 140 489**
WA2ZAA 5,283,540 3163 130 466
**K6SEN 4,170,084 2855 143 378**
**WA8ZDF 4,108,115 2689 133 432**
W3WJD 4,082,784 2581 130 438
W3GPE 3,996,737 2544 130 433
**W4BVV 3,719,430 2350 129 456**
**WB5OOE 3,387,500 2246 127 415**
**VX9A 3,322,611 5109 77 202**
WB5DTX 3,293,472 2172 130 416
**W7SFA 2,888,704 2462 120 296**
W3FRY 2,424,246 1766 125 381
**Z/WW 2,410,752 4269 63 193**
W3BWZ 1,501,200 1201 110 340
WA3ATX 1,191,762 1019 100 329
WA5LES 1,154,554 988 110 327
W3DHM 988,002 876 90 303
K4CG 981,750 853 102 323
**H31KC 775,720 1573 67 153**
W4USN 726,948 722 91 290
K2CW/2 698,472 781 76 251
W4MII 583,968 692 88 228
W4QAW 562,520 590 87 256
LU1BAR/W3 510,080 611 86 234
K3TGM 301,665 429 65 190
WA4YBV 255,120 409 67 173
W3TV 193,404 325 54 159
W3FA 136,675 296 52 123

## EUROPE

**DLØPG 7,930,918 5535 134 483**
**DK2BI 6,059,119 4528 123 424**
DKØKX 4,479,037 3850 120 401
**OH1AA 4,371,132 3716 136 427**
DLØWW 4,204,565 3431 130 405
OH2AW 3,631,195 3451 114 371
**GB3MCG 3,123,128 3303 102 307**
**HB9H 2,101,440 2528 106 374**
SK5AA 742,000 1469 70 201
YZ2CBV 558,600 1177 67 218
DLØII 107,217 414 46 125

## OCEANIA

**KS6FF 2,249,304 3504 77 145**

## ASIA

**JA3YKC 1,241,229 1366 112 207**
JA1YFL 830,323 990 107 192
JA7YKR 681,600 1212 78 135
JH1YDT 581,120 890 87 143
JA6YTU 348,493 635 78 119
JA3YDS 147,968 397 52 84

## SOUTH AMERICA

**PJ1AA 6,989,316 5055 116 362**

Our deep thanks to the following stations who sent in check logs, and to those whose logs we solicited for checking purposes:

OZ7XU, SP9CXM, LA2SQ, SP9DLS, LA8BN, SM5UF, PA1GRE, SM5BNZ, HA5HR, SL5ZW, LA7ZN, LA2CQ, PAØLEG, SM7ASN, LA2ZR, YO9-8593/PH, SP9CSU, SP5JB, SP5IFU, SP4HCU, W/SK, W4ZT, WB5MSX, WA5NDV, W6CLM, WA9UCK, JA1-18987, VE3NE, DM-2BKH, DM2BYN, DM2BYO, DM2-CBB, DM2CMF/P, DM2COJ, DM-2CTF, DM2CWJ, DM2CZF, DM2-FBN, DM2FGN, DM2YLO, DM3RTG, DM3VUH, DM3YPE, DM-2703/A, OH5MJ, OH5YX, OH5ZP, OK1AJJ, OK1AMB, OK1ATO, OK1JH/P, OK1TA, OK3CAW, OK3CFA, W1YN, K2DT, K3DR, K2MFY, WA/ORP, W4JUK.

