Amateur Radio

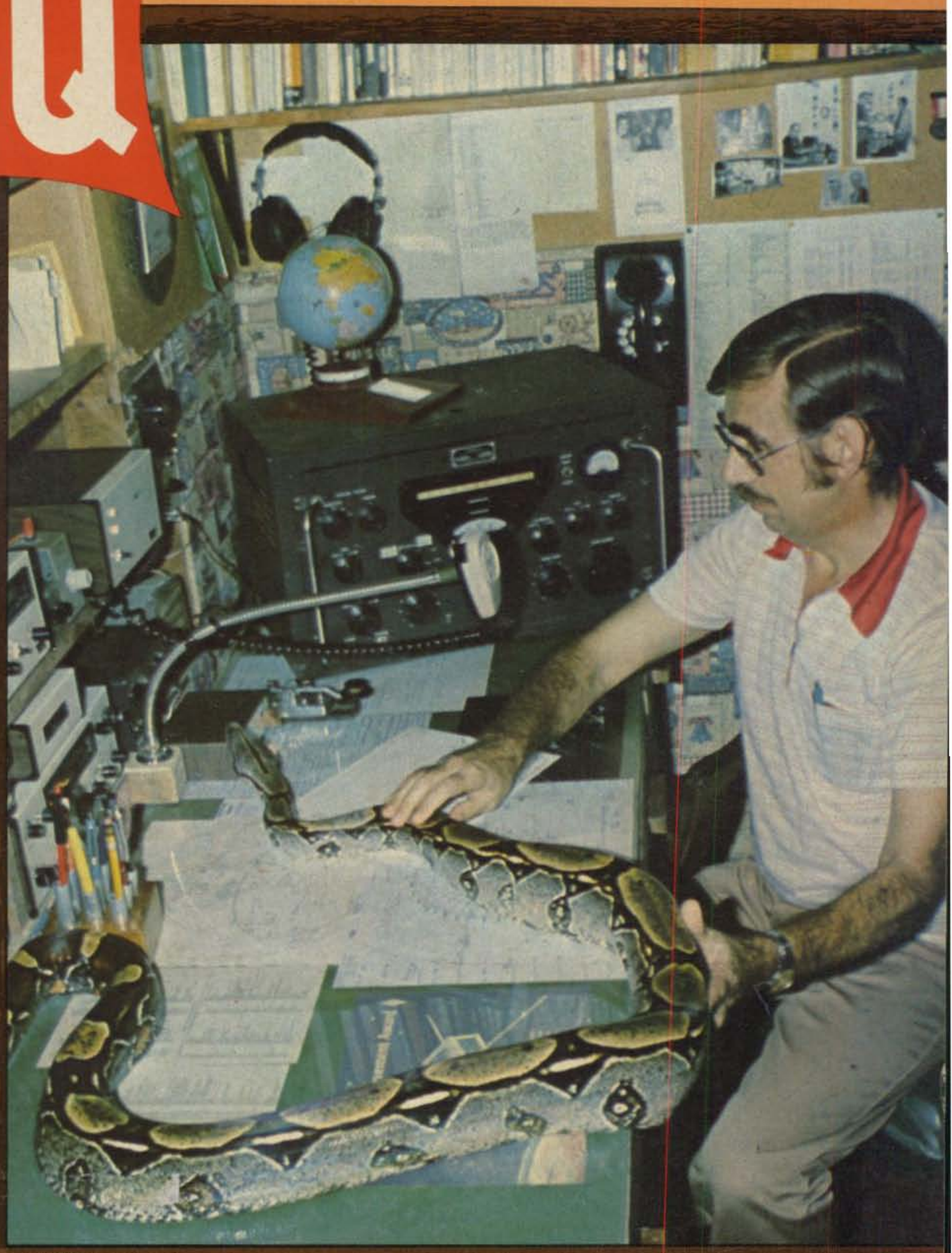
ICD 08240

Our 33rd year in amateur radio.

April 1977

$1.25

CQ



Jungle DX with only 5 watts power.

Read OA8V's Exciting story on page 16.

The Radio Amateur's Journal

TS-520

As a TS-520 owner, you go on the air with a sense of pride and confidence. Thousands of these precision-built beauties are in operation all over the world . . . in ham shacks, field day sites, in DX and contest stations and in countless mobile installations. No other rig has ever offered the performance, dependability, versatility and value that is built into every KENWOOD TS-520.

It lets you go on the air almost anyplace with its built-in 110/220 VAC and 12 VDC power supply. The TS-520 employs two rugged, time-proven S-2001 (equivalent 6146A) final tubes which are known for long life and superb linearity.

You have certainly heard the TS-520's clean signal on the air and have probably heard a lot of glowing praise by other hams. So if you don't already own a 520, maybe it's time that you did.

TV-506 Subject to FCC certification **TV-502** **VFO-520** **TS-520** **SP-520**

TS-520 Specifications

MODES: USB, LSB, CW
POWER: 200 watts PEP input on SSB, 160 watts DC input on CW
ANTENNA IMPEDANCE: 50-75 Ohms, unbalanced
CARRIER SUPRESSION: Better than −45dB
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 S-2001, 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.

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.

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.

TV-502

The TV-502 transverter puts you on 2-meters the easy way. Simply plug it in and you're on the air. Operates in the 144.0-145.7 MHz frequency range with a 145.0-146.0 MHz option. The TV-502 is completely compatible with the TS-520, the TS-820 and most any HF transceiver.

TV-506

The TV-506 is similar to the TV-502 except that it opens up the 6-meter band to your HF rig. It operates in the 50.0-54.0 MHz frequency range for full coverage.

TRIO-KENWOOD COMMUNICATIONS INC. 116 EAST ALONDRA/GARDENA, CA 90248

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PLUGS BETWEEN YOUR MICROPHONE AND TRANSMITTER

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LSP-520BX. 30 db dynamic range IC log amp and 3 active filters give clean audio. RF protected. 9 V battery. 3 conductor, ¼" phone jacks for input and output. 2-3/16 x 3-1/4 x 4 inches.

$59.95

LSP-520BX II. Same as LSP-520BX but in a beautiful 2-1/8 x 3-5/8 x 5-9/16 inch Ten-Tec enclosure with uncommitted 4 pin Mic jack, output cable, rotary function switch.

SUPER LOGARITHMIC SPEECH PROCESSOR

Up To 400% More RF Power is yours with this plug-in unit. Simply plug the MFJ Super Logarithmic Speech Processor between your microphone and transmitter and your voice is suddenly transformed from a whisper to a **Dynamic Output.**

Your signal is full of punch with power to slice through QRM and you go from barely readable to "solid copy OM".

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CWF-2BX Super CW Filter

By far the leader. Over 5000 in use. Razor sharp selectivity. 80 Hz bandwidth, extremely steep skirts. No ringing. Plugs between receiver and phones or connect between audio stage for speaker operation.

• Selectable BW: 80, 110, 180 Hz • 60 dB down one octave from center freq. of 750 Hz for 80 Hz BW • Reduces noise 15 dB • 9 V battery • 2-3/16 x 3-1/4 x 4 in. • CWF-2PC, wired PC board, $18.95 • CWF-2PCK, kit PC board $15.95

$49.95

CMOS-8043 Electronic Keyer

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

• Built-in Key • Dot memory • Iambic operation with external squeeze key • 8 to 50 WPM • Sidetone and speaker • Speed, volume, tone, weight controls • Ultra reliable solid state keying ±300 volts max. • 4 position switch for TUNE, OFF, ON, SIDETONE OFF • Uses 4 penlight cells • 2-3/16 x 3-1/4 x 4 inches

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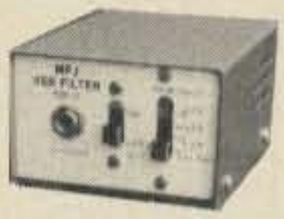
NEW

MFJ-16010 Antenna Tuner

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

• Small enough to carry in your hip pocket, 2-3/16 x 3-1/4 x 4 inches • Matches low and high impedances by interchanging input and output • SO-239 coaxial connectors • Unique wide range, high performance, 12 position tapped inductor. Uses two stacked toroid cores



$29.95

SBF-2BX SSB Filter

Dramatically improves readability.

• Optimizes your audio to reduce sideband splatter, remove low and high pitched QRM, hiss, static crashes, background noise, 60 and 120 Hz hum • Reduces fatique during contest, DX, and ragchewing • Plugs between phones and receiver or connect between audio stage for speaker operation • Selectable bandwidth IC active audio filter • Uses 9 volt battery • 2-3/16 x 3-1/4 x 4 inches

$27.95

MFJ-200BX Frequency Standard

Provides strong, precise markers every 100, 50, or 25 KHz well into VHF region.

• Exclusive circuitry suppresses all unwanted markers • Markers are **gated** for positive identification. CMOS IC's with transistor output. • No direct connection necessary • Uses 9 volt battery • Adjustable trimmer for zero beating to WWV • Switch selects 100, 50, 25 KHz or OFF • 2-3/16 x 3-1/4 x 4 inches

$49.95

MFJ-1030BX Receiver Preselector

Clearly copy weak unreadable signals (increases signal 3 to 5 "S" units).

• More than 20 dB low noise gain • Separate input and output tuning controls give maximum gain and RF selectivity to significantly reject out-of-band signals and reduce image responses • Dual gate MOS FET for low noise, strong signal handling abilities • Completely stable • Optimized for 10 thru 30 MHz • 9 V battery • 2-1/8 x 3-5/8 x 5-9/16 inches

$27.95

MFJ-40T QRP Transmitter

Work the world with 5 watts on 40 Meter CW.

• No tuning • Matches 50 ohm load • Clean output with low harmonic content • Power amplifier transistor protected against burnout • Switch selects 3 crystals or VFO input • 12 VDC • 2-3/16 x 3-1/4 x 4 inches

MFJ-40V, Companion VFO $27.95
MFJ-12DC, IC Regulated Power Supply, 1 amp, 12 VDC $27.95

$15.95

NEW

CPO-555 Code Oscillator

For the Newcomer to learn the Morse code.
For the Old Timer to polish his fist.
For the Code Instructor to teach his classes.

• Send crisp clear code with plenty of volume for classroom use • Self contained speaker, volume, tone controls, aluminum cabinet • 9 V battery • Top quality U.S. construction • Uses 555 IC timer • 2-3/16 x 3-1/4 x 4 inches

TK-555, Optional Telegraph Key $1.95

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73, Martin F. Jue, K5FLU

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TR-2200A

A 2-METER STATION THAT GOES WHERE YOU GO

The high performance portable 2-meter FM transceiver endowed with Kenwood's characteristic high level of quality. The TR-2200A provides superior performance for the active outdoorsman . . . portable, mobile or airborne . . . pleasure or emergency. 12 channel capacity (6 supplied). Built-in telescoping antenna can be easily replaced by a "rubber duck" antenna (RA-1 option). Connection for external antenna. External 12 VDC or internal ni-cad batteries. Battery-saving "light off" position. Hi-Lo power switch (2 watts-400 mW). Everything you need is included: batteries, charger, carrying case and microphone. Or mount it in your car as a mobile rig using an MB-1A mounting bracket (option).

TR-7400A

Featuring Kenwood's New and Unique CONTINUOUS TONE CODED SQUELCH SYSTEM • 4 MHz BAND COVERAGE • 25 WATT OUTPUT • FULLY SYNTHESIZED, 800 CHANNELS

Outstanding sensitivity, large-sized helical resonators with High Q to minimize undesirable out-of-band interference, and a 2-pole 10 7 MHz monolithic crystal filter combine to give your TR-7400A outstanding receiver performance
This compact 6 2 pound package measures only 7-3/16" wide, 10-5/8" deep, and 2-7/8" high and is designed to give you the kind of performance specifications you've always wanted to see in a 2-meter amateur rig. High performance specifications of: Intermodulation characteristics (Better than 66dB), spurious (Better than −60dB), image rejection (Better than −70dB), and a versatile squelch system make the TR-7400A tops in its class.

TRIO-KENWOOD COMMUNICATIONS INC. 116 EAST ALONDRA/GARDENA, CA 90248

KENWOOD
...pacesetter in amateur radio

APRIL, 1977 VOL. 33, NO. 4

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200

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Zero Bias

Our cover shot and topic of our lead story this month is about Paul Wyse, OA8V. Not being a Herpetologist or snake maven I really couldn't say what kind of snake it is that Paul is touching so gingerly. They both appear to be listening intently, trying to pick out some exotic call perhaps or just comparing notes on how to load up the rig. It's hard to tell from this shot how thrilled Paul is to have all of this extra help but he does seem intent on keeping our reptilian friend on the operating desk and off of his lap. Of course I'm surmising all of this from the photo but that's what makes this picture so interesting. I wrote to Paul asking for details but the info didn't arrive as this issue was completed. Anyway it seems Paul and the snake like each other and perhaps the snake can be brought in to "squeeze" those last few milliwatts out of the QRPp rig.

Well the calendar has come around full circle and April marks my first anniversary as Editor of *CQ*. The traditional gift for a first anniversary is something made of paper and to celebrate the event or just mark the rapid pace of *CQ's* production schedule, my office is inundated with scraps of paper. It's been a very full year and those of you who have seen me at various hamventions may have noticed my beard and hair taking on a whiter tinge.

This year has produced some decidedly marked changes in *CQ* from simple face changes to a change of printer and at long last having a magazine on schedule. The last of the older issues to be produced was the January issue and from what I have heard most of you got your February and March issues way before the January issue arrived. This was especially painful as February had Part II of Bill DeWitt's "Slow Scan Television, Overview '77" in it and many if not all of you would have to read it out of sequence. It's a good series and answers many of the questions you have been asking. Part III, the concluding part is in this issue.

I regret that I haven't had more time to answer letters or to acknowledge much of the material received here. This is the goal I have set for my second year. Due to the pressure of constantly generating a magazine, many of the formal aspects will change. This month we added Chris Kelly to our staff and she has been busy updating all of our records, handling contest logs and digging into a huge pile of correspondence. We also plan to add another person to the staff this year to help with the technical editing. Anyone out there tempted to get in on "the exciting world of publishing" can send in their resume.

One face change that has met with many favorable comments has been the addition of the words "Amateur Radio" in big bold letters at the top of the cover. That's what we're about and our stock in trade. The letters and phone calls indicate that you share in the pride of being an amateur and recognize this as a means of attracting many newcomers (via the newsstands) to pick up *CQ* and read about what amateur radio has to offer.

Another change we've instituted recently is a short one line description of what's being covered in each of our monthly columns. We have taken out the drawings of the columnists (and made them all happy) in favor of a simpler heading. Again this is a move to make the first time reader or even an old

(continued on page 70)

the TEMPO 2020

...an accepted and proven performer

- Phase lock-loop (PLL) oscillator circuit minimizes unwanted spurious responses.
- Hybrid Digital Frequency Presentation.
- Advanced Solid-state design...only 3 tubes.
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- Fixed channel crystal control on two available positions.
- RF Attenuator.
- Adjustable ALC action.
- Phone patch in and out jacks.
- Separate PTT jack for foot switch.
- Built-in speaker.
- The TEMPO 2020...$759.00.
- Model 8120 external speaker...$29.95. Model 8010 remote VFO...$139.00.

Send for descriptive information on this fine new transceiver, or on the time proven Tempo ONE transceiver which continues to offer reliable, low cost performance.

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Prices subject to change without notice.

Announcing

• **Las Cruces, NM** — THE MESILLA VALLEY RADIO CLUB will sponser the Whitney's Bean Feed and Swap—Fest on Sunday, April 24th, at 10:00 am. Located near Las Cruces, New Mexico at La Mesa with talk—ins on 16—76, 04—64 and 3940 KC. Fun for all the family with big prizes, plenty of food and the usual beverage truck. All included for $5.00 for adults $1.75 for kid tickerts. Eat, drink and win a prize with Whitney, K5ECQ as host. Free overnight parking at grounds so come for a spell. All correspondence should be made with Thomas B. Rapkoch Jr., 640 W. Las Cruces, New Mexico 88001

• **Dayton, OH** — The 8th Annual FM B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 29, 1977, at the Dayton Biltmore Towers (hotel), Main at First Streets, from 8 pm until midnight. Admission is free to all hams and their friends. Sandwiches, beverages, snacks, and C.O.D. bar will be available. A live floor show will be presented by TV personality Rob Reider (WA8GFF) and his group and will be followed at 11pm by a fabulous prize drawing featuring an ICOM IC—245 and many others. See you where the action is! Dayton, OH

As a suggestion for publicity, it might be helpful to notify and request the aid of local politians in planning your hamfest as in the announcement below.

• **Flushing, NY** — On Saturday, Jan. 29th, Donald Manes, Queens Bourough President, proclaimed that day as "Queens Amateur Radio Day". Mr. Manes issued the Proclaimation at the Hall of Science Museum, located at 111th Street and 48th Avenue, Flushing Meadow Park, Queens. Mr. Wallace West, Executive director of the Museum and Jim Jaffe, WA2VOS, President of the Hall of Science Radio Club received the Proclaimation from Mr. Manes.

• **Sierra Vista, AZ** — Bill (Willaim J.) English, W7LHI/ WA7KZT, has been elected to the Arizona State House of Representatives. Bill is an electronic and oceanographic engineer who is presently working as an independent real estate developer. Licensed since 1947 (advanced), Bill is a life member of the American Radio Relay League as well as the Quarter Century Wireless Association. He is also past president of the Cochise Amateur Radio FM Association in Sierra Vista, Arizona.

• **Liberty, MO** — The P.H.D. Amateur Radio Assn., Inc., of Liberty, MO (Kansas City Area) will sponsor their Eighth Annual Northwest Missouri Hamfest on Saturday and Sunday, April 23 and 24 at the Kansas City Trade Mart, Exhibit Hall 2 (Municipal Airport terminal building). Ther will be a complete program of forums, a large number of commercial exhibits, swap tables, YL—XYL program—all inside an air—conditioned building. Unlimited free parking. Doors open from noon to 6pm on Saturday, April 23 and from 9am to 5pm on Sunday, April 24. There will be a Saturday night banquet at the world famous Gold Buffet, with ARRL

(continued on page 10)

think of yourself as an antenna expert! —you select your components!

1. Get optimum performance band for band. Choose from medium or high power resonators for your favorite bands.
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Get fixed station reports from your mobile—operate 6-10-15-20-40-75 or 80 meters with the experts and join the vast majority using Hustler for nearly two decades.

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For Deck or
Fender
Location

Model MO-2
For Bumper
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THE NEW ICOM 4 MEG, MULTI-MODE, 2 METER RADIO

ICOM introduces the first of a great new wave of amateur radios, with new styling, new versatility, new integration of functions. You've never before laid eyes on a radio like the **IC-211,** but you'll recognize what you've got when you first turn the single-knob frequency control on this compact new model. The **IC-211** is fully synthesized in 100 Hz or 5 KHz steps, with dual tracking, optically coupled VFO's displayed by seven-segment LED readouts, providing any split. The **IC-211** rolls through 4 megahertz as easily as a breaker through the surf. With its unique ICOM developed LSI synthesizer, the **IC-211** is now the best "do everything" radio for 2 meters, with FM, USB, LSB and CW operation.

The **IC-211** is so new that your local dealer is still playing with his demo. Just hang in there and you can grab this new leader for yourself. ICOM's new wave is rolling in.

Frequency Coverage: 144 to 148 Mhz
Synthesizer: LSI based 100 Hz or 5 KHz PLL, using advanced techniques
Modes: SSB (A3J), FM (F3), CW (A1)

Selectivity: SSB ± 2.4 KHz or less at −60db
FM ± 16 KHz or less at −60db
Sensitivity: SSB 0.25 uv 10db SINAD
FM 0.4 uv for 20db Q.S.

Power Supply: Internal, 117V AC or 13.8V DC
Power Output: 10W PEP (SSB), 10W (CW, FM)
Size: 111mm H x 241mm W x 264mm D
Weight: 6.8 kg

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Announcing *(continued from page 7)*

guest speaker. Preregistration is $2.00, admission at the door will be $2.50. Preregistration, Including banquet, is $8.00. Those desiring banquet tickets are urged to order them in advance. Talk in on 146.34/.94 and 3.925 MHz. For information and preregistration write to: PHD Amateur Radio Assn., Inc., P.O. Box 11, Liberty, MO 64068

• **Mobile, AL** — The Mobile Amateur Radio Club will hold its annual Hamfest and Computerfest on April 16 and 17. All the newest equipment on display-computers. Swap and shop all day Saturday from 9 to 5. Banquet at 7pm. Doors open Sunday at 9am. Activities for the ladies and children. Camp sites available. Over 1500 people expected. The biggest fest on the gulf coast. For more information contact Marvin Uphaus, K4EVG, 512 Tuttle Ave., Mobile, AL 36602

• **Damascus, MD** — "The Potomac Area VHF Society will hold its sixth annual hamfest on Saturday, May 7, 1977, from 8am to 5pm at Friday Pan Park on West Ox Road in Herndon Virginia which is approximately 15 miles west of Washington, D.C. Registration of $3.00 includes flea market or tail gate sales. Professional food and beverage catering and unlimited parking will be available. Talk—in on 146.52 and 31.—91. repeater. This is the hamfest formerly held in Westminister, Md., but moved to Virginia because of the recently enacted Maryland traders law. For further information contact K3DUA or WA3NZL.

• **Birmingham. AL** — On May 7 and 8, 1977, there will be one of the country's largest flea markets, technical and operating forums, huge prize drawing, manufacturers and distributors displays, and ladies and childrens activities. This will be held at the Alabama State Fairgrounds, Birmingham, and Rodeway Oxmoor at I—65 and Oxmoor Road. Booth display area will be offered free of charge to bona fide distributors, manufacturers, publishers, etc., on a first—come, first—serve basis. Others may rent space in inside or outside flea market areas at a small charge. No admission charge. Prize ticket donations $1.00. Saturday activities include a free hospitality suite at the Rodeway Inn—Oxmoor. Motel reservations are available toll—free at 800-228-2000 for the Rodeway Inn, or through any Birminham Radio Club member for other accomodations. The Birminghamfest last year registered almost 3,000 attendees. Please consider this to be your invitation to join us in not only the friendliest but one of the biggest hamfests in the country. Talk—in on 34/94, 3965 khz. For booth display space, information, and reservations, write to: BIRMINGHAM—FEST, P.O. Box 603, Birmingham, AL, 35201

• **Meadville, PA** — We are in the process of making plans for our third annual Northwestern Pennsylvania Hamfest to be held at the Crawford County Fairground May 7, 1977. The proceeds from the hamfest are used to support an emergency communications system for the Crawford County area. As part of our fund raising activities, we sell tickets for various low priced door prizes which are amateur radio accessories, parts, books, electronic components, etc. We would appreciate any donation that your fine firm might make to the "Friendly Hamfest".

• **West Liberty, OH** — The Champaign/Logan Amateur Radio Club will hold its annual flea market on May 15, 1977, at the West Liberty Lion's Park, West Liberty, Ohio. Trunk sales and tables $1.00. Door prizes. Talk— in on 146.52.

Our Readers Say

Boo ARRL!

Editor, CQ:

I should like to add my voice to the Ameco Publishing and CQ Magazine notes on favoring ARRL at the apparent expense of private publishers in regard to promotion of amateur licensing.

While the ARRL may offer fine services, either free or at minimal charge, and exist as a non-profit organization, still it is wrong to grant it preferred treatment in the face of private companies that wish to offer like services.

The whole picture of American tax exemption needs overhauling; certainly those who declare a non-profit existence but nevertheless do employ people and do deal in huge sums of money ought not be business-like operations.

H. Church, W0KXP/9
Lebanon, IL

QSL Reminder

Editor, CQ:

Those who send QSL cards in envelopes are cautioned to place the complete return address, including ZIP Code number in the upper left hand corner on the front side of envelopes sent. If letter is undeliverable and contains no visible return address - the Dead Letter Branch of the Post Office will charge the sender 20 cents.

Earl Stacy, K7BD
Selah, WA

Amateur Radio Insurance Exclusion?

Editor, CQ:

I wrote a letter concerning the extra Insurance premium on CB Radios in Automobiles and whether State Farm Insurance Co. was going to include Amateur Radios or not. The enclosed letter is the answer I got back from State Farm. I think the letter will be worth printing in your magazine for the information of all Amateurs.

Joe Harper, WA7GSM
Nampa ID

Dear Mr. Harper:

Thank you for your recent letter concerning the CB radio exclusion and the effect this newly added exclusion has on the coverage of two-way radios licensed in the Amateur Radio Service.

Your interpretation of the situation is basically correct. The CB radio, tape recorder and tape player theft exclusion endorsement only excludes theft coverage for those specific types of equipment listed, i.e., CB radios, tape recorders, tape players, and combination units that contain one of these. Since "ham" radios do not fit into any of the above categories of equipment,

they are not affected by this endorsement. They, therefore, continue to be protected against loss by theft under the comprehensive coverage of your automobile policy.

Once again, I would like to thank you for taking the time to write. Thank you also for the precautions you take to keep your equipment from being stolen. That kind of effort will help us keep your insurance costs as low as possible.

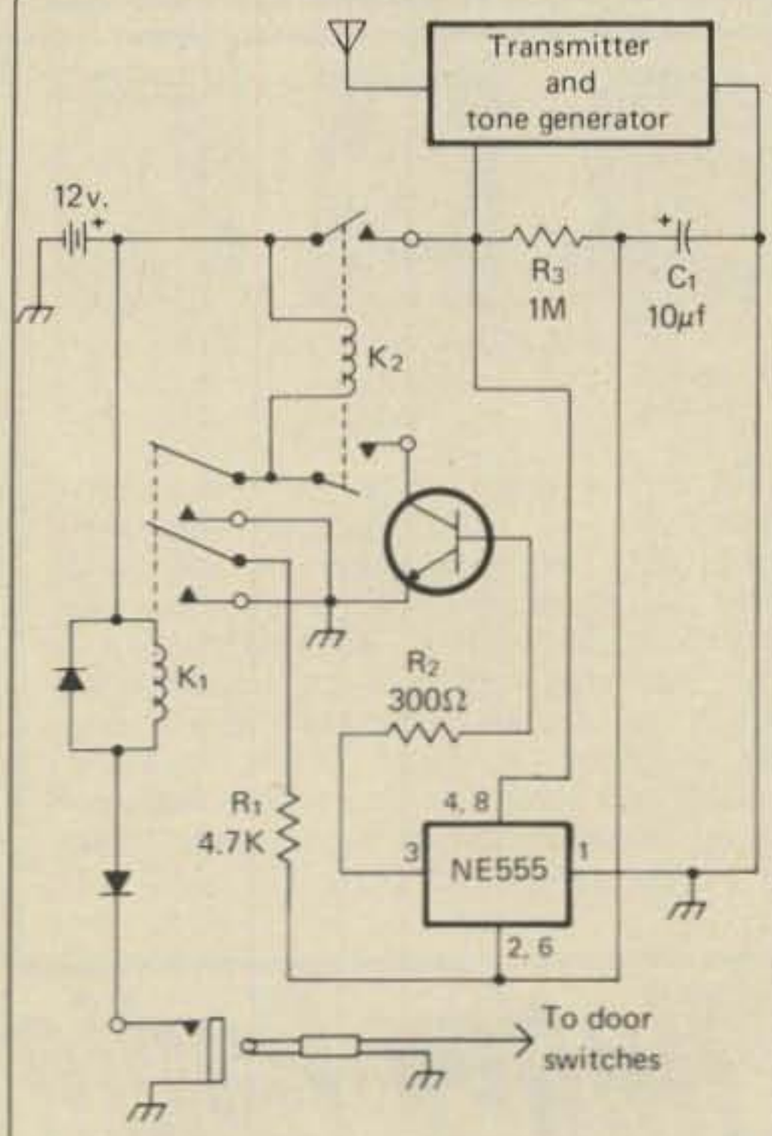
Sincerely,
Joe Naffziger

Soundless Mobile Alarm

Editor, CQ:

I am sending you the enclosed blurb for your consideration, hoping you might find it suitable for publication in your magazine.

If you want to protect your mobile rig with an alarm, and would like to do more than try to scare the thief with a beeping horn, etc., the circuit shown below will give you (or, preferably, the police) the opportunity to meet the culprit personally. When he opens the car door, relays K1 and K2 activate the tone-modulated transmitter, which can be any legal power/freq./antenna configuration (a few milliwatts should be adequate). The thief hears nothing, but you are immediately alerted via a receiver on the transmitter's frequency.



In this circuit, the transmitter remains on for about 15 seconds (determined by R3 and C1) after the door is closed; until the NE555 times out, the transistor (any NPN of adequate current rating) keeps K2 closed, supplying voltage to the transmitter.

The alarm draws no current when not activated. If it is provided with its own battery and an attached whip antenna, it will be completely self-contained, and cannot be disabled from outside the vehicle (assuming the door switches are inaccessible).

Alan Day, K8ITH/AE8DBL
Salesville, OH

New Canadian Prefix

Editor, CQ:

1977 is the Centennial Year of the Japanese Canadians. To help celebrate and publicize this event, the Department of Communication has kindly issued a special call. This call, in place of VE is to be used by all Japanese Canadian Radio Amateurs and their immediate family for 1977.

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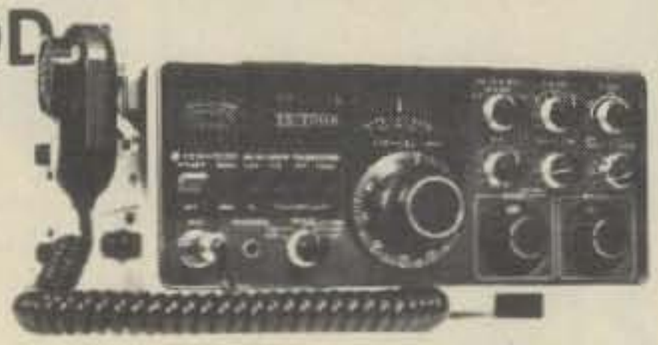

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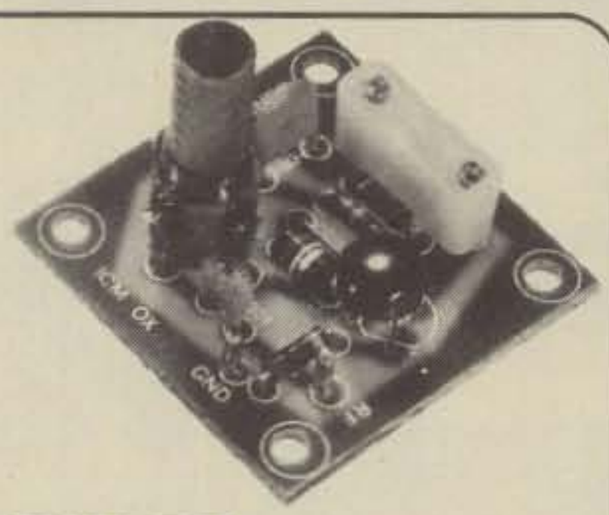

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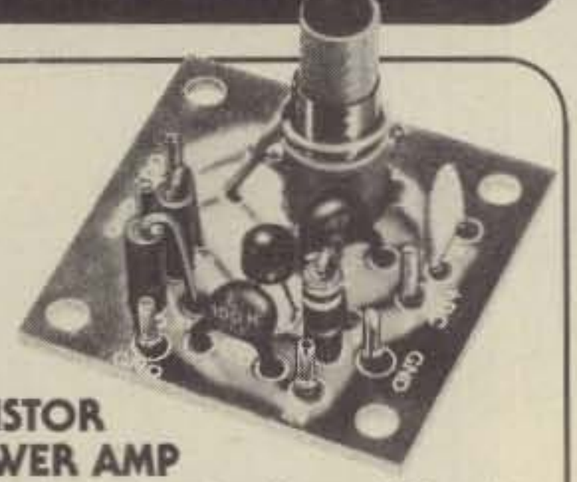

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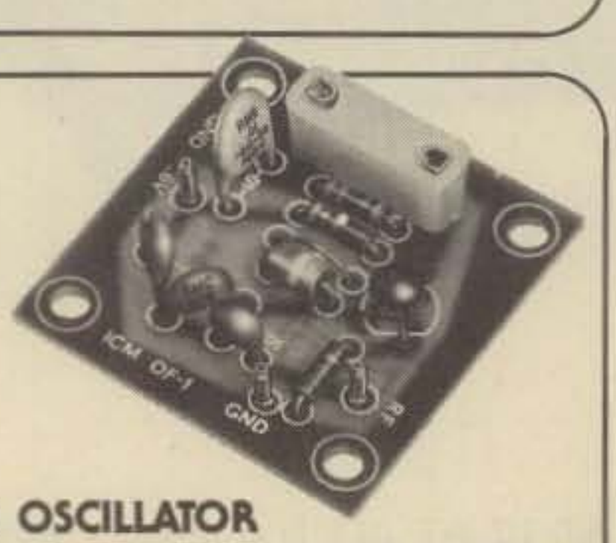

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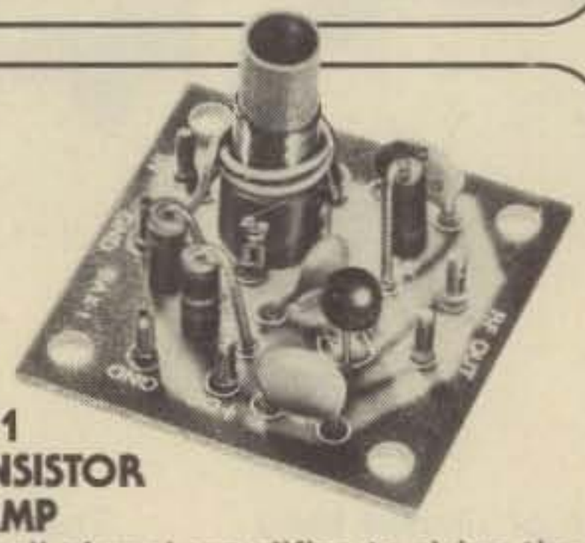

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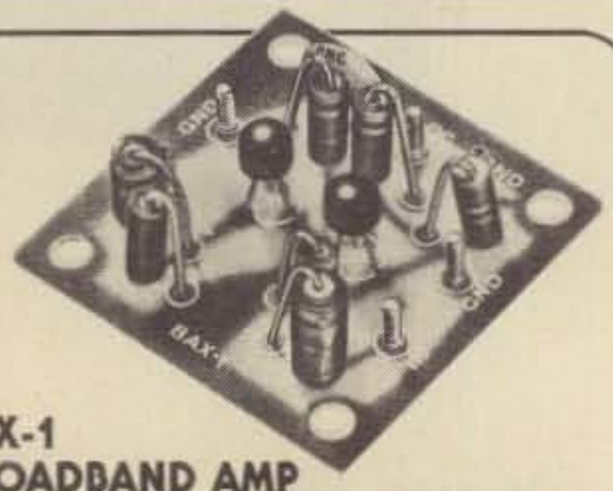

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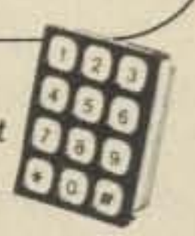

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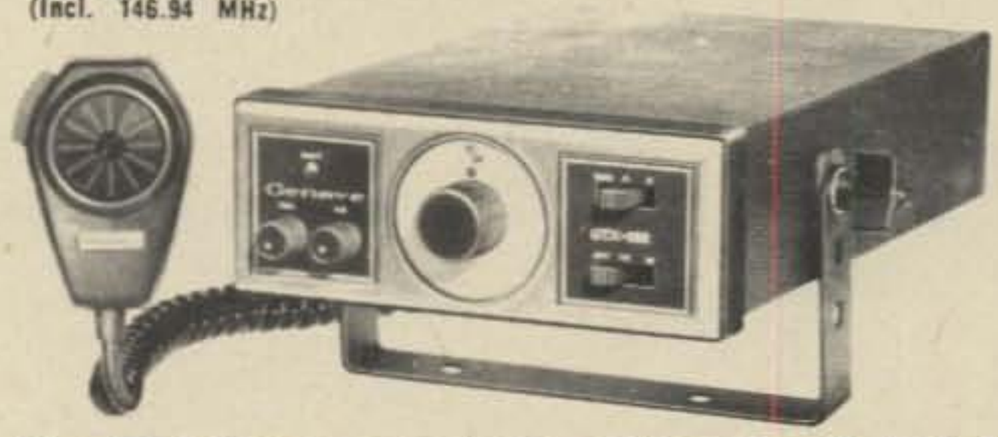

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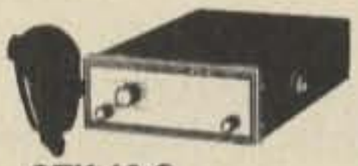

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Jungle Drums, Natives, and local wildlife throw a new light on working DX with only 5 watts from the Peruvian jungles.