## STATION OPERATORS

### Multi-Operator Single-Transmitter

**CT1OY** & K7CBZ. **CY6AO:** CY6AGV, CY6GN, CY6CCB, CY6AVO, CY6AP, CY6ANO, CY6BK, CY6TK, CY6JD. CY6ASA, CY6CEC, CY6AMR, CY6AMU, CY6CFR, CY6CDA, CY6AYX. **XJ3AA:** VE3FFA & VE3ABG. **DL0WU:** DK4TP, DK5EZ, DJ4AX, DJ8SW. **DL0JK:** DK1DU, DK2XX, DK8ZK, DK8ZL, DF1FL, DF2FK. **DL0KL:** DJ2EH, DK7NM, DK6NN, DJ4BE, DK9NV, DK9NU. **DJ0EK** & DJ0BA. **DL0UE:** DL3LU, DJ5FW, DJ4GO, DK4OV, DK2SS, DL8RL. **DL8HA** & DL8CM, DL8CH, DL8FR. **DL0IB:** DF1SD, DF1SR, DF2SJ, DF2SR, DF4SN, DJ3SR, DJ0RQ, DJ0YI, DL1SE. **DK9RM** & DL3RJ, DL2RM, DK3RY. DL08W: DF3FB, DF3FD, DF2FJ. **DM2DUK** & DM2AYK. **EA8CR** & EA8LO, OH2MM. **F6DWY** & F6DXF. **FG0MM:** WA1JKJ, WA1JYY. **G3WYX** & G3HTA, G3RUV, G3TJW. **G4DAA:** G3FXB, G3MXJ, G3XBN, G3ZQW, G4BUE, G4BVH, G8KMQ. **G3RCV:** G3XMD, G3RZP, G3ZAY, G8KNW. **G3RAC:** G3XVR, G4BRK, G4ASV, G3ZZI, G8DMJ. **G8JC:** G3RMF, G3TOD, G3TOZ, G4BXS, G4CXM, G4DXD, G4DXE, G8JBU. **G5YC:** G5AQO, G8IPX, G4CEC, G4CEK, G8JQE, G8JON, G6VF, G3PAF. **G3KMI:** G3ZYW, G3WIE, G4AMI, G4CEN, G4AMH, G8KGG, G4DMY, G4ATU, G3ZER, G4DZC. **G3UNU:** G4BVY, G4DUA, GD8EXI, G8FXO, G8KDO, G8KYE, G8HNF. **G3EBH** & G3TGK. **GM3ZRC:** GM3HZN, GM3LRG, GM3LYI, GM3XNJ, GM4DGE. **GW4ENT:** GW3LDC, GW3NWS, GW4BLE. **GW3XNS** & GW3YFD. **HA3KMA:** HA3ME, HA3MG, HA3PG, Laszlo, Egon. **HA5KFN/5:** HA5HY, HA5GF, H5-513, H5-503, H5-504. **HA5KKC/7:** HA5MA, HA5MD, HA5MO. **HAØKLE:** HAØLO, HAØLZ, HAØMJ, HAØLJ, HAØ543. **HA5KDQ:** HA5KO, HA5HO, HA5FM. **HA4KYH:** HA4YL, HA4YO, Zoltan, Antal. **HA9KOL:** HA9OT, Geza, HA9PB. **HA6NKI:** HA6NN, Vegerti, Denesi, Tozer Gy, Szaboj. **HAØ. KDA:** HAØDI, HAØDV, HAØLK. **HA2KRB:** Dezso, Csaba. **HA3KHC:** Arpao, Ferenc. **HA6KVB:** Laszlo, Ferenc. **HA9KOV:** Istvan, Csaba. **HV3SJ:** DJ3HJ, JA4CBP, DF2GX. **I1DSG** & I1ANF, I1GUB, I1GJC, I1PCT, I1RBP, I1UW, I1VVZ. **I2VTB,** & I2OLW, I2ECV. **I1KN** & I1LBH, I1FNX. **I4JEK** & I4DZ, I4-NLO, I4MFA, I4BRC, I4YGG, I4MNY, I4MEY, I4CKM, I4XTD, I4ZRP. **I4XZC** & I4IJY, I4GZA, I4DLS. **JA2YAB:** JA2JW, JA2IYJ, JA2JSF. **KA6GYL** & KA6GRI. **JA6YAP:** Kondo, Tsutsumi, Sato, Watanabe. **JA9YBA:** JH1GUO, JH2FKX, JH2SGU, JA3VEN, JA9DZS, JA9FSU, JA9GGH, JA9DPR, JA9GLL, JA9GOE. **JA1ZLO:** Club. **JA3YCZ:** JA2UET, JH2FQW, JA3OGE, JA3XGF, JH3CFG, JA8JLT. **JA2ZAP:** Club. **KP4AXM:** K1OTI, WB2POJ, K1DPG, Grant McCartney. **LZ2KKZ:** Christo, Danko, Penkoen. **LZ1KDP:** LZ1-A-508, LZ2H57, LZ1F84. LZØBFR: LZ1CQ, LZ1KX, LZ1-E-198. **OE7UU** & OE3GSA, OE4SZW. **OH2BM** & OH2BCP. **OH6DX** & OH6JP, OH6JW, OH6KN, OH6KT, OH6UM. **OH4RH** & OH4RF. **OH3EW** & OH2CG, OH2BNP. **OK3KAP:** OK3TFN, OK3CWU, OK3TPV, OK3TFM. **OK1KSO:** OK1WT, OK1AMF, OK1JWA, OK1ADH, OK1SF. **OK1KCP:** Seti, Taclar. OK1-KSL: OK1AQ, OK1AHG, OK1FAF. **OK1KRQ:** OK1IDK, OK1AYQ. **OK3KFO:** OK3TFH, OK3TCY. **ON6MP** & ON6NL, PAØMJK, PAØEDN, PAØMPM. PI1PT: van Kessel, Saalbrink, Kokee, Klok, Bloem. **PJ8YFQ:** K4YFQ, WB4VVF. **PY1EMM:** PY1TC, PY1ZBJ PY1ZAE. PY7APS, F3TA. **PY3AHS** & PY3APH, Jacobus. **SM5AOE** & SM6BJI. **SK6AB:** SM2CUD, SM6AGR, SM6CZZ, SM6-ASB, SM7EAN. **SK2AU:** SM2DOS, SM2DYS, SM2BFL, SM2FQG. **SM5AZU** & SMØMC, SMØATN. **SP6PZB:** SP6FAF, SP6FIH. SP9KRT: SP9HMF, SP9FKQ, SP9ZW. **SP6KDA:** Club. **SP3GEM:** Club. **SP2DVH:** Club. SP9KOT: SP9ZW, SP3FYI. **SP3GUA:** Club. **UK9AAN:** UA9AN, UA9AEN, UV9AB, UW9BY, RA9AFC, UA9-165516, UL7-02671. **UK9QAA:** UA9RR, UA9-134-11, RA9QBE, RA9QAQ, UA9QAX, UK9OAD: UA9OAD, UA9ODW. **UK9CCE:** UA9EI, UA9-154-940.**UKØAAB:** UAØABY, UAØAEE, UAØ-103294, UAØ-10340, UAØ-103344, UAØ-10343. **UKØFAA:** UAØEH, UAØFBE, UAØFBA, UAØFBW, UAØ 153-69, UAØ 153-79. **LKØSAA:** UAØSCF, RAØSCO, UAØSBO. **UKØCBE:** Frolov, Turkin, Rubinshtein, Vlasov, Krivosheev. **VP2A:** WA2BCM, K2IGW. **VP2M:** VE7SV, K7JCA, VE7BD, W7EXM, VP2MF. **VP5WW:** WB4EYX, WB4-IAE. **W4EV/VP9** & WA1RFM. **WA1NZT** & K1YXK. **WA1STN** & WA1NNC. **W1MX:** WB2MZE, WA8WNU, WAØUCU. **WA1QNF** & WA1OCU. **W2HPF** & W2IIJ, WA2MBP, WA2UBM, WA3SWF. **K2BMI** & WB2RWY. WB2WID. **K2FL** & WA2POG, K3KNH. **W2YD** & WB2RKK, WA2UOO. **W2UI** & WA3KRD. **K2GXT:** WA3YBT, WA3YQE, WA2FQE. **K3GJD** & WA3VUQ, WA2KWB, WA3LQV, W3GHR. **W9SZR/3** & WB2EXK. **K3BW** & W3SS, K3JLK. **W3NX** & K3NEZ, W3DRD. **K3RLE** & WA3YHT. **WA4LZR:** W4LBT, W4LKG, WB4-HYN, WA4FCT, WB4JRM, WA4AZP, WB4OGW. **W4YWX** & W4BTZ, K4LRO. **WA4BTC** & WB4UZT. **WA4CTC** & WB4TPU. **K4WAR:** W6HGF, K7LSU, WB4GCL. **K4EBY** & K4LDR. WB5EPY & K5TSR. **WB5HVY** & WB5JWB, WA4BPK, WB5NSC, WB5NQS. **W5RRR:** W5LSZ, W5TFC. **W6ONV** & WA9-UCE. **W6PAA** & W6OWQ, WA6VEF, WB6AIN, KC6RS, OH1VR. **WB6KBK** & WA6PGB. **WB6GFJ** & WB6KRW, K6CQF, W6OAT. **W6KG** & W6DOD. **W6UA** & W6UM. **K3MNT/7** & WA1KKM, W5QQQ, WN7AGN, WA7TLK, WA7UQG. **W7VRO** & W7EKM, W7DQM, WA7ZWG. **K8YZW** & K8DVV. **WB8LDH** & W8LBM, WA8PPF, WB8RXN, WA8ILQ, WA1DXS, WB8DFK, W8CNL. **WB8-IAY** & WA8LWX, W8MTZ, BobVLG. WB8QJL & WB8HSF, WB8HNB, WB8-RMD. **W9LT** & WB9KTA, K9UF, K9UWA. **WA9PBK** & W9UDK, W9DOB, WB9NDP, WB9PUL, WA9LGT. **WB9BWU** & WA8RXM, WB9BJR, WA9AIB. **WA9IVL** & W9MLG, WA9JCO, WA9LZA. **K9KWK** & WA9FWY. **WØMYN** & WBØCMM, WBØHBS, WØMS. **WBØNHG** & WBØLEX, WBØHAD. **WØEEE:** WBØGQP, WB9FAT, Miller, Mery. **WØCIV:** WBØMHL, WBØKFM, WBØCQL, WAØUSW, KØYVI. **YO8KAN:** YO8ME, YO8MI, YO8GV, YO8AGZ, YO4KBJ: YO4WU, YO4CT. **YZ3TDX:** YZ3BU, YZ3EY. **YU4EXA** & YU1DIQ, YU1OIF, YZ4RS6633. **YZ1FJK:** Club. **YZ2CBM:** Grubisic, Koljatic. **ZL1AA:** ZL1ACG, ZL1ATX, ZL1TB. YZ1ABF: YU1OBH, YU1OBK, YU1OET, YU1OFJ, YU1NTG. 4U1ITU: K4IIF, OH2KH. **4M7AA:** Club. **ZS6ERB:** ZS6BNB, ZS6AJA, ZS6VA. **5LZA** & 5LZFT. **6D2MX:** XE2MX, W6DQX, WA6GLD. **UR2AAB:** Vlad, AI & Lenja. **UK2OAA:** Club. **UK2RBA:** UR2REN, UR2REO, UR2RDI, UR2FAB: Endel, Tonis, Margis, **UK6FAA:** UF601274, UF6FCO, UF601254. **UK7LAH:** UL7LEZ, UL7026133, UL7026177, UL7026233, RL7LAH. **UK7AAF:** Club. **UK7LAF:** UL7LBM, UL7026091, UL7026203. **UK7FAP:** UL7FAF, UL7FAE, AL702780. **UR2GKW:** UQ2ON, UQ2PJ, UQ2GBJ, UQ2OC. **UK2GAG:** Alex, Val, Alex, UK2GJB: UQ2MU, UQ2OP, UQ203791. **UK2BAS:** UP2PAJ, UP2-PAQ, UP2038609. **UK2PAF:** UP2BCI, UP2BCR, UP2PAQ, UP2PAV. **UK2-PAT:** UP2BSW, UP2BCQ, UP2BCT. **UK2BAV:** UP2NC, UP2MC, Jonas, Kestas. **UK2PBK:** UP2BCQ, UP20381518. **UK2BAB:** UP2BAF, UP2BBF, UP2CG, UP2038214. **UK6APA:** UA6APW, UA6101081, UA6APP, UA6ARD. **UK2AAO:** UV3CC, UA3147-19, UA3142303, UA3EAI, UA6150363, UA3ADM. **UK3ABB:** UW3BO, UV3CO, UW3FI. **UR3SAB:** UA3SCR, UA3SF, UA3SAQ, UA3151117, UA315125. **UK6LAZ:** UB50731024, UA6150262, UA6101152, UB5073470. **UK3AAC:** UA3HK, UA3AAH, UA9154139, RA3ACE, VA3AGX. **UK3ABO:** Club. **UK3QAA:** UA3QCR, UA3QAQ, UA3QDW. **UA3QAE:** UA3GO, UA3GBW, UA3GBJ, UA3QAX, UA3QDC, UA3RH. **UK3WAC:** Club. **UK4WAB:** Boris, Vlad, Gene. **UK3TBF:** Club. **UK3AAI:** Club. **UK3YAI:** Yuri, Alex, Nick. **UK3ACM:** Andrey, Andrey, Boris. **UK3MAA:** Club. **UK3EAA:** UA3EAL, UA3147146, UA3147115. **UK4LAC:** Yury, Harry. **UK3DBA:** UA3142141, UA3142531. **UK1WAA:** Boris, Igor, Oleg. **UK4AAA:** UW4AK, UA4156366, UA4156296. **UK6YAB:** UA610210, UA610280, UA6YAS. **UK6LKP:** UA6LLT, UA6150331, UA6150330. **UK6AAJ:** UA61011055, UA6101945, UA6101720. **UR4PAE:** Victor, Vlad, Mike. **UK4YAN:** UA4YAW, UA4YAL, UA409791. **UR3DCC:** UA3DBR, UA3DFT, UA3142370. **UK4PNZ:** Germ, Vlad. **UK5MAF:** UY5LK, UA6HZ, UB505922, UB5MDC, UB5MAK, UB5MCD. **UK5IAA:** Vlad, Valery, Valery. **UK5QBE:** Club. **UK5MAG:** UB5059610, UB5059611, UB50-5924. **UR5WAZ:** UB5068227, UB5WCW, UB5068398. **UK5EDB:** Vitaly, Vlad, Yury. **UK5VAD:** UB5VAO, UB5VBM, UB5VAI. **UK5IAI:** UA6LAC, UT-5AL, UB5073912. **UK5ZAK:** UB5ZAW, UB5ZAL, UB5069150. **UK5VAH:** Club. **UK5EDQ:** Club. **UK5LAS:** Club.

### Multi-Operator, Multi-Transmitter

**DK2BI:** DK5WL, DK5WM, DK5WN, DK6WA, DK6WL, DK9WB, DC2WM. **DKØKX:** DJ1FG, DJ4PT, DJ6KA, DJ7YP, DK1AG, DK1QH, DK3RG, DK4QT, DK6QA, DK6QO, DK8BH, DK9QB, DL8OH, DL8QE. **DL0II:** DJ2YE, DJ5PE, DJ4TJ. **DL0PG:** DK2QL, DK3BJ, DJ9IE, DJ5KY, DJ9TQ, DK1QV, DK1FW, DJ1FC, DK7QC. **DL0WW:** DA2BD, DJ4OQ, DJ5NR, DK7FO, DK3ZC, DL3ZA, DL6NK, DL6OE, DB2FZ, DC6CK, DC6FF, DC6VD, DC8DE. **GB3MCG:** G3UKS, G4AYL, G3WGN, G3YPW, G3SJK, G3VCT, G4CDZ, G3RYV. **H3IKO:** HP1KC, HP1AC, HP1PM, HP1TS. **HB9H:** HB9LG, HB9AEB, HB9AGC, HB9AIB, HB9AIG, HB9AJM, HB9ALM, HB9ALX, HB9AQS, HB9AL, HB9BCD. **JA1YFL:** JR1GVZ, JE1TSD, JF1SMV, JG1CVR, JH2KKW, JA4JBT, JR6GD, JA0JCJ, JH1VSL, JH2NXZ, JF1HKX, **JH1YDT:** JH1BBT, JH1GNU, JH1AGH, JR1BSM, JH1KLA, JR1EYB, JR1FNR, JR1FVK. **JA3YDS:** JA3UOQ, JH3DDJ, JH3HRW, JR3PYW, JA4KPJ, JA9EBA, JA9FOR, JA9GLT, JA9OZG. **JA3YKC:** JA2VUP, JA3LDH, JA3ODC, JA3QJD, JA3REU, JA3RZN, JA3TRO, JA3UHW, JA3UPK, JH3AIU, JH3BBQ, JH3FZB, JH3GLP, JH3HBI, JH3-KWQ, JH3LIJ, JH3NYM, JH3PLE, JH3VES, JR3BVX, JR3WLK, JE3JBI, JE3KKC, JA5GZB. **JA6YTU:** JA6PEZ, JA6AD, JA6RCB, JA6QET, JH6AKT, JA6AAB, JA6BPA, JA6RLM, JA6BSM, JA6SVP, JA6QW, JA6ERR. **JA7YRR:** JA7CFB, JA7CLN, JA7CLX, JA7CXV. **K2CW/2** & W2LSX, K2BPP, K2JAO, K2JQR, W2BCU, WA3BNF, WB2BYW, W2FHN. **K3TGM:** WA3VVI. **K4CG:** K3WUW, WB8EAS, WB4BQX. **K6SEN:** W6PVB, WB6YBL, WB6PXP, K6BCE, K6SVL, W6BHY, K6SSN, WB6OLD. **KS6FF:** KS6DV, ZL1BTU, WS6FG, KS6FN. **LU1BAR/W3:** WA3UTA, KØCMF, LU2DX/W3. **OH1AA:** OH1NH, OH1NK, OH1NM, OH1LW, OH1IW, OH1SS, OH1SY, OH1XB, OH1ZK, OH1MD, OH1TV OH2FS, OH3NB, OH3ZC, OH6QY. **OH2AW:** OH2BR, OH2BAD, OH2BBM, OH2BCV, OH2BFS, OH2BGA, OH2BIA, OH2BMV, OH2BPB, OH2BPJ, OH2BPN, OH2EO, OH2KA, OH2VB, OH5XL. **PJ1AA:** PJ2ARL, PJ2BT, PJ2CL, PJ2CR, PJ2CW, PJ2DB, PJ2JW, PJ2MP, PJ2YD, PJ3BB, PJ9EE. **SK5AA:** SM5EUU, SM5FUG, SM5ELP, SM5FQS, SM5FYA, SM5FGU, SM5GRG, SM5FLO, SM5BVS, SM5FEX, SM5EDX, SM5FDD, SM5BFJ, SM5ACQ. **VX9A:** VE3MJ, VE3MR, VE3GMT, VE3IAA. **W2PV:** WA1ABV, W1GNC, W1GQO, WA1KID, K1OME, K1ZND, WA2AYC, WB2-OEU, WA2SPL. **WA2ZAA:** K2GL, W1GYE, K2KUR, K6SSS, W2SKE, K2UYG, W2GUH/0, W1HFB, K2BQO, WB2SQN, WA2DHF, W2GLM. **W3AU** & W3ZKH, K3EST, W3ADT, WA3AMH. W3IN, CX1EK/W4, W3AZO, WB2-JYM, WA3TAI. **W3BWZ:** K4CFB, W6AXX, WA3AFQ, WA3KSQ, WA3NGS, WN3ANE. **W3DHM:** WA3JLT. **W3FA:** WA3ABC, W3GZO, K3URZ. **W3FRY:** K3HTZ, K3DZB, W3KFK, WA3LNM, WA3RID, WA3JYB, WN3ZLU. WN3-ZLV. **W3GPE:** K3CY, K3OIO. K3WIV. WA3GUL. WA3PHQ, WA3WIM, W3GM, W3GHM. WN3VYD. TI2ICC. **W3TV:** W3AOH, W3VW, K3GL. **W3WJD:** K3YUA. WA3LRO, W3BGN, W3DQG. **WA3ATX:** W5SCO, WA3COJ. **W4BVV:** K3ZNV, K4GKD, K5CIT, K6UA, KØDDA. WA3UHO, WB4BGV, WB4MRI, W3BOV, W4OCW. **W4MII:** WB2QHB. K5WTA. **W4OAW:** W4RVE, K4GTS. **W4USN:** W4DM. W4EZ. WA4JVO. **WA4YBV:** WB4GON, WB4GHF, WB4BAB. **WA5LES:** K5LZO. K5BGB, K5KYU. WB8FUO. WA5WCT, WA5ZNY. **WB5-DTX:** WA5UCT, W5BJA, W5ZSX, WB5OFP, K6MQG, WB5EEE, W5QWF. **WB5OOE:** WA5JMK. WR4JFZ/5. WB5IZN. W5TMN, K5KSI, WA5QXD, WB5KVM. WA5WWH. **W7SFA:** VE7ZZ/W7. K7HTZ. WA7OTT, CR6SM/W7, W7APN, W6BXO. WA7MEO. **WA8ZDF:** K3HZL. WA3GJU, W3GXF, K8HLR, K8IDE. K8EHU. K8RMK. II4OI. WA8IUN, WA8VMO. WA8RWU, WA8YVR, WA8TBQ, W8KFL, WN8RIJ. **YZ2CBV:** YZ2RTG, YZ2RKE. **ZF1WW:** K3DPQ, K3JGI.