JUNGLE FLEA POWER

BY PAUL M. WYSE*, OA8V, WA4ZND

One of the most gratifying results of operating QRPp comes from asking the question "How copy my five watts from the jungles?" and then leaning back in the old mildewed reclining chair and listening to the flattering comments. Before the QSO is finished there is sure to be a breaker or two who express their amazement at my QRPp signals also. All too soon the big clock strikes 11 p.m. and I realize a whole evening of entertainment has passed; everyone else has "retired to two meters" (a term used by Latinoamericans for going to bed). OA8V throws the big switch and soon is off in dreamland, thinking of how he can make those fantastic 5 watts even more outstanding with some superdooper antenna.

First Introduction to QRPp

"I well remember my first introduction to QRPp more than eleven years ago. Our family had just arrived in Yarinacocha, the center of operations for the Summer Institute of Linguistics (SIL) in Peru. I had been assigned as a radio operator for the communications network. I shivered with excitement upon viewing the rustic operations center overlooking lovely Lake Yarinacocha (Palm Lake). The operating position was 20 feet off the ground and open on all sides so one could keep a close check on the weather as well as have a good view of any aircraft landing or taking off from the sparkling lake.

Casilla 2492, Lima 100, Peru S.A.

"During one of the first days on duty in the communications center, I noted an extremely weak signal from one of the stations on the net. Later I discovered why he was so weak. The particular transceiver that he was using consisted of a small commercial shortwave receiver (a "Villager") with an a.m. transmitter, consisting of a IU4 oscillator driving a 3V4 final, which was modulated by the audio section of the receiver. This homebrewed jungle walkie-talkie used ten D cells to put out one watt on the assigned frequency of 5340 KHz. Harold Davis, assigned to Indian community development and literacy supervision, was using this unusual rig from the head waters of the Amazon river. Some 6-8,000 Machiguenga Indians, a nomadic group, inhabit this isolated area of southern Peru. Mr. Davis had to do much of his traveling between villages by trail or raft. During most of the year, a float plane was unable to land in the rivers, which were too shallow and swift. The QRPp rig furnished communications needed to keep in touch with his family back at the SIL center and to contact a doctor in case of need for himself or the Indians.

Some of the operators were frustrated by the weak signals, but understanding the problems facing Harold, I found copying the QRPp signals a challenge. It was fun to look for ways to improve our receiving setup to give better copy of weak signals. I was gratified at how well communications went, especially in the early morning hours, and Mr. Davis was so impressed that he usually

asked for this unique set when preparing for a visit to one of the remote areas. The lightweight rig gave him extra weight allowance on the plane which he used for extra food supplies, even though it meant he might have to repeat some of his messages several times. So it was then that I first became involved in QRPp operations. Readers will perhaps be interested, at this point, in learning about the purpose of our jungle-based operations.

J.A.A.R.S.

"Yarincocha is the jumping off place for SIL linguists whose goal is to analyze Peru's unwritten Indian languages reduce them to writing, and then to translate the New Testament into these languages. "Jungle Aviation and Radio Service" (JAARS) was formed to provide the transportation and communication service necessary to speed up the work of reducing the more than 2,000 unwritten languages of the world into writing. Here in Peru, each tribal team has a portable SSB transceiver which is the only communications link between the remote jungle village he is working in and the outside world. Advances in the "state of the art" lets SIL's jungle communications network go QRP, using Stoner transceivers with 10 to 20 watts PEP output and rechargeable ni-cad batteries. Transistorization has increased the reliability and reduced the weight of the radio package from 132 pounds in 1947 to a mere ten pounds today. Weight is a major factor for the tribal workers for whom air transportation is the only means of reaching their remote outposts. The Helio Courier, a specially designed aircraft that utilizes very small airstrips (600 to 900 feet), has a payload limited to 770 pounds. This weight limit is reached all too soon for a linguistic team as the members first weigh themselves, then their sleeping and camping gear, radio equipment, and a six-weeks food supply.

Jungle QRPp Saves The Day

In April, 1969, during the jungle net's roll call, one of the stations failed to check in. Whenever this occurs for three consecutive days, we immediately dispatch a plane to check on the linguists' safety. This particular station was 400 miles northeast of Yarina just off the Amazon River on the border between Peru, Columbia and Brazil. The 400 mile flight to check on the Anderson's would be quite expensive, so I took special pains the next morning to listen for Ticuna, the absent station. I finally imagined I was hearing something way down in the noise level. By asking a number of questions which were answered with rogers or negatives, it was determined that everything was ok at Ticuna. There was a problem with the radio, but they didn't want a plane until the following week. When Lam and Doris arrived back at our jungle Center, I checked out the radio and found

The view from the SIL Institute overlooking beautiful Lake Yarinacocha.

an open final transistor. The power out was measured at a mere 18 milliwatts. I figured four hundred miles on 18 mw to be over 22,200 miles per watt!! Almost around the world with 1 watt must be some kind of a record at 5 mhz!

C.W. Indian Style

QRPp communications is nothing new for the jungle tribes: many of them have developed very unique systems of communications. While some groups whistle their messages through the jungles, others use some form of signal drums. The Bora

The Helio Courier is a lightweight plane designed for use on small airstrips (600-900 ft.). SIL personnel are flown to some of the outposts by this plane. Dave, OA8-CG, balances on one of the floats.

These are the large Bora Drums mentioned in the article. They provide the Bora tribe in Eastern Peru with a telegraphic system for sending messages over long distances. OA8V observes that the hearing capabilities of the Bora tribesman far exceed his own.

tribe in eastern Peru developed a telegraph system to send messages long distances. This system uses large signal drums which are made in pairs from hollowed hardwood logs. Each is approximately 5 feet long. The smaller one, called "the woman drum," is about 1½ feet in diameter while the larger, "man drum" is 2 feet in diameter. Two holes, each near the drum's end, are connected by a slit. Each of the two drums has two tones, depending on which side of the slit is hit, making four possible tones for the pair. Two tones are used to provide the rhythm and the other two pick out the message. At night drum operators can send messages 20 miles away, a distance that requires travel four and five hours by trail. If the message is to be sent a greater distance, it is relayed by another set of drums; when the message is received it is acknowledged by return messages.

One of the secrets to the Indian's communications system is their sensitive ears! I was impressed by this several months ago when visiting the Aguaruna Indians in OA9 land. I was waiting for a JAARS plane to pick me up, when an Aguaruna sitting beside me said, "Here comes your plane, I can hear it now." I listened but heard nothing; after several minutes I finally saw it. I can always see the plane before I hear it but not the Indians. They can often hear a plane five minutes before it arrives.

Wild Dream

Operating QRPp all day pulling signals out of the 5 MHz jungle QRN was very fatiguing. I still looked forward to spending a little time in the evening operating OA8V. After finishing my 5 BDXCC in February, 1973, my enthusiasm for amateur radio dropped off considerably. The Drake twins, Bandit 2000B, and the unusual OA8 call could work almost anything on the band; I just didn't find much challenge anymore. One evening while listlessly tuning the band, I came across a good friend, Lee, KZ5OD. He was all excited about his new rig, an Argonaut. Even though it only ran 5 watts, his signals were 5x7 and we enjoyed a good solid QSO. As I was talking with Lee about QRPp, a dream started developing: ". . . wouldn't it be fun to get an Argonaut, carry it out to a remote jungle village hundreds of miles from civilization or any of the modern conveniences, put on a QRP, battery powered, solar charged, DX-pedition, and then write up the results for one of the magazines . . .?" Well, that's still a dream, but I've done a lot of reading since and my dream keeps getting bigger. The understanding XYL, sympathetic to my aspirations, brought my dream closer to reality when she surprised me with a new Argonaut on Christmas Day, 1973.

Furlough

That same Christmas we were on a year's furlough in Charlottesville, Va., where I was taking some update training in electronics and working toward my extra ham ticket. Though living in an apartment complex wasn't very conducive to erecting good antennas, I was anxious to try out the new rig. I dug out an Aguaruna bow and several arrows from our artifact collection, and, after

OA8V at the QRPp operating position.

Mobile installation of the Argonaut in OA8V's '69 Ford. It was used during cross-country trip during his 1974 furlough in the U.S.

numerous attempts, finally used them to string a long wire from the kitchen window at ground level to the top of a tree 200 feet away. The next step was to build an antenna tuner. The built in s.w.r. indicator on the Argonaut made tuning the antenna a snap. It was really exciting to find that the long wire would tune all bands 80 thru 10.

At this point I really started getting cold feet. I was convinced that QRPp would do wonders with a good antenna, but with just 200 feet of wire? The Argonaut manual suggests calling loud stations for best results, so I tuned 75 meters until I heard an S-9 plus CQ from Kentucky and gave him a call. I was really delighted with the 5x7 I received and the comment that if I were only using 5 watts, he'd better throw his 2KW away, as it was only running up the electric bill. And so it went on the other bands as well. The next four months netted many enjoyable QSOs, even some DX such as DL, PY, KP4, etc. I was hooked on QRPp!

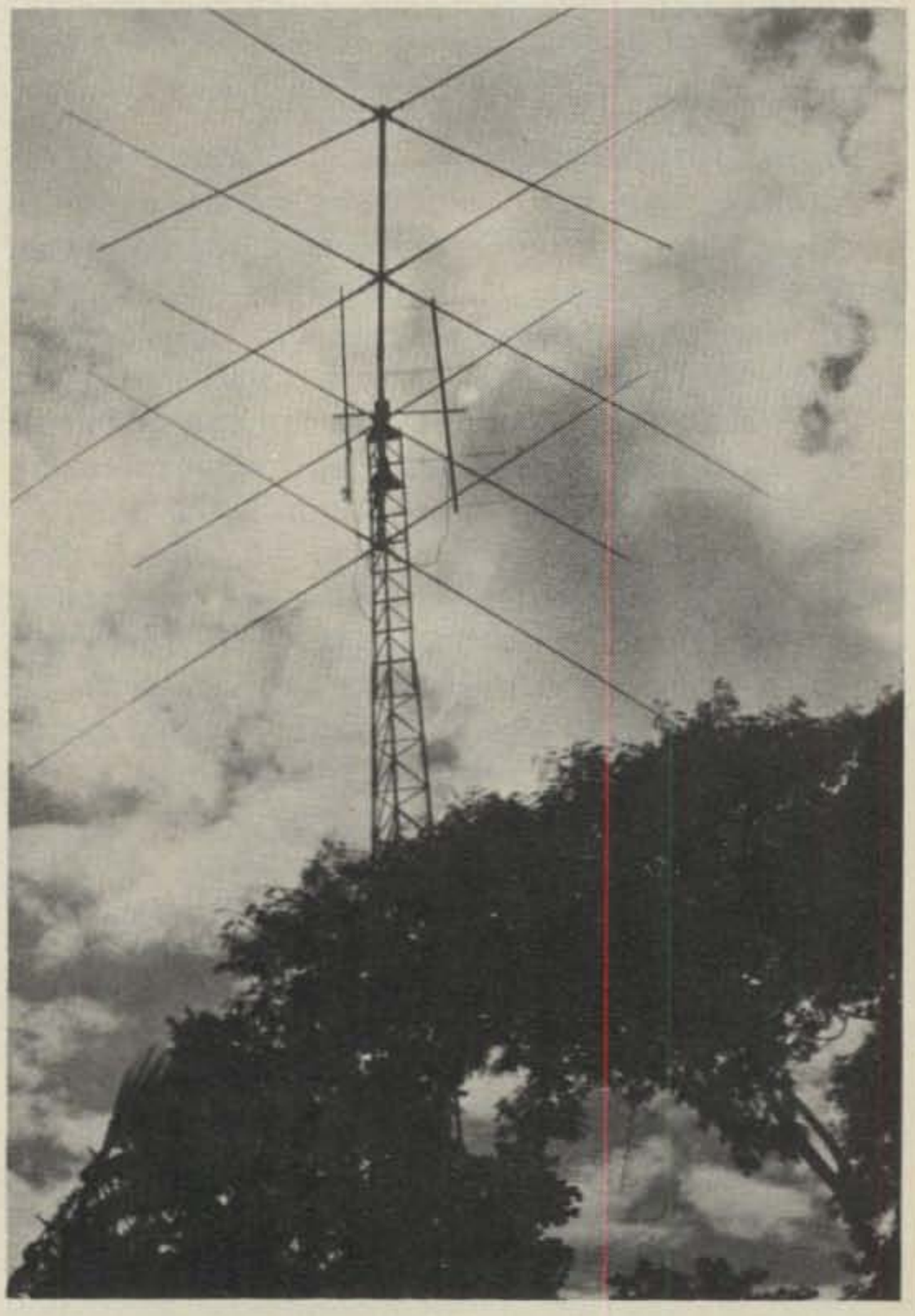
From Charlottesville

Before returning to Peru we had a lot of traveling to do. The XYL is from Oregon, and grandpa and grandma wanted to have a chance to know their grandchildren before we said goodby for another five years. I decided to lash up the Argonaut in the car for our travels. The installation was very simple: power came from the cigarette lighter and a Hustler antenna was mounted on the bumper of the '69 Ford. I didn't expect any great results mobile, but figured I could at least s.w.l. and make the 55 m.p.h. speed limit more enjoyable. Here again the little Argonaut was really surprising and gave a number of enjoyable QSOs as well as keeping friends back in Virginia informed on our travels.

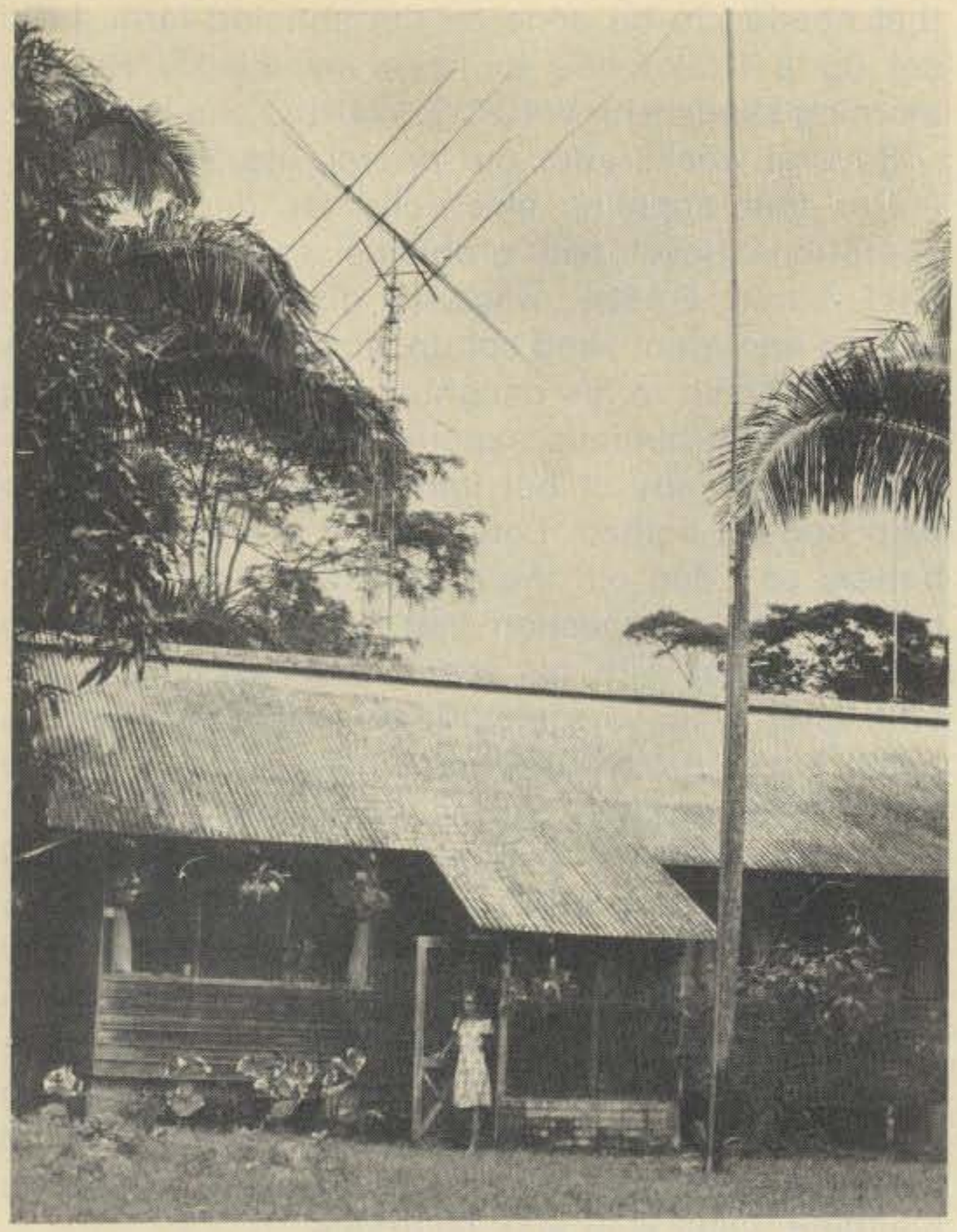
Back In The Heart Of Peru's Jungles

August, 1974, found us back in the jungles. A lot of work had piled up, as well as some maintenance that needed to be done on the antenna farm. I did set up a Drake line to keep my weekly Sunday morning skeds with W4QCW, W4RBC and WB4GSE.

Several weeks after our arrival, the 200 kw generator that supplies electricity for our center of operations developed problems and we were all QRT. Loren, OA8BL, was very disappointed, as he had an important sked set up with WØME in Kansas to run a patch to his daughter, who was just going through the traumatic experience of beginning college without any of her immediate family there to help her get settled. Loren had a 4 amp hr ni-cad battery so I dug out the Argonaut and offered it to him with the suggestion that he might be able to make contact with his friend and set up another time later when the electricity would be back on again. I was pretty sure the Argonaut would be too weak to run a patch. Not only did Loren make contact with WØME but also ran the best patch he had ever had! When Loren finished, WA5PAU called in with traffic and ran a long haul patch all the way to Oregon. The patch lasted 20 minutes and was solid copy on both ends. WA1FCM was right when he said "Flea power is more effective than no power." With a good antenna, it appeared that the amazing Argonaut could even be used for traffic handling when skip was favorable.



Close-up shot of the OA8V quad.



The antenna farm at OA8V. In the foreground is the 65 ft. vertical used on 160-80-40 meters. In the background is the 4el, 4 band OA8V quad on a 53 ft. tower made from half-inch galvanized pipe.

Antenna Important

I firmly believe that the antenna system is one of the most important components of a good amateur station. This is especially true when one is using QRPp and needs every dB. I spent considerable time working on the antennas before making my QRPp debut from OA8V. OA8V's location leaves something to be desired, making it even more important to have the antenna system up to par.

The vertical used on 80 and 40 meters had worked very well for DX so it was not changed. It consisted of a 65-ft. vertical with 15, 66-ft. radials spread out from the base. It is fed direct on 3.8 and through a L/C ntework on 40. It works amazingly well on 160 too, with a loading coil at the base. An inverted Vee for 40 meters was used for local South American QSOs where the radiation angle of the vertical was too low.

I have used a triband quad for the past 10 years. One of the fiberglass spreaders was broken so I took it down to repair it. It grew to be quite an unorthodox OA8V design. It is a 4 el. 4 band quad on a 15-ft. boom. There are two elements on 20, 3 el. on 15 and 4 el. on 10 and 6. The 6 and 10 meter driver elements are gama matched into a single coax feedline while the 15 and 20 meter driven elements are gama matched to a second feedline. This is all mounted on a homebrew 53-ft. self-supporting tower made from half-inch galvanized water pipe. Completing the antenna system is a 5 el. yagi for 2 meters and a 11 el. yagi for 432 MHz. These are used for Oscar satellite communications.

New Country On Oscar Satellite

Ted, W4FJ, sent a Johnson 6N2 transmitter down to Peru and encouraged some Oscar operation since there has been little activity from Peru. I found Oscar to be very intriguing. I must say it took me off the HF bands for a while. I mention it here, as it also is a QRP operation. With 40 watts output on two meters, I worked 24 states and 17 countries through Oscar 6 and Oscar 7 during the past year. I then built a varactor tripler for 432 and ended up with 5 watts output for mode B. QRPp operation has been so good that alternate Mondays have been set aside by AMSAT for QRPp only operations on Mode B of Oscar 7.

QRPp And Contests

Now back to the HF bands. I have enjoyed contesting for more than 15 years, so I set aside a few early morning hours of my schedule to give out a few reports during the 1975 ARRL DX contest. 160 and 80 meters were chosen, since there is not much activity on those bands from Peru. I fired up the Drake rig and the few hours before sunrise netted 30 QSOs. Saturday evening was the next time I could get on the air. This time I thought I'd give the Argonaut a try, since I didn't have enough time available to get serious about this contest anyway. I was pretty sure I ought to be able to make a few contacts on 15, so I called a CQ which netted 19 QSOs in the 30 minutes before the band closed up. Now with my courage a little stronger, I decided to try the ridiculous and give kilowatt alley a try. I was really pleased to make 20 contacts in that many minutes. What was even more pleasing was all the comments made on the 59005 report that was sent (signal report plus power). First the comment was, "Missed your power. Please repeat your power," or, "I think you meant 59500," thinking I had transposed the number. After the power was cleared away, then came the "Fantastic!", "You gotta be kidding!" and, "What in the world are you using for an antenna?"

By now my courage was really high and I was ready to try the impossible, 75 meters s.s.b. with 5 watts PEP input! I went to bed for a few hours and got up at 0900 GMT to try and catch the morning peak. I hooked the Argonaut up to the 65-ft. vertical and started calling "CQ Test." A half hour went by and I was ready to give up and call 75 meters impossible for QRPp, at least from 8 degrees south of the equator, when some station said, "OA8V, if you would listen up the band we would be glad to work you." The net results was ten two-way SSB QSOs in 8 different states in 10 minutes. That

hooked me for good on QRPp and the weekend ended with 255 QSOs in 40 states. Results in contests have been consistently good. For example, I had a really good time in the 1976 CQ WW DX CW contest, with a total of 326 QSO's and a score of 118,491. I worked six new ones including C5AZ, to bring my DXCC QRPp total to 129.

After the contest I was so excited about QRPp operations that I sold the reliable Drake line to a friend and decided to operate only QRPp. I did purchase the Ten Tec 405 solid state amp. to help out on an occasional patch I'm asked to run but rarely turn it on. By now you're probably saying, "With a call like OA8V you could make DXCC with a wet noodle for an antenna!" I'm sure the call helps, but W2GRR worked 100 countries from New York in just three months and thirteen days with his Argonaut. I believe Sandy did it all on 20 meters with a 4 el yagi at the modest height of 40 feet. Four others, K4OCE, K8MFO, W6PQZ and K2KUR, have also qualified and received the QRPp DXCC trophy, which is offered by *The Milliwatt* thru Ade Weiss, K9EEG.

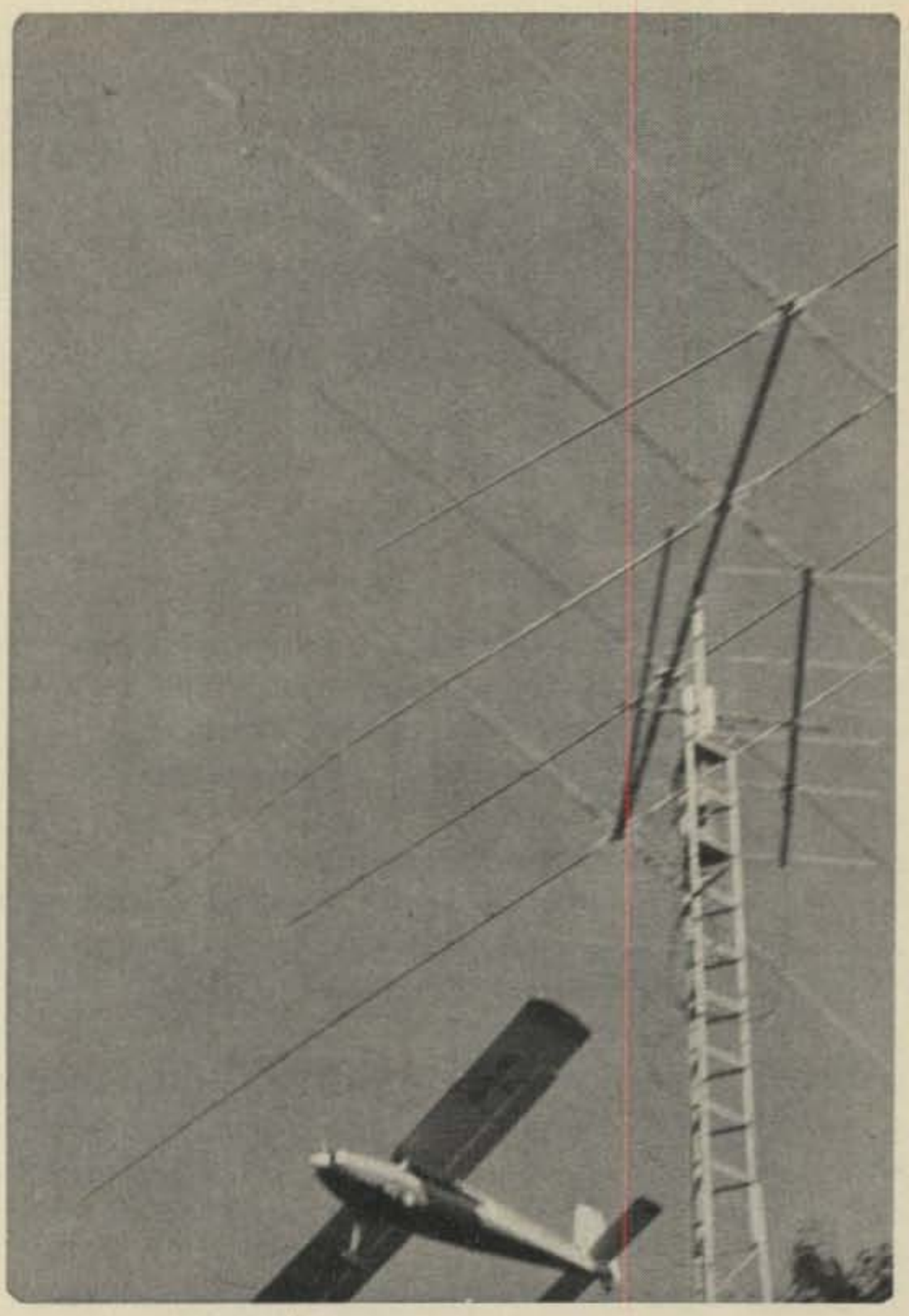
QRPp Techniques

QRPp operating presents a real challenge, both technically and operationally. Following are some suggestions for giving QRPp a try. First: the antenna system. A super efficient sky wire goes a long way. Every dB counts and is needed. There are none to throw away! Make sure the feedline matches the antenna and the antenna is matched to the transmitter. Second: keep feedlines as short as possible. All feedlines have some attenuation. Third: use low loss lines. I use foam type RG8U. You might think that with low power you could use smaller line such as RG 58 U, but your losses will be higher. I prefer open wire feedlines but they are impractical here in the humid jungle. Fourth: keep antennas in the clear and as high as possible. This helps those precious milliwatts get radiated and not absorbed by surrounding objects. Fifth: for DXing, keep the angle of radiation as low as possible. With plenty of radials, a vertical is a good DX performer especially on the low frequency bands. Dipoles work much better for local short range communications.

Now for the operating techniques. I believe the following suggestions will help your QRPp operating experience be both successful and enjoyable.

1. Watch band openings and closings. Often there are unusually strong signals when the band is just opening up or closing into a very selective area. These peaks are often quite short, perhaps only several minutes long, but can often net a new one. The low frequency bands' signals peak up at both sunset or sunrise when the path is through darkness.

I found this out on February 4, 1976 when I was



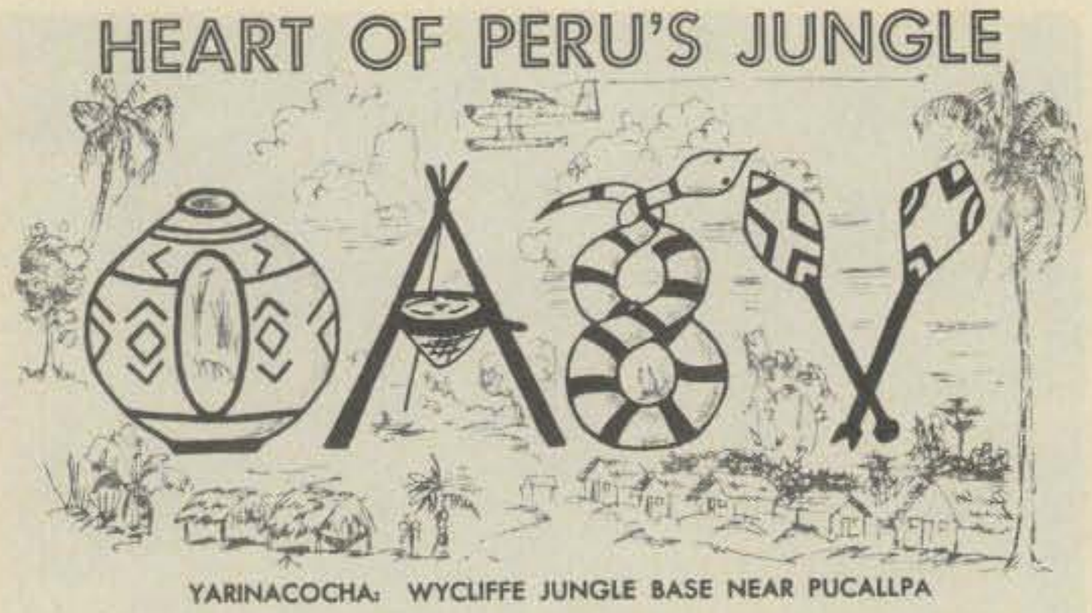
Close up of the OA8V triband quad antenna and the Helio Courier, the major source of transportation.

able to work both Chris G4BUE and Neil GW3OAY on 3.5 MHz during their sunrise. I received 559 from both stations. Other stations I've worked at sunrise in Europe with 3.5 watts output on 80 meters are UK2PAF, YU2DX, SP7CTY, UK2GKW, SP7HT, and UA3HI in Moscow over 7450 miles from my QTH. During the month of June, Peru's sunrise and Japan's sunset occur at about the same time and that is the only time I have been able to work JA's on 160 meters.

2. Call the loud signals. I usually look for strong stations calling CQ and very seldom call CQ, especially on the lower bands.

3. Make transmissions short. It's easy to get covered up in the QRM when one is QRPp. Keeping transmissions short also helps overcome QSB, which is much more pronounced with low power. I take breaks often to make sure the other station is copying, especially on SSB. Example: "Name is Paul, break." If I get "OK" I go on but if not, I keep saying, "Name is Paul; name is Paul." Break for three seconds and then try again. Eventually a signal peak or lull in QSB/QRM will let the info get through and the QSO can be completed.

4. Mention early in the QSO that you're running QRPp. On CW I often sign OA8V/QRPp and on



This unique QSL designed by OA8V, tells the OA8V story in pictorial symbols with a jungle theme.

phone, "OA8V with 5 watts," or "Thanks for the report on my 5 watts," etc. This makes the receiving station aware of your low power and he will often take a special interest in the challenge of copying your weak signals.

5. Use the highest band that is completely open to you. I almost always begin at 10 meters and work down to the first band that is open. When open, 10 meters is the most enjoyable with less QRM and works very well for QRPp.

6. Watch propagation. During solar disturbances you're often in for some very unusual surprises. I was really shocked to hear 9J2CL coming through at 8:40 am local time in the morning on a dead band. He was 579.

7. Speak very clearly and distinctly. By careful enunciation readability can be improved.

8. Keep average power high. I run as much audio as possible without distortion. The best way to do this is ask several stations where you are rather weak, (i.e., what setting of the audio gain gives the best readability). I received many favorable comments on how well my audio comes through. "You sound loud but do not register on the S meter." I have also built the IC speech processor by VK9-GN (also serving with JAARS) *(Ham Radio,* Dec. 1971, p. 31) and use from 10 to 20 dB of clipping.

The group at Yarinacocha SIL Headquarters: (left to right) Floyd, OA8AT, Flight Coordinator; Millie, OA8AU, OA8AT's XYL; Dave, OA8CG, Pilot; Russ, OA8CD, Personnel Manager and his seeing-eye dog Rusty; Walden, OA8BW, Radio Operator; Paul, OA8V, Director of Support Affairs Division and author of this story; Eddie, OA8AQ, Chief Pilot; John, OA8W, Radio Technician. Not in the photo—Glen, OA8P, Community Development and Literacy Worker.

9. On CW form your characters distinctly. A good fist goes a long way with QRPp. I find 13-15 WPM gives optimum results under marginal conditions.

10. Be confident! If I can do it, you can do it too. Believe you can and then keep trying until you do. Satisfaction with performance comes from making complete QSO's, and not from strong signal reports.

11. Have lots of patience.

The final satisfaction to QRPp operation is to see others catch the QRPp bug. I've designed a little QRPp Award QSL card. Chris, G4BUE, thought my signals were quite weak when we worked on 80 cw, but after seeing the QSL, also got the bug and purchased a Heathkit HW 7. This little rig has bagged 39 countries in 9 zones and 3 continents for Chris. It was a pleasure to have KH6HC call me with his Argonaut as I was finishing a QSO with UAØHT on 20 c.w., which was followed by one with KH6GI using 18 watts. Others are getting the bug, too. EL2EB said, "Standby," when I mentioned I was using QRPp, and he came back on QRPp to make it a 2 way QRPp QSO. Al OA8S, built a 1 watt s.s.b. transmitter and small receiver and has been having a ball. It's the only equipment that Al has.

How Many Miles Per Watt Are You Getting?