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### QRP *(from page 50)*

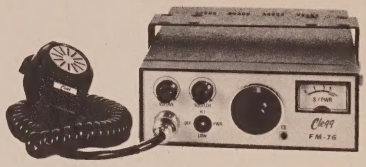
off the sides. Gain has not been measured, but judging from comparison with a dipole for receiving, it should be conservatively 4db. The small pieces of wood at both ends of the elements (see picture) support wire elements for 15 meters. Spacing is rather wide for optimum 15 meter operation, but it seems that the predictable gain is realized despite the use of #18 copper wire elements. A separate feedline and matching balun is used, and tuning procedures are the same as noted above for 20 meters. And the antenna really works on both bands. The first station that I called with the new beam on 20 meters was UA1PAA—I got him and had a solid ten minute QSO. That's not too impressive until you learn that I was running 700 miliwatts output at the time! That was my first QRPp DX and what a thrill! Over 20 countries have been worked with the minirig so far. I've really been bitten by the DX bug and gone QRO to four watts. The list stands at 54 countries now and WAC. And during a past SS contest, I racked up 27 QSO's in one hour—with 700 milliwatts. As far as stateside work is concerned, I'm thinking seriously of dropping to the 100 milliwatt level—it's too easy with 700 milliwatts and this beam. All I can say is that for about $9.00 and an afternoon's work, I've been working stations that I never dreamed of working with QRPp before. What's more, the antenna has held up beautifully under 60 mph gusting winds. And on top of that, this antenna is

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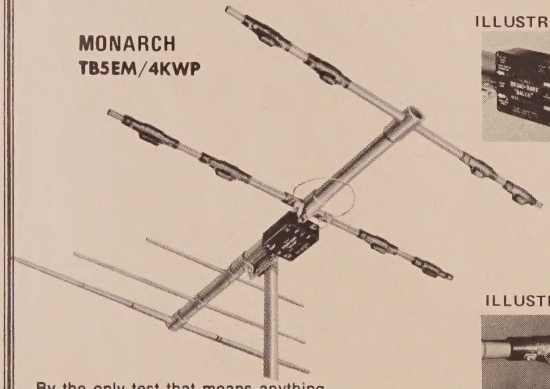


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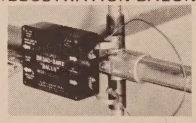
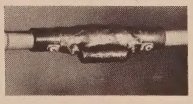


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beautiful—it looks like some huge prehistorical eagle landing on my mast with wings outstretched. If you are looking for a cheap, dependable, and effective antenna, this could be it.

73, Ade, K8EEG/Ø

**Novice** *(from page 50)*

(Novice) and Element 3 (General, Conditional, and Technician) class written exams; so look for new License Manuals incorporating the new material shortly. The new study guides suggest the areas the student should study, rather than listing many sample questions, without changing the scope of the exams to any appreciable extent.

We will be looking for your News and Views, suggestions, entries for our Photo Contestant any other material of interest to the young of heart. Send all mail to: Herbert S. Brier, W9EGQ, Novice Editor, CQ Magazine, 409 S. 14 St., Chesterton, Ind. 46304.

**Antennas** *(from page 48)*

"It is the new Swan SWR-3 Pocket s.w.r. meter," I said. "Good for a kilowatt below 21 MHz, and 500 watts up to 30 MHz. It is rated to 55 MHz."

Pendergast reached for a screwdriver and started to remove the case.

"You don't have to remove the cover. The schematic is very simple (fig. 8). It is an uncomplicated version of the strip-line s.w.r. device, made up on a printed circuit board. Basically, it is composed of two directional couplers, back to back. One coupler is used for forward readings, and the other for reverse readings. The basic design was described several years ago in *QST* magazine."

"That looks like just the instrument for Field Day," exclaimed Pendergast as he removed the cover and peered into the little box. After a moment, he replaced the cover.

"I'll drop down to *Friendly Bob's Place* and pick one up. There's not much left in amateur radio that you can get for ten bucks." He paused as he headed for the shack door.