Present standing at OA8V with 5 watts or less is 129 countries in 33 zones, all worked in the last year. 9V1SH, 11,923 miles from me, is the best DX so far. He was worked on 10 meters s.s.b. for 4769 miles per watt. How many miles are you getting out of your watts? The QRP ARC 1 club has some interesting awards. One of them is for working over 1000 miles per watt. OA8V is qualifying for this award on all 5 bands. Following is the run down:

9V1SH on 10 meters for 4769 miles per watt.
JR2LPA on 15 SSB for 3866
YB8ACK on 20 SSB for 4610
JA2BAY on 40 SSB for 3860
UA3UI on 80 CW for 1493

Anybody ready to work 5BDXCC with 5 watts or less? That's an impossible challenge you say. I don't think so. My available time for ham radio averages less than an hour a day but even with this time the past year has netted the following: 17 countries on 80, 12 on 40, 92 on 20, 62 on 15 and 67 on 10. Amazing? maybe. Possible? absolutely! Satisfying? you bet! Challenging? You can say that again! Should I try it? By all means! You'll be in for the time of your life. It's a whole new ball game. BUT BE CAREFUL. The QRPp bug really bites and has a terrible itch. Even the jungle mosquitos are mild compared to it. ■

The proof of the pudding is in the eating.

The proof of Triton IV is in owner satisfaction.

Here's some of the proof . . .

K4EME — This is my second TRITON IV. They are excellent xceivers! **WA8ICK** — Luv it. Dynamite! **W9NXU** — I am very thrilled with this unit, it is great. I think you have scooped the field. **WA0AYA** — I like CW and full break-in. (Beautiful) **K3TFU** — I love the unit. **WA3VEZ** — Rig is just great. Combined with your service makes a super transceiver. **WN0SED** — Beautiful radio to use. Magnificent CW filter! Just a pure joy. **W8IIT** — I have had my TRITON IV for two months and am delighted with it. **YN1MBV** — It is a very nice rig. **W3GTX** — New features very welcome. **W0BYC** — Bought one of the first TRITON II, like it so well I updated it with a TRITON IV. **W2TBK** — It is absolutely fantastic. **WB0OPI** — I am pleased with the rig. **WA3GJA** — Very-very-very nice. Good audio quality. **W5ZBC** — The most outstanding rig I have ever used. **K8CJQ** — Excellent rig, Good filters. **W7BKK** — Very happy . . . getting excellent quality reports. **W2CET** — Power-signal reports good. **WB2UEH** — I like the compactness and appearance. **VE3IBK** — An excellent rig with superior receiving quality. **K4IVM** — I think it is tops. **WA4LOG** — I've become so used to dip, peak and adjust, this TRITON is a beautiful new experience. **KL7IHW** — Easy to set up—works great. **K4JXD** — Seems to be very FB rig. **WA7KHE** — Fantastic performance. Thanks for a fine rig. **WB4BPG** — No problems—fine rig. **VE1BZ** — Good work. **W9HQT** — Receiver better than expected, CW break-in is super. **W0AP** — Tremendous transceiver. I appreciate your engineering. **WA2ZRO** — Wonderful. **K0SFV** — Real nice rig. You thought of almost every feature and built it in. **KQ9DQ** — Beautiful. **WB0JIQ** — Beautiful radio; however, your ads do not do justice to the radio. **WN5SOH** — Very sophisticated—Easiest tuning rig ever. Very glad I bought it. **K3OJV** — Very impressed. **W4LZP** — Very good results. Put out 100 watts as good as 300 watt rigs. **WA4DQY** — I think the TRITON IV is great. **W6QXN** — Appreciate full CW break-in. **W0INH** — Enjoy light weight. **VE3CYK** — I am extremely pleased with the clarity of receiver and after putting rig on the air, received unsolicited compliments on the audio quality of the transmitter. **K4PHY** — Was 3rd in USA, first in fourth district in WWCQ contest. **W8RYU** — Own Argonaut. Both fine rigs. **W4CDA** — Compact, light weight, good engineering. **WB2WZG** — TRITON IV is the most versitile CW/SSB radio I have ever used. **WB2FMV** — Outstanding. Highly pleased with performance. **WA8ACZ** — A real nice rig. I have owned about every other make. **W5EGK** — Works nicely. **WB4ECO** — I tried this rig, a pleasure to operate. **WA4YRK** — Excellent reports on audio. **WB8NKB** — Wonderful. **W9QPQ** — An excellent rig. Love it. **W8SOP** — Makes running SSB nets a real breeze. Also good on CW nets. **WL7IRT** — Fantastic rig. **W4MDB** — Has rekindled my interest and enthusiasm in Amateur Radio to an extent I hadn't thought possible. It far out distances any competitive product at **any** price. **W6EYR** — Very nice. Been a ham for 45 years and now solid state perfection. **W2RPH** — Excellent rig. **WN0TDK** — TRITON IV is a fabulous piece of equipment. **W5VIW** — Very nice rig **WB2LQF** — Wow! **W9JCV** — Tnx for giving us a FB piece of equipment made in the USA. **W8GHO** — Very pleased. **K4KXB** — Seems to have everything desired. **W4SZ** — A pleasure to operate. **W2FKF** — Greatest rig I ever had. So far in a month 34 QSO's without one miss. Been a ham since 1922. **W4GVC** — Nothing but complements. **WB9EZE** — Well pleased with performance and simplicity of operation. **K4ETI** — Rig is great. **W8CNV** — Man—! what a rig. I've had this call since 1929. Never saw anything like it and I've seen them all! **WB2MZU** — Seems like everything the S- - - - - O- - was supposed to be at one third the price. **WN0VHE** — I think it is a very good rig. **WB9FTD** — Break-in CW is very impressive. **K0CBA** — I believe it is one of the finest HF transceivers on the market. I can't tell you how pleased I am with the noise blanker. I can get on the air from my home station again for the first time in a few years. Other rigs with noise blankers just didn't hack it. **WA7YHW** — I am very pleased with this equipment. It is certainly of high quality. **W7IIA** — Excellent equipment. **WB0RWA** — Couldn't be more pleased with it. It certainly has performed beautifully and is all I expected and more. **WB4QJT** — Like it very much — keep up the good work. **WN1YVX** — Really impressed with looks and performance. **W0NC** — Very FB rig. Performs up to specifications, an excellent design. **K8PBZ** — Already have TRITON II and IV. **W7KD** — This little "T-4" is smooth as silk . . . I've received some very flattering reports about transmitter voice quality and the CW operation is the greatest. **WN8TTO** — I found that the TRITON IV was the best rig on the market for around $800. I love it! **W2JBK** — It is absolutely fantastic. **W8FEI** — Am amazed at receiver performance. I thought I had a top notch receiver with the H- - - - - - - -! **W1FYM** — Your guarantee is refreshingly proper. **W8M0K** — Sure makes a guy look twice at his old tube type gear. **W1TFS** — Finest CW ever, CW selectivity very good. **WB6IVR** — Very satisfied with TRITON IV. Just what I was looking for to use on my yacht. Thanks. **WA8ONP** — Also have a TRITON II. I am pleased that Al Kahn and the **good guys** at TEN-TEC thought of the CW operator! **W2EMX** — Excellent Amateur gear meets and exceeds advertised claims. **W0AMJ** — It looks like there is nothing left to be desired. It is beautiful. **W6SE** — The receive function is outstanding. It is superb in transmit. **W1BV** — In love with this fantastic gem. It's so easy and a pleasure to operate. **W6ASH** — Very happy with performance. Particularly impressed with full break-in and light weight. **WA0IMS** — By far the best rig I have ever operated. I am glad I decided on the TRITON IV and not one of the other transceivers on the market. **WA8HQ0** — Thank you gentlemen.

Add your name to the growing list. See your TEN-TEC dealer or write for full details.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862
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a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

Pendergast slammed the door and strode to the center of the room. He shook himself like a puppy and the rain cascaded from his clothes to the floor, forming a small pool of water at his feet.

"T'is not a fit night for man or beast," he proclaimed as he took off his water-soaked jacket. "No antenna work tonight, nor for the next forty days and nights, judging from the downpour."

"Wrong," I replied. "I'm doing my thing *indoors*, safe and dry."

The wind hissed at the crack in the door and the shack trembled slightly under the fierce gusts. Pendergast squelched over to my desk in his wet shoes and looked over my shoulder.

"What's that gadget?" he demanded. "Something new?"

"Look at this," I said, proudly. "It's a real jazzy *antenna bridge!*"

"I have one," sniffed my friend. "Very compact, with a noise generator . . ."

"You are not in the same league," I interrupted. "This is no 'Mickey Mouse' device. This is a *real* r.f. bridge. Maybe not as sophisticated as a *General Radio* bridge, or a *Hewlett-Packard* R-X meter, but plenty good for antenna measurements, and the price is much more modest."

Pendergast looked closely at the bridge and grinned, "Say! This *is* a beauty! Tell me all about it!"

I motioned for him to sit down in the operating chair. "This is an antenna bridge that will directly measure the resistive and reactive component of an antenna, or of any device connected to the bridge terminals," I said. "It is the *Millen 90673 Antenna Bridge,* brand-new on the market (fig. 1).

"The antenna bridge has quite an interesting history. I think the first practical one was developed by Bill Scherer, W2AEF, and was described in the September, 1950 issue of *CQ.* He described an *Antennascope* (fig. 2) which was a simple r.f. bridge having an adjustable resistance as one arm. This made it possible to actually measure the resistive impedance of the antenna under test, as the bridge null depends upon the ratio of the bridge impedances. Because an antenna is a pure resistance at the resonant frequency, the bridge is balanced when the potentiometer resistance is equal to the radiation resistance of the antenna. This, of course, is a very simple system to determine the r.f. resistance over a small range of any device connected to the bridge."

"What happens if the antenna is reactive—off resonance?" inquired my friend.

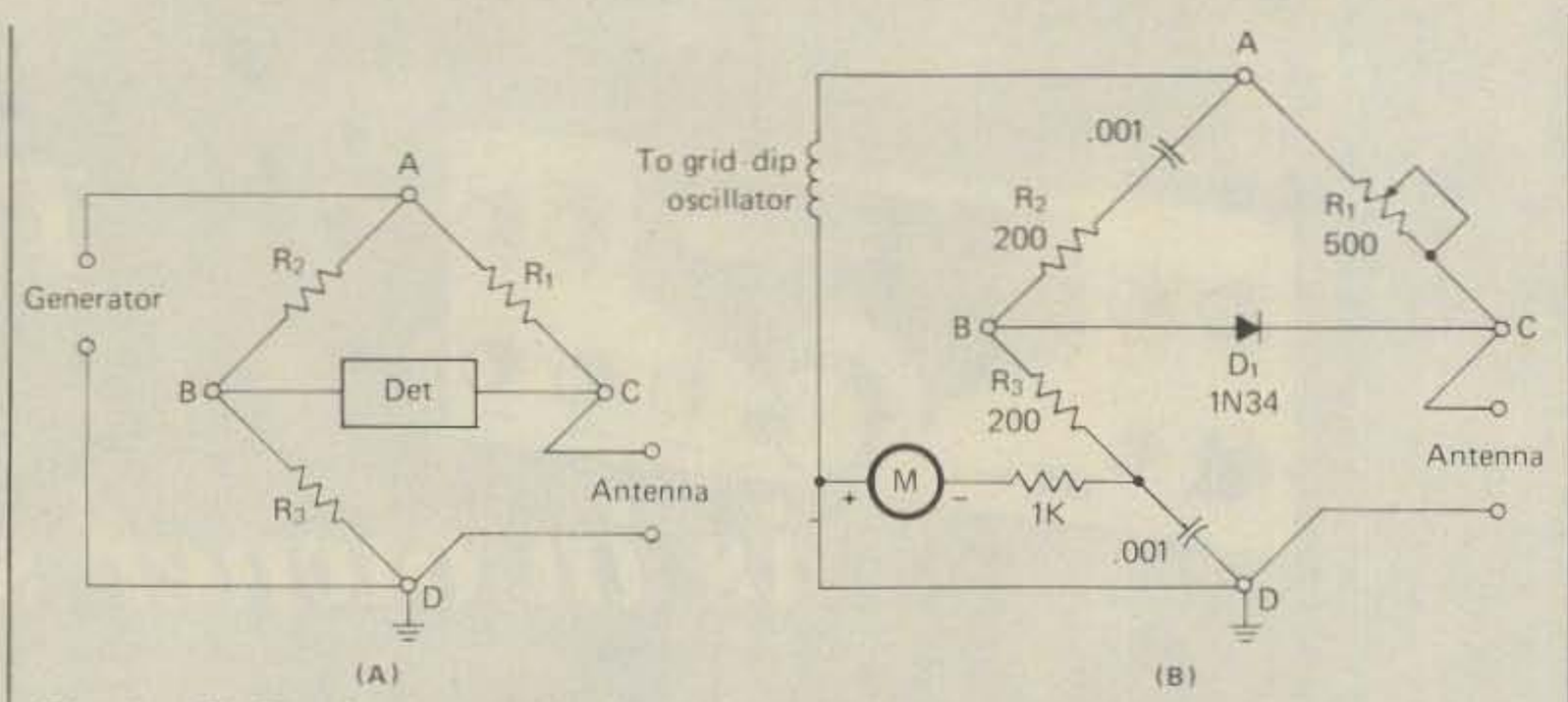
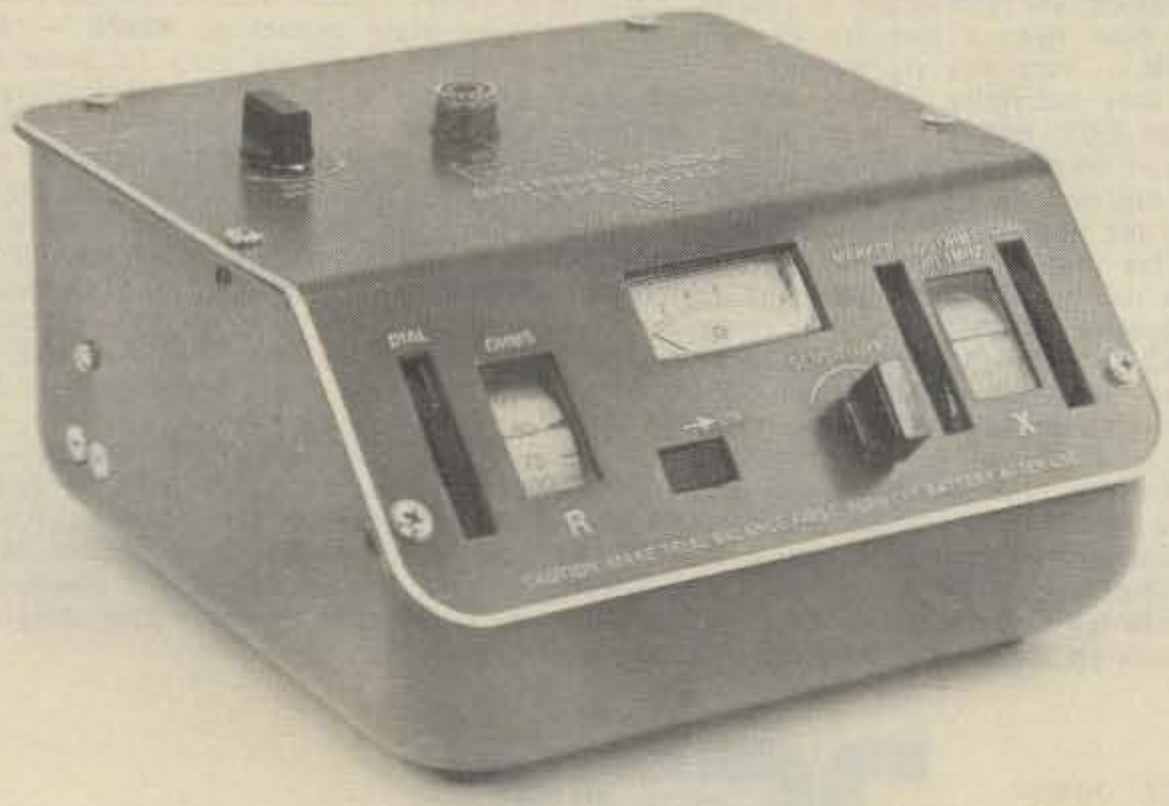


Fig. 2—(A) The fundamental bridge circuit. The detector indicates a null when the bridge is balanced (Antenna resistance equal to R^1, R^2 and R^3). (B) The W2AEF Antennascope. One leg of the bridge is a variable carbon resistor (Centralab type M composition potentiometer). The detector is a 0-200 microammeter. When the potentiometer is equal to the antenna resistance, the bridge is nulled. Capacitors are added to the bridge to provide the proper d.c. return for the meter circuit. An incomplete null indicates that the antenna under measurement is reactive (nonresonant).



The Miller 90673 Antenna Bridge.

*48 Campbell Lane, Menlo Park, CA 94025.

"The bridge null is imperfect," I replied. "That's one of the problems of this simple bridge. It can only give good results with a nonreactive load. The more reactive the load being measured, the poorer the null. And the user has no way of determining if the reactance is positive or negative, or the magnitude of the reactance. In addition, bridge calibration depends upon the excellence of the potentiometer, which is frequency-sensitive as far as calibration goes. As a result, the simple resistance-type r.f. bridge is a low precision instrument.

"An improved version of the r.f. bridge called the *Macromatch* was shown in the January, 1972 issue of *QST* (fig. 3). A differential capacitor is substituted for the potentiometer in this design, the capacitor dial being calibrated in terms of the resistive load. The capacitor has two identical sections on the same shaft arranged so that when the shaft is rotated to increase the capacitance of one section, the capacitance of the other section is decreased."

"I see," replied Pendergast. "This solves the problems of the potentiometer, but how about measuring reactance?"

"The Macromatch design did that," I replied. "An inductor, L^1, and a capacitor, C^3, have been added to the 'unknown' arm of the bridge. These units are variable and are series-resonant at the frequency of measurement.

"When a load, or antenna, having both resistance and reactance is connected to the bridge, the differential capacitor is adjusted for a null, balancing the resistive component of the load. And then the reactive component is balanced by varying capacitor C^3. This provides a complete null on the meter.

"If the external load is inductive, more capacitive reactance is required to establish balance. This calls for *less* capacitance. If the external load is capacitive, less capacitive reactance is required. And this calls for *more* capacitance. When both the resistive and reactive portions of the load have been balanced, the Macromatch meter reads zero."

"Very nice," said Pendergast, shaking his head in admiration. "And the dials can be calibrated directly in terms of ohms, no doubt."

"The resistive dial is calibrated directly," I replied. "The reactance dial calibration is correct at only one frequency. In this design, the dial is calibrated at 1 MHz. Frequency corrections are then simply made by dividing the reactance dial reading by the measurement frequency in MHz. Thus, for 14 MHz, as an example, the reactance dial reading is divided by 14."

"Well, what about the new Millen r.f. bridge?" asked Pendergast as he examined it closely. "What's inside this little box?"

"It is a sophisticated version of the *Macromatch* circuit," I replied. "The Millen circuit is shown in fig. 4. A differential capacitor is used for the resistance measurement, and a coil-capacitor combination is placed in series with the load terminals. The series capacitor is used as the reactance measuring device. In order to provide a better null measurement, a simple detector-amplifier circuit is added between the indicating meter and the bridge."

"What do you use to drive the bridge?" asked my friend.

"Well, the bridge requires a signal level of between 2 milliwatts and 100 milliwatts. I use the Millen 90651-A grid-dip oscillator. This is the vacuum tube job. Most solid state dippers don't have sufficient output to drive the bridge properly.

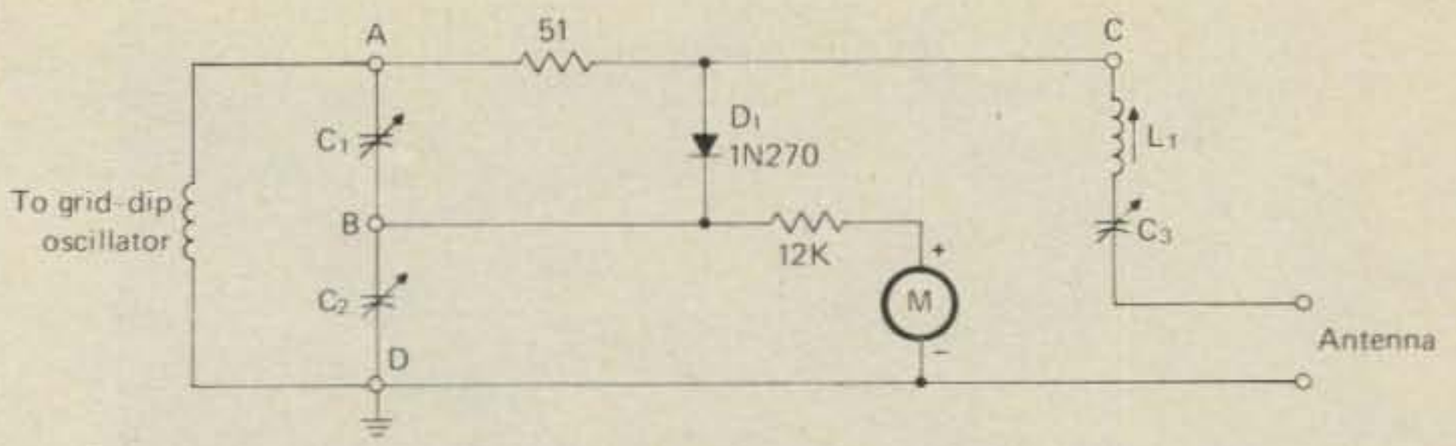


Fig. 3—A simplified schematic of the Macromatch r-f bridge. The points A, B, C, D correspond with the same points in fig. 2. Capacitor C^1, C^2 is a differential unit; two identical sections mounted on the same shaft and arranged so that when the shaft is rotated to increase the capacitance of one section, the capacitance of the other section is decreased. Inspection shows that this circuit is similar to those previously discussed, except that the differential capacitor makes up two legs of the bridge.

An inductor and capacitor are added in the "antenna" leg of the bridge. When L^1 and C^3 are series resonant at the frequency of measurement, the bridge measures the antenna resistance. Antenna reactance is compensated by adjusting capacitor C^3, which is calibrated in ohms. The coil L^1 allows the bridge to measure both positive (inductive) and negative (capacitive reactance). To align the bridge, a known resistance is placed across the terminals, the resistance dial (C^1, C^2) is adjusted for best null with the reactance dial (C^3) set at zero. The balancing inductor (L^1) is then adjusted for a null reading on the bridge.

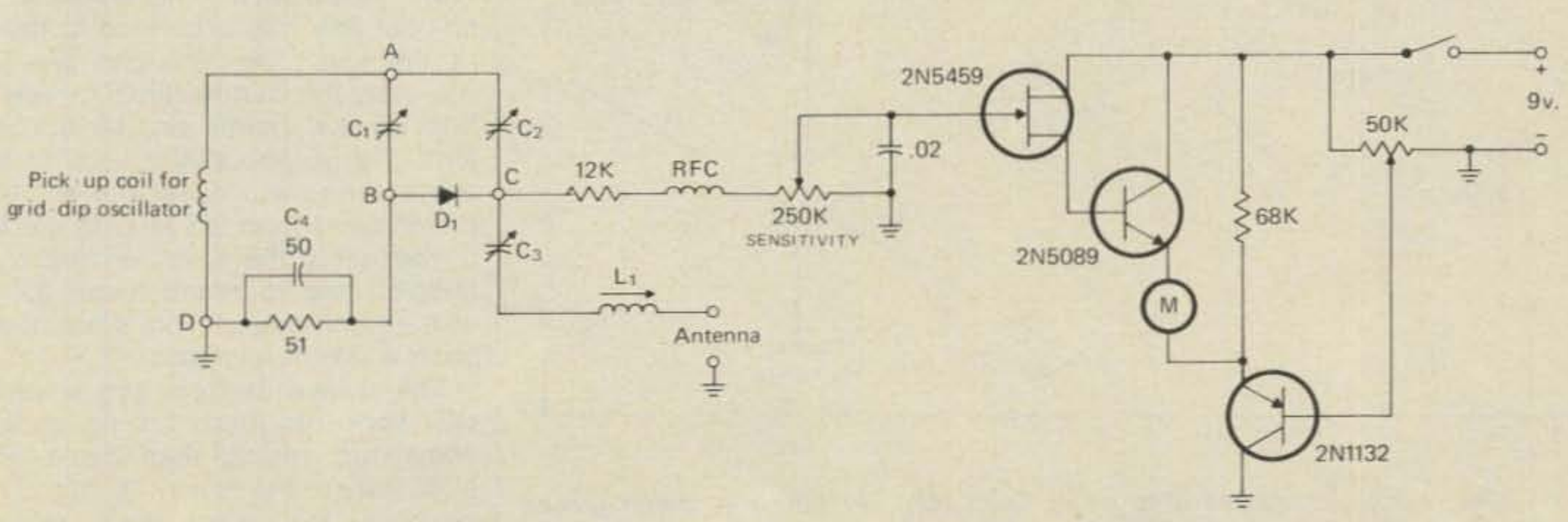


Fig. 4—A simplified schematic of the Millen r.f. bridge. Differential capacitor C^1, C^2 is the "Resistance" dial and capacitor C^3 is the "Reactance" dial. Capacitor C^4 and inductor L^1 are adjusted for the best null at the operating frequency of the bridge. A null detector and d.c. amplifier provide the meter reading. Instrument works from a 9 volt battery.

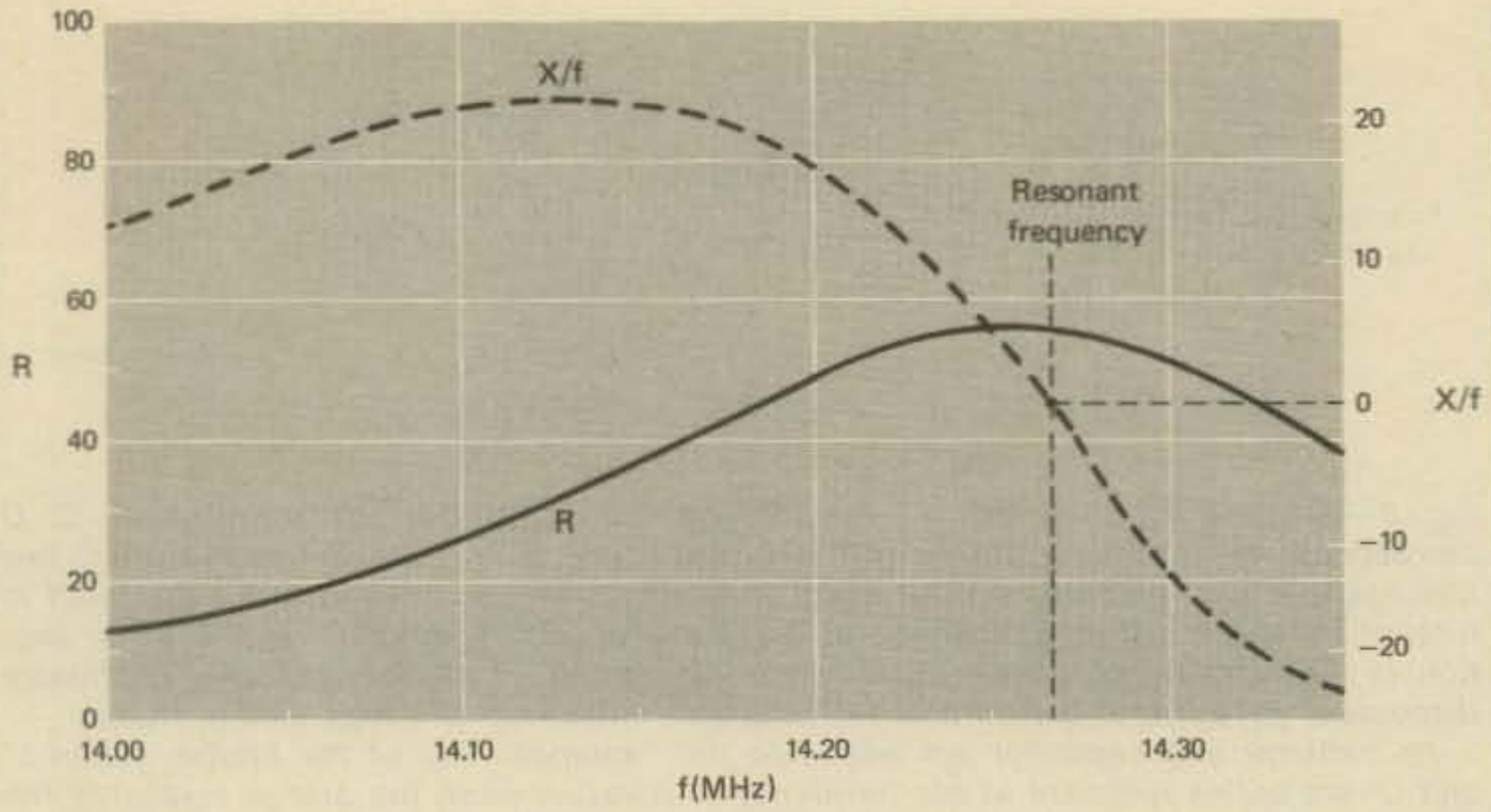


Fig. 5—R-X plot of tri-band beam antenna made at 20 meters. At the resonant frequency the radiation resistance of the antenna is about 55 ohms, but varies over the range of 12 to 56 ohms across the band. The reactance ranges from +25 ohms near 14.15 MHz to −20 ohms at 14.35 MHz. When plotted on a Smith Chart, the s.w.r. on the transmission line is 4.2 at 14.0 MHz, 2.4 at 14.1 MHz, 1.15 at 14.26 MHz (the resonant frequency) and 1.7 at 14.35 MHz.

"The bridge operates over the range of 1700 kHz to 30 MHz, and can be used with reduced accuracy as high as 60 MHz. The resistance range of the bridge is 10 to 150 ohms and the reactance dial is calibrated from 5 to 220 ohms. Plug-in reactance coils are furnished to cover the high frequency amateur bands."

"Well, have you used the bridge? And how did it work out?" asked Pendergast as he buried himself in the instruction manual.

"Yes, I've used it," I replied. I tossed a sheet of graph paper at my friend (fig. 5). Here's a plot of my 20 meter beam in terms of resistance and reactance. I made the same measurements with a General Radio r.f. bridge and the results are nearly identical. In addition, you can use the bridge to measure small capacitors and inductors in the workshop.

"I've found out that it is very helpful to know the reactive properties of my antenna. The s.w.r. meter only tells part of the story. The r.f. bridge tells the rest of it. I certainly wouldn't be without some form of r.f. bridge, and this new Millen job certainly works nicely. And it is light enough so that you can carry it and a grid-dip oscillator right up the tower and perform measurements right at the antenna. Try *that* with a full size, commercial bridge!

"I usually make all of my antenna measurements at the bottom end of an electrical half-wavelength of transmission line. I set everything up on a table at the base of the tower rather than climbing up to the antenna. Its easy to remove the effects of the transmission line, especially if you plot the measurements on a *Smith chart.*"

Pendergast blushed slightly at the mention of the Smith chart, and quickly changed the subject.

"Have you received any interesting mail recently," he asked.

"Yes," I replied. "I have a nice letter from Mike, W5OIB, who recently ran a series of tests between a 40 meter Quad loop and a 40 meter ground plane. The Quad loop was supported at the apex on a 70 foot tower and fed at that point with a 50 ohm coaxial line. The ground plane was mounted on the roof of a two-story house (fig. 6). That put the base of the ground plane about 28 feet above ground. The top of the ground plane was about 61 feet in the air, so the physical location was quite similar to that of the Quad loop."

"How did the two antennas compare?" asked Pendergast eagerly.

"Well, Mike ran both of the antennas for on-the-air checks with plenty of DX stations. Of course, he found the Quad loop directional, at right angles to the plane of the loop. But in the best direction for the loop, he came to the conclusion that the ground plane gave him better signal reports. He ended up by taking the loop down and using only the ground plane."

"Very interesting," responded my friend. "I would have bet my money on the Quad loop!"

"That's what makes antennas so fascinating," I replied. "You can't predict in advance how a given antenna will work in a given situation. At least, I can't do it.

"Mike also says that he tried a single-wire 80 meter 'sloper' antenna slung from a 48 foot steel tower (fig. 7). The wire was a quarter-wavelength long and he trimmed it for lowest s.w.r. at 3.8 MHz. The shield of the coaxial line was grounded to the top of the tower. As you can see from the plot, the bandwidth between the 2-to-1 s.w.r. points on the transmission line is about 400 kHz. In fact, the antenna will cover the whole 80 meter band from 3.5 MHz to 4.0 MHz if you allow the s.w.r. on the transmission line to reach about 2.6-to-1 at the band edges. That's not bad for such a simple antenna.

"Most ham exciters and amplifiers will work into loads having an s.w.r. somewhat greater than 2-to-1. However, when the s.w.r. is high, it is possible to arrive at a situation where the equipment won't load properly because the transmission line transforms the antenna reac-

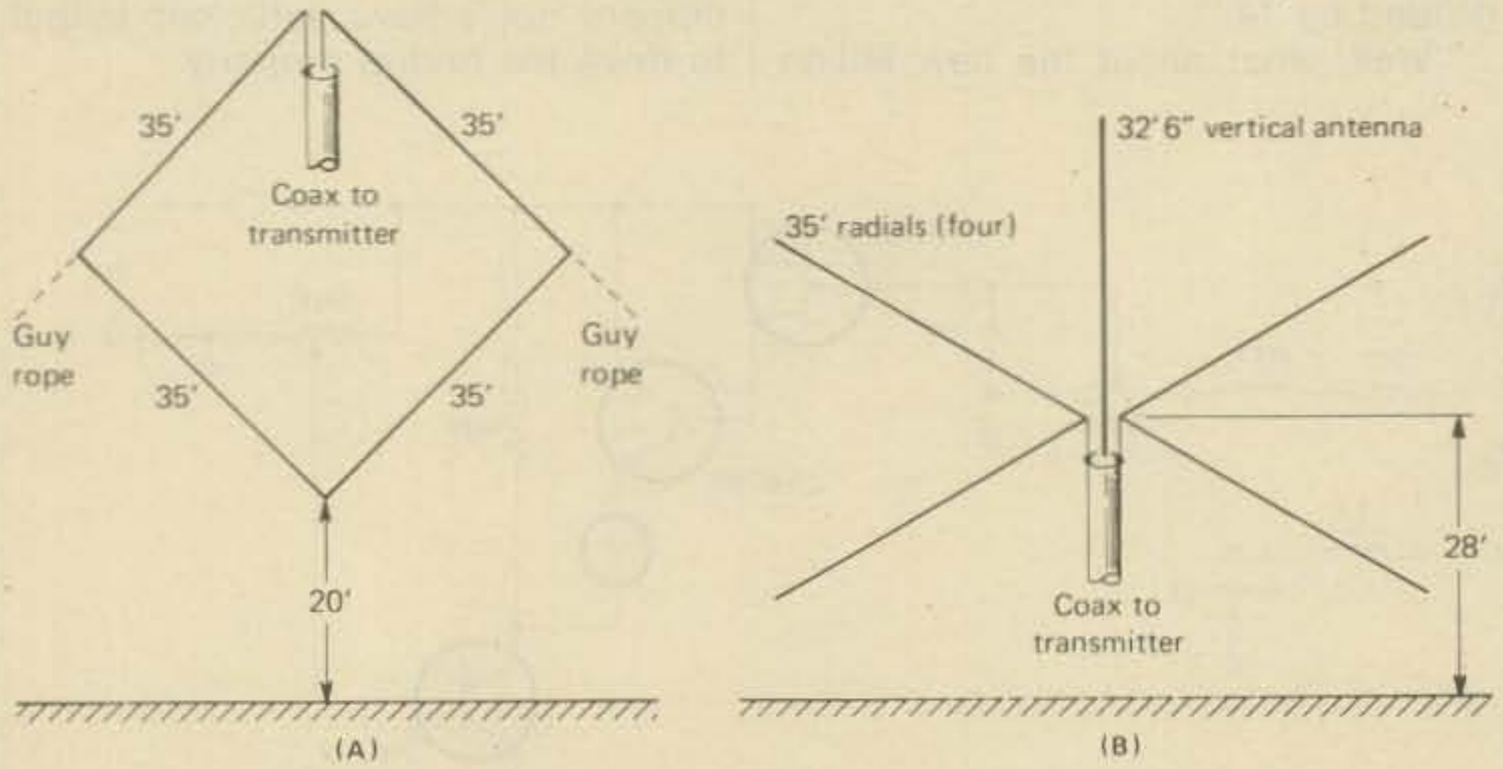
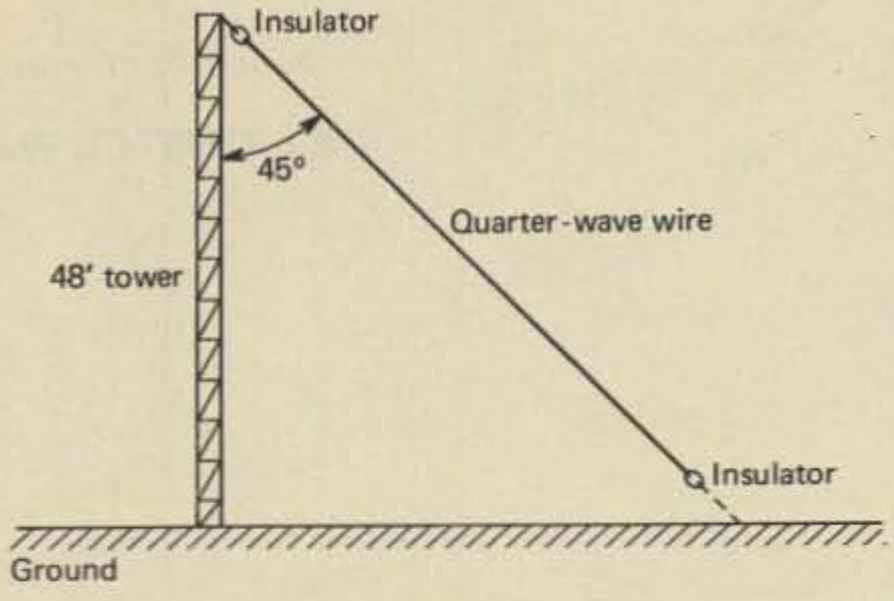
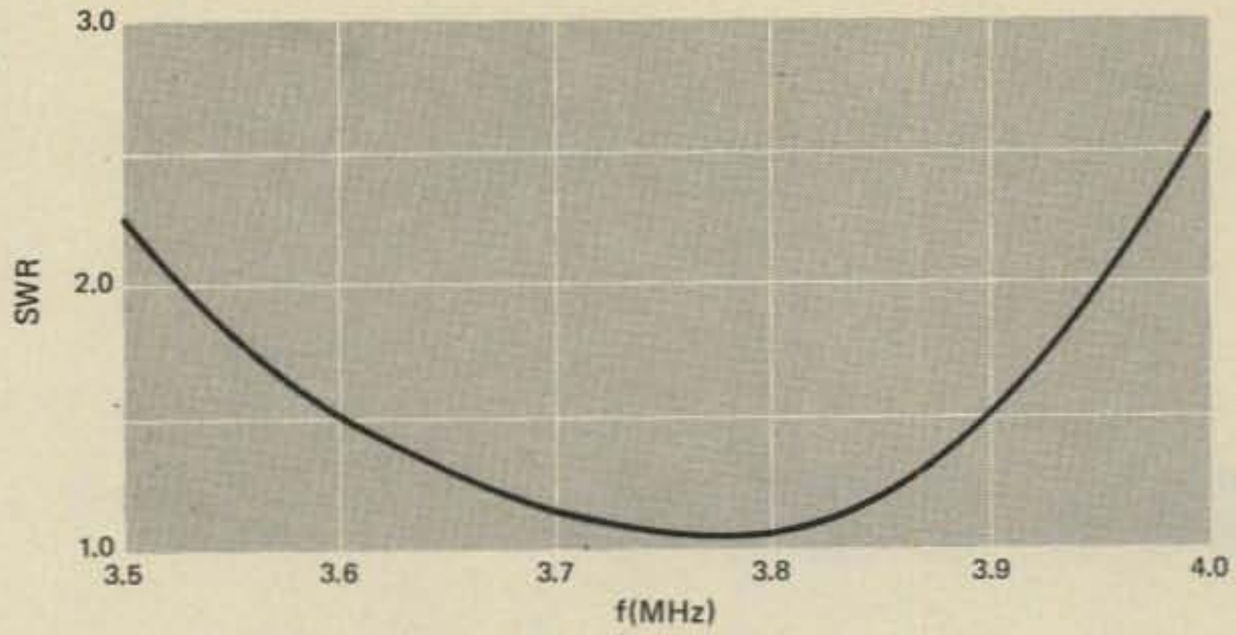


Fig. 6—Mike, W5OIB, compared a 40 meter Quad loop (A) with a 40 meter ground plane (B). Both antennas were approximately the same height above ground. Directivity of the Quad loop is into and out of the page. Over a period of time W5OIB found that the ground plane was slightly superior to the loop in overall performance. On-the-air checks were run with DX stations in all continents.



(A)



(B)

Fig. 7—The s.w.r. curve for the 80 Meter Sloper antenna of W5OIB. A quarter-wavelength wire is run from the top of a 48-foot tower. The wire is fed at the top end with a coaxial line. The shield of the line is grounded to the tower at the top. The included angle between tower and wire is about 45 degrees. Wire length and angle are trimmed to provide resonance near 3.8 MHz.

tance to a value that is outside the loading limits of the equipment. You literally 'run off the dial' in trying to achieve proper loading."

"What do you do in a case like that?" queried Pendergast. "Suppose I wanted to operate this sloper at 3.5 MHz and I couldn't get my transmitter to load properly. What would I do?"

"Well, devices exist that are called *line flatteners* that can be placed between the transmission line and the transmitter. These gadgets will transform the s.w.r. on the line to a reasonable value that the transmitter will accept.

"The simplest line flattener is an extra length of coaxial line. If the line length is changed, the loading condition of the transmitter will change. The higher the s.w.r. on the line, the greater effect will be noticed as line length is changed. If the s.w.r. is low, changing line length will have little, if any, effect on transmitter loading. If the s.w.r. on the line is high, slight changes in line length can transform a difficult loading situation into an acceptable one. Or the reverse can happen. Changing line length can really screw up the loading.

"An inexpensive stunt is to make up sections of coaxial transmission line of various random lengths. I have line sections that are two, four, eight and sixteen feet long. Every once in a while, when experimenting on an antenna, I'll need an extra line section to allow the transmitter to load up properly. I splice it in the line, and everything works fine!

"Remember! This stunt *does not* change the s.w.r. on the line! It merely places the transmitter along the line at a point which falls within the limits of tuning of the transmitter. Not many fellows know this stunt, and it is a very handy one. Some transmitters are quite touchy as to the antenna load and when I have loading problems, the first thing I do is to add line length, a section at a time.

"A more sophisticated line flattener will have a rotary coil that does the job. For v.h.f. work, adjustable "trombone" line sections are used. But it is all the same idea of adjusting line length to fit the needs of the transmitter."

Pendergast sighed. "Well, as soon as this storm is over, I'm going to borrow your Millen bridge and run a check on my 20 meter beam."

"That's a good idea," I agreed. "I suggest you run resistance and reactance measurements, plot the results in your lab notebook and file them away for reference. Then at a later date, if you think you have antenna trouble, or you can't bust your way out of a DX pile-up, you can re-run the measurements and see if the antenna curves have shifted at all.

"Last year I was having troubles with my tri-bander. It just didn't seem to be cutting the mustard on 20 meters. I re-ran the antenna measurements and found that the reactance curve had shifted considerably from the measurements I made about a year ago. Sure enough, when I took the beam down, I found one of the traps had been damaged. I replaced the trap and the

(Continued on page 69)

a monthly feature by

BILL DEWITT, W2DD

In Focus

Television on the Amateur bands

What's What

Attendant with the increased use of scan converters, I have received many inquiries in regard to combining pictures, titles, etc. using scan converters like the Robot 300 and 400 series. For this reason, much of this month's column will be devoted to detailed instructions relative to this subject—but first, a few paragraphs about people!

Slow Scan Station Of The Month, W1VRK

Gene Hastings, W1VRK, of Swampscott, Mass. is a well-known early bird of SSTV. Gene, who works for a newspaper, is a writer and photographer of considerable talent. His *QST* article, "What You Always Wanted To Know About SSTV and Were Afraid To Ask" did much to promote interest in slow scan.

A recent project of Gene's has been the construction of a WB9LVI designed scan converter using the W3LY/W3GKW boards. In the accompanying photos you can see the professional-looking end result of Gene's efforts. Like all other LVI scan converter builders, Gene is delighted with the results he's getting.

Our thanks to W1VRK for the excellent pictures of his equipment and the sharp-as-a-tack picture of Murray Bugen, K1WPS surrounded by slow scan and RTTY equipment. (Not to mention that matching pair of Signal Ones!)

*2112 Turk Hill Road, Fairport, N.Y. 14450.

Fig. 1—Gene Hastings, W1VRK adjusts a Big Bertha lens on his Robot 80 camera.

Fig. 2—No transmitter showing, so W1VRK's slow scan gear dominates this picture of his well-equipped station.

More About Maple Hill High School's Arc And Station WB2YCR

A recent letter from John Kienzle, WA2UON, advisor and trustee at the school's club station, points out that Chuck Schaffer, K2LOI, was most helpful in getting the club members started on their slow scan projects. John says that Chuck was indeed their "SSTV Elmer"! (See December '76 In Focus for story on how the Maple Hill High School ARC got into SSTV.)

The "We" Syndrome Comes To SSTV

Ever run into one of those "WE" types? I mean the fellow who says, "WE got OUR hair cut today." Or, "We went to the dentist today and had OUR tooth pulled." I just can't resist running an "off the tube" photo of OM "WE" himself, calling CQ with BOTH heads. See fig. 7.

"That German SSTV Pre-Amp"

I'm looking for more reports on the performance of the SSTV pre-amp described by Dr. Werner Berthold, DK1BF in the November 1975 issue of *Ham Radio Magazine.*

Dick Spencer, WA5LKB reports that he is using this pre-amp with excellent results in conjunction with his Robot 400 scan converter. Bob McMillen, W3ATV, and Walt Bieda, W2ELF have also built the unit and are testing it. Tony Gallo, W3LDS, reports that he is very satisfied with the results he's been getting with his.

At this writing, Tony Pessiki, N3TV, is designing a circuit board version of his own featuring quad 741 op amps. I expect to have a chance to test this unit sometime soon. Meantime, if any other slow scanners have been using this pre-amp, please let me hear from you. DK1BF's design is a clever one worthy of more interest than I've noticed so far.

Fig. 3—Front view of W1VRK's version of the WB9LVI scan converter. A very professional looking job. Note the mini-Monitor by Video-Guard on top of the converter.

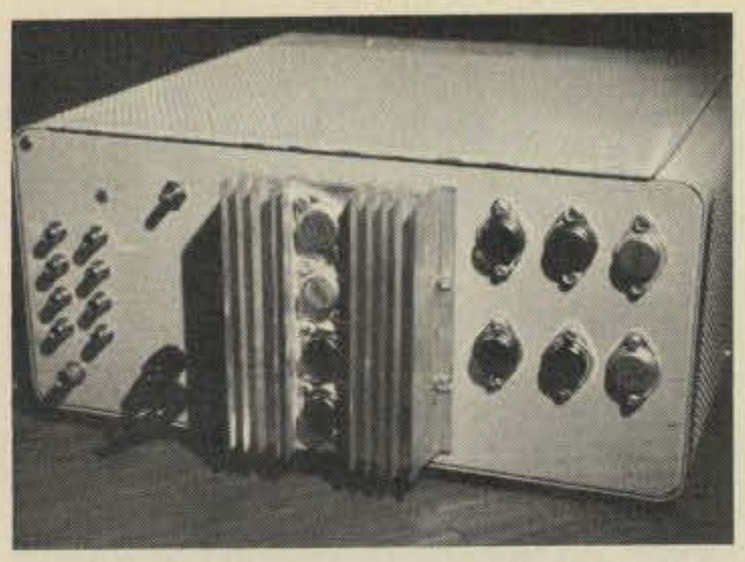


Fig. 4—Rear view of Gene's scan converter.

SSTV Frequencies— What Do You Propose?

"In Focus" for January posed a question for the consideration of all amateurs on slow scan. In effect, I asked for positive suggestions regarding just where in each authorized band segment YOU would suggest SSTV operation.

Many DXers object to the presence of SSTV on 14230 kHz. That frequency (plus or minus a few!) is also a favorite for hours-long phone patches emanating from South America. Clearly, a move UP the band is in order.

HOW ABOUT BETWEEN 14260 and 14275 kHz?

Evening operation around 3845 kHz. is a disaster most of the time due to teletype from sources unknown.

HOW ABOUT GOING UP BETWEEN 3860 and 3875 kHz?

I have nothing against net operation but I know that it will be tough to find frequencies that aren't occupied by one net or another. SO —here is a challenge. We amateurs claim to be great communicators. Can we communicate well enough to find a solution to this problem— or should we start pushing-shoving-name calling and elbowing around to achieve its resolution?

If you have a positive suggestion, please write to me, or, better yet, offer your comments at the SSTV Seminar in Dayton!

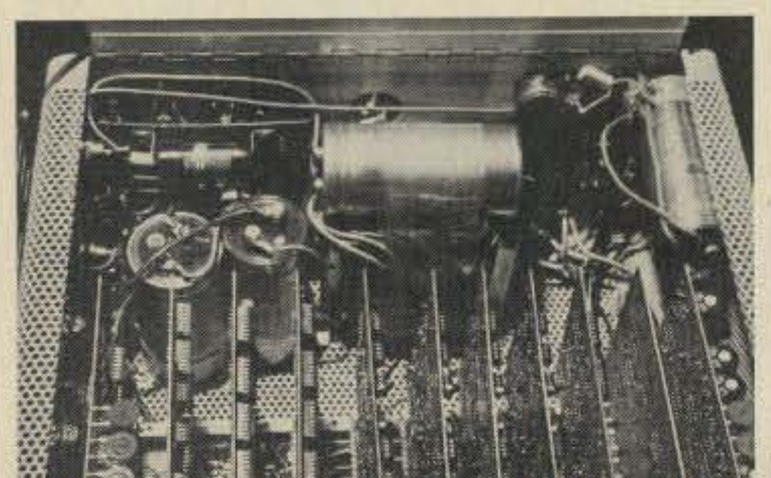


Fig. 5—Interior view of scan converter showing vertical configuration of PC boards.

Fun With Your Scan Converter, Pictures, Titles And "Stuff"

Scan converters can liven-up your SSTV picture programs considerably by opening the door to picture-combining possibilities.

During the next few months, "In Focus" will demonstrate how to have fun using the memory feature of scan converters in combination with tape recorders, SSTV Keyboards, and cameras to create picture combinations not possible without a memory system.

Make Use Of All That Equipment!

Many amateurs owning scan converters also have an SSTV Keyboard. So, why not put your SSTV Keyboard to use by adding a title or some comments to your pictures? (You can also have a little fun by adding appropriate remarks *VISUALLY* to your playback of received pictures.

While the techniques described here were derived using a Robot 400 Scan Converter, they can easily be adapted to practically any other converter.

Quick And Easy Titles On Your Scan Converted Pictures

Let me say at the outset that what you're going to do is easier than trying to describe it!

If you have an SSTV Keyboard, it's a cinch to add a title at the top of a picture. Here's how to do it:

Write the picture into memory as usual. The source of the picture can be your receiver, tape, or a camera. OK, now switch over to the Picture Hold position. See fig. 7.

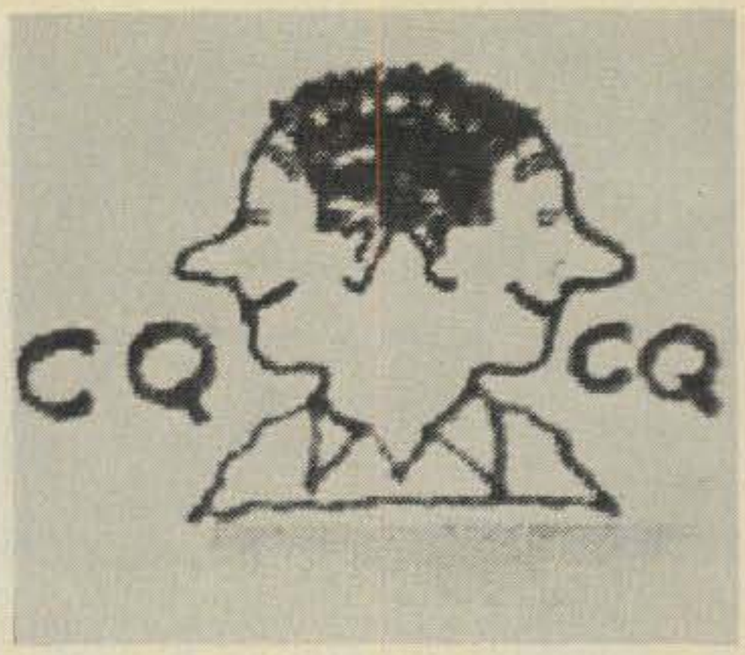


Fig. 7—Here's that chappie who says, "WE got OUR haircut today, etc."

Fig. 6—Well-known slow scanner Murray Bugen, K1WPS sitting next to a mouth-watering collection of Slow Scan, RTTY, Signal Ones etc.!!

Next, plug your SSTV Keyboard into the "OTHER" input of your scan converter. Set the Keyboard for ONE LINE operation. "Punch in" the word you want as a title and select either black or white background (on the Keyboard).

Fig. 8—George Washington without a title.

Fig. 9—Adding a title to George's picture isn't difficult if you have an SSTV Keyboard and a scan converter!

Set the Memory Input Selector switch for "OTHER" input. Flip the Continue-Hold switch to Continue—and your title will appear at the top of the picture. Return the Continue-Hold switch back to HOLD. See fig. 8.

Fig. 10—Use Lines 1 and 5 of your SSTV Keyboard to get this effect. Blank out Lines 2, 3, and 4 with the space bar.

information.

Want to add a name or other item at the BOTTOM of the picture too? It gets more complicated, but read on!

Fig. 11—"Writing-in" George's handsome face wipes out the word FRIEND at the top, but don't worry—that can be fixed.

will occur BEFORE the picture wipes out Line 5. As the next frame proceeds down the screen, flip the Continue/Hold switch to Hold as the image approaches Line 5. See fig. 10.

8. Set your Keyboard for 1 LINE

Fig. 12—Replacing the top title is easy. Just set the Keyboard for One-Line Display, flip a switch or two, and VOILA!

Now that you have a pretty picture with a title on it, why not tape record it?

Don't forget to set the Transmit Select switch to the Memory position to insure that the tape recorder will receive the stored picture/title

Fig. 13—The words "My Friend" are derived from Lines 2 and 3 of the Keyboard. Half size letters are created by setting the Robot Width control as described in the text.

Top And Bottom Titles On Your Scan Converted Pictures

1. View the taped recording (of desired picture) as necessary to stop it about ONE-HALF FRAME FROM THE START OF THE PICTURE.

2. Set up the words you want at the top and bottom of the picture on Lines 1 and 5 of your keyboard. Use the space bar to clear Lines 2, 3, and 4.

3. "Write" the Keyboard input into memory and snap the Continue/Hold switch into the HOLD position. See fig. 9.

4. Change the Memory Input switch from "Other" to "Tape".

5. Watch the monitor screen for the "blink" indicating the start of a frame.

6. Start the tape and flip the Continue/Hold switch to Continue.

7. The picture will proceed down the screen. A vertical synch pulse

Fig. 14—Girl's head test picture displayed via a WB9LVI scan converter. (Picture appears stretched horizontally compared to Fig. 15.)

DISPLAY. Change the Memory Input switch back to OTHER.

9. Wait for a frame "blink" and then flip the Continue/Hold switch to Continue. This will "Write-in" Line 1 at the top of the picture. See fig. 11.

Fig. 15—Girl's head test picture (derived from same tape as used in Fig. 14) displayed via a Robot 400 scan converter.

Fig. 16—Unusual effect noted on W2DD's P-7 monitor every April 1st. Comments requested.

Frosting On The Cake?

With the Robot 400, you can put a little frosting on the cake by setting the 400's Width control to the 8 o'clock position whilst writing in the top caption. This will give you one-half size letters!

Refer back to step 9 above, but BLANK OUT LINE 1 with the spacing bar. Now you can write in two or three lines at the top of the picture as shown in fig. 12. Pretty neat, eh?

Ulterior Motive Department—A-HAA!

The techniques outlined for captioning pictures sound a bit complicated, but once you get the hang of it, they're really not difficult at all. However, I do have an ulterior motive in presenting this information. As illustrated here, much can be done with the controls and features of existing equipment—BUT, ONE SINGLE ADDED CAPABILITY would simplify the problem of combining pictures and add special effects capability as well.

What is needed is a "house synch" system for SSTV. Preferably a system that would accept the outputs of existing SSTV cameras, Keyboards, and taped SSTV. This would eliminate the timing problems attendant to putting frames together etc. It would also permit mixing for "Overlays" and switching from one source to another without loss of synch. This same capability is needed for Fast Scan inputs to scan converters.

Anyone out there with a "Little Black Box" all ready to go?

Picture Quality—Robot's 400 Versus Homebrew "LVIs"

Last Fall, some of the East Coast SSTV Net gang got together for a few drinks and dinner. Piece de Resistance (pardon the Ohmic pun!) was a comparative look at the same pictures simultaneously displayed from tape via some WB9LVI—designed scan converters and a Robot 400. The results were reported to be v-e-r-y inter-esting!

Statements of comparative performance without laboratory control techniques and measurements are inadvisable to say the least. However, according to some of those present it appeared that the WB9-LVI design converters displayed slightly better resolution and noise immunity.

Courtesy of Mel Liebowitz, W3KET, who took the pictures, and Bob McMillen, W3ATV, who sent them to me—you can judge for yourself how things stacked up in the direct picture comparisons of figs. 13 and 14. Resolution chart comparisons appear to verify the comments of viewers of this interesting side by side display.

Simplicity of operation, low power consumption, extreme compactness, and overall performance were the features of the Robot 400 well-received by those viewing the comparison.

Resolution Of P7 Monitors Is Hard To Beat

I should mention that W3ATV also sent me pictures representing a resolution chart displayed on the p-7 CRT of a WOLMD designed monitor (WA9MFF kit). The image source was the same tape used in the above mentioned comparisons, camera was a Sony CU-2100 and a sampling fast-to-slow scan converter. As expected resolution via this analog system was superior to both the Robot 400 and the LVI scan converted images — but significant photographic image sizes make anything but a qualitative comment

(Continued on page 69)

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

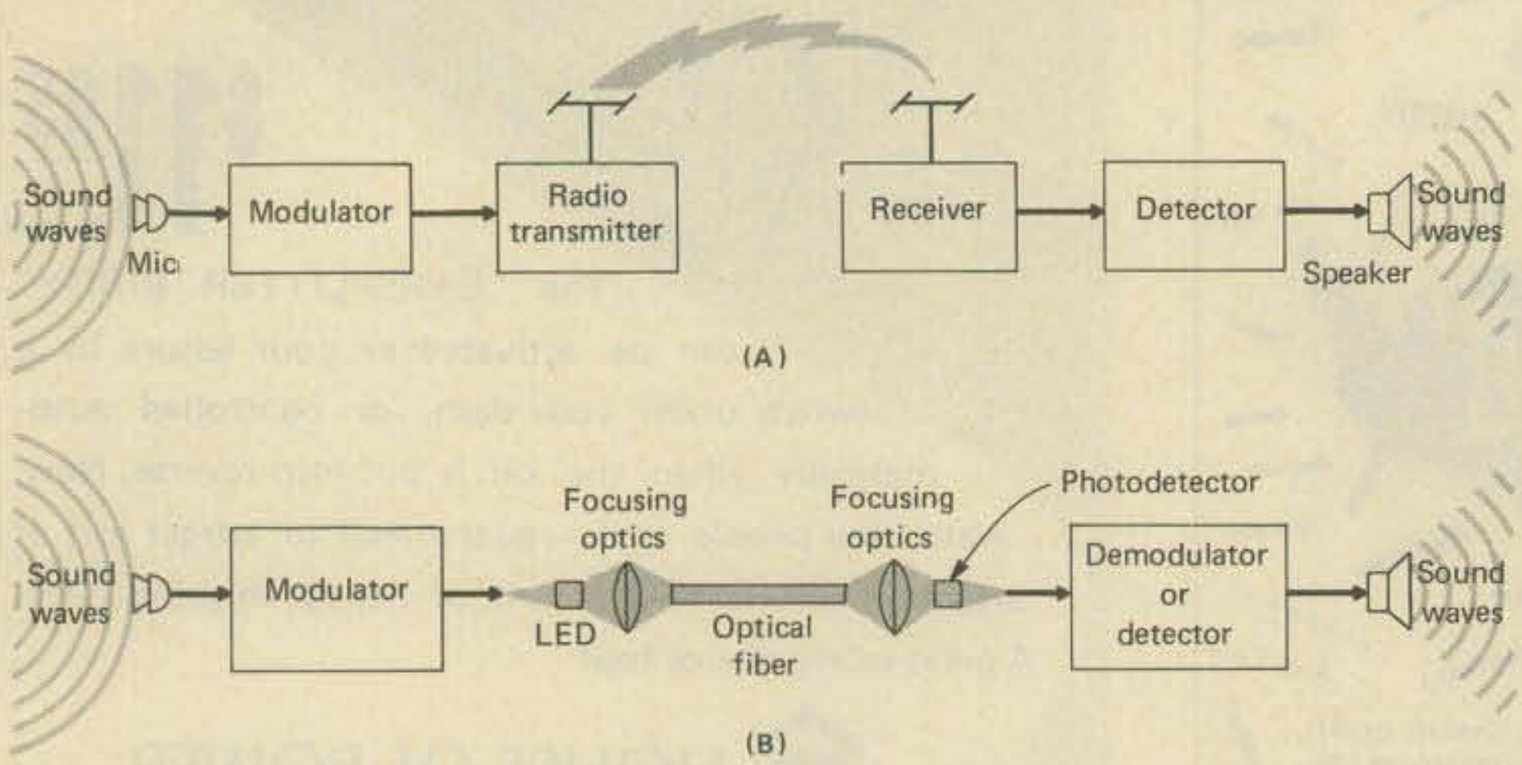


Fig. 1—radio-telephone link as compared with a optical fiber link.

In an attempt to keep our readers up to date with the latest techniques in the communications field we often discuss new components and methods for doing older jobs in new, often better ways. With this thought in mind we felt it was time to discuss a "new" technology that is making a tremendous impact on the communications area today.

This technology is the transmission of information, both analog and digital over optical fiber communication links. This also, happens to be very closely related to the business that this author is involved in.

An optical fiber communications link is very similar to a radiotelephone link in general principles and can be easily understood by comparing it to one as in fig. 1. In the top portion sound waves are converted into electrical signals by a microphone, and used to modulate a radio transmitter. The resulting r.f. is then transmitted through the air to a receiving antenna where it is collected, fed to a receiver, detected or demodulated, and then converted back into sound waves by means of a loud speaker.

In a similar manner, the sound waves in the lower portion of the figure are also converted into electrical signals which are then used to modulate the light emitting from an L.E.D. or similar fast acting light source. This modulated light is then focused onto a specially manufactured optical fiber by means of conventional optics. At the other end of the fiber, which may be a kilometer (3900 feet) or more in length, the emerging modulated light is again focused onto a sensitive photodetector where it is converted back into electrical signals. These are further processed and, as shown, fed to a loud speaker where the desired sound is faithfully reproduced.

*5 Melville Lane, Great Neck, NY 11020.

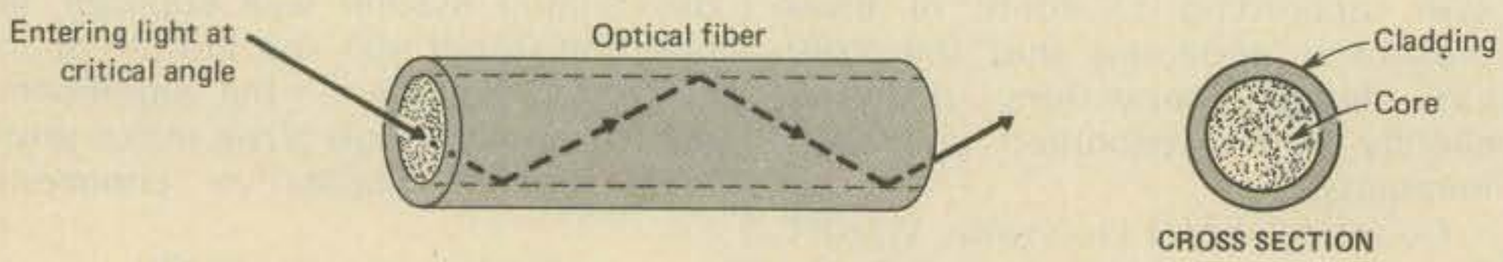


Fig. 2—Detail of fiber operation.

The unique part of this system is, of course, the optical fiber. By means of special techniques, glass, fused silica (quartz), or plastic is melted and drawn into long, continuous filaments that can range from a few thousandths of an inch in diameter to a sixteenth of an inch or so. These filaments may be many thousands of feet long if so desired. The filaments are then clad with a material having a different refractive index[1] than that of the "core" material with the result that as shown in fig. 2, light entering the fiber at a certain critical angle, is propagated through the fiber by an effect known as total internal reflection.

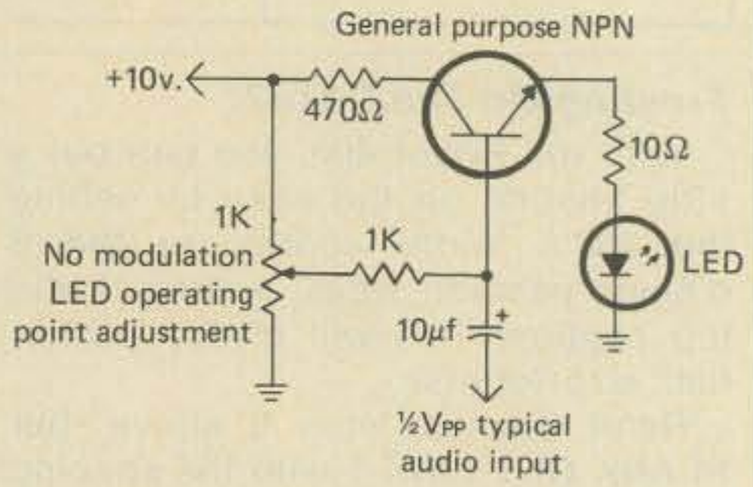


Fig. 3—An LED a.m. "transmitter". Adjust the pot for about ½ brilliance of the LED with no audio input. Then vary the audio input level so that peaks just turn off the LED.

What that means to the user however, is that light entering the fiber at one end will come out at the other end at a level that is a function of the degree of attenuation of the particular fiber. At present, commercially available glass fibers with attenuation factors of 10 db per thousand meters can be purchased and experimental fibers with losses of 1-2 db per km have been made. For the experimenter, plastic fibers with attenua-

(Continued on page 69)

[1] The index of refraction of a material is a number that signifies the degree of bending that occurs when a light passes through the material.

CQ Reviews:

The Heathkit SB-230 1KW Conduction-Cooled Linear

BY HUGH R. PAUL*, W6POK

While glancing through the latest Heathkit catalog my attention was drawn to the SB-230 conduction cooled linear amplifier. It struck me as strange that I had not heard many of them on the air, since the unit has been on the market for quite some time. Curiosity got the better of me and I made an effort to track down one or two of them for evaluation.

The SB-230 is a state of the art design employing an Eimac 8873 triode in a grounded grid circuit. The 8873 is an extremely compact tube capable of 1 kw input on c.w. It is similar in appearance to the Eimac 4CX250B except it is a bit larger and does not have external anode cooling fins. One side of the 8873 is flat and is the surface from which heat is conducted away from the tube, thus resulting in cooling without the need for a fan and its attendant noise.

Efficient conduction of heat away from the tube is made possible by a space age development known as beryllium oxide ceramic. A block of this material is coated on both sides with a thermal bonding agent and is then clamped between the flat side of the 8873 and the finned anodized heat sink, which is bolted to the back of the SB-230 cabinet. This ceramic is probably the most efficient heat conducting material available today and is also a good insulator at high voltage levels.

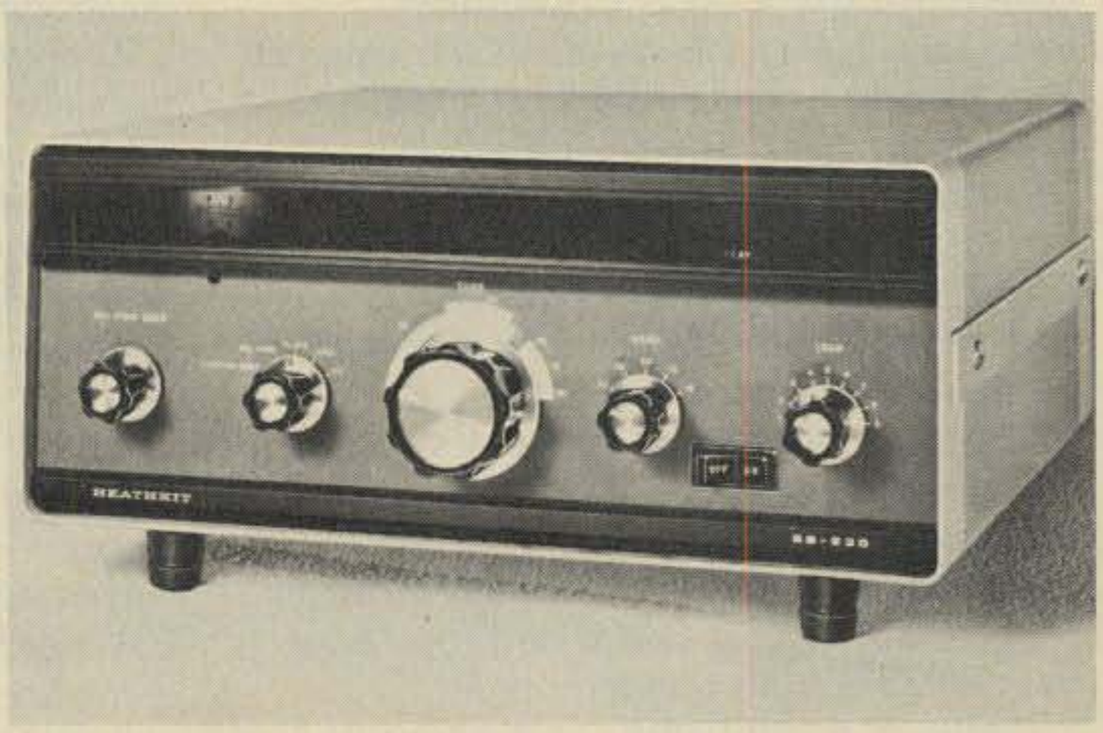
The Heathkit manual is careful to point out the dangers inherent in the use of beryllium oxide. The dust resulting from crushing or drilling the material is poisonous. If the material is heated above 1000 degrees F there is a danger of poisonous fumes being released from the material. If these warnings have prevented you from acquiring an SB-230, forget it. *It is not a dangerous kit to assemble or operate.* I have worked with this material and I can assure you that normal handling does not present any danger. If the Eimac 8873 were to become hot enough to heat the ceramic material to 1000 degrees F you would find that it was functioning as a fuse rather than a vacuum tube. The 8873 would self destruct.