"What do you think about the Sunspot Cycle?" he asked. "When is it starting to go up?"

"Well," I replied, "My uneducated guess is that we will see the sunspot count starting up in August, 1976. I won't know until some time after that date that I have guessed right, but I'll make a modest wager that August will be the turning point. But conditions won't magically improve right after that. But by fall of 1977, I would

think that things would be on the upswing, especially on 15 meters."

"How about 10 meters?" asked my friend.

"Maybe spring of 1978. That will give you plenty of time to get that new 10 meter beam working."

Pendergast smiled. "10 meters is my favorite band. Plenty of newly-licensed amateurs have never experienced the great DX days on 10 meters at the peak of the last sunspot cycle. They will have a big surprise and thrill in store for them."

"And what about the 11 meter CB band?" I asked. "What do you think will happen to *that* when the sunspot count goes up?"

Pendergast shuddered. "I remember it about 10 years ago when there were fewer CBers than there are now. It was a madhouse then. I can't imagine how horrible it will be in a few years. I hope some of the smart, savvy CBers will become amateurs before that unhappy time arrives." ■

**In Focus** *(from page 53)*

not being able to adjust their non-existent diaphragms!

Faster films like Kodak Tri-X Pan and Polaroid's 107 require some means of reducing the amount of light flux reaching the film.

I'll discuss exposure control for these films, film speeds, and further info on close-up lenses in upcoming columns. In the meantime, go ahead and TRY SOMETHING!

### *Worthwhile Photographic Book*

If there are any professional photographers out there among you slow scanners — or advanced amateur photographers, Kodak has a new book out called *Kodak Professional Photoguide.* It is also called *Kodak Publication R-28,* sells for about $8.50, and believe me, it's worth twice the price! It contains every kind of data you could possibly wish for in all phases of B&W and color photography. It covers Films, Exposure, Filters, Flash, Camera Lenses and Perspective, and even contains a sample gray scale and a color chart, plus eight built-in circular slide rule calculators.

### *Free Trip To Naples?*

Naples, Florida, that is, where Bob Weinig, K4FZ holds forth. I'm sure that not only the equipment but the fine cabinet space available will be the envy of everyone seeing the picture (fig. 5) of Bob's beautifully equipped "shack"! As you can see in the other photo (fig. 6) Bob has engineered a nifty system for televising flat copy material. The three curio picture lights used to illuminate the copy are controlled by a solid state dimmer.

Incidentally, Bob's "menu board" has vertical angle pieces forming slots into which cards 8 inches wide are slipped. The camera track consists of two ½ inch aluminum angles. The camera rolls back and forth on plastic wheels.

Every time I work K4FZ, he's trying something new. Always seeking ways to create more interesting pictures. His latest project is a system for projecting slides onto a translucent screen between the camera and the slide projector. Sounds great Bob, send us some more pictures!

### *Any More SWV's Out There?*

From Uxbridge, Mass. comes a neat card signed by Bill Smith who is a non-ham SSTV viewer. Bill's well-equipped set-up includes a Robot 70A monitor, Drake R4C and SPR-4 receivers, and, a two-element beam at 70 feet! Although Bill describes himself as a short wave listener, I have a feeling that he's a ham at heart. Come on Bill, find someone to help you get a ticket, we need you!

### *News And Views From Europe*

Looking for an OK contact? Josef Psota, of Kosice, is one of Czechoslovakia's active slow scanners. Josef builds all of his own equipment. His homebrewed transceiver uses 30 transistors and 7 tubes. He pumps 75 watts into a dipole suspended 40 meters off the ground between two buildings.

Take a look at fig. 7 showing Josef's homebrewed camera. A very neat job in all respects. The camera circuitry uses 23 transistors. Yes, his monitor is homebrewed too! Thanks to Mike Ludkiewicz, W1DGJ, for the photo and info on OK3ZAS's gear.

From Denmark, an oldie but goodie to wind up this month's column. It was a long time ago that T. I. Pedersen, OZ4IP sent me the accompanying picture (fig. 8) of his "mobile station", but I still get a kick out of it. I hope you will too!

### *Final-Final*

Please keep those letters and pictures coming my way. They are what make this column interesting for your friends around the World, they DO want to know what you're doing even if the band conditions are poor most of the time. As it says in the call-books, W2DD lives at 2112 Turk Hill Road, Fairport, N.Y. 14450.

73, Bill, W2DD


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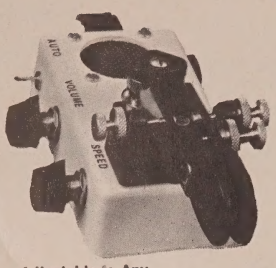
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## DX *(from page 58)*

**PY0PO**—To PY7PO
**ST2AY**—c/o K3RLY
**SU1IM and SU1MI**—Via Ibrahim Ibr, Mohd., 7 Roda Street, Cairo, Egypt
**SV0WZ**—To OE3NH
**TA1ZB**—c/o W5QPX, 101 Rita Blanca Trail, Amarillo, TX 79108
**TU2GA**—Via K9KXA
**VE1ASJ/XJ1**—To K1RQF
**VP2EEI**—c/o K1LPA
**VP2KN**—For contacts after Jan. 1, 1976, via W7OK
**VP2MEO**—To VE3CZV
**VP2MOC**—c/o K2JOC, 130 W. Central, Moorestown, N.J. 08055
**VP2SV**—Via K3GYD
**VP2VAN**—To K2FJ
**VQ9DF**—c/o ON6FN
**VR4DX**—Via SM6CVZ
**VR8D**—To JA0CUV/1, Box 22, Mitaka, Tokyo 181, Japan
**VS9MB**—c/o G3KDB
**YB1HF & YB1AR**—P.O. Box 314, Bandung, Indonesia
**YS1GMB**—Via W3HNK
**YU1ZWA/5U7**—To I1HAG
**ZB2CJ**—c/o G3ATU
**ZD8TM**—Via W3KT, NOT via W3KTW
**ZK2AQ**—For WPX Contest period, March, 1976, QSL to Bill Rindone, WB7ABK
**ZL3LN/C**—To ZL4BA
**3D2KG**—c/o YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
**5X5NK**—Via DL1YW
**8P6HN**—To W0OIR
**9L1BH**—c/o SM3CXS
**9L3JM**—Via W4BAA
**9M6MA**—To JA1KLT
**9M8HB**—c/o HB9XJ

73, John, K4IIF

## Contest Calendar *(from page 61)*

**Scoring:** One point per QSO and one point for each QTC reported.

**Multiplier:** For non-Europeans, number of EU stations worked on each band. Europeans will use the ARRL list and call areas as follows: JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9/UA0. In addition the multiplier on 3.5 may be multiplied by 4, on 7 MHz by 3, and on 14/21/28 by 2.

**Final Score:** Total QSO points, plus QTC points, times the sum total multiplier from all bands.

**QTC Traffic:** Additional QSO points may be realized by reporting a QTC. This is a report of a QSO you have made earlier in the contest and later sent back to a European station.

The general idea being that after a number of EU stations have been worked a list of these can be reported back to another EU station. One point may be earned for each QSO reported. A QTC can only be sent from a non-European to a European station.

A QTC contains the time, call and QSO number of the station being reported. i.e.: 1300/DK2BI/134. This means that at 1300 GMT you worked DK2BI and received his number 134. It may be reported only once and not back to the originating station.