To prevent such a situation, Heathkit has incorporated a thermal circuit breaker into the SB-230. If the heatsink reaches a temperature of 400 degrees F, the breaker opens and causes the Hi-Temp lamp to light on the front panel. When this happens the 8873 amplifier tube is biased to cut-off and the transmit-receive relay will open to return the input and output circuits to the exciter only mode, i.e. the transmitter is now connected directly to the antenna, bypassing the amplifier.

When the amplifier is not "on" the exciter is automatically connected directly to the antenna. If the amplifier is "on" and you wish to connect the exciter directly to the antenna to facilitate tuneup, there is a position on the meter switch labeled "exciter only", which allows you to bypass the amplifier.

Additional safety features include a circuit breaker in the power transformer primary and micro switches which open the primary circuit if the top or bottom covers of the linear amplifier compartment are opened with the amplifier plugged in. The

(Continued on page 70)



The Heathkit SB-230 1KW conduction-cooled linear amplifier.

*291 Macalester Drive, Walnut, CA 91789

The world's first digitally tuned 80M-10M SSB transceiver

with over 40,000 frequency synthesized channels.

• Ultra-stable frequency synthesizer • Large LED readout • 200 Watts PEP input • *All* solid state including electronic tuning • Front end filtering • Built-in TVI filtering • Modular construction • WWV Receiver, Squelch, Noise blanker, VOX, Speech processing are standard • Full metering.

Discover a whole new world of communications with the CIR ASTRO 200 . . . the Ham SSB Transceiver that has established a new plateau of sophistication for the serious enthusiast.

The built-in digital synthesizer with LED readout gives you over 40,000 crystal controlled channels in the 80 through 10 meter bands with 100Hz resolution. Just press a momentary switch and tune your frequency with no moving parts.

Calibrate it with WWV at the turn of a switch for absolute accuracy. No more crystal calibration.

And, as for frequency drift, the ASTRO 200 is ten times better than VFO types. Total filtering sets the ASTRO 200 above all others for TVI and harmonic suppression. Selectable USB or LSB allows you complete flexibility, and extended band coverage covers many MARS frequencies. CW operation features include semi break-in CW with adjustable delay and side tone . . . no key click or CW chirp.

CIR offers a complete range of accessories including fixed station console and external frequency synthesizer for crossband DX work.

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a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

"A High-Power Holiday—An Old Idea Revisited"

While this won't appear until April, when the spring warmth and sprouting greens change the world, right now it is a bleak January day, and South Dakota is brown and gray outside, where it is colder than my old bones care to feel. So I've been rummaging around my memory about the past year and taking stock of just where the meaning of it all lies. Usual beginning-of-year assessment. I got to poking into corners in a sombre mood and came across something that my old friend Rockey, W9SCH, wrote a while back. It hit the mood perfectly. That's why I'm going to share it with you readers. Despite the fact that it will be April and springtime when you get it. He wrote:

"In my last letter, I offered as a suggestion to further 'homebrewing' the idea of a club contest which involved the construction, from scratch, of some working piece of electronic gear related directly to amateur radio. I initiated just such a contest among the members of the New Trier High School Radio Club recently, and am able to report that it was a success. There were a total of five entries out of an active membership of sixteen. These included two tube-type QRP transmitters, one all solid-state QRPp transceiver (which achieved a 5000 mile/watt QSO, a club record), an RF wattmeter, and a digital-type keyer with memory, all worthwhile items. The winning project was a tube type QRP transmitter submitted by Scott Schillereff, WB9CXN, and included a VFO and final amplifier lineup. The prize was a copy of the *Electrical Engineering Handbook* by Pender and McIlwain.

"It is interesting to observe that "Schlitzie Schillereff's" ham experience is 100% QRPp. So far as I know, he has never run over twenty watts in his two-year ham career (Advanced Class now). Since he is president of the club, you can appreciate the efforts on my part to stir up interest in QRPp operation with some success. But not all members are QRPp fanatics—the secretary's dad owns a KW and a beam which she will probably use when she gets her General ticket. But QRPp is a prominent interest in the club. It shows what can be accomplished if the leaders of a club group will only put forth some effort in introducing younger members to the varied facets of our hobby. Oh yes, may I bask in the reflected glory of one of "my boys" in the club? Michael J. Gordon, WB9FHC, the treasurer of the club, recently published an article entitled "Calculating Toroid Inductance" in the February, 1972, issue of *ham radio.* I'm very proud of him. The article will be something of a classic, I'm sure. But this all is mentioned merely to show what responsilble leadership in a club with younger members can do in the way of restoring the "ham" to amateur radio. If one or two nuts in each club throughout the U.S.A. would give some time and effort to illustrating to younger members that an alternative *does* exist to 'appliance' operation, I'm sure that we'd soon be hearing 'TX HOMEBREW HR OM' much more frequently on the air.

"On another subject, I found the following piece while rummaging through some old *QST* magazines in the Milwaukee Library the other day. It will perhaps add another chapter in our history of QRPp ham radio. You will perhaps recall that Fred Schnell, the author of the letter, was one of the truly *big* amateurs of the early days, and perhaps of all time. He was one of the first to operate on the 'shortwaves'—100 meters—one of the first to work "across the pond" with Leon Deloy, F8AB. He was the ham who cruised with the U.S. Navy in 1925-26 and 'sold' the Navy on use of the high frequency spectrum. His 'Schnell Tuner' was the model for shortwave receivers for more than a decade. Last I heard of him, he was chief engineer for the Chicago Police about twenty years ago.

"I think that this remains one of the most rational letters ever published in *QST* (I wonder whether the present editor would have published it?—I have my doubts). Needless to say, the following issues of *QST* were full of both pros and cons. The 'conservatives' then, as now, put forth their usual argument reflecting fear that we would lose privileges and status . . . In case you don't remember, the '10 mentioned by Schnell was a triode originally designed for output service in audio equipment. If I recall correctly, it was rated at 350 volts, 50 ma., and 7.5 watts plate dissipation. These tubes were the rage when I was young and I still have one laying around here somewhere. We used to really 'pour the coal' to them: I ran 800 volts at 100 ma to one once (and some characters would use as much as 1500 volts on the plate!). I burned a hole right through the plate, but the '10 kept right on working for months that way. But enough of this, . . . and on to Mr. Schnell's letter of *1931.*"

A High Power Holiday?

"Mr. *QST* Editor, I would very much like to sit down with the Old Man, the Grand Old Man of amateur radio, and unburden myself of some thoughts, make heart-to-heart confession as it were. I cannot afford to galavant all over the country, tagging around after him, because Heaven and you alone know where he is and neither of you will tell. About the time I thought I was close on his heels in one district, he probably would be over in another. So about the best I can do is to write out my yarn and you can pass it along to him to see what he thinks of the idea, a three year 'High Power Holiday.' Well, here goes, and I hope the Old Man is comfortably seated, the pipe properly filled with plenty

*83 Suburban Estates, Vermillion, SD 57069

of tobacco and hitting on all eight, the cat peacefully sleeping and the static nil.

"Ever since I first heard the magic word 'wireless' there was enough mystery in it to fascinate me. I investigated it year after year and have been investigating it ever since only to find that we call it "radio" instead of wireless. The investigation has been a mighty expensive experience but it also has been quite a productive source of real enjoyment throughout these years, with a thrill here and another there. Of course, it all goes back to those days when radio was 'in its infancy' and a spark transmitter was a nuisance, and we knew it but wouldn't admit it. Why, if any amateur would dare to use a spark transmitter today, he would bring upon himself the wrath of the whole country. Such a transmitter would blanket two of our amateur bands and wash out all the commercial and government stations in between and on both sides for quite a few kilocycles. You know, those old spark transmitters never used less than 250 watts according to the transformer rating, but no honest Old Timer will deny that a good many of them were pulling 15 to 20 amperes from the 110 volt house line. And the funny part of it was that only a few of them were able to do any real DX like we do with our c.w. tube transmitters. Five hundred miles was good DX, 800 miles was very good, and when somene clicked off 1000 or 1200 miles, that was something to write ARRL headquarters about.

"And that is what brings me to my feet and that's what makes me think we are burning a lot of power—in fact, wasting it unnecessarily. Not only that, but we actually boast and brag about the amount of power we use, when we ought to be ashamed of ourselves for even mentioning it. Oh, yes, I'm right in the same boat. I've had what might be considered high power gear ever since two-killowatt transformers have been rated at one-kilowatt, and I've been operating a c.w. transmitter that uses two 250 watt tubes. I'm not throwing bricks at anybody—I'm thinking of my own misguided efforts too.

"We talk up the fact that we United States amateurs have the cream of it all. We are allowed to use one kilowatt of power input (if we can afford it) when amateurs in some other countries are allowed only 10 watts. We are permitted to use any part or all of the amateur frequency assignments while amateurs in some other countries get but small slices of one amateur band. Yes, and there are some who even kick about this, they want more frequency and they even get up petitions about it. Why, we used to shudder at the thought of what would happen to us if we had been restricted like the Canadian amateurs were back in those old days! They could use one kilowatt of power on 50 meters. A very generous allocation it would be today, but in those old days it was enough to crush the spirit of any but the most persistent amateur.

"I value the advice of The Old Man above all others. To me, his word is the final word in amateur radio, with all due respect to ARRL officers and directors. And that's why I'd like to see how he feels about these things. Suppose we could find out how the whole amateur fraternity feels about this three-year 'High Power Holiday' and suppose the great majority was in favor of it. Then, suppose we could send a couple of ARRL officers down to Washington to ask the Federal Radio Commission to listen to our story. Suppose these officers told the Federal Radio Commission that we amateurs want to declare a 'High Power Holiday' and that we request the necessary authority which would permit us to use nothing larger than a Type '10 tube in the output stage of our transmitters. There would be no power limit, of course. If some amateur was skillful enough to sock 100 watts into that tube and get 99 watts out, hats off to him. Suppose we asked the Federal Radio Commission to make such a regulation—what would happen? There would be set up such a yell as you never heard before—such a yell that we wouldn't need transmitters; the yell would be heard 'round the world and petitions would grow on antennas. Yes, but if we all agreed to abide by it, what more could we do?

"What would we do with all our high power apparatus? Well, what did the Navy do with the battleships when the Ten-Year Naval Holiday was declared? Scrapped them! We wouldn't have to scrap our apparatus —we could lay it away and if the low-power idea didn't work out for the greatest good of the greatest number, then we could start right up where we left off, and undoubtedly with a lot of new ideas for greater efficiency. Any amateur who can afford to buy 250 watt tubes and burn the power for them can afford to lay them away for a time and try the low-power idea. It must be given a fair chance and no half-hearted effort is going to be worth the candle. One year would be too short a time for such a radical experiment. I think that by the time two years had gone by we would commence to appreciate what could be done with such a transmitter and by the time the three years had gone by we wouldn't care a hoot about the high-power transmitter.

"The 'High Power Holiday' idea may be a radical one, but thoroughly reasonable and a practical one. We know that a 250 watt transmitter located in New York is capable of putting a signal into Australia. And, we know that a transmitter using but a single Type '10 tube is capable of doing the same thing. We know that amateurs in some countries use not more than 10 watts of power and yet they put good signals over to us. A 10 watt transmitter of high efficiency is much better than a 1000 watt transmitter of low efficiency, all things considered. Who is there to say that we cannot make our low power transmitters more efficient than anything we have today? Who will say that we cannot discover some entirely new transmitting and receiving antennas and who will say that we cannot develop more sensitive, more selective and better receivers? Who will say that we cannot do satisfactory long-distance communication with the power that can be put into a Type '10 tube? And who will say that such a scheme wouldn't give each and every amateur a better chance to display his knowledge and ingenuity and make him strive for highest efficiency? Well, who would? I believe we have enough frequency bands in which to accomplish these things and to that belief I shall stick until I have concrete evidence to prove otherwise.

"Not so long ago I saw a motorboat race in which five motorboats participated. Each boat was exactly like the others, the same size, shape, and weight. The motors were alike, the rudders were alike and each one used the same quantity and the same quality of gas and oil. No changes were permitted, other than adjustment of gas and oil mixture. The race was to see which boat would travel the greatest distance in the least time. The chap who won it actually walked away from the others. Why? Because he knew how to adjust his gas and oil mixture for the greatest power and the highest speed over the greatest distance. Why not try the same idea in amateur radio?

(Continued on page 69)

CQ Reviews:

The Palomar Engineers R-X Noise Bridge

BY HUGH R. PAUL*, W6POK

Palomar Engineers is currently marketing an R-X Noise Bridge for $39.95. This is a device that should be in every ham shack worthy of the name. It is an accessory item that is definitely not a luxury. Those of you who are not familiar with the function of an R-X noise bridge, keep reading.

How many times have you installed a new beam or constructed a dipole and then spent hours pruning and adjusting in order to get a low v.s.w.r. across the band? If you are like most amateurs you probably were depending on an s.w.r. bridge to adjust the length of the antenna or to prune the feedline so that your transceiver will see a reasonable v.s.w.r. When you get through, the antenna may or may not be radiating efficiently.

To properly tune an antenna, we must first determine that it is resonant at the point in the band where we wish to obtain the lowest v.s.w.r. Next we must determine the radiation resistance at the feedpoint. This resistance must match the terminal impedance of the feedline if efficient transfer of power is to take place. It is also helpful to determine the reactance of the antenna both above and below the resonant point, since this tells us over what portion of the band our transmitter will be able to operate without suffering from the ill effects created by a high standing wave ratio.

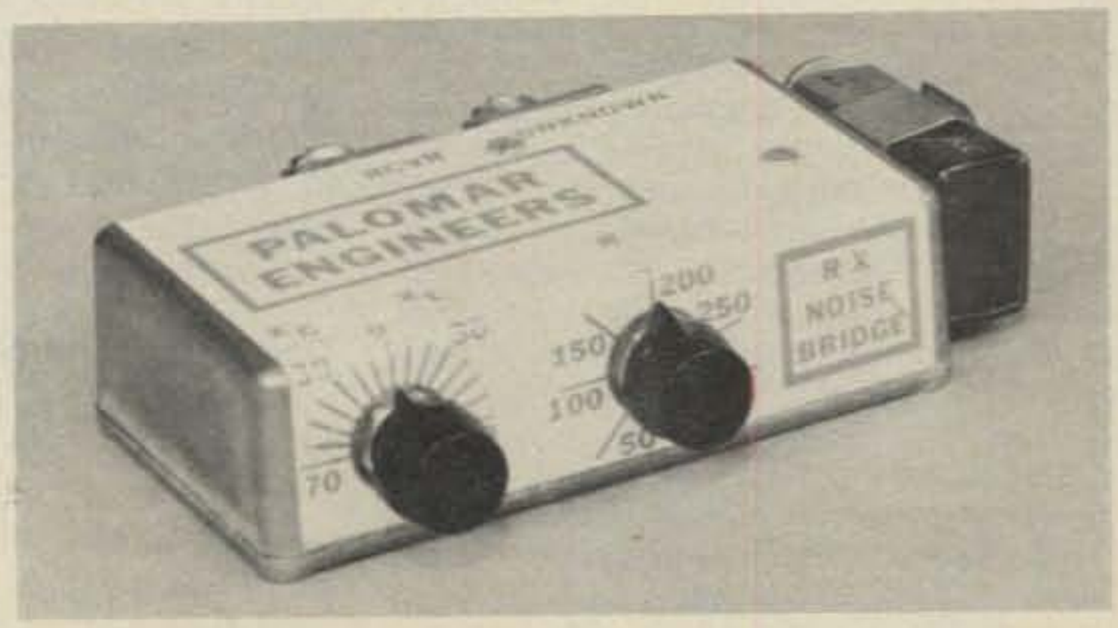
The Palomar Engineers R-X Noise Bridge contains a wideband noise generator. Two arms of the bridge are driven equally by the noise generator through a three-winding broadband ferrite transformer. A third leg of the bridge has a calibrated variable resistor and a calibrated variable capacitor in series. The antenna or other "unknown" circuit to be measured is connected as the fourth leg of the bridge. A short wave receiver is connected across the bridge and functions as a null detector.

When R and C are adjusted for a null (minimum noise out of the receiver) their dial settings can be read to measure the resistance and reactance of the unknown. By tuning the receiver, the R and X of the unknown can be found at different frequencies.

With an antenna connected as the "unknown" its resistance and reactance can be found at frequencies above and below resonance. At frequencies lower than resonance an antenna appears as a capacitor and resistor in series. The values of both are read directly from the R and X dials. At frequencies higher than resonance the antenna appears as an inductor and resistor in series. These values also are read directly from the R and X dials with the inductance read as a "negative capacitance" value. Conversion of X readings into inductive and capacitive reactance is done with a conversion formula calculation. At the resonant frequency X=0 and the radiation resistance is read directly from the R dial. This is assuming that the bridge is connected directly at the antenna feedpoint. Where this is not practical, you can first cut the feedline to an exact electrical half wave length or multiple thereof at the desired resonant frequency and place the bridge at the transmitter end of the feedline and adjust the antenna to resonance.

If the feedline is other than a half wave length, but the electrical length is known, the readings determined by the bridge can quite accurately be converted to the correct antenna resistance and reactance through the use of Smith Charts. Com-

(Continued on page 70)



The Palomar Engineers R-X noise bridge.

*291 Macalester Drive, Walnut, CA 91789

a monthly feature by

HERBERT S. BRIER, W9EGQ

Novice

"How to" for the newcomer to Amateur radio

Using Headphones For More Successful Contacts

"If you never use headphones to listen to the stations you work, chances are that you are not getting the maximum amount of information and pleasure from your radio contacts." That is the way that I started this column, intending to write a few words of praise of headphone reception. But I found myself faced with a bothersome question: if using headphones is such a good idea, why is it that about the only time I use them myself is late at night when the rest of the family objects to the house being filled with c.w. and s.s.b. signals while they are trying to sleep? The only honest answer that I could come up with was, "Yes, signals are more readable through headphones than through a loudspeaker when conditions are poor. But my old 25-year-old, 4000-ohm "featherweight" phones are hot and uncomfortable to wear and are "tinny" to listen to. But no more! My new phones are comfortable to wear, and they are more pleasant to listen to. The family also appreciates the silence.

In the early days, every operator used headphones from necessity. The signal delivered by the receiver detector was not strong enough to drive a loudspeaker. In addition, available audio amplifiers were noisey, and the loudspeakers had more built-in distortion than headphones. Of course, audio amplifiers with total harmonic distortion (THD) of less than one percent and high quality loudspeakers have been available for years. Nevertheless, many headphones have better quality ratings than the most expensive loudspeakers. This potentially higher quality of headphone reception is not the primary reason for using phones with communications receivers. The primary reason is increased communications efficiency. You hear more of what the signals are trying to tell you, because you do not have to strain them through normal household noises, like the television receiver in the next room, family conversations, and other extraneous noises that always seem to become the loudest when you are listening to something particularly important on the loudspeaker. But it is good to know that you do not have to listen to poor quality when you choose to use headphones.

*409 So. 14th St., Chesterton, Ind. 46304.

Mike Povman, WA2DNF, 147-04 75th Ave., Kew Garden Hills, N.Y. 11375, earned his Novice license in December, 1975, and earned his General five months later at the age of 12. He is now working on the Advanced ticket between school work and working c.w. and code between 10 and 80 meters. His Kenwood TS-520, mini-Quad, and low frequency dipoles have racked up 42 states and 23 foreign countries. We are sending WA2DNF a 1-year subscription to CQ Magazine for his winning entry in our Photo Contest. If you wish to enter, send us a clear photo of yourself operating your station and some details about your radio career to: Photo Contest, c/o Herbert S. Brier, W9AD Novice Editor, CQ, 409 So. 14 St., Chesterton, Ind. 46304.

Choosing The New Phones

Our new phones are Archer "deluxe" 8-ohm Mono phones, catalogue No. 279-200A from Radio Shack for approximately $8.00. They weigh approximately 10 ounces and are cushioned both for comfort and to screen out unwanted noises from the

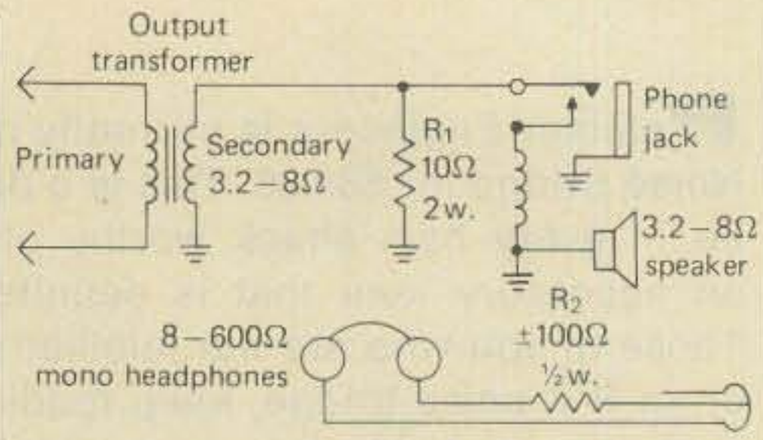


Fig. 1—One variation of the headphone/speaker jack connection. Here the phone jack is connected to the 3.2 or 8 ohm voice coil winding of the speaker output transformer.

user's ears. They have a nominal power rating of one milliwatt. Similar headphones with impedance ratings of eight and 600 ohms are also available from other suppliers. Either impedance works well when two precautions are taken. One is not to overload the phones. With their nominal power rating of one milliwatt and audio amplifiers with outputs up to several watts, they are easy to overload. One milliwatt of audio power pumped directly into your ears is loud. And when stronger signals rattle the phones, the result is paralyzing to the middle of your brain. The other precaution is to make sure that the receiver is working into a matched load when the phones are plugged in for good quality and minimize the chances of damaging either the phones or the output components of the receiver as the phones are plugged in or out.

Virtually all phone/c.w. communications receivers have headphone jacks. In examining over a dozen of their instruction manuals, however, we discovered that most manuals either ignore headphone reception entirely or dismiss it with a statement like "Plugging in the headphones mutes the loudspeaker" and then go to the next statement. Their headphone/loudspeaker circuits are variations of two types, however. Just over half of them connect the phone jack to the 3.2 or 8-ohm voice coil

winding of the speaker output transformer. (fig. 1) The rest feed the phones from a separate 600-ohm winding from the transformer. (fig. 2).

At first glance, the first circuit seems better suited to low-impedance phones and the other to high-impedance phones. Actually, because the headphones require so little power compared to the power available from the speaker circuit, by the time you add a couple of resistors to the circuit to attenuate the signals in the phones to managable proportions, either impedance works well.

Referring to figures 1 and 2, connect a 10-ohm, 2-watt, fixed resistor permanently across the 3.2 or 8-ohm voice coil winding of the receiver audio output transformer. The resistor establishes a constant load on the receiver output circuit and has neglible effect on normal operation. Resistor R_2 in series with the center tip of the phone plug and one terminal of the phone cord limits the volume in the headphones to a comfortable level when the receiver volume control is set to approximately the same point used for loudspeaker listening. Try 100 ohms for R_2 in fig. 1, and try 10,000 for R_2 in fig. 2. Do not disconnect wires already connected to the speaker/headphone circuits in the receiver when adding resistors R_1 and R_2.

News And Views

Bob Hadjak, WD8BRF, 1834 Paisley St., Apt. #12, Youngstown, Ohio 44511, was WN3FNT, 1966-1967; WA3JDT/WB8FAR (Technician), 1967-72; and WD8BRF, Novice and General since last August. Getting an education and earning a living sometimes interferes with one's hobbies! Bob's present station consists of a Yaesu FT-101E transceiver feeding a "secret" 70-foot antenna in his apartment through a Dentron super tuner.

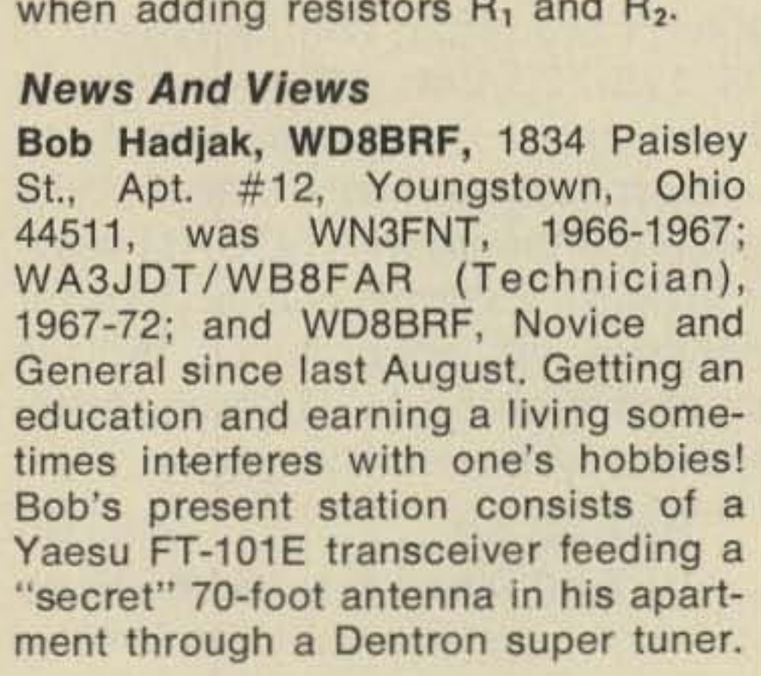


Fig. 2—Another variation has the phone jack connected to a separate 600 ohm winding on the speaker output transformer.

Steve, WA9EZJ, Hobart, Indiana, is vague about exactly how many countries he has confirmed (about 200); but, like most DX'ers, he can recite chapter and verse about the non-QSL'ers. A Wide-spaced, 3-element, 20-meter beam, 55 feet high; and a multi-band dipole couple his Hallicrafters SR-400A transceiver and Heathkit SB-220 amplifier to the horizon.

He has worked 23 states in two and a half months mostly in the mornings and on weekends. He would welcome suggestions on how to put up a better indoor antenna . . . The members of the Maple Hill High School Radio Club WB2YCR, Castleton, N.Y. have been getting practical experience with propagation conditions on the 21 MHz Novice band. They are scheduling PT1TSH, Technical High School, Helmond, Holland, in Europe and with the Walsh High School Amateur Radio Club WB0RTO, Waslsh Colorado. In addition, a former club member now stationed with the Navy in Hawaii is trying to set up a similar schedule between Hawaii and WB2-YCR. What time of the day would you set a 21 MHz sked between Hawaii and New York for best chance of success?

Headline in Chicago, Illinois, newspapers last Thanksgiving: "Two radio Hams electrocuted erecting new antenna mast." The one inacurracy in the item was that the victims were not radio amateurs. They were two 14-year-old boys erecting their first CB antenna. The mast fell into the power lines, and their lives were snuffed out in a futile accident. Please spare us the sad duty of having to write such a notice about you!

Mail your "News and Views," pictures, and suggestions for the column to: Herbert S. Brier, W9AD, Novice Editor, CQ, 409 So. 14th St., Chesterton, Indiana 46304.

73, Herb, W9EGQ

A NEW STAR IS BORN! THE RPT 50 SIX METER NBFM REPEATER

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To best take advantage of the DX as well as the extended range capabilities we recommend our optional tone squelch board TS1 and TTD1 touch tone decoder.

The Model RPT 50 is supplied as complete repeater system. The receiver, transmitter, control circuitry, C. W. Identifier & 115/230 Volt AC power supply are all contained on a standard relay-rack panel and chassis unit. For most installations a user supplies AC power and suitable antennas with 50 OHM coaxial feed (PL 259 fittings). External connections for autopatch, tone control, etc. are provided. Built-in identifier programmed with up to 159 bits. Automatic emergency battery power changeover capability.

RPT 50 Kit $465.95
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IF 10.7F Kit	10.7 MHz IF module includes 2 pole crystal filter	27.50
FM455 Kit	455 KHz IF stage plus FM detector	17.50
AS2 Kit	audio and squelch board	15.00

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TX144B Kit	transmitter exciter – 1 watt – 2 meters	$ 29.95
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TX220B W/T.	same as above – factory wired and tested	49.95
TX432B Kit.	transmitter exciter 432 MHz	39.95
TX432B W/T	same as above - factory wired and tested	59.95
TX150 Kit	300 milliwatt, complete 2 meter transmitter, less crystal and mike	19.95

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PA2501H Kit	2 meter power amp – kit 1 w in – 25w out with solid state switching, case, connectors	59.95
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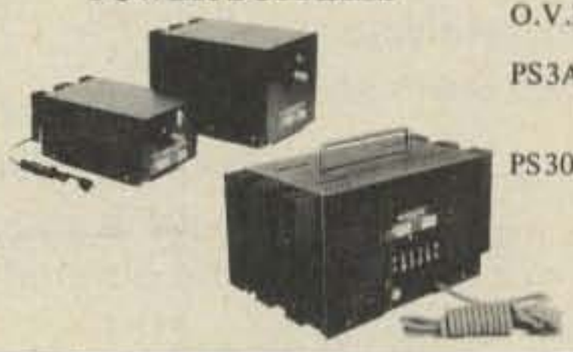
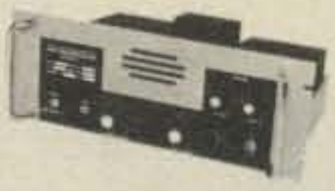
PA4010H W/T	same as above – factory wired and tested	74.95
PA144/15 Kit	2 meter power amp – 1w in – 15w out – less case, connectors and switching	39.95
PA144/25 Kit	similar to PA144/15 kit except 25w out	49.95
PA220/15 Kit	similar to PA144/15 for 220 MHz	39.95
PA432/10 Kit	power amp – similar to PA144/15 except 10w and 432 MHz	49.95
PA140/10	10w in – 140w out – 2 meter amp – factory wired and tested	179.95
PA140/30	30w in – 140w out – 2 meter amp – factory wired and tested	159.95

POWER SUPPLIES



PS15C Kit	15 amp – 12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection	79.95
PS15C W/T	same as above – factory wired and tested	94.95
PS25C Kit	25 amp – 12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection	129.95
PS25C W/T	same as above – factory wired and tested	149.95
O.V.P.	adds over voltage protection to your power supplies, 15 VDC max	9.95
PS3A Kit	12 volt – power supply regulator card with fold back current limiting	8.95
PS3012	new commercial duty 30 amp 12 VDC regulated power supply w/case, w/foldback current limiting and over voltage protection, wired and tested	239.95

REPEATERS



RPT28 Kit	repeater – 10 meter	TBA
RPT28	repeater – 10 meter, wired & tested	TBA
RPT50 Kit	repeater – 6 meter	TBA
RPT50	repeater – 6 meter, wired & tested	TBA
RPT144 Kit	repeater – 2 meter – 15w – complete (less crystals)	465.95
RPT220 Kit	repeater – 220 MHz – 15w – complete (less crystals)	465.95
RPT432 Kit	repeater – 10 watt – 432 MHz (less crystals)	515.95
RPT144	repeater – 15 watt – 2 meter – factory wired and tested	695.95
RPT220	repeater – 15 watt – 220 MHz – factory wired and tested	695.95
RPT432	repeater – 10 watt – 432 MHz – factory wired and tested	749.95
DPLX144	2 meter, 600 KHz spaced duplexer, wired and tuned to frequency	399.95
DPLX220	220 MHz duplexer, wired and tuned to frequency	399.95

TRANSCEIVERS

TRX 144 Kit	case and all components to build 15 watt 10 channel scanning 2 meter transceiver (less mike and crystals)	219.95
TRX 220 Kit	same as above except for 220 MHz	219.95
TRX 432 Kit	same as above except 10 watt and 432MHz	254.95

SYNTHESIZERS

SYN II Kit	2 meter synthesizer, transmit offsets programmable from 100 KHz - 10 MHz, (Mars offsets with optional adapters)	169.95
SYN II	same as above, wired and tested	239.95

WALKIE TALKIES

HT 144B Kit.	2 meter, 2w, 4 channel, hand held receiver with crystals for 146.52 simplex	129.95
NICAD	battery pack, 12 VDC, ½ amp	29.95
NICAD	battery charger	5.95
Rubber Duck	2 meter, with male BNC connector	8.95

OTHER PRODUCTS BY VHF ENGINEERING

CD1 Kit	10 channel receive xtal deck w/ diode switching	6.95
CD2 Kit	10 channel xmit deck w/switch and trimmers	14.95
CD-3 Kit	UHF version of CD-1 deck, needed for 432 multi-channel operations	12.95
COR2 Kit	complete COR with 3 second and 3 minute timers	19.95
SC3 Kit	10 channel auto-scan adapter for RX with priority.	19.95
Crystals	we stock most repeater and simplex pairs from 146.0-147.0 (each)	5.00
CWID Kit	159 bit, field programmable, code identifier with built-in squelch tail and ID timers	39.95
CWID	wired and tested, not programmed	54.95
CWID	wired and tested, programmed	59.95
Microphone	2,000 ohm dynamic mike with P.T.T. and coil cord	9.95

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In this concluding part, Bill answers some "nuts & bolts" type questions on how to actually get on SSTV and get the most out of your equipment. Be sure to read Bill's "In Focus" Column each month to keep up with the latest happenings in television on the amateur bands.

Slow Scan Television Overview '77 Part III

BY BILL DEWITT*, W2DD

Author's Note: Parts 1 and 2 of this article presented a descriptive view of slow scan television and the equipment presently used by amateurs involved in this phase of amateur radio.

Continuing in the question and answer format, Part 3 deals with the operational aspects of SSTV. No attempt is made to cover every item. The purpose here is to give the reader enough information so that he can decide if he wants to know more.

The continuing questions and answers of Part 3 should give a reasonable idea of what one does with a monitor, camera, and tape recorder, once the commitment "to go Slow Scan" has been made.

*2112 Turk Hill Road, Fairport, N.Y. 14450

Fig. 1—Uneven illumination (intentional) with one lamp illustrates the need for balanced lighting of this 7 inch square "station ID" picture.

Where Do I Find SSTV Activity In The HF Bands?

In the United States, an Advanced or Extra Class license is required for SSTV transmissions in the bands below 28mHz. By far the greatest amount of slow scan action is on the 14mHz. band around 14230 kHz. Other activity centers around 28680, 21340, 7171, and 3845 kHz.

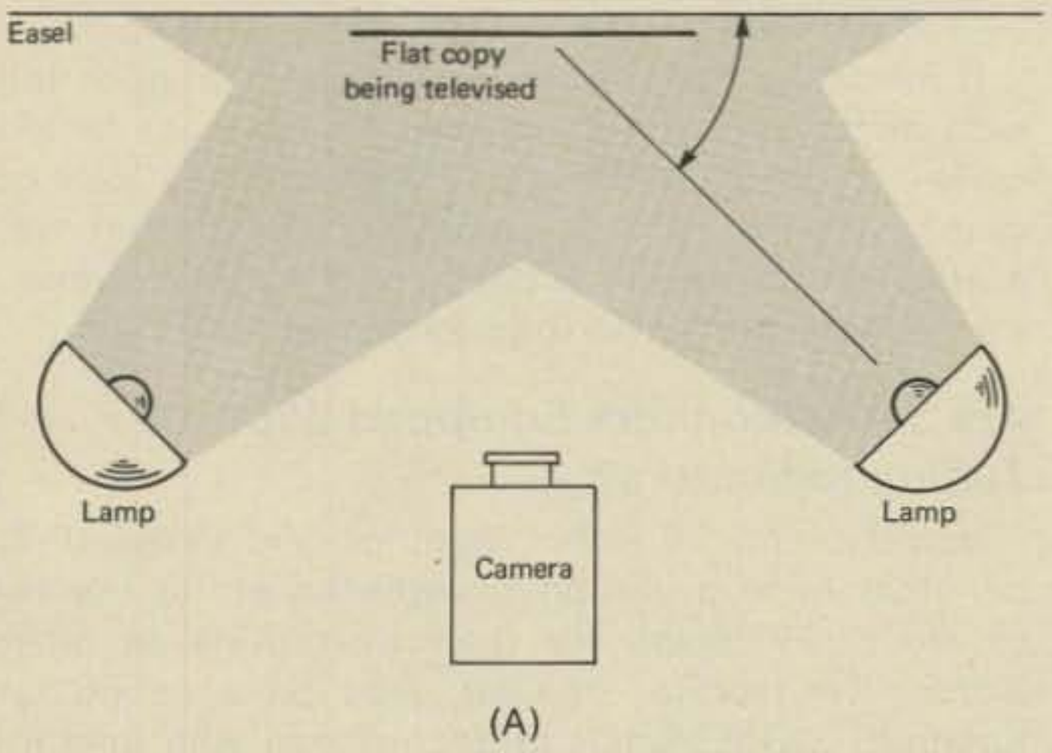
In the author's opinion, SSTV should move to higher frequencies in both the 3.8 and 14mHz. bands. (This point will be discussed at the SSTV Seminar in Dayton this Spring.)

What Would I Have To Learn—To Get Satisfactory Results With SSTV?

Geting good results with SSTV won't require learning anything that would challenge your intellect! And, it's fun learning how to use apparatus that adds a new dimension to your amateur radio interest.

Here are some examples of what you need to know—not the least bit difficult:

1. How to tune in an SSTV signal.



(A)

Fig. 2—Uniform illumination of the "ID" picture with balanced lighting arrangement shown in fig. 2A eliminates dark corner, improves facial and hair details.

2. How to adjust the brightness and contrast of a monitor. (You've already done this on your broadcast TV set, right?)
3. How to illuminate a subject for televising—otherwise described as setting up a couple of lights at 45 degrees to the subject.
4. How to focus and adjust an SSTV camera.
5. How to make a "CQ tape" and how to tape other "program material".

Could I Get By With Just One Light?

Yes, you could. But if you want good quality pictures of either "flat copy" or people, balanced lighting with two lamps is needed. See figs. 1, 2, 3, and 4.

A single lamp directed at SMALL flat copy like a QSL card or photograph is generally adequate. However the use of only one lamp will result in sharp shadows and washed-out highlights if the subject is a person's face. For good tonal range, use balanced lighting whenever possible.

Fig. 3—Pearl "PT" Taylor, W8QZ, uses this simple but effective easel board to televise "flat copy". Note how an inexpensive dual lamp is used to flood the subject with light.

Would A Camera, Monitor, And A Tape Recorder, Be All I Need For SSTV Operation?

Those are the basics, but you'd be happier if you owned a tripod or some means of supporting the camera (see photos). You'll also want to get some portable lights.

Is It Difficult To Set Up SSTV Equipment And Connect It To An HF Transceiver?

No. The only connections involved are made to the audio input and output of the transceiver. No internal wiring changes are involved. The instruction books supplied with commercially built equipment are more than adequate for initial adjustments and inter-connection with your s.s.b. gear.

Fig. 4—Bob Weinig, K4FZ, built a track to guide his Robot 80A camera back and forth as necessary for each subject. Note the vertically oriented lamps used by K4FZ to get balanced lighting.

Fig. 5—Appearance of SSTV picture caused by incorrect tuning. Here, the pitch of the received signal is too high with resulting loss of blacks and a washed-out look.

How Do You Tune In A Slow Scan Signal?

There's no substitute for a little "hands on" experience in tuning in an SSTV signal. To get proper picture structure and brightness, the receiver must be tuned so that the synch pulses are at 1200 Hz. At this point, the received "warbulation" will be varying between 1200 Hz. (synch freq.) and 2300 Hz. (white). In between those frequencies are the shades of gray-to-black.

Yes, But How Do I Know When The Video Is Varying Between 1200 And 2300 Hz.?

If voice comments precede the video, you just tune in the voice correctly and the video will be OK. If a voice transmission does not precede the video, vary your receiver tuning slowly until the line structure of a picture appears on the monitor screen. Correct tuning is achieved when the whites are whitest and the blacks are blackest.

Fig. 6—Appearance of SSTV picture tuned in correctly with good whites, blacks, and tonal range in between.

Fig. 7—Appearance of SSTV picture resulting from too low pitched signal. Lack of frequencies above about 1700 Hz. causes loss of whites in picture.

If the audio pitch of the received signal goes too high or too low, the image will be too light or too dark— or disintegrate completely due to loss of synch. See figs. 5, 6, 7, and 8. As indicated above, a little experience is a big help. Fact is however, it's really easier to do than to explain!

Are SSTV Monitors Equipped With Tuning Indicators?

Some models of Robot, Sumner, and Venus (P-7) monitors have provision for viewing either the received SSTV images or their waveforms. In other words, the monitor can be used as a scope for tuning in SSTV signals in accordance with Instruction Book directions.

Starting with the monitor in the 'scope mode, the operator tunes to obtain a certain pattern representing correct tuning. He then switches over to the picture display mode.

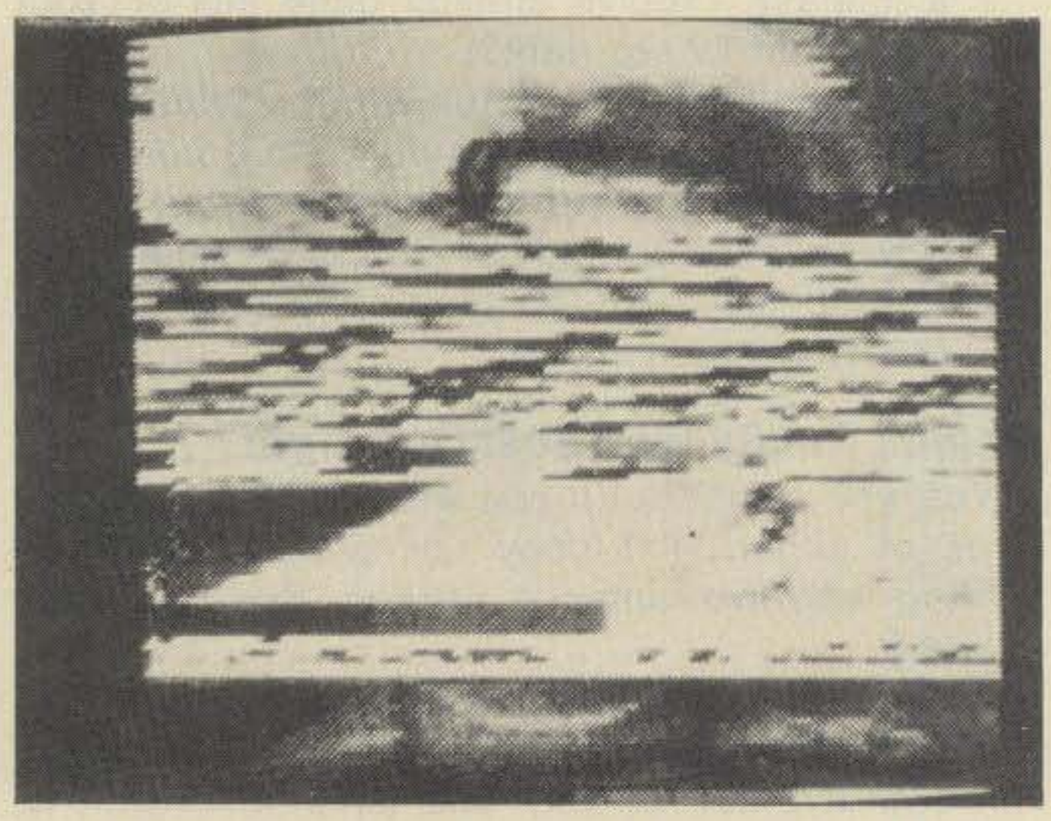


Fig. 8—Deliberate mis-tuning of SSTV signal during its 8 second scan shows how the line structure is destroyed when synch pulses are lost by detuning.

Fig. 9—A tape recorded "portrait type" picture can be used to set up a monitor when no gray scale tape is available. This photo illustrates the effect of too much brightness and too low contrast. Highlights in the flesh tones lack detail and shadow areas in the hair are not very dark.

A less elegant tuning aid is an LED device driven by a circuit tuned to the synch pulse frequency. In this case, when the SSTV signal is tuned in correctly, the front panel mounted LED flashes at the line frequency of 15 Hz.

Which Comes First, Camera or Monitor Adjustment?

Many slow scanners don't own a camera. For those who do, the answer is—MAKE MONITOR ADJUSTMENTS FIRST. Correct contrast and brightness adjustments of the monitor are necessary for satisfactory reception of SSTV pictures.

One of the worst mistakes you can make is to

Fig. 10—After brightness and contrast adjustments, highlight details are gained (eyebrow at right showing, and hair fronds are visible around girl's head). Shadow areas are darker.

Fig. 11—Too high contrast is demonstrated in this photo. Eyebrow detail is gone, hair detail is diminished, highlights lack tonal range.

compensate for incorrect lighting and/or camera adjustment by incorrect adjustment of the monitor controls!

Set up your monitor FIRST, and to the greatest extent possible, leave it alone.

How Do You Set Up A Monitor?

A basic approach to this problem is to set the brightness control *just below* the point at which whites "bloom" or flare. Set the contrast control *just below* the point at which detail is lost in dark areas. (You can't make this adjustment on received pictures of black letters on a white background or vice versa.) You can use a received portrait type

(Continued on page 80)

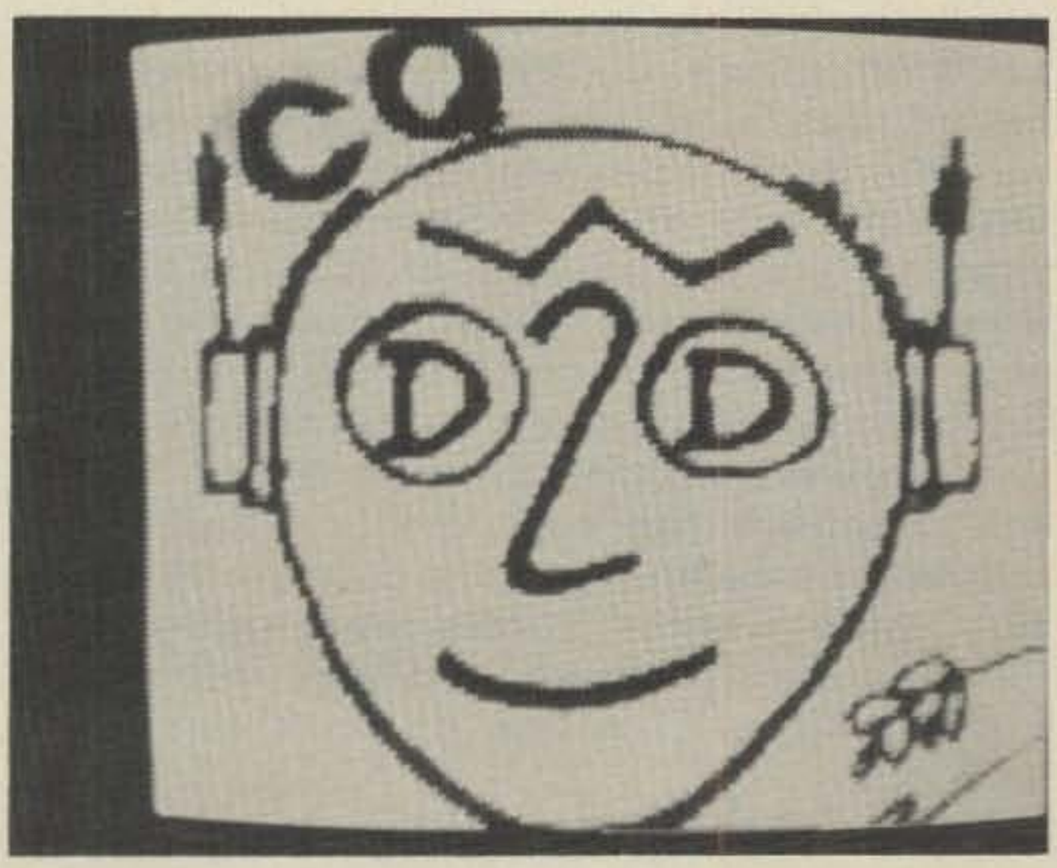


Fig. 12—SSTV CQs don't have to be as monotonous as their audio counterparts. Use a picture or two and let your imagination run rampant. The author denies any similarity between this sketch and his actual appearance!

A close look at the electrical nature of lumped LC trap circuits.

The Multi-Band Trap Antenna—Part III

BY JOSEPH M. BOYER*, W6UYH

This paper discusses the function and design of the multi-band trap antenna invented by Howard K. Morgan† in 1940. Up to this point, a picture of this periodically resonant antenna as a collection of single band naturally resonant radiators, isolated from one another by parallel resonant LC circuits, magically snapping "open" and "shut" like switches activated by frequency sensitive gremlins, has been avoided.

Instead, in Part I, a method was introduced to permit conversion of any antenna into its equivalent r.f. transmission line. This simple concept was then used in Part II as a tool to inspect the calculated input impedance behavior of two monopole antennas which differed from one another only in conductor diameter. In one case the two monopoles functioned as naturally resonant quarter-wave vertical antennas; in the second case, a "loading coil" was inserted in series with each monopole at an electrical height of 47 degrees above the input terminals, and the influence of such coil's reactance on the monopole was inspected quite closely at a center frequency of 3.750 MHz. It turned out that when we were through, we had "inadvertantly" designed a two band Morgan antenna. The "loading coil" reactance had originated from the Morgan forty-meter-band trap operating out of resonance on eighty meters. In the process we had worked out the basic steps necessary to design, analyze, and understand the function of such multi-band antennas.

In this part of the paper, the electrical nature of the lumped LC trap circuits will be looked at, then placed into the Morgan multi-band antenna and its design carried out in progressive band-by-band steps for coverage in the ten to eighty meter ham bands. At the conclusion of the series, some of the limitations inherent in the lumped LC trap, multi-band antenna will be discussed.

The Trap

In describing the impedance behavior of the monopole antenna over the relatively narrow frequency width of a single ham band, the word *series circuit* was used. Although a useful term, the writer always mentally bites his tongue when employing the word *circuit* to describe antenna function. No antenna is really a circuit: if it were it would not radiate at all. In a gross sense, the essential difference between a *true circuit* composed of *lumped* inductance L, lumped capacity C and ohmic loss resistance RΩ and that of any antenna is electrical *size*. True circuits employed in electronic "black boxes" are exceedingly minute in size when their physical dimensions are compared to the wavelength λ of the r.f. energy flowing through them.

When, a passive device (no tubes or transistors) composed of L, C, and R is no longer sufficiently small in terms of the operating wavelength, it begins to function as an RF *transmission line*. All r.f. transmission lines are antennas, radiate waves, and thereby possess an R_r term in their total impedance. This is the basis for all the newer type, electrically small antennas such as the DDRR[1,2],

*Antenna Consultant
17302 Yukon, Suite 63, Torrance, CA 90504

†Reference number 1, part I.

[1]J. M. Boyer, "Hula Hoop", pp. 44-46, *Electronics*, January 11, 1963.

[2]U.S. Patents: J. M. Boyer: 3,151,328; 3,247,515; RE 26, 196.

the King[3] BAR antenna, and others. The only way the radiation resistive term R_r can be cancelled in an r.f. transmission line is to bring *another antenna* —or a set of antennas—close enough to it to affect its electromagnetic field. Although strange, this is the correct way to think about a non-radiating coaxial transmission line: the inner conductor is viewed as one *antenna* surrounded concentrically by an infinite number of other parallel, out-of-phase antennas which cancel out the *time average* radiation resistance of the inner conductor over one complete r.f. cycle. In the true sense, there is *no such thing* as a "shield" for radio waves.

A true lumped LC circuit can only function once to simulate a "closed" or "open" switch. Here the term *once* means "at a single RF frequency". A "closed" circuit switch function can be accomplished by L and C connected in series at its single resonant frequency f_o. An "open" circuit switch function is represented by L and C connected in parallel at the single resonant frequency f_o. At all other frequencies over a total RF bandwidth in which the circuit is sufficiently small in electrical size compared to λ, no circuit switch action will occur. Off resonance, a true circuit displays only a rising or falling reactance magnitude, plus of course its ohmic loss $R\Omega$.

In marked contrast, an antenna or r.f. transmission line may be said to act like a periodically "opening" and "closing switch: that is, at an infinite number of different r.f. frequencies, an antenna or transmission line keeps flipping back and forth between a low and then a high impedance condition. The frequencies at which such "switching" functions occur need not even be in harmonic relationship: if you connect two r.f. transmission lines in series, each having different characteristic impedances Z_o (or K_m), you obtain a *compound* transmission line[4]. Such a line flips back and forth between high and low impedance at portions of the frequency spectrum in a non-harmonic fashion.

You might say to yourself, "He certainly is making a big deal out of this business of lumped LC circuits and transmission lines!" Well, we must do that here because we will soon connect what we will initially *assume* to be an ideal lumped LC circuit trap in series with a linear antenna. This is a mating of two electrical systems of quite different behavior: like marrying a lion to a pussy cat.

Ok; as has been said, an ideal parallel LC circuit "opens" only once at a single resonant frequency f_o to yield a high magnitude of impedance Z_p through its terminals. Such parallel resonant impedance can be expressed by the relation,

$$Z_p = \frac{(R_C - jX_C)(R_L + jX_L)}{(R_C + R_L) + j(X_L - X_C)} \text{ Ohms} \quad (2.0-1.)$$

In the above equation, R_C is the ohmic loss resistance of the circuit capacitor; R_L is the ohmic loss resistance of the circuit coil, and X_C and X_L denote the capacitive and inductive reactances of the capacitor and coil respectively at the resonant frequency f_o. In what follows, we will only consider what may be called "good quality" traps: those in which an air or vacuum insulated capacitor is employed. The ohmic loss R_C of a well designed air or vacuum capacitor is so microscopically small (when protected against moisture) at high frequencies that it may be neglected in equation (2.0–1.). Therefore, in high quality band traps, all ohmic circuit loss resistance may be considered to reside only in the coil used. The coil ohmic loss resistance is expressed as,

$$R_L = \frac{X_L}{Q} \text{ Ohms} \quad (2.0-2.)$$

Because we can now regard all ohmic loss to be in the circuit coil, we can then avoid dealing with the complex impedance R+jX seen in equation (2.0–1.), by using a more simple relation for this the *resonant* parallel circuit impedance:

$$Z_p = \frac{(X_L)^2}{R_L} \text{ Ohms} \quad (2.0-3.)$$

Once we know the parallel impedance of our trap at the resonant frequency f_o, we may then use Z_p to get the non-resonant trap impedance when it is operated at a much lower frequency f. When f is lower than f_o, the trap will look like a series inductance. When f is displaced from f_o by a minimum factor of 3/Q, we may also conveniently forget about coil loss resistance R_L and obtain that very important trap non resonant series reactance X_s by the relation,

$$X_s(\,) = \frac{1}{Q\,M\left[\frac{1}{(M)^2} - 1\right]} \times Z_p \text{ Ohms,} \quad (2.0-4.)$$

where M is equal to the given band operating frequency f to trap resonant frequency f_o ratio f/f_o. We will also be using that factor M in terms of the changing electrical length of our Morgan conductors, so it is worth a second glance. Of course circuit Q is equal to X_L/R_L, where we get R_L from equation (2.0–2) for our particular coil. As it's a "ring around" situation, we first choose Q then get R_L afterward.

Now, a parallel connected LC circuit operates like the "mirror image" of a series connected LC circuit: its input reactance goes inductive below the resonant frequency f_o, and goes capacitive at frequencies above f_o. Therefore, in a Morgan antenna, all the traps closer to the antenna input

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[3]R. W. P. King et al, "Transmission Line Missile Antennas, *IRE Transactions on Antennas and Propagation*, Vol. AP-8, pp. 88-90, January 1960.

[4]*Very High Frequency Techniques*, Volume II, pp. 922-925, McGraw-Hill Book Company, Inc., N.Y., First Edition.

terminals 1, 2 than the *one resonant trap* at a given frequency band f_o ($_n$), will look like a string of series loading coils spaced at certain points along the length of that portion of the Morgan operating on this particular band. In the "active" band in which that one trap is resonant, it also displays this low frequency side inductive, high frequency side capacitive reactance behavior; the difference is that in the active band of the trap (a) the magnitude of reactance is much larger than its off band X_s and (b) you can not neglect R_L in calculating such trap impedance. That means you have to use *equation (2.0–1.) for such case.

From what has just been said, we can see that the correct design and analysis of the Morgan trap antenna operating across many ham bands can become very involved and difficult unless a sharp little tool like the antenna analogue concept is put to work to *snip* the total antenna into small parts which can then be easily handled on a band-to-band step basis.

Band Trap Design

The L to C ratio and Q parameters of the parallel resonant circuits selected for the traps in a Morgan multi-band antenna have a first order effect on the final electrical lengths of its conductors and also on its on-the-air performance. We secured an introduction to the conductor shortening effect of the trap "loading coil" influence in part I. Therefore, we will at this point plunge directly into the design of a Morgan five bander using one set of trap parameters. Later, the effect of alternate trap parameters will be discussed. Armed with such information, the reader may then modify his own Morgan design accordingly. Our initial trap design here is based on the following objectives:

(1) Use of standard capacity values for the trap condensers.
(2) Attainment of approximately the same parallel resonant trap impedance Z_p in each amateur band.

The resonant frequency f_o for each band trap will be selected in the center of each ham band from ten to eighty meters. Our f_o list will therefore be:

$f_o(_{10}) = 28.850$ MHz;
$f_o(_{15}) = 21.225$ MHz;
$f_o(_{20}) = 14.175$ MHz;
$f_o(_{40}) = 7.150$ MHz;
$f_o(_{80}) = 3.750$ MHz.

At the lowest frequency band of coverage, eighty meters, no band trap is required. Consequently, we need only four trap capacity values (in farads):

$C_{10} = 25 \times 10^{-12}$ F; $C_{20} = 50 \times 10^{-12}$ F.
$C_{15} = 35 \times 10^{-12}$ F; $C_{40} = 100 \times 10^{-12}$ F.

At the above listed f_o's the capacitive reactance $-jX_C$ of the selected condensers is found by the relation,

$$-X_C = \frac{1}{2\pi f_o\,(\text{Hz})\ C\,(\text{F})}\ \text{Ohms}$$

We therefore obtain the following capacitive reactance values, using three decimal place accuracy:
$X_C(_{10}) = -220.665$ ohms; $X_C(_{15}) = -214.242$ ohms;
$X_C(_{20}) = -224.557$ ohms; $X_C(_{40}) = -222.594$ ohms

Because we know that at resonance the magnitude of X_C must equal that of the coil inductive reactance X_L, we can just remove the minus sign in front of each of the capacitive reactances obtained and substitute these magnitudes into the relation,

$$L = \frac{+X_L}{2\pi f_o(\text{Hz})}\ \text{Henries,}$$

to obtain the necessary calculated values of coil inductance needed in each band trap:

$L_{10} = 1.217 \times 10^{-6}$H; $L_{15} = 1.606 \times 10^{-6}$H;
$L_{20} = 2.521 \times 10^{-6}$H; $L_{40} = 4.945 \times 10^{-6}$H.

Because of the persistance of the idea that the trap serves as an "antenna insulator" and must therefore have super high Z_p, the designer feels the urge to select a very high value of trap Q which must reside in his coil. For reasons which will be seen later, we will not do that here. Instead we will select a reasonable value of 100 for all trap coils. Using this value of Q with each of the resonant frequency reactances we obtained above, we may employ (2.0-2) to get the values of ohmic resistance R_L predicted for each coil in its band of resonance. This easy step yields,

$R_L(_{10}) = 2.206$ ohms; $R_L(_{15}) = 2.142$ ohms;
$R_L(_{20}) = 2.246$ ohms; $R_L(_{40}) = 2.226$ ohms.

Now that we know both R_L and the resonant coil reactance X_L, there is no problem in using equation (2.0-3) to find the resonant parallel impedance Z_p offered by the traps at their f_o's:

$Z_p(_{10}) = 2.207 \times 10^4$ ohms; $Z_p(_{15}) = 2.143 \times 10^4$ ohms;
$Z_p(_{20}) = 2.246 \times 10^4$ ohms; $Z_p(_{40}) = 2.226 \times 10^4$ ohms.

To utilize that "coil loading" effect of the traps on the length of the conductor sections when they are operating at band frequencies below f_o, we must also calculate the *series* X_s inductive reactance value produced by *each* trap on all the f_o's lying in the bands below its resonance. We use equation (2.0-4.) for this little chore. Here, remember that M is the ratio of operating frequency f to trap f_o:

Ten Meter Trap ($f_o = 28.850$ MHz; $Z_p = 2.207 \times 10^4$ ohms)
On $f_o(_{15})$:
$M = 21.225/28.850 = 0.736$
$X_s(_{10})_{15} = 353.801$ ohms
On $f_o(_{20})$:
$M = 14.175/28.850 = 0.491$
$X_s(_{10})_{20} = 142.946$ ohms
On $f_o(_{40})$:
$M = 7.150/28.850 = 0.248$
$X_s(_{10})_{40} = 58.276$ ohms

*The interested reader will find an excellent, lucid treatment of LC circuits by a down-to-earth master engineer in F. E. Terman, *"Radio Engineer's Handbook,"* pp. 135-171, McGraw-Hill Book Company, Inc., N.Y., N.Y.

On f_o $(_{80})$:

$M = 3.750/28.850 = 0.130$

$X_s(_{10})_{80} = 29.180$ ohms

Fifteen Meter Trap (f_o=*21.225* MHz; Z_p=2.143x10^4 ohms)

On $f_o(_{20})$:

$M = 14.175/21.225 = 0.668$

$X_s(_{15})_{20} = 258.345$ ohms

On $f_o(_{40})$:

$M = 7.150/21.225 = 0.337$

$X_s(_{15})_{40} = 81.431$ ohms

On f_o $(_{80})$:

$M = 3.750/21.225 = 0.177$

$X_s(_{15})_{80} = 39.082$ ohms

Twenty Meter Trap (f_o=*14.175* MHz; Z_p=2.246x10^4 ohms)

On $f_o(_{40})$:

$M = 7.150/14.175 = 0.504$

$X_s(_{20})_{40} = 151.883$ ohms

On f_o $(_{80})$:

$M = 3.750/14.175 = 0.265$

$X_s(_{20})_{80} = 63.861$ ohms

Forty Meter Trap (f_o=*7.150* MHz; Z_p=2.226x10^4 ohms)

On f_o $(_{80})$:

$M = 3.750/7.150 = 0.524$

$X_s(_{40})_{80} = 161.049$ ohms

To explore the $jX_{in}(_{1,\ 2})$ on the band edges, repeat the above calculating process, but use $M = f_{low}/f_o$ or f_{high}/f_o, to get the *change in X_s at each band frequency limit.*

Monopole/ Transmission Line Characteristic Impedance K_m

When we explored the two monopoles in part I, you will recall that we obtained two different values of K_m; for our number 10 gauge wire monopole conductor, $K_m(_1)$ was 560.32 ohms; for our tubing conductor of 2.0 inch radius, $K_m(2)$ was 340.10 ohms in value. These values of K_m apply *only* to our two monopoles when they are operated in the eighty meter band. When we shift our design to any of the other ham bands, we must calculate new K_m values for the characteristic impedance of our antenna analogue transmission line, even though we are still employing the same two conductors of fixed physical conductor radii. To understand this, recall that in Schelkunoff's equation (1.0-1.) everything is a constant except the ratio 2(h)/a. Now, a "monopole" in a Morgan antenna is *only* that portion of the total antenna extending from the base input terminals up to the trap which happens to be resonant at a given ham band. Because the r.f. wavelength λ_o at each new band center is different, that 2(h)/a ratio in equation (1.0-1.) keeps changing band-by-band. To account for this, we just repeat the steps we went through in part I to get K_m on eighty meters:

A. Calculate $\lambda_o' = 984/f_o$(MHz) in the given band.

B. Get the conductor radius in degrees as $a^\circ = a'/\lambda_o'$.

C. Plug the new value of a_1 or a_2 into (1.0-1), letting 2(h) always equal 2(90)°.

When we do this, band-by-band, still using our old conductor radii of a_1=4.245x10^{-3} ft. and a_2=1.667 x10^{-1} ft., we get the resulting table of K_m values for each band and each monopole:

a_1=4.245x10^{-3} ft.	a_2=1.667x10^{-1} ft.
$K_m(_1)_{80}$=560.32 ohms	$K_m(_2)_{80}$=340.10 ohms
$K_m(_1)_{40}$=521.60 ohms	$K_m(_2)_{40}$=301.37 ohms
$K_m(_1)_{20}$=480.54 ohms	$K_m(_2)_{20}$=260.31 ohms
$K_m(_1)_{15}$=456.32 ohms	$K_m(_2)_{15}$=236.10 ohms
$K_m(_1)_{10}$=437.90 ohms	$K_m(_2)_{10}$=217.67 ohms

Notice that the *average* characteristic impedance of the monopole analogue line is largest in value at the very lowest band frequency $f_o(_{80})$, and smallest at our highest band frequency $f_o(_{10})$. If we had included $f_o(_6)$ it would have dropped in value even lower. Alright! That does it! We now have a complete list of preliminary design parameters for our multi-band Morgan. Sure we've worked a bit to get them, but now its all down hill, and will be fun the rest of the way.

We will now use these tabulated values to *climb* up our monopole, band-by-band, to obtain only one unknown value: the electrical length of the *last* top conductor section which ends in the resonant trap on a given band. We did this "inadvertantly" in part I to get a two-band Morgan. The only difference between our old two-band Morgan and this new five bander we're about to tackle is in the number of conductors and traps we must juggle. We don't want to do this in some careless way which can get us mixed up.

A Check Out Diagram

In science, when we deal with a problem involving a number of different values of constants and a range of variables, it's kind of nice to have a map or diagram of each step needed along the way to avoid making errors; a sort of simple computer program; after all, the pro's use them to keep from getting mixed up, so why shouldn't we?

Fig. 1 shows a general diagram of the Morgan antenna in the form needed for us to climb up the monopole length sections and also inch around each off-resonant trap reactance X_s, until we reach and obtain the electrical length of the last conductor section in that band's active monopole antenna. It isn't as bad as it looks at first glance (nothing ever is!). Down at the bottom, the very first ten meter band conductor section is labeled $h^\circ(_{10})$. Then, at the top end of conductor $h^\circ(_{10})$, the ten meter band

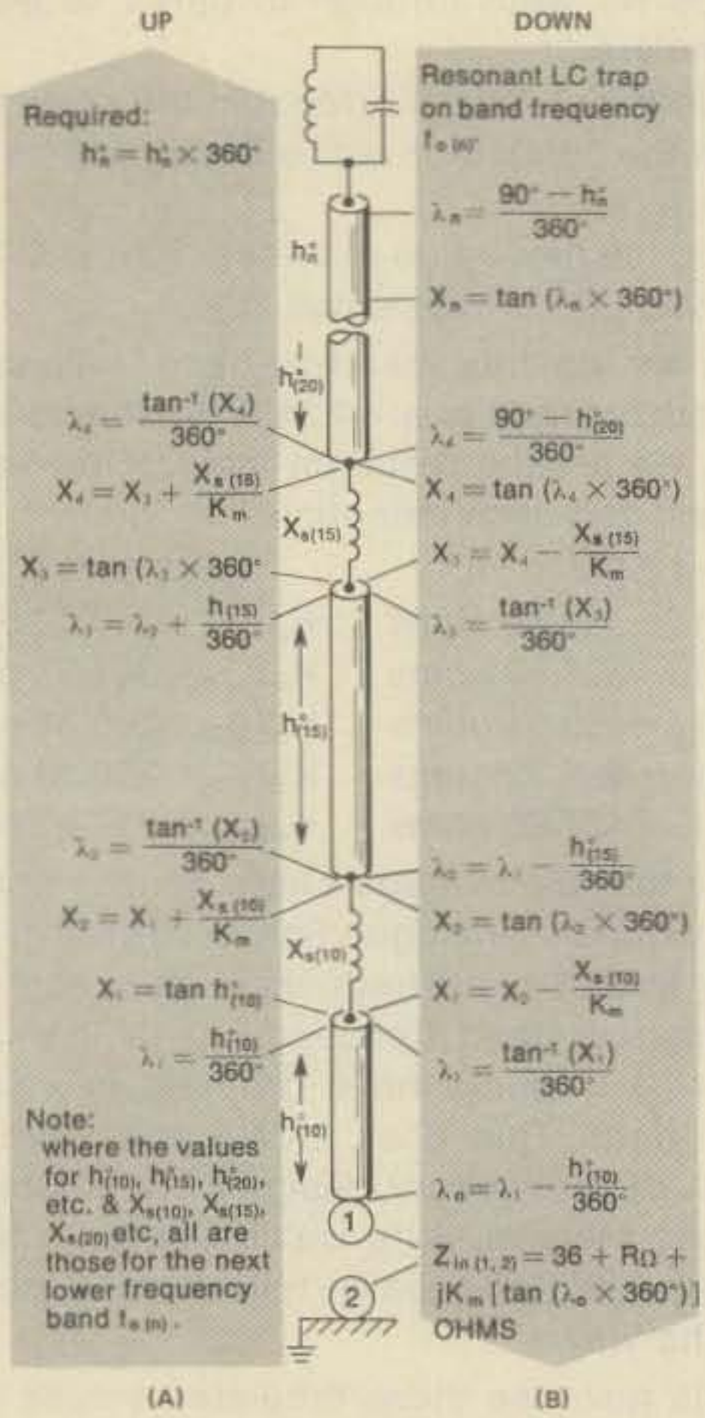

Fig. 1—(a) Successive steps for "climbing" Morgan monopole in a given ham band to determine last top conductor electrical length $h^\circ_{(n)}$ needed to establish monopole resonance at a given band frequency $f_{o(n)}$. (b) Successive steps for "descending" monopole, after length $h^\circ_{(n)}$ has been found, too determine input impedance $Z_{in(1,2)}$.

trap is shown as a series inductive reactance $X_{(10)}$, representing it as out of resonance at our operating frequency $f_{o(n)}$. Above the ten meter band trap extends another conductor for fifteen meter band operation labeled $h^\circ_{(15)}$; at its top is the fifteen meter band trap, again shown as non resonant at $f_{o(n)}$ thereby inserting more inductive reactance $X_{s(15)}$ in series with our monopole. Above the non-resonant fifteen meter trap, a short part of the next conductor section $h^\circ_{(20)}$ is seen. We then use our imagination to realize that $h^\circ_{(20)}$ will also end in the twenty meter band trap, and above that there will be another conductor. It's just the old string of "bones" thing in electrical form.