A maximum of 10 QTC's to the same station are permitted, and the same station worked several times to complete this quota. Only the original contact has QSO point value.

Keep a uniform list of QTC's sent. QTC 3/7 indicates that this is the 3rd series and that 7 QSO's are now being reported.

**Awards:** Certificates to the highest scoring stations in each country and call areas listed in the multiplier. Continental leaders and stations have at least half the score of the continental leaders will also be awarded.

**Disqualification:** Violation of the rules of the contest, or unsportsmanship conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification. Decision of the Committee is final.

It is suggested that you use the official log and summary forms. A s.a.s.e. with sufficient IRC's to the DARC will get you a supply. (W/K and VE stations can send their request to WA3KWD, Hartwin E. Weiss, 323 North Street, Millersburg, PA 17061 or to W1WY. Figure 40 contacts to the page if you make your own, and use a separate sheet for each band.

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone. To the DARC Contest Committee, D-895 Kaufbeuren, P.O. Box 262, West Germany.

### *European Country List*

C31 — CT1 — CT2 — DL, DM — EA — EA6 — EI — F — FC — G — GC Guer — GC Jer — GD — GI — GM — GM Shetland — GW — HA — HB9 — HBO — HV — I — IS — IT — JW Baer — JW — JX — LA — LX — LZ — M1 — OE — OH — OHO — OJO — OK — ON — OY — OZ — PA — SM — SV — SV Crete — SV Rhodes — TA1 — TF — UA1346 — UA2 — UB5 — UC2 — UO5 — UN1 — UP 2 — UQ2 — UR2 — UA Franz Josef Land — YO — YU — ZA — ZB2 — 3A — 4U1 — 9H1.

## Propagation *(from page 63)*

| | | | | |
|---|---|---|---|---|
| Far East | 14-16 (1)<br>20-23 (1) | 07-10 (2)<br>10-13 (1)<br>21-23 (1)<br>23-00 (2)<br>00-02 (3)<br>02-04 (2)<br>04-07 (1) | 02-03 (1)<br>03-04 (2)<br>04-05 (3)<br>05-06 (2)<br>06-07 (1) | 03-06 (1) |
| South Pacific & New Zealand | 13-15 (1)<br>15-17 (2)<br>17-19 (3)<br>19-20 (2)<br>20-21 (1) | 02-07 (1)<br>07-10 (2)<br>10-16 (1)<br>16-18 (2)<br>18-19 (3)<br>19-22 (4)<br>00-02 (2) | 23-01 (1)<br>01-02 (2)<br>02-06 (3)<br>06-07 (2)<br>07-08 (1) | 00-02 (1)<br>02-06 (2)<br>06-07 (1)<br>02-05 (1)* |
| Australasia | 15-18 (1)<br>18-21 (2)<br>21-22 (1) | 19-21 (1)<br>21-22 (2)<br>22-00 (3)<br>00-01 (2)<br>01-07 (1)<br>07-09 (2)<br>09-13 (1)<br>13-15 (2)<br>15-16 (1) | 00-01 (1)<br>01-04 (2)<br>04-06 (3)<br>06-07 (2)<br>07-08 (1) | 02-05 (1)<br>05-06 (2)<br>06-07 (1)<br>04-06 (1)* |
| Caribbean, Central America & Northern Countries of South America | 15-18 (1)**<br>10-13 (1)<br>13-15 (2)<br>15-18 (3)<br>18-19 (2)<br>19-20 (1) | 06-07 (1)<br>07-10 (3)<br>10-15 (2)<br>15-18 (3)<br>18-21 (4)<br>21-22 (3)<br>22-23 (2)<br>23-02 (1) | 19-21 (1)<br>21-22 (2)<br>22-03 (3)<br>03-05 (2)<br>05-06 (1) | 20-21 (1)<br>21-03 (2)<br>03-05 (1)<br>23-04 (1)* |
| Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay | 12-16 (1)**<br>10-12 (1)<br>12-13 (2)<br>13-15 (3)<br>15-17 (2)<br>17-18 (1) | 05-07 (1)<br>07-09 (2)<br>09-15 (1)<br>15-17 (2)<br>17-18 (3)<br>18-19 (4)<br>19-20 (3)<br>20-22 (2)<br>22-00 (1) | 20-21 (1)<br>21-23 (2)<br>23-01 (1)<br>01-03 (2)<br>03-04 (1) | 22-03 (1)<br>00-02 (1)* |
| McMurdo Sound, Antarctica | 16-18 (1) | 17-20 (1)<br>20-23 (2)<br>23-01 (1)<br>07-09 (1) | 21-23 (1)<br>02-03 (1)<br>03-06 (2)<br>06-07 (1) | 04-06 (1) |

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Government Surplus Communication Equipment. If you haven't received our new catalog write for free copy today! Wayne Russell, 9410 Walhampton, Louisville Ky. 40222.

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COLLINS 62S-1 Mint $895. Dick Shideler, 3731 Evergreen Visalia, Ca. 93277.

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FOR SALE: Heath HW-202 W/Xtals, $170, Heath HW-16 W/Xtals, $80, Hallicrafters SR46A W/Xtals $40. Martha Fanning, 2150 Goebbert 210, Arlington Hgts. IL 60005.

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MOTOROLA 30-50 MC desk top monitor receiver very nice $30., G.E. mobile 30-50 mc monitor 4er6d very clean $20. W. Davis, 2255 Alexander Ave., Los Osos, Ca. 93402.

HT-37 mint $150.00 SX101A $150.00 Ranger $75.00, HQ 110C $75.00 SASE for list. John Maver 1049 W. Holliston Ave. Pasadena Ca. 91104.

WANT: TS 700 and 2 Meter Final for cash. Sell Argonaut W/PS and 405 Final $300.00 or trade for VHF gear. (305)842-4744. S.E. Fason, 2800 Ocean Dr. 22 8-8, Rivera Island, FL 33404.

WANTED: SB-102 CW filter. Sell HP-13A DC Supply $39.00. K3FOD, P.J. Serafinas, 925 Coleridge Rd., Baltimore, Md. 21229.

WANTED: All Band Xcvr. Age unimportant but must be bargain, primarily for c.w. use. W4UMPY, Box 917, Augusta, Ga. 30903.

WANTED: Teenage book series "Rick Brant Science Adventures" by John Blaine. D. Sloan 218 W. 20 Ave. Vancouver, B.C. Canada.

WANTED: Type 3AP5 or any other 3 inch cathode rav tube with a P5 phospher. Also a 1stedition copy of CQ's "The RTTY Handbook" (about 1958 or 59) LeTourneau WB0CTE, 2338 E. South Ave., No. St. Paul MN 55109.

SELL: Old ham magazines and books (some 1st editions). Swap? Johnson, 1410 Teresa, Largo, FL 33540 or 813-584-0355.

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

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MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO, issues at 20 cents each (including USA shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

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

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WANTED: Model 28 ASR or KSR. State condition, price etc. All letters answered. Bill Johnston, 1808 Pomona Dr. Las Cruces, NM 88001.

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WANTED: Heath 2 meter transceiver with crystals in good condx. Tom Dorneack, 2515 College, Downers Grove, IL 60515.

WANTED: Heath Electronic thermometer in good conx. Tom Dornback, K9MKX, 2515 College Rd. Downers Grove, IL 60515.

FIRST ANNUAL ELMIRA HAMFEST, Sept. 25, For details, write WA2SMM, 320 W. Ave., Elmira, N.Y. 14904.

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VIKING CHALLENGER Xmter 80-10 and 11 $35. Gonset G.66p. Rcvr. with Power supply $35. WB/VNR (213)346-5871.

FOR SALE: SB-220 Filament transformer, brand new. $40.00 plus postage. Alex Desmeules, VE2AFC, P.O. Box 382, Quebec 4, Que. G1R4R2 Canada.

SWAP QST, CQ, HR, 73. Personal and club collections. My need/spares list for yours and/or SASE. Want SW-3 bottom plate and coils. Bob May, Box 30, Jonesboro, Tn. 37659.

MOD TCS-4 Radio Equip. Type COL-52245 Transmitter with pwr cable and schemetic, 1944 vintage, SASE for info or First $35. M.O. plus $5. for shipping gets it. W5OBB, 1701 Westside Dr., Sherman, Tx. 75090.

WANTED: Quality gen-coverage receiver - Ameco all band preamplifier, Hammarlund HC10 Slices. P.K. Outlaw, Rte. 1 Box 60, Bethune, SC 29009.

CLEGG 22er AM tx out board FM mod A1 $165.00 WA2CMO N.J. (609-693-8754.

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

TRIPOLE New! 80-6 plus 160 antenna! 80 to 120 feet. Guaranteed. $54.95 kit. Sase for information. Universal Radio Co. Dept C2, Box 26041, El Paso, TX 79926.

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LOOKING for used gear? Buyers and Sellers radio brokerage has the equipment you want at the prices you want to pay. Call our HAM GEAR HOTLINE: 617-536-8777, Weekdays 9-5 EST.

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

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

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

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

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

"HAMFEST" - July 25, Stark County Fair Grounds, Canton, Oh. Call 216-455-4449 or write WA8SHP, Box 3 Sandyville, Oh. 44671 for information.

FOR SALE: Brand new Swan-160X complete with 117XC power supply-speaker combination. Never plugged in. $500 or best offer. W0MEK, Pisek, ND 58273. 701-284-6291.

BUY-SELL-TRADE. Write for free mailer, Give name address, call letters, complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, Etc. SSB & FM. Associated Radio 8012 Conser, Overland Park, Ks. 66204 913-381-5901.

WYOMING RANCH LAND. Wild Horses, antalope, deer, elk. 10 acres $30 down, $30 month. Owner - K6ICS, Mike Gauthier, 9550Q Gallatin, Downey, Ca. 90240.

WANTED small prop pitch motor. Will pay cash or trade large prop pitch motor. Call collect to Al Hart 313-585-0600.

TS520 Never Used with CW filter and external VFO. AC only $675. Heath desk microphone mint $400. Linear $175. W6TC 415-584-4649.

WANTED: Specs, Schematic Diagrams for Zenith Model B835R Table AM & FM Radio. S.L. Ballinger, WN2BSS, 102 Garden St. Poughkeepsie, N.Y. 12601.

WANT: Riders Vol. 23. SX88 SX73. H.E. Parr Clifton Hill, MO 65422.

NEED manual or schematic for Receiver R-105A/ARR-15. A.J. Mony, Rt. 2, Douglasville, GA 30135.

WANTED: Murch Ultimate Transmatch. Must be in at least mint condition. Michael Povman 147-04 75 Ave. Flushing, N.Y. 11367.

COLLINS 75S1 with Waters Notch Filter, 32S1 with 516F2 Power Supply $750. Wanted - Triex or Aeromotor Tower. F.P. Heinemann, Brockway Landing, Lyme Ct. 06371.

TWO OLD RADIOS: Freshman Masterpiece and Motorola International Short Wave. Sell only to collector and one who can come see. John, WB9OEQ, 6050 North Oakley, Chicago IL 60659.

WANTED: SB-102 C.W. Filter, Sell HP-13A DC Supply. $40. Lamplin 105-B Freq. mtr. $75.00, P.J. Serafinas, 925 Coleridge Rd. Baltimore, Md. 21229.

WANTED: Extra Heavy Duty Antenna Rotor. Ed Lubowicki, 543 Middlesex Ave., Metuchen N.J. 08840.

GONSET COMMUNICATOR III - 6 meters w/xtals $69. Homebrew Pwr Supply Heathkit SB 101 etc, $20. Above plus shipping. WB5FDT Bob Via, 6827 Spring Hurst, San Antonio, TX 78249.

RADIO AND ELECTRONIC Collector Magazine. Collectors of antique radio and related items, please note. Subscriptions $2.50 per year, trial 3 issues $1.00. RAECM, 2374 Queenston Rd., Cleveland Heights, OH 44118

NO DX QSLs? Try ham sentences in 54 languages on your card. It works! K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy. Riverdale, MD 20840.

WANT 250th's preferable Eimac unused with ribbed anodes. Also want a copy of Keen's "Wireless Direction Finding" in good condition, and a cipy of sixth edition NAB Handbook. Paul Rockwell, W3AFM, 5800 Hillburne Way, Chevy Chase, Md. 20015.

FOR SALE: as set, KWS-1, 75A4, SC-101 Control 68Y-1 Antenna Selector Unit. $800. C.A. Gobs, Rt. 1 Box 85B, Leesburg, Va. 22075.

FOR SALE: QST/73/CQ/HR SASE for list. E.D. Guimares Jr., RFD 2 Box 480 Middleboro, MA 02346.

WANTED: Quality gen-coverage receiver, Hammarlund HC 10 slicer- Ameco tunable preamplifier. P.K. Outlaw, Rt. 1 Box 60. Bethume, S.C. 29009.

SELL: 3600-0-3600 volt 1 amp plate xfmr with 110/220 primary $40. Want: Johnson 250 W Matchbox, Vacuum Variables: 1500 pf, 2000 pf. Paul Bittner, 304 W. 17th St., Grand Island, NE 68801.

WANTED: Collins 30L1 Linear. Galaxy V Mark 2 Transceiver. Ralph Sieloff, RD 2, Lagrangeville, N.Y. 12540.

SORENSON model OSB6-15 DC power supply 5 to 9 volts @ 15 amps. Brand new, with schematic. Cost over $400, sale priced at $175.00. G. Alfred Dodds, P.O. Box 25, Brunswick, OH 44212.

GOVERNMENT SURPLUS Communications equipment. If you haven't received our new catalog, write for your free copy, now! Colonel Wayne D. Russell, 9410 Walhampton, Louisville, Ky. 40222.

SWAP: Three VHF-ARC-5 xmtrs 50, 144, 220 mHz w/pwr supply-modulator for what-have-you? R. Voelker-WA2PCL, 101-23 Lefferts Blvd. Richmond Hill, NY 11419.

WANTED: Ranger, Navigator, AF67 or SF68. John H. Guthrie, W3SJL, St. Marys, Pa. 15857.

## Announcements *(from page 12)*

quirements of fossil fuel for New England. For further information contact: Toward Tomorrow Fair, 200 Hills House North, University of Massachusetts, Amherst, MA 01002, 413-545-0474.

● **Traverse City, MI** — The Cherryland Amateur Radio Club will award an attractive certificate during the Centenial year of 1976, to any Amateur Station that works the Club Station WB8VKB, or uses our club repeater WR8AEN, or who works five of our Cherryland Radio Club Members, July 4th to the 10th. Rules are simple. To receive a Certificate simply confirm your QSO with your QSL card, along with a stamped 8½ by 11 envelope and enclose 50 cents to W8GI, Box 141,Kingsley, MI 49649.