However, on the one particular band frequency $f_{o(n)}$ we are concerned with at the moment, there will be one last conductor of unknown length $h^\circ_{(n)}$ (where n takes on the given band length in meters) which we need to determine in electrical degrees. If this last conductor section turned out to be $h^\circ_{(40)}$, we'd be just one band away from finishing our design task; if $h^\circ_{(n)}$ represented $h^\circ_{(80)}$ we'd get its length in one fell swoop and finish the job. Finally, in fig. 1, there is one band trap which is shown as a parallel LC circuit. That circuit represents the one resonant trap in the band at which we are working.

Along the left hand side of fig. 1 is a label λ_1 at the very top of conductor section $h^\circ_{(10)}$. This label λ_1 represents the distance $\lambda_1 = h^\circ_{(10)}/360^\circ$ from that point on the monopole down to the base terminals 1, 2 in wavelength at the operating frequency. Right near to λ_1 there is a reactance symbol X_1. It represents the reactance of the antenna at the same point in normalized ohms. The little formula next to X_1 says its normalized reactive magnitude is equal to the tangent of $h^\circ_{(10)}$ degrees. Above the ten meter trap another height label λ_2 is shown, and at the same electrical height above the monopole base there is another value of X_2 ohms. Above these points are more λ and X labels, each of them being equal to a little formula which shows how to reach these points in terms of those below. Everything ends, in terms of λ and X, right at the base end of the last conductor section $h^\circ_{(n)}$ remaining below the resonant band trap. All these λ's and X's are our climbing steps needed to obtain the length $h^\circ_{(n)}$ band-by-band.

Finally, over on the right hand side of the figure the same λ and X labels appear, except that now the little formulas are subtractions instead of additions. You guessed it: those notations on the right hand side are used to *climb down* the monopole *after* we have obtained a calculated length for $h^\circ_{(n)}$ in order to (a) check on the accuracy of our answer for $h^\circ_{(n)}$ in a given band in terms of whether $jX_{in(1,2)}$ comes out very close to j0 ohms and (b), to shift frequency in the band over to the edges in order to find out what $jX_{in(1,2)}$ calculates to be there so we may find v.s.w.r. in our fifty ohm feed line. As we remember from part I, we first obtained $jX_{in(1,2)}$ then put R_r (and even RΩ) in series to get total antenna $Z_{in(1,2)}$ and thus find v.s.w.r. Remember; if we don't like the answers we get for band edge v.s.w.r., we can always do something like changing K_m (by selection of different conductor radii) to make things more to our liking. This is the great thing about "paper antennas"; they can be "erased" and reworked without waste of expensive tubing or trap components. Now let's begin climbing our Morgan to design it.

The Ten Meter Band

In using the antenna analogue tool, we always start at the bottom and climb up the antenna to design it; then climb down again to check on the accuracy of our answer. On ten meters we start by finding the electrical length of $h^\circ_{(1)}$ in degrees. This step is so easy we have to restrain ourselves from laughing. In a Morgan trap antenna, as we said, its

(Continued on page 72)

DenTron amateur radio products have always been strikingly individual. This is the result, not of a compulsion to be different, but of a dedication to excellence in American craftsmanship. This dedication now extends to one of the worlds finest high performance military amateur amplifiers.

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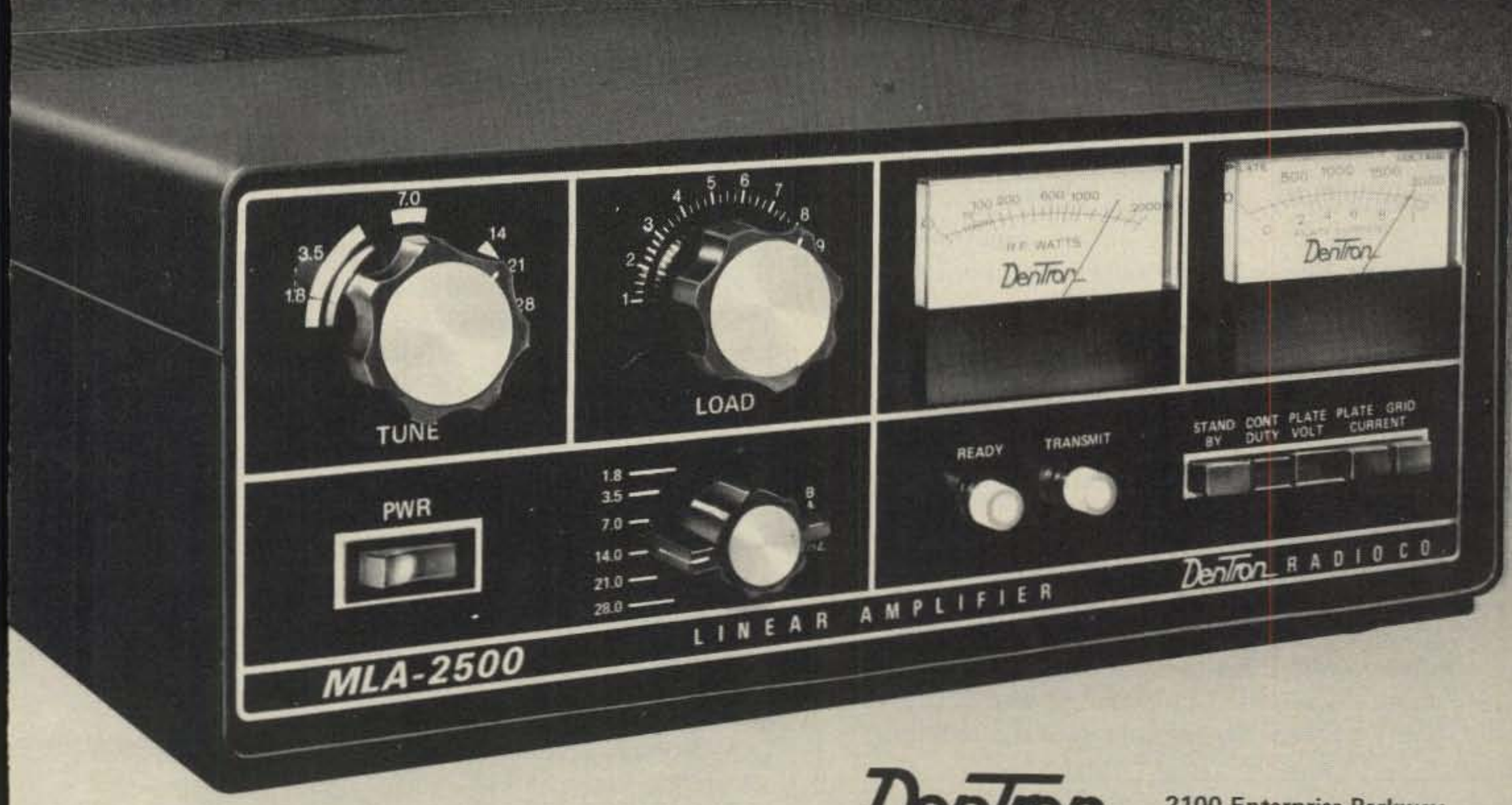

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Forewarned is forearmed! Read this exclusive report to CQ by Professor Heisseluft on an area that vitally concerns all of us.

Broadcasters Threaten Takeover of Amateur ULF Band at WARC 79

BY PROFESSOR EMIL HEISSELUFT*
Lauton Institute
Grossmaul-an Der Donau, Austria

Operators in the Amateur Service must, by this time, recognize that the Broadcast Service is seeking new frequency allocations in the high-frequency bands for use by international broadcasters. Under consideration, for example, is the band 3900-4000 kHz in Region 2. Now, through Professor Heisseluft, we learn that certain broadcast interests are also seeking exclusive use of the bands below 3 kHz. In his paper, which we are honored to publish this month, the Professor explains why such allocations are a threat to the Amateur Service and to the world's population. *Alan, K2EEK*

Introduction

While it is not generally known, electromagnetic frequencies below 3 kHz have long been available to amateurs for experimentation. These frequencies, which include the ultra low-frequency (ULF) band, represent but one portion of the spectrum which is thought to be useful for information transfer through paranormal perception. More specifically, perceptual channels may exist in the ULF band and at lower frequencies which permit information to be conveyed by extrasensory perception (ESP).

Because the ULF band and even lower frequencies may be useful for subliminal broadcasting, broadcasting interests will seek exclusive allocation of these frequencies to their service at the World Administrative Radio Conference (WARC) to be held in 1979. Occasionally-reliable sources indicate that unless such a move is contested by amateurs and others, these allocations will undoubtedly be granted.

In this paper, we examine the phenomenon of ESP and its relationship to the ULF band, and the reason why broadcasters seek exclusive allocation of all frequencies below 3 kHz to the Broadcast Service. We conclude that such allocations are not in the best interests of the Amateur Service or the world's population in general.

Extrasensory Perception (ESP) and the ULF Band

While the study of extrasensory perception is an emerging science, there are many who now hypothesize that information transfer by paranormal processes is mediated by ultra low-frequency electromagnetic waves (0.3 to 3 kHz). Kogan,[1,2,3,4] for example, believes this to be the case for the following reasons:

- Attenuation at these frequencies is slower than that predicted by the inverse-square law
- Source-receiver distances lie in the induction field range (we are dealing with wavelengths of 100 km and greater)
- The low bit rates (on the order of 0.005 to 0.1 bit/sec) are compatible with the information-carrying capacity of ULF waves
- Ordinary electromagnetic shielding is ineffective as an attenuator.

An even more restrictive hypothesis has been put forth by Persinger,[5,6] who suggests that 7.8 Hz "Shumann Waves" and their harmonics may be

*Professor Heisseluft is currently traveling through Europe on a lecture tour. Correspondence to the Professor may be directed c/o *CQ*, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050

responsible for paranormal information transfer. These waves which propagate in the earth-ionosphere waveguide, would be expected to exhibit asymmetry between east-west and west-east propagation, to be adversely affected by geomagnetic disturbances, and to result in preferred transmission times which lie between midnight and 4 a.m. local time.

The hypothesized relationship which exists between paranormal perception and the ULF band (and lower frequencies) has led some broadcasters to believe that the frequencies below 3 kHz may be useful for subliminal broadcasting, and in particular, subliminal advertising.

Subliminal Phenomena With Application To Advertising

Advertising methods which employ subliminal techniques—that is, which employ phenomena which are below the threshold of consciousness or beyond one's personal awareness, but which can affect the subconscious—are well-known, and are in use today. One example of subliminal advertising is shown in fig. 1. Here, a specially prepared frame has been spliced into a motion picture film for the purpose of suggesting to the viewer that he or she is thirsty. While this single frame is not consciously seen by the viewer due to the high frame repetition rate, it is, nevertheless, perceived by the viewer's subconscious. Predictably, the chances that the viewer will purchase liquid refreshment after sensing this frame are great.

With the above as background, one can better understand why broadcasters seek exclusive allocation of the ULF and lower-frequency bands. By transmitting information such as advertisements in these bands during the hours between midnight and 4 a.m. local time, broadcasters hope to plant their messages in a subliminal manner; that is messages will be planted directly in a person's subconscious while he or she is asleep. Further, by using this technique, it should be possible to reach millions of people simultaneously.

For ULF broadcasts to be successful, of course, requires that ESP exist. We thus are led to inquire whether certain individuals do indeed possess perceptual channels for information transfer.

ESP—Experimental Observations

A recent review of experimenal work in the area of paranormal information transfer by extrasensory perception was published by Puthoff and Targ.[7] These scientists performed more than fifty ESP experiments under controlled laboratory conditions. Several individuals participated in the experiments, all of whom had developed the remote perceptual abilities required to permit them to describe correctly such items as buildings and roads. In fact, the ESP mechanism observed by Puthoff and Targ

Fig. 1—An example of subliminal advertising used in the film industry.

is best described as "remote viewing."

The experiments produced three principal results:

- Using "remote viewing," it is possible to obtain accurate descriptions of remote locations
- Variations in the viewing distance from a few meters to 4000 km did not degrade the quality of perception
- The use of a Faraday cage for electrical shielding did not prevent high-quality perceptions from being obtained.

The results obtained by Puthoff and Targ are in agreement with some unpublished results of ESP experiments I performed as a student under Professor Jerry Ostermond-Tor. These experiments were performed in 1958 while Ostermond-Tor was on leave to lecture on communications at a small university in Bad Salzuflen, Germany. By agreement, Ostermond-Tor was to concentrate on his surroundings, whatever they were, at 1600 GMT every day. I, in turn, sequestered myself at the Lauton Institute each day at this time, and attempted to sketch the visual impressions which I received.

A particularly good example of our ESP experiments is shown in fig. 2. Here, on August 28, 1958, Ostermond-Tor had concentrated on the "Hinter der Wieke" in Bad Salzuflen (fig. 2a). The visual image, or remote view, which I perceived is shown in fig.

(A)

(B)

Fig. 2—(A) The "Hinter der Wieke" in Bad Salzuflen, Germany. (B) a rough sketch of a visual impression received by me at 1600 GMT on August 28, 1958, in Grossmaul-an Der Donau, Austria.

2b, and bears a remarkable resemblance to the buildings viewed by Ostermond-Tor. That the visual image is not a truer reproduction of the original scene may have been due to the occurrence of a minor geomagnetic storm on this particular day, and to the fact that our experiments were conducted during the day, and not during the more-preferred times in the middle of the night. This result, and the results of other experiments, however, convinced me that paranormal perception exists, and that some individuals can perceive information which is not presented to them in conventional ways.

Discussion And Conclusions

Having demonstrated the existence of paranormal perception, the threats posed by allocation of the ULF band and lower frequencies to the Broadcast Service should be obvious. First, exclusive allocation of the frequencies below 3 kHz to the Broadcast Service will limit, if not eliminate, ESP investigations by amateur operators and others. Second, should subliminal broadcasting begin, who can say what thoughts will dominate our thinking when we first awake . . . thoughts initiated by ULF broadcasts perceived during the night!

Such threats to the Amateur Service and to the world's population cannot be tolerated, and for that reason, must not be taken lightly. We conclude, therefore, that every effort must be made prior to, and during, WARC 79 to insure that frequencies below 3 kHz are not allocated to any particular service, and that these frequencies remain available to all for use in experiments involving extrasensory perception. ■

References

[1]Kogan, I.M., "Is telepathy possible?" *Radio Eng.*, Vol. 21, p. 75, 1966.

[2]Kogan, I.M., "Telepathy, hypotheses and observations," *Radio Eng.*, Vol. 22, p. 141, 1967.

[3]Kogan, I.M., "Information theory analysis of telepathic communication experiments," *Radio Eng.*, Vol. 23, p. 122, 1968.

[4]Kogan, I.M., "The information theory aspect o f telepathy," RAND Publ., Santa Monica, CA, p. 4145, 1969.

[5]Persinger, M.A., "ELF waves and ESP," New Horizons Trans. Toronto Society for Psychical Research, Vol. 1, No. 5, 1975.

[6]Persinger, M.A., "The paranormal-P. II: Mechanisma and models," M.S.S. Information Corp., New York, 1974.

[7]Puthoff, H.E., and R. Targ, "A perceptual channel for information transfer over kilometer distances: Historical perspective and recent research," *Proc. IEEE*, Vol. 64, No. 3, 1976.

CQ Reviews: The Radio Shack Model SCT-11 Stereo Cassette Tape Deck

BY BILL DEWITT*, W2DD

Of interest to many amateurs is Radio Shack's recently announced Stereo Cassette Tape Deck, Model SCT-11. The SCT-11 has just about every feature one could ask for in a cassette deck, including the ability to decode Dolby® encoded f.m. signals.

A prime physical feature of the SCT-11 is front loading of cassettes into a lighted compartment. This convenience feature makes it possible to stack the unit with other components or install it between shelves. If you have ever used a cassette recorder, this is a feature you will appreciate.

There are other physical features of the SCT-11 of particular interest. It has high quality nicely damped dual VU meters with scales big enough so that you can set your recording levels without using a microscope.

A small item, but one this reviewer has come to appreciate, is a separate ON/OFF switch. You don't have to disturb your preset levels of anything to turn the deck On or Off.

The functions of Play, Record, Fast Forward, Rewind, Pause, and Stop/Reject are controlled by practical-sized key switches with positive "feel" and definite action. Small push buttons control the Source Input and Dolby® functions.

Recording levels are controlled by a neat concentric dual control with a clutch linkage between the knurled knobs. This permits setting both the Right and Left channel levels simultaneously or separately if desired. Output level for both channels is handled by a single control.

Rounding out the front panel features of the SCT-11 are three other items worthy of mention. LEDs are used to indicate that the Dolby® function is in use, and when the push button is set for Chromium Oxide type tape.

Headphone and microphone jacks are on the front panel, as is a digital tape counter with re-set capability.

On the rear panel there are screw-driver adjustments for the Dolby® f.m. calibration (set *once* and left alone thereafter).

Also on the rear panel are AUX IN and PRE-AMP OUT jacks plus a DIN jack for IN and OUT connections with amplifiers and receivers equipped with DIN connectors.

A very complete instruction book is supplied with the SCT-11, and although it is a bit on the small side, a complete circuit diagram is included.

After using the Radio Shack Model SCT-11 unit for about a month, this reviewer found it to be a convenient-to-use, high quality piece of equipment. Setting up the Dolby® calibration is a bit complicated but not really difficult if you follow the carefully worded instructions. The quality of musical reproduction should satisfy almost any hi-fier. Claimed Wow and Flutter levels are less than 0.2% with less than 0.12% being typical. This is more than adequate for SSTV!

The SCT-11 weighs 12 lbs. 13 oz. and is 5 11/16" × 15 7/16" × 10 1/16". Selling price is $229.95. ■

The Radio Shack SCT-11 stereo Cassette tape deck with Dolby®.

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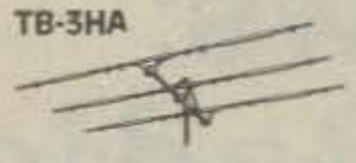

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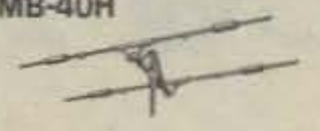
TB-2A

Light-weight, two-working-element antenna for 10, 15 and 20 meters. $129.95

MB-40H



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a monthly feature by

JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

W8YEK Wins First CQ S.S.T.V. DX Award

The DX Department is delighted to announce the award of Slow Scan TV DX Award Certificate #1 to E. J. (Gene) Kundert, W8YEK, of Delphos, Ohio. Gene's application was credited with an initial score of 108 countries by Asst. DX Editor, Rod Linkous, W7YBX, and he'll probably be applying for a first endorsement in a very short while as his application was filed back in January.

Gene has been a licensed amateur radio operator for 32 years, and is an enthusiastic equipment builder and DXer. He has over 300 countries confirmed on s.s.b., and has added a Model 300 Robot to the equipment shown in the accompanying picture.

He is now putting the finishing touches on a keyboard for slow scan TV.

The CQ S.S.T.V. DX Award is available to any licensed amateur submitting proof of contact with 100 countries, using 2-way S.S.T.V., according to the CQ DX Award rules. Copies of the rules and an application blank may be obtained by sending a business-size, self-addressed, stamped envelope to Rod Linkous, W7YBX at 5632 47th Ave., S.W., Seattle, WA 98116.

DX Clubs

As the DX clubs of the country play a major role in bringing DXers together into a united front, this column emphasizes information on DX clubs to promote better communication between the various groups. Here are the new officers for several of the clubs. These folks have a big job and their contributions are important to DX. CQ would like to recognize each and every one of them and invites all club secretaries to send the DX Editor a list of your current officers for printing in a future issue.

*P.O. Box 205, Winter Haven, FL 33880.

Alamo DX Amigos: President—John Shean, K5DB; Vice-President—Bill Eckenrode, K5ETJ; Secretary—Bruce Woodward, W5OSJ; and Treasurer—Corky Sarvis, WB5CIT.

Mile-Hi DX Association: President—Bob Pierce, WB0CGJ; Vice President—Joe Hart, WB0HAD; Secretary-Treasurer—Roger Preece, WB0RTZ.

Mississippi Valley DX & Contest Club: This is a new club serving St. Louis and vicinity including southern Illinois. Interested DXers in that area are urged to contact Jim Glasscock, W0FF, or Ward Silver, WB0GQP.

Northern California DX Club: President—Orm Meyer, K6QX; Vice-President—Rich Lawton, K6QZ; Secretary—Henry Davis, K6IXS; Treasurer—Rod Deakin, WA6CUV; Directors—K6DC, W6JZU and W6MUR.

North Florida DX Association: President—Bill Walker, WB4EYX; Vice-President—Dick Hicks, K4UTE; Secretary-Treasurer—Billy Williams, WA4UFW and Activities Manager—Allen Moore, WB4QKE.

Radio Club of Puerto Rico: President—Julio Negroni, KP4CV; Secretary—Heidi Morales, KP4EDE; Treasurer—

The WAZ Program

Single Band WAZ

20 Meter C.W.

14...SP5EWY

20 Meter Phone

36...W5TWI

S.S.B. WAZ

1354...YU3EY
1355...VE6HN
1356...WA6EVX/KG6
1357...JA3WBK
1358...I1YG

C.W.—Phone WAZ

4035...WB4LFM
4036...WA8SWM
4037...WB8HAD
4038...WB5HIH
4039...W6HRB
4040...JA3CSZ
4041...K4SMX
4042...SP9CV

The complete rules for all WAZ awards are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a business-size, self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Gene Kundert, W8YEK, winner of the first CQ S.S.T.V. DX Award certificate. Gene has worked over 100 countries on S.S.T.V. with this beautiful station. The console took 5½ months to build. The back is enclosed with plexiglass and cooling is controlled by 2 thermostats and blower-type fans.

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 bosed on the current prefix total, regardless of an operator's all-time count.

Mixed

W4WV	1645	PAØSNG	1229	YU2DX	995	DL1CF	872	YU4EBL	782
K6JG	1453	YU1BCD	1182	DL1MD	993	W4BYU	859	K8UDJ	750
F9RM	1430	W8ROC	1181	I6SF	988	WA1JMP	857	CT1LN	749
W9DWQ	1365	WB4KZG	1180	K2AAC	983	G3DO	849	WA5LOB	749
VE3GCO	1340	WA2EAH	1150	K6ZDL	981	WAØCPX	844	PY4AP	735
W2NUT	1333	WA6GLD	1125	K4KQB	960	JA1AG	831	KØBLT	733
W3GJY	1321	WA5VDH	1117	W4IC	950	YU3EY	811	K7NHG	719
W3PVZ	1304	WØAUB	1082	K5DB	923	W6NJU	811	WA6EPQ	713
W4WSF	1275	K6SDR	1037	WØSFU	908	W9WHM	811	PAØVB	706
W8LY	1272	W9FD	1035	SM7TV	905	W9ZTD	807	WA8TDY	681
ON4QX	1268	YU1AG	1034	WA6TAX	899	IØJX	803	OE6RP	622
W4CRW	1251	W6ISQ	1028	W3YHR	882	SM6DHU	803		
WB2FMK	1240	WB4SIJ	1020	YU2OB	882	IT9AGA	791		
W4QBY	1230	WAØKDI	1019	WA6JVD	875	K2ZRO	782		

S.S.B.

W4UG	1405	I8YRK	1008	WA2EAH	900	W4IC	800	CR7IK	613
F9RM	1358	DK2BI	1003	WØYDB	884	OE2EGL	780	I4LCK	608
I0AMU	1257	HP1JC	954	K2POA	883	YU1AG	771		
K6JG	1248	WB2NYM	941	ZL3NS	874	G3DO	765		
IØZV	1181	YU1BCD	940	WA5VDH	861	OK1MP	763		
I8KDB	1136	WA6TAX	925	WB4KZG	860	W2EHB	750		
W4WSF	1119	CT1PK	923	W3YHR	857	WA5LOB	747		
W9DWQ	1089	IT9JT	916	DJ7CX	852	W6YMV	720		
I4ZSQ	1058	F2MO	904	W6RKP	822	WB6DXU	708		
PAØSNG	1034	WB4SIJ	904	W3DJZ	818	CX2CN	702		
DL9OH	1033	DL1MD	903	PY3BXW	808	WB2FMK	700		

C.W.

W8KPL	1281	YU1BCD	962	WA2HZR	853	WA6JVD	803	OK2DB	693
W8LY	1253	DJ7CX	957	K2AAC	836	WA2EAH	800	WB4KZG	650
K6JG	1146	G2GM	939	WA5VDH	836	I6SF	771	K6ZRO	649
WB2FMK	1120	VO1AW	932	IT9AGA	825	W4BYU	768	K1LWI	629
DL1QT	1100	W3ARK	910	W6ISQ	824	W4IC	754	VE4OX	600
ON4QX	1081	W2HO	885	YU1AG	814	VO1KE	750	OK2QX	600
W9FD	1053	K6ZDL	876	K7ABV	812	OK2BLG	714		
W2AIW	972	W4WSF	860	VK3AHQ	809	SM5BNX	706		

Jesus Figueroa, KP4CQM; Directors—KP4AET, KP4AOC, KP4BDL, KP4QM and KP4RM.

Southeastern DX Club: President—William Barr, K4KZP; Vice-President—Stewart Woodward, K4SMX; Secretary—Al Smarr, W4BTZ and Activity Manager—Jim Wilson, W4MWT.

Twin City DX Association: President—Dave Webster, KØIEA; Vice-President—Ed Martinson, WØGYH; and Secretary—Jim Spaulding, WØOUE.

Western Washington DX Club: President—Al Clark, W7YTN; Vice-President—Joe Naylor, K3MNT; Secretary—Kurt Heidergott, K7MOK; Treasurer—Dick Bennett, WA7RUY; and Trustees—K7RA, K7VPF, W7APN, W7JIG, W7KWC, W7OTO, W7PHO, W7YBX and WA7GRE.

YASME Foundation: President—Don Wallace, W6AM; Vice-President—Danny Weil, VP2VB/MM; Secretary-Treasurer—Bob Vallio; QSL Manager—Rubin Hughes, WA6AHF and Directors—WA5LES, KV4AA, WØMLY, W6OAT, JA1KSO, OH2BH, W6KG, W6QL and VK2EO.

Eric Gell, G3JTO, of Nottingham, England earned C.W.—Phone WAZ #4006 running only 100 watts to a dipole up 20 feet. Eric is 48 and has two potential junior ops aged 12 and 8.

New DX Committeeman

The DX Department is pleased to announce the appointment of Maxwell C. Gilliland, WB0NHG, to represent the Mile-Hi DX Association on the CQ DX Awards Advisory Committee. We are delighted to have our first Committeeman from the Denver Area since the Committee was begun in 1967.

DX Club Addresses

Here is an expanded list of club names with addresses through which the club may be contacted. Some of these addresses are for club secretaries, some are for the CQ DX Award's Advisory Committeeman representing the club, all of them should enable you to reach the officers of the club in question. Updated addresses and the addresses of other DX oriented clubs not on this list are always welcome:

Alamos Amigos DX Club—3302 Litchfield Dr., San Antonio, TX 78230

British Columbia DX Club—744 Nevis Drive, Richmond, British Columbia, V7A 1J6 Canada

Canadian DX Association—P.O. Box 717, Station Q, Toronto, Ontario M4T 2N7, Canada

Delta DX Association—1445 Homestrad, Metairie, LA 70005

Dept. of State Amateur Radio Club—W3DOS, c/o VO, SA-2, Dept. of State, Washington, D.C. 20520

Eastern Iowa DX Association—3712 Tanager Drive, NE, Cedar Rapids, IA 52402

Frankford Radio Club—c/o K2FL, 616 Chestnut St., Palmyra, N.J. 08065

Ft. Wayne DX Association—7918 Schwartz Rd., Ft. Wayne, IN 46815

Gulf Coast DX Repeater, Inc.—12610 Barbizon, Houston, TX 77089

Indy DXers—227 North Routiers, Indianapolis, IN 46219

Lake-Cook DX Association—2935 West Bonnie Brook Lane, Waukegan, IL 60085

Long Island DX Association—P.O. Box 73, Westbury, N.Y. 11520

Michigan DX Association—c/o WA8TDY, 3528 Craig Drive, Flint, MI 48506

Mile-Hi DX Association—P.O. Box 39092, Denver, CO 80239

National Capital DX Association—P.O. Box DX, Boyce, VA 22620

Newark News DX Club—P.O. Box 539, Newark, N.J. 07101

North Alabama DX Club—c/o K4AEB, 711 Pinecrest Rd., Huntsville, AL 35802

Northern California DX Club—P.O. Box 608, Menlo Park, CA 94025

North Florida DX Association—911 Rio St. John's Drive, Jacksonville, FL 32211

Northern Illinois DX Association—P.O. Box 519, Elmhurst, IL 60126

North Jersey DX Association—c/o P.O. Box 73, Rochelle Park, N.J. 08065

Pacific Radio Amateur Transmitting

The CQ DX Awards Program

S.S.B.

468....PY1FI
469....WBØCGJ
470....WB2TSL

C.W.

246....JA1SGU
247....IØWLS
248....YU2QL
249....JH3AIU
250....OK1MIN

S.S.B. Endorsements

310....IØZV
310....K6JG
200....PY1FI
150....DA2KD
150....OK1IQ
150....PY1FI
150....WBØCGJ
3.5/7 MHZ....OK1IQ
QRPP....WBØCGJ

C.W. Endorsements

250....VK4KX
200....WA5VDH
150....JH3AIU
150....WA5VDH
150....YU2QL
3.5/7 MHz....WA5VDH
OSCAR....W2RS

Complete rules and application forms for the *CQ* DX Awards program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S.W., Seattle, Washington 98136.

The WPX Program
New Certificates

Mixed

554....I6BZH
555....JA1WWO
556....HA8QC
557....DJ0YD
558....YU3EY
559....OK1VU
560....OK2BLI
561....W5DRW
562....K2UPR

S.S.B.

951....WA0JYL
952....I1NUC
953....K6JG
954....DJ0YD
955....I5BWJ
956....WA2AOG
957....OK1IQ
958....OK1CFH
959....OK2BLI
960....I8SRP
961....W5DRW
962....G4DMN

C.W.

1549....K6JG
1550....DJ0YD
1551....DM2AMK
1552....DM2AHD
1553....I1YRL
1554....WA2AOG
1555....K0PMZ
1556....W0IUB
1557....OK2BPF
1558....F8PM
1559....W5DRW

Endorsements

MIXED: 1005 DL1MD, 1010 W8CNL, 811 YU3EY, 798 DJ0YD, 754 W6KYA, 620 OE6RP, 600 K9-UQN, 550 K8YQW, 500 DJ8WD, W5DRW, 443 OK1VU, 407 JA1WWO, 405 HA8QC, 400 K2UPR

SSB: 1020 W9DWQ, 838 I6SF, 907 DL1MD, 753 WB9EBO, 662 I1NUC, 657 DJ0YD, 600 W7KOI, 562 OK1IQ, 377 OK2BLI, 373 W5DRW, 321 I8SRP, 319 WA0YJL, 314 I5BWJ, 300 OK1CFH, G4DMN.

CW: 932 VO1AW, 800 WA2EAH, 648 W0IUB, 614 DL1MD, 602 OK1IQ, 600 F6CRT, KH6HC, OK3-BT, 567 DJ0YD, 505 I1TLA, 502 OK3JV, 460 OK2BPF, 452 DJ1YH, 435 K0PMZ, 422 F8PM, 400 ZD8TM, 380 W5DRW, 325 WA2AOG, 311 I1YRL, 303 DM2AHD, 302 DM2AMK.

10 Mtrs: WA5VDH, W6TCQ, W5-10353, K6JG.
15 Mtrs: K4RDU, W6TCQ, W5-10353, K6JG.
20 Mtrs: W6TCQ, K6JG, W5-10353, OK1IQ.
40 Mtrs: WA5VDH, K6JG, W6TCQ, OK1IQ, W5-10353
80 Mtrs: OK1IQ, K6JG, W6TCQ, W5-10353.
160 Mtrs: ZL3GQ, W0IUB, OK2BPF.
Africa: W6TCQ, K6JG.
Asia: OK3JV, OK1IQ, K6JG, W6TCQ.
Europe: JA1WWO, W6TCQ, OK1IQ, K6JG, JH1VRQ, OK2BPF, I8SRP.
No. America: G3YBH, W6TCQ, K6JG.
Oceania: W6TCQ, K6JG.
So America: W9EVD, K6JG, W6TCQ

Complete rules for WPX can be found in the May, 1976 issue of *CQ* Magazine. Application forms may be obtained by sending a business size, self-addressed, stamped envelope to "CQ WPX Awards," 5014 Mindora Dr., Torrance, CA 90505.

Society—45-601 Luluki Road, Kaneohe, HI 96744
Potomac Valley Radio Club—c/o RFD 1, Box 73A, Boyce, VA 22620
San Diego DX Club—4245 Cobalt Drive, La Mesa, CA 92041
Southeastern DX Club—798 Rays Rd., Stone Mountain, GA 30083
Southern California DX Club—736 Seward, Hollywood, CA 90038
Southern New England DX Association—c/o 146 Paradise Ave., Middletown, RI 02842
South Florida DX Association—441 West Tropical Way, Plantation, FL 33317
Texas DX Society—1921 Meadowview, Alvin, TX 77511
Toronto DX Club (Canadian DX Association)—P.O. Box 717, Station Q, Toronto, Ontario M4T 2N7 Canada
Twin Cities DX Association—c/o 1507 Kaltern Lane, Minneapolis, MN 55416
Virginia Century Club—c/o P.O. Box 62484, Virginia Beach, VA 23462
Western Washington DX Club—c/o 5632 47th Ave., S.W., Seattle, WA 98116
Willamette Valley DX Club—P.O. Box 555, Portland, OR 97207
YASME Foundation—P.O. Box 2025, Castro Valley, CA 94546

Our sincere appreciation to the *West Coast DX Bulletin*, WA6AUD Editor and Publisher, for a number of these listings.

From Nov. 6-14, 1976, the Kortrijk section of the Union of Belgian Amateursenders operated ON7VT from a major hobby exhibition, above, hosting 50,000 visitors. All 10 U.S. call areas were worked using this rare prefix. Lucky WPX enthusiasts may QSL direct to P.O. Box 39, B 8500 Kortrijk, Belgium. Equipment demonstrated at the amateur radio booth, aside from regular VHF and UHF stations, included SSTV, ATV, RTTY, and a c.w. decoder with video display. (Tks ON5KD, City Manager of Kortrijk, Belgium)

Most Wanted Countries on C.W.

The Long Island DX Association recently polled its membership regarding the countries most needed on c.w. The results may be rather surprising to you as the pattern of operation on code frequently differs from that on phone. Many brass-pounders have confirmed countries which have seldom been activated on phone, and vice-versa. Here is the list as per the big guns of the Long Island group. If someone took a similar poll along the west coast the results might be significantly different, but these are certainly rare ones. *DXpeditioners take note!*

1. **VK9,** Mellish Reef
2. **VS5,** Brunei
3. **FR7/T,** Tromelin Island
4. **YI,** Iraq
5. **BY,** China
6. **A5,** Bhutan
7. **3Y,** Bouvet Island
8. **VK0,** Heard Island
9. **VQ9,** Farquhar Island
10. **S2,** Bangladesh
11. **FB8W,** Crozet Island
12. **ZM7,** Tokelaus Islands
13. **FW8,** Wallis Island
14. **A6,** United Arab Emirates
15. **XT,** Voltaic Republic
16. **FR7G,** Glorioso Island
17. **XU,** Khmer Republic (Cambodia)
18. **KG6,** Mariana Islands
19. **YB,** Indonesia
20. **VP8,** South Sandwich Island

Here and There

YASME News—Lloyd and Iris Colvin report making some 8000 contacts with 123 different countries during their stay on Anguilla. Their Anguilla call was VP2EEQ. They found the

Henry Schrier, PA0GF, recently qualified for the WAZ certificate, proudly displayed on the wall above, after 31 years on the air. Henry runs 180 watts to a dipole and a ground plane and has accumulated 220 countries without making a special effort. Henry's former calls include PJ0X and JZ0KF.