● **Honolulu HI** — The Honolulu Amateur Radio Club will hold its Hamfest/Swapmeet on July 3 and 4 at the Kaimuki High School, 2707 Kaimuki Ave., Honolulu between the hours of 0800 AM and 3 PM. Charges per stall will be $2.00. Activities include a Hidden Transmitter Hunt. Registration is $1.00 per vehicle. The HARC Bicentennial Dinner will be held at the Flamingo Chuckwagon Restaurant, 1015 Kapiolani Blvd. Activities include displays and prizes. Cost per person is $10.00. For additional information and participation write George Stillman, P.O. Box 7111, Honolulu, HA 96821.

● **Charleston, SC** — The Charles Towne Hamfest will be held at the Gaillard Municipal Auditorium on July 11th. Registration is $2.00 which includes a door prize ticket. Activities include an indoor fleamarket, displays, homebrew contest, cw copying contest, historic tours, and a special program on the Marconi Wells Fleet Wireless Station. Saturday activities include QCWA, MARS, S.C. SSB Net Banquet, and a hidden xmtr hunt. Motel accomodations available at reduced rates - reservations urged. Talk in on 34/94 and 3915. For further information write Charles Towne Hamfest, Box 4555, Charleston, S.C. 29405.

● **Cary NC** — The Fourth annual Midsummer Swapfest will be sponsored by the Cary Amateur Radio Club, Saturday July 17, 9:00 AM thru 3.00 PM, at the Lion's Club Shelter. Registration and informal buying/selling/swapping/eyeballing/relaxing 9:00 - 11:30. Registration $1.50. Dealers welcome. Talk in on 146.28/88 146.04/64, 146.52. Info, SASE to: CARC, Box 53, Cary, NC 27511.

● **Swampscott, MA** — The Federation of Eastern Massachusetts Amateur Radio Associations are now requesting nominations for the "Ham of the Year" award. Only amateurs in the first call district are eligible and the winner will be selected by who has performed an outstanding public service. Nominating letters should include the candidate's name and a complete description of the service performed. Letters shall be sent to the Chairman of the FEMARA Awards Committee, 28 Forest Ave. Swampscott, Ma. 01907.

● **Alpine, TX** — Stolen from Dick Ellis, W5YCK, 104 West Avenue A. Alpine, Texas 79830, one Heath HW 202, Series 00316 Transceiver. Modified: BNC Antenna Connector, Scanner with LEDs over top (extra) barswitch. Three switches to left not connected. Right switch turns scanner on/off. Wires were cut at back panel. Phone: 915-837-3728

## Our Readers Say *(from page 7)*

to the trend we've seen in the mechanics magazines just before the amateur radio publications.

One of your letter writers offered that he would rather see the handicapped articles elsewhere than in *CQ*. I guess his meaning was as you took it, but my first impression was that he'd like to see more notice taken on that topic in other places as well, not just here. Oh, well; maybe I'd just as soon have repeater articles limited to *Ham Radio*. That's the only major amateur publication I don't subscribe to. I'm a low band man myself, but 2M FM is a part of today's ham radio, and it's what makes my own local club, Egyptian RC in Granite City, IL, the fireball outfit that it is. There must be room for all of us; and if I can help a 2 meter Tech. while another ham can help the handicapped, maybe we've both done more to serve than just stand and wait.

H. Church, WØKXP
Lebanon, IL

### Heisseluft Erratum

Editor, *CQ*:

What a wonderful job you did of publishing my latest work! The layout of the April article is well done, and contributes to the ease with which the reader can study the material.

Unfortunately, small but significant errors appear in Figure 3. Not only were the lables on the ordinates interchanged, but so too were the words "cold" and "warm". Also, the (A) is missing from the top figure.

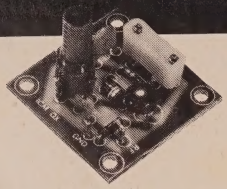
Emil Heisseluft
Grossmaul-an Der Conau , Austria

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

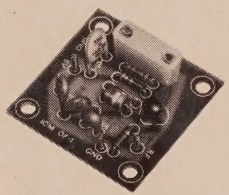
# for the experimenter!

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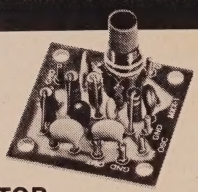


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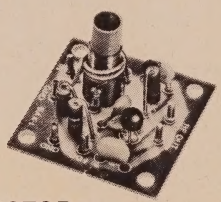


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(HC 6/U HOLDER)

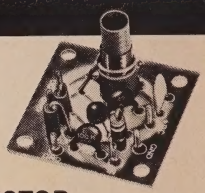
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|---|---|
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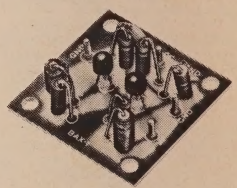
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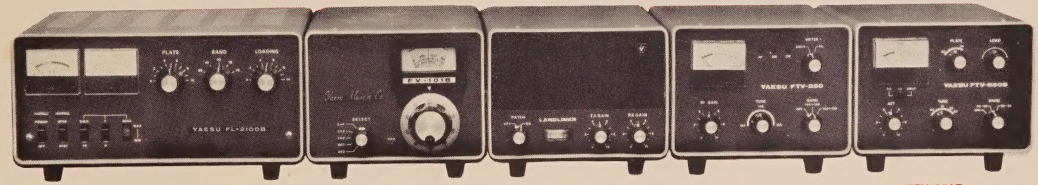

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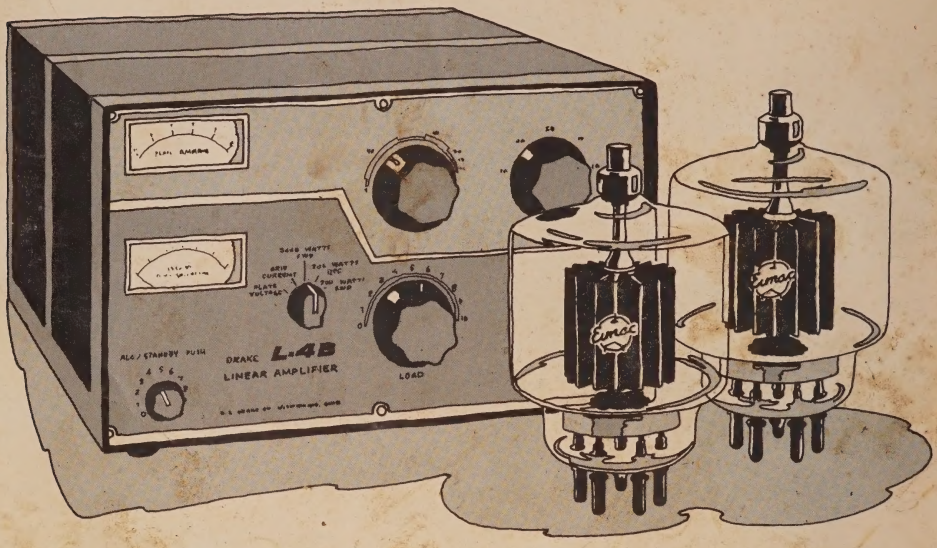
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