CQ DX Honor Roll

The *CQ* DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The ARRL DXCC Country List, less deleted countries, is used as the country standard. Total number of current countries on the DXCC as of this listing is 321*. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the *CQ* DX Honor Roll, annual updates are required. Honor Roll updates may be submitted anytime.

C.W.

W6PT 321	W4YWX 312	W2GT 302	W4BQY 299	W6NJU 288
K6EC 317	W8LY 309	W6ISQ 302	K6JG 297	WA6EPQ ...284
W6ID 316	W9DWQ 307	W0AUB 302	WK3AHQ ...296	DJ7CX 280
ON4QX 315	WA6GLD 306	DL3RK 301	WA8DXA 291	K1SHN 280
W8KPL 313	W4IC 305	K6LEB 300		

S.S.B.

W2TP 320	I8YRK 311	K4MQG 306	W6TCQ 298	WA4WTG ...286
T12HP 319	I0ZV 311	ZL1AGO 306	I5WT 297	WB2RLK 286
WA2RAU ...319	W6EUF 311	W6NJU 305	VE3MJ 297	SP5BSV 285
DL9OH 318	ZL3NS 311	ZS6LW 304	K6AQV 296	WA0KDI 285
G3FKM 318	F2MQ 310	W6KZS 303	WA2HSX ...296	XE2YP 285
I0AMU 318	I6FLD 310	W9KRU 303	HP1JC 295	OE1FF 284
K2FL 318	K6EC 310	YV1KZ 303	WB6DXU ...295	OE3WWB ...284
W3CWG 318	K6JG 310	EA4LH 302	W0YDB 294	YV1LA 284
W3NKM 317	SM5SB 310	I4ZSQ 302	DL6KG 293	K1KNQ 283
W4EEE 317	W6KTE 310	W9QLD 302	VE7WJ 293	DL1MD 282
W9ILW 317	W6REH 310	WA6AHF 302	W6FW 293	K8GQG 282
W4UG 316	W9JT 310	F9MS 301	W9YRA 293	WB4SIJ 282
W9DWQ 316	K9WEH 309	OE2EGL 301	K4HJE 292	W3CRE 280
W3AZD 315	KH6BB 309	XE1AE 301	W4WSF 292	XE1KS 280
W4SSU 315	W2QK 309	G3DO 300	YS10 292	OK1MP 279
I8AA 314	W4IC 309	G3TJW 300	W6FET 291	W9MIJ 279
I8KDB 314	K4RTA 308	K8DYZ 300	DK2BI 290	WB6PNB ...279
IT9JT 314	K6WR 308	OZ3SK 300	G3RWQ 290	DK1FW 278
VE3MR 314	W6RKP 308	W0SFU 300	W9OHH 290	K3EH 277
W3DJZ 314	WA2EOQ ...308	WA6GLD ...300	WA0CPX ...290	W7YBX 277
W6EL 314	K6YRA 307	VE2WY 299	DJ7CX 288	K8PYD 276
F9RM 313	SM6CWK ...307	VE3GMT 299	G3KYF 288	W6HUR 275
SM6CKS 313	WA3IKK 307	W2CNQ 299	K1SHN 287	WA2VEG ...275
W6YMC 312	K3GKU 306			

*CR8—Portuguese Timor deleted since last Honor Roll

people of Anguilla to be friendly and helpful and the flat terrain more suitable for DXpedition operations than some of the neighboring, mountainous islands. A radio amateur license was immediately available upon payment of a $25.00 licensing fee.

The Colvins ended 1976 with more than 70,000 QSO's during their operations from 9 different DX countries. In addition, Dick Spenceley, KV4AA, a former president of the YASME Foundation and presently a director, made 35,306 QSO's during the year using his bicentennial call, AJ3AA. It is likely that every serious DXer in the world made at least one QSO with a YASME station in 1976.

Need A QSL Manager—Bob Gorman, Jr., W4ZTW, of the North Florida DX Association would like to volunteer his services as QSL Manager for any interested DX station. Bob has been an active DXer since 1953 and he certainly knows the ropes. You can reach him at 2812 Elisa Drive East, Jacksonville, FL 32216.

CX2CN, Sam Barreiro, has had one of the strongest signals from South America for many years. Sam recently qualified for WAZ and is frequently active in the CQ Worldwide DX Contests.

Max G. Long, CP1EU, and harmonic. Max confirmed Bolivia for many a happy DXer before going QRT in May, 1976. He is now located in Logan, Utah and is on the air as W7LGG.

Outgoing QSL Services—As everyone is aware, the American Radio Relay league has started operation of its outgoing QSL Bureau. This should be the most economical way for League members to QSL their DX contacts.

For a number of years there have been several outstanding private services which enabled the DXer to QSL very economically. At presstime we haven't heard whether these individual services expect to close down or continue operating. They continue to forward cards for the DX Editor's K4IIF/C6A operation so we know that for now they are still in business.

As these services do offer help in obtaining a return QSL, and also can be more economical when only a few cards are to be sent, they fill a need. They also serve both members and non-members of the League. Therefore it may be worth while to drop them a line and ask for their rates per card and other details of their service. Be sure to enclose a self-addressed, stamped envelope to facilitate a reply. Here are the addresses presently in our files:

W3KT QSL Service, RD 1, Box 66, Valley Hill Road, Malvern, PA 19355

W7IZH QSL Service, Box 17987-D, Tucson, AZ 85731

World QSL Bureau, 111 Farm Hill Way, Los Gatos, CA 95030

World Wide DX QSL Bureau, 10316 Aztec Drive, Sun City, AZ 85351

New Prefixes—Guernsey Island is now GU, Jersey Island is GJ and the Seychelles, including Aldabra, Farquhar and Desroches are S79.

Netherlands Prefixes—The Dutch licensing authorities are now issuing PA3 calls to class A & B licensees, PE1 calls to class C licensees and

Ernest Vranka, Jr., OE3EVA, is another recent WAZ winner. Ernest is 20 years old and a student of physics and math at the University of Vienna. He has been licensed since October, 1973 and has worked over 230 countries.

PD0 prefixes to class D. Calls issued in previous years *will stay the same,* except for some PI calls and those graduating to a higher class license. For example, a move from class C to either class A or B would change the prefix to PA2 with the suffix remaining the same.

YB8—This rare prefix has been activated by Francisco, YB8ACM, from Sulawesi Island, Indonesia.

Reciprocity with Philippines—The U.S. has had a reciprocal agreement with the Philippines since Oct. 25, 1976. Those wishing to operate /DU should apply to the Philippines Telecommunications Board, Quezon Boulevard, Quezon City, Philippines.

QSL Information

A9XBD (on RTTY)—via Geoff Smith, C & W, P.O. Box 14, Bahrain
CEØAE—To WA3HUP (Callbook listing is reported to be incorrect for a direct mailing to CE0AE. WA3HUP is OK in callbook.)
CT4AT—c/o W1YRC
D2ALB—Via P.O. box 262, Benguela, Republic of Angola
FGØCXV/FS7—M. Wise, W4PRO, 15 Willow Rd., Hampton, VA 23364
FGØGD/FS7—Via W9IGW, Route 12, Bloomington, IN 47401
FGØGE/FS7—To W1VYE, 68 School St., Weston, MA 02193
FOØGC (1976 CQ WW Phone Contest)—c/o WA6AHF
FP8JP—Via P.O. Box 224, St. Pierre et Miquelon
FPØBG—To VE1AIH, P.O. Box 663, Halifax, Nova Scotia, Canada
HI8LC—c/o W2KF, *NOT* W4KF
JW7FD—Via LA5NM
JY7ZH—To DJ9ZB
K4IIF/C6A—c/o W4KA
KC4AAC—Via K7ODK
KG6RL—Box 189, Saipan, Mariana Islands 96950
KG6SW—To W7YBX, 5632 47th Ave., S.W., Seattle, WA 98116
KX6MU—c/o WB6DPO
OX5ND—Via J. Browning, W6ASA, 6202 Lochvale Dr., Rancho Palo Verdes, CA 90274
P29EJ—To P.O. Box 1486, Lae, Papua, New Guinea
P29JS—c/o P.O. Box 2053, Konedobu, Papua, New Guinea
PJ8CM—Via W5AT, F. Jerome, 908 Holoway, Midwest City, OK 73110
PJ9MM—To W1GNC
PYØZAE (Trindade Island)—c/o PY1CK
TR8BJ—Via DJ5DA
VP1MPW—To W5QPX
VP2EEQ—c/o WA6AHF
VP2LDU—To WA7OTT, *NOT* VE3FFA
VP2MT—Via JA1KSO
VP2VDJ—To WA6AHF
VR4DX—c/o P.O. Box 332, Guadalcanal, Soloman Islands
YB3AB—Via PAØLOU
ZD8AA—To WA4TLB
ZD8AB—c/o ZD8AR
3AØFY—Via F9UW
4T3A—To VE3EOP
4W9GR—c/o DK4PP
5W1AB—To W4KA, 1044 S.E. 43rd St., Cape Coral, FL 33904
5Z4WL—Via DL3WL
7P8BC—To WA9SMM
9D5A—c/o WA6AHF
9D5B—Via K4OD
9J2NL—To IT9AF
9K2EP—c/o SMØOS
9Q5SW—Via JA8JN
9Y4A—To W2AYJ

Rick Dorsch, HC5EE/WB8ABN, is QRV from Cuenca, Ecuador Saturdays at 2200 GMT on 14222 working his QSL Manager, John, WA8TDY. Rick is a very active participate in the CQ DX Contests.

Late QSL Information

FGØMM—WA1JKJ
KC4AAC—K7ODK
VE2ZN/SU—VE2YM, P.O. Box 35, Dorion, P.Q. J7V5R8, Canada
VC9UM—VE4UM
VKØAC—VK3ZQA
VP8MS—K4MZU
VP8OT—c/o BAS office, Port Stanley, Falkland Islands
3D6BE—Box 1158, Mbabane, Swaziland
4W9GR—DK4PP
7P8BC—WA9SMM
HI8LC—Via W2KF, *NOT* to W4KF

73, John, K4IIF

SEND IN EARLY FOR ALL CQ CONTEST FORMS

1976 CQ C.W. World Wide DX Contest
High Claimed Scores

The following are high claimed scores received by January 27, 1977.

USA
Single Operator

All Band

W3LPL	1,538,784
W1ZM	1,298,388
W2GXD	1,261,746
K1GQ	1,167,450
W4RX	1,119,144
K3ZO	1,107,964
W1YK	1,000,835
WA1STN	892,852
K6PU	883,464
K2BMI	876,026
W7IR	852,436
WB4AEX	851,200
W6PLH	843,967
K9DX	823,404
W3GRF	822,952
W1RR	783,941
W4YWX	747,656
W3AP	721,112
W5WMU	711,075
W1DAL	688,744
K4LRO	675,454
W1YN	611,822
AA3KOC	571,320
AD4BAI	518,058
W3KWB	507,200
K6SE	507,150

Single Band

1.8 MHz

K1PBW	22,626
W5USM	3,420
K4YFQ	3,344
W1BB/1	2,375
K8WOT	1,430

3.5 MHz

W1MX	108,288
W7KW	30,561
WA8JUN	28,542
K9OTB	23,940
W7JLU	18,788
K2RR	17,516

7 MHz

W5WZQ	322,383
WB5DTX	284,900
WA7WXY	174,720
W9VNE	143,184
K2LWR	115,050
W7YTN	112,320
WB4OGW	87,575
WB4QKE	60,700
W3GK	43,808

14 MHz

WB9LHI	281,559
W8KFL	275,209
K8HLR	267,150
WA1NKK	235,175
WB2RWY	230,956
WA3SWF	221,130
K5BGB	200,561
K2IGW	192,456
W4AAV	191,520
WB4DIU	188,890
K8UQA	187,143
WA5RTG	176,229
AC8BDO	160,688
W9KNI	160,128
WA9PBK	159,960
WA8GLY	154,098

21 MHz

W4WSF	113,634
WA8KCX	80,122
AC9LT	71,904
W4WHK	67,517
K9BGL	67,456
AA6PGB	66,600
WA7HRE	38,610
WA4DRU	36,960
WA9LZA	34,713
AC9ZTD	33,930
WB9KLB	31,980

28 MHz

WB4OSN	5,964
K5EWJ	4,520
W8WPC	4,173
K9KWK	1,820
WA4EWX	1,586

Multi-Single

WA8ZDF	1,631,784
W2YD	1,487,250
W3BWZ	1,334,085
WA1NRF	1,136,124
K3MNT/7	1,055,472
WA6NGG	974,972
WAØCPX	897,672
K2BT	835,086
W7FR	539,138
K6QZ	528,515
K6ZM	519,590

Multi-Multi

W3WJD	4,173,687
W2PV	3,250,152
W3FRY	2,836,080
WA1RHA	2,257,668
W3TV	1,008,790
AA3ATX	988,816
K2CW	965,811
K4CG	948,090

DX
Single Operator

All Band

9Y4VT	3,438,644
EA2IA	1,444,560
KH6IJ	1,297,440
DL7AV	890,590
DJ5JH	705,640
VO1KE	661,203
8PØA	655,571
VE3KZ	561,825
ON6VN	531,409
WA1RFM/VP9	506,890
FPØBG	477,576
KX6DC	464,121
JE1SSE	412,653

Single Band

1.8 MHz

KV4FZ	43,400
PAØHIP	14,105
OK1ATP	9,792
EA8CR	7,696
KH6CHC	3,630
G3YMC	3,575

3.5 MHz

VR3AH	178,560
OH1XX	120,365
DL6KB	114,240
I3GNQ	107,750
KG6JIH	103,632
GM3CFS	86,022
YU1EXY	83,895
DLØKL	73,036
DJ2AA	69,600
YO6EX	54,458
OH2BCI	51,148
SM2DMU	40,868

7 MHz

VK6HD	261,250
JA2INO	128,140
VE7IG	104,790
JA1CWZ	104,328
OH1IJ	100,800
OH1PS/2	82,834
I3LID	82,388
YO3BEJ	74,218
JH1RFM	64,448
DK6PY	64,220
YU3TAA	50,163

14 MHz

PY4OD	1,168,344
DJ6RX	420,512
FC9UC	415,740
PY7AKQ/8	375,180
DJ2BW	358,800
G3HCT	286,552
JA2NLX	252,969
YO4KCZ	240,178
G3KDB	238,875
4X4UH	226,950
JR1JFO	184,149
ZL2BCO	167,315
JA2CMM	160,474
VU2ACD	153,670

21 MHz

VR1AA	252,408
CX2AQ	172,126
IØMGM	151,725
EP2VW	107,600
G3RZI	100,674
DK1VN	78,676
I4DVT	69,339
G4CNY	67,376
JA6AKW	57,456
9H1CH	57,348
JR6RRD	51,246
IØDYB	42,640

28 MHz

VK4XA	28,082
YV4CB	19,272
ZL2ACP	13,432
LU3DSI	4,746
JG1FJT	2,288

Multi-Single

9Y4A	3,767,676
PJ9MM	3,736,427
ZD8W	3,736,304
K4DBZ/C6A	1,959,693
9D5A	1,854,212
9K2EP	815,115
VE3AKS	784,704
HK4AOY	753,104
DL7ON/LX/P	736,281
PJ8CM	680,688

Multi-Multi

VE3DU	1,339,158
DK5VD	1,190,449
JA3YKC	1,048,285
JA3YBF	732,290

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The April, "Story of The Month" as told by Raleigh is:

Raleigh Poisson, W7PXA

All Counties #146, 4-22-76

"First became interested in ham radio in the mid 1930s, but never got the nerve to get a ham ticket at that time.

"During WWII I was in the U.S. Army Signal Corps. I was sent to Asmara, Eritrea where our group started the large radio relay station. I was transmitter attendant, tuning up transmitters, changing frequencies and performing routine maintenance.

"Before WWII I lived in Maine and after WWII I lived in Massachusetts.

"In 1950 I came to Washington State, joined the Spokane Radio Club in the fall of 1950. Got my first ham ticket in 1951 and lived in the Spokane area until May 1975 when I came to Orcas Island, San Juan County.

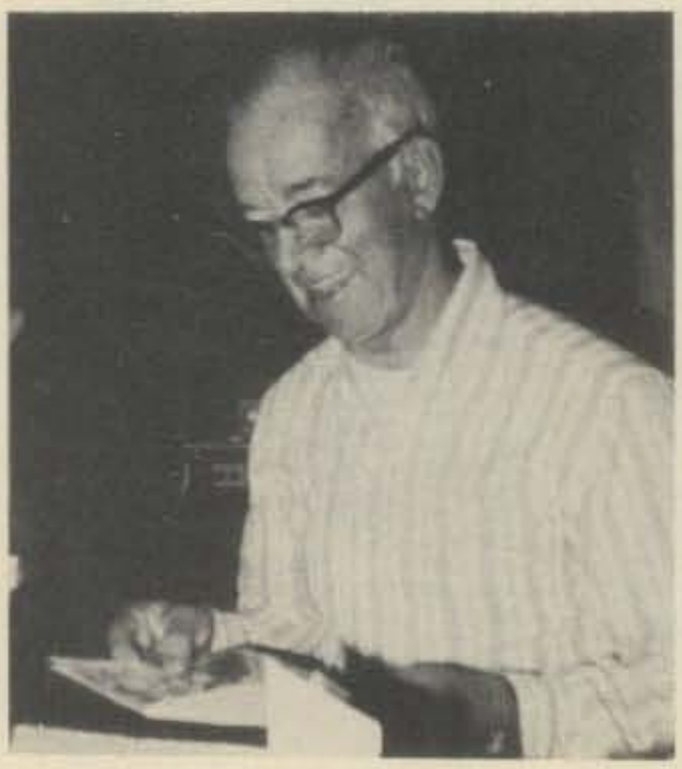
"Orcas Island, the Gem of the San Juans, is the largest island in the San Juan Islands with 56 square miles of varied terrain—rainfall averages 20-25 inches per year; highest point is Mt. Constitution, elevation 2409.

"Have been living 2½ miles south of the Olga post office (Orcas Island) since 1975 but was getting my mail at Box 308, Eastbound, but I finally decided to patronize the Olga post office, so now my mailing address is Star Route Box 42, Olga, Washington 98279.

"I started County Hunting in the mid 1960s. I probably could have finished *All Counties* sooner if I had used a beam on 20 meters instead of a vertical. I'm glad the chase is over, have not yet decided if I'll go for second time around, I might after a while.

"Am now semi-retired, living on Social Security. Have greatly enjoyed County Hunting and was happy to meet Patricia Smith, WA7GMX at the Skagit County Hamfest and our photograph was in *CQ* last month."

*P.O. Box 73, Rochelle Park, N.J. 07662.



Raleigh, W7PXA checking his cards and heard to say, "Oh that last county, at last!"

Special Honor Roll
All Counties

#162—Joseph B. Vaughan, K8NQP 12-29-76

Awards Issued

Joe Vaughan, K8NQP was proud and happy to pick up *All Counties* #162.

The MARAC Club Station, WB0DPD (Trustee, Bob, K0AYO) added USA-CA-2500 to it's collection, endorsed, All Mobiles, All S.S.B.

Don Priebe, W2IN (ex-W2IAM) had me send him USA-CA-1500.

Harry Daley, VE1AIG did a lot of paper work and came up with USA-CA-1000 endorsed All S.S.B., All 20; also USA-CA-500 endorsed All S.S.B., All 75, All 20.

Larry Sitton, WB7AYN obtained USA-CA-500 and USA-CA-1000.

Evelyn Welliver, WB4RVW was issued USA-CA-500 and USA-CA-1000.

Mike Gilmore, K7CLO acquired USA-CA-1000.

Ron Toller, W4MNZ claimed USA-CA-1000 endorsed All 2 × S.S.B.

Curtis Gidding, WB0RJY (Not WB0-RTY as reported last month) gained USA-CA-500, endorsed All S.S.B.

USA-CA-500 Certificates were sent to:

Ralph Young, WB4RJF.

Doug Hendricks, W7ISY.

Awards

Diploma De La Linea Ecuatorial (DEHC): This Diploma is available to stations making the required contacts with stations in HC-Ecuador, the land of, and named after the Equatorial Line. Contacts after 15 November 1945 count. Any band, any mode, and s.w.l.s are OK.

Required:

Africa, Asia, Europe, Oceania	1 QSO.
Any Novice	1 QSO.
North and Central America	2 QSOs.
South America	3 QSOs.

To apply, send data on QSOs and One U.S. Dollar or equivalent or 8 IRCs to DEHC Manager, R. Dorsch, HC5EE, P.O. Box 253, Cuenca, Ecuador, South America.

The Worked Delaware (W-DEL): This Certificate of Achievement is issued for confirmed QSOs with the three counties of Delaware, which are: Kent, New Castle and Sussex. QSOs after May 1956 are valid. Send QSLs and postage for return of your cards and to cover postage of the Award to: John B. Wilson, K3AMS, 1005 Greentree Road, Newark, Delaware 19711. Award by courtesy of the Delaware Amateur Radio Club and it is also available to SWLs.

North Carolina Counties Award: This Award of the Alamance Amateur Radio Club is issued in 4 Classes: D—30 Counties; C—50; B—75 and A—100 confirmed QSOs. Send GCR list and $1.00 for basic Award, endorsements for s.a.s.e. Apply to: Alamance Amateur Radio Club Inc., P.O. Box 503, Graham, N.C. 27253.

USA-CA Honor Roll

2500		1000		500	
WBØDPD	231	VE1AIG	427	WBØRJY	not
		WB7AYN	428	WBØRTY	1150
1500		WB4RVW	429	VE1AIG	1151
W2IN	315	K7CLO	430	WB4RJF	1152
		W4MNZ	431	WB4RVW	1153
				W7ISY	1154

Delaware Counties Award.

Karl Adkins, WA6MAR, one of the best and most consistent Net Controls.

Wisconsin Counties Award: The basic Award for 40 Counties and endorsements for 60 and 72. Send GCR list and $1.00 to: Bob Thorne, K9DAF, 1743 N. Clayton Avenue, Neenah, Wisconsin 54956.

Notes

This is being written shortly after New Years and I want to sincerely thank *ALL* for the nice Christmas and New Years cards that arrived from all over the U.S., Japan, South America and Europe—they warmed the cockels of my heart.

Sad to report that County Hunter and MARAC member, Edward Van Bosch, W6KDI (ex-WB6HQQ/K9BHE) became a silent key 12-20-76, per W6CCM.

It seems that everyone has a different idea about the Independent Cities and the Alaskan Judicial Districts, so here is the data:

Independent Cities

The following is a list of Independent Cities and Counties for which they may be used—remember no matter how many times you work a station or stations in such a City, you may use the City only once—so be sure to pick the ONE you need. Since USA-CA started, counties that have been absorbed include Princess Anne, Norfolk and Nansemond in Virginia and Ormsby, Nevada. Also Carson City, Nevada is now considered an Independent City. Thus at this writing we now credit 3075 COUNTIES.

In Virginia:

ALEXANDRIA—Arlington *or* Fairfax
BEDFORD—Bedford
BRISTOL—Washington
BUENA VISTA—Rockbridge
CHARLOTTESVILLE—Albermarle
CHESAPEAKE—Isle of Wight
CLIFTON FORGE—Alleghany
COLONIAL HEIGHTS—Chesterfield *or* Prince George
COVINGTON—Alleghany
DANVILLE—Pittsylvania
EMPORIA—Greensville
FAIRFAX—Fairfax
FALLS CHURCH—Fairfax
FORT MONROE—York
FRANKLIN—Southampton
FREDERICKSBURG—Spotsylvania
GALAX—Carroll *or* Grayson
HAMPTON—York
HARRISONBURG—Rockingham
HOPEWELL—Prince George
LEXINGTON—Rockbridge
LYNCHBURG—Amherst *or* Bedford *or* Campbell
MARTINSVILLE—Henry
NEWPORT NEWS—York
NORFOLK—Isle of Wight
NORTON—Wise
PETERSBURG—Chesterfield *or* Dinwiddie *or* Prince George
PORTSMOUTH—Isle of Wight
RADFORD—Montgomery
RICHMOND—Chesterfield *or* Henrico
ROANOKE—Roanoke
SALEM—Roanoke
SOUTH BOSTON—Halifax
STAUNTON—Augusta
SUFFOLK—Isle of Wight *or* Southampton
VIRGINIA BEACH—Isle of Wight
WAYNESBORO—Augusta
WILLIAMSBURG—James City
WINCHESTER—Frederick
CARSON CITY, NEV.—Douglas *or* Lyon *or* Story *or* Washoe
WASHINGTON, D.C.—Montgomery *or* Prince George, Maryland
ALASKAN JUDICIAL DISTRICTS as found in P.O.D. #26; First/SOUTHEASTERN, Second/NORTHWESTERN, Third/SOUTH CENTRAL, Fourth/CENTRAL

A nice letter from Tom Ross, K9GTQ who said, "I was part of a *happening* in the history of amateur radio at 0810Z, 18 December '76 on 3905 kHz, the Original Bicentennial

(Continued on page 74)

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

Twenty meters should continue to be the optimum band for DX during April. The band should open to most parts of the world shortly after sunrise, and remain open for DX during most of the daylight hours. With longer hours of daylight, the band will often remain open well past sundown, with a late peak in conditions towards South America between 10 p.m. and Midnight, local time.

Expect fewer openings on *15* meters compared to the winter months, but some fairly good DX still should be possible during the daylight hours. Best bet is for openings towards southern and tropical areas during the afternoon hours when conditions are HIGH NORMAL or better.

Not many DX openings expected on *10* meters this month, but an occasional one should be possible from all USA time zones towards Central and South America, and from the western states towards the South Pacific. Be sure to check this band during the afternoon hours when conditions are HIGH NORMAL or better.

Expect an improvement in DX conditions on *40* meters during the month. The band should open towards Europe and the east an hour or two before sundown; towards the south an hour or two after sundown, and towards the west after Midnight and peaking an hour or so before sunrise. Expect good DX openings throughout the hours of darkness.

Good DX openings to many areas of the world should also be possible on *80* meters during the hours of darkness and at sunrise.

There is also a chance for some *160* meter DX openings during the same time period as *80* meter openings.

Seasonably favorable propagation conditions should continue during April for openings between the northern and southern hemispheres. Best time to check these openings from the USA to Australasia, South America, southern Africa, etc. is during the twilight period at sundown and sunrise, on *20* meters. These inter-continental openings can take place at other times and on other bands as well, as shown in the DX PROPAGATION CHARTS.

Thunderstorm activity is expected to increase during April in the northern hemisphere, and this should result in increased levels of static on all h.f. bands, but especially on *40, 80* and *160 meters.*

*11307 Clara St., Silver Spring, MD 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For April, 1977

Propagation Index ..... Day	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 10, 20	A	A	B	C
High Normal: 8, 14, 21, 27	B	B	C	D
Low Normal: 1, 4, 6-7, 9, 11-13, 15, 19, 22-23, 25-26, 28	B	C	D	E
Below Normal: 2-3, 5, 16, 18, 24, 29-30	C	D	E	E
Disturbed: 17	D-E	E	E	E

Where *expected signal quality is:*

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

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of (3) will be *fair* (C) on April 1, *poor* (D) on the 2nd and 3rd, *fair* (C) on the 4th . . .

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.

V.H.F. Ionospheric Openings

Lyrids, a major meteor shower should take place April 21-23. Expect it to peak during the early morning hours of April 22, with an average of 15 good-sized meteors entering the earth's atmosphere every hour. This should make possible meteor-scatter type openings on the v.h.f. bands.

A seasonal increase in sporadic-E ionization usually begins during April, and continues through the spring and summer months. Expect an increase in short-skip openings on both *15* and *10* meters during April, as well as an occasional opening on *6* meters. The openings on *10* and *15* meters will range between approximately 400 and 1300 miles, while those on *6* meters will usually be between 750 and 1300 miles. While Sporadic-E ionization can occur at just about any time, there is a tendency for it to peak between 8 a.m. and Noon and again between 5 and 9 p.m., local time.

Widespread auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the vhf bands. Best times for these to occur are during periods of radio storminess on the h.f. bands. Check the *Last Minute Forecast* at the beginning of this column for those days during April that are expected to be BELOW NORMAL or DISTURBED.

Sunspot Cycle Activity

According to the Swiss Federal Solar Observatory at Zurich, December, 1976 was a month of variable sunspot activity. The sun was completely spotless for the first week of the month, but the number of spots increased quite a bit during the remaining three weeks. Sunspot activity reached a peak on the 16th with a daily count of 39. The monthly median value was 15. This results in a smoothed sunspot number of 12.7, centered on June, 1976. This means that the present sunspot cycle has remained stalled at a level of approximately 13 for the past *five* months. A smoothed sunspot level of approximately 9 is forecast for April, 1977.

Short-Skip Propagation

For openings between 50 and 250

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.

miles, use *80* meters during the day and *160* meters at night. Between 250 and 750 miles, *40* meters should be best during the day, *80* meters at sunrise and sunset, and *160* meters during the hours of darkness. For openings between 750 miles and the one-hop, short-skip limit of 2300 miles, use *20* meters during the day, *40* meters at sunrise, and *80* meters during the night. Expect an increase in short-skip openings on *15* and *10* meters between distances of 400 and 1300 miles, but these will occur sporadically. There is also the possibility for openings on *15* meters during the afternoon hours over distances between approximately 1300 and 2300 miles. Check the *CQ Short-Skip Propagation Chart* which appeared in last month's column for more details.

The DX PROPAGATION CHARTS in this month's column contain DX propagation predictions for each amateur band between *10* and *160* meters for the period *April 15* through *June 15, 1977*. Beginning this month and continuing through the summer and fall, the times shown in the CHARTS will be local *daylight* time (EDT, CDT, MDT and PDT).

73, George, W3ASK

April 15-June 15, 1977
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

*Indicates Best Time for 160 Meter Opening.
**Indicates Best Time for 10 Meter Opening.

April 15-June 15, 1977
Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

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

(continued on page 72)

SEND IN EARLY FOR ALL CQ CONTEST FORMS AND LOG SHEETS

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

It's back to the "ole soap box." Take a look at the long list of activities scheduled for the month of April, and the resulting doubling-up of dates. We lost the second week-end because of Easter, but the ARRL "Marathon" in February and March does not help the situation any.

Really now, is it necessary to have two 48 hour periods for each mode? All the other major contests only occupy a single week-end. I have always said and still contend that the other organizations are not getting a fair shake.

Remember we want to look like nice guys come the WARC in 1979.

Bob Thompson, K6SSJ has advised me that the 1977 Fresno International DX Convention on April 1, 2, and 3 will be the biggest yet. A full program is being planned, exhibits, equipment demonstrations, technical talks and a contest forum that will feature several famous DX guests. The Club station, possibly with the special call NC6DX, will be on the air on all bands during the entire Convention period.

The Dayton Hamvention will also be held in April, at the end of the month, but no program has been released as of this date (mid-January). It is hoped that a Contest Forum will be included, last year's being such a huge success.

73 for now, Frank, W1WY

Common Market DX Contest

C.W.—0600 to 2400 GMT Sat., April 2
Phone—0600 to 2400 GMT
Sun., April 3

The purpose of this contest is to increase activity between radio amateurs in the Common Market of Europe and the rest of the world.

There are 9 countries in the Common Market. Belgium, West Germany, Italy, Denmark, Great Britain, Luxembourg, Ireland, Netherlands and France.

Classes: Single operator—all band, low band (80 & 40), high band (20, 15, 10) and multi-operator, single TX, all band only.

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

Points: *For Common Market stations*—QSO with other CM stations, 1 point. With non CM inside Europe, 2 points. With all other countries, 5 points. (Own country may be worked but for multiplier only.)

For non CM stations—QSO with CM stations, 5 points. With other Europeans, 2 points.

Multiplier: *For CM*—Each DXCC country worked on each band. *For non CM*—Each CM country worked on each band.

Final Score: Total QSO points × total multiplier from each band.

Awards: Certificates will be given to the highest scorers in each class, in each country, on each mode. Trophies to the Top scoring single operator in each mode, in the CM and outside the CM.

There is a S.W.L. Class. Score 5 points for each complete QSO reported. Certificates for both c.w. and phone.

Use separate log for phone and c.w. and for each band. Include a summary sheet and the usual signed declaration that all rules and regulations have been observed. Disqualification regulations for excessive dupes and etc. will be enforced.

Mailing deadline is April 30th to: Michel Le Bon, ON4GO, Chee de Wavre 1349 B, 1160 Brussels, Belgium.

Tennessee QSO Party

Two Periods (GMT)
2100 Sat. April 2 to 0500 Sun. April 3
1400 to 2200 Sunday, April 3

Many counties with low activity will be activated by portable and mobile stations for this the 7th annual party.

The same station may be worked on each band and each mode, mobile and portables in each county change. Tenn. may work other in-state stations for QSO and multiplier credit.

There is a bonus period for out-of-state stations. Look for Tenn. mobile and portables on Sunday between 0500 and 0600 on 75 meters.

Exchange: Signal report and QTH. County for Tenn., state, province or country for others.

Scoring: One point per QSO. Tenn. stations multiply total QSOs by sum of (states + provinces + Tenn. counties) worked. Out-of-state stations, QSOs by Tenn. counties. (max. 95)

There is a 200 point bonus for Tenn. mobile and portable stations for each county change outside own county. (min. of 10 QSOs per county)

Frequencies: CW — 3550, 7050, 14050, 21050, 28050. Phone—3980, 7280, 14280, 21380, 28580. Novice—3725, 21125, 28125. (no repeater contacts)

Awards: Certificates to each station submitting a log with 15 or more contacts. Plaques will be given to the top phone and c.w. scores in Tenn. and out-of-state entries, and the winning mobile, and portable stations.

Calendar of Events

*Apr.	2-3	Polish "SP" C.W. Contest
Apr.	2-3	Common Market DX Contest
Apr.	2-3	Tennessee QSO Party
Apr.	2-3	6 Meter Contest
Apr.	2-4	Zero District QSO Party
*Apr.	2-4	ARCI QRP Contest
Apr.	3	Wisconsin QSO Party
*Apr.	12-13	DX-YL to W/VE YL C.W.
*Apr.	16-17	Polish "SP" Phone Contest
Apr.	16-17	Bermuda Contest
Apr.	16-17	County Hunters SSB Party
Apr.	16-17	Florida QSO Party
Apr.	16-17	ARRL CD C.W. Party
Apr.	23-24	ARRL CD Phone Party
Apr.	23-24	Dutch PACC Contest
Apr.	23-24	Swiss "H-22" Contest
Apr.	26-27	DX-YL to W/VE YL Phone
May	1-2	Connecticut QSO Party
May	7-8	Vermont QSO Party
May	7-9	Georgia QSO Party
May	14-15	Massachusetts QSO Party
May	14-15	Kansas QSO Party
May	14-16	Michigan QSO Party
May	15	World Tele.-Comm. Phone
May	22	World Tele.-Comm. C.W.
May	21-22	New York State QSO Party

*Covered last month.

*14 Sherwood Rd., Stamford, Conn. 06905.

Use a separate log sheet for each band with over 25 QSOs, and a check sheet for logs with over 100 contacts. There is a disqualification clause for stations soliciting contacts from non-contestants.

Mailing deadline is May 1st to: Dave Goggio, W4OGG, 1419 Favell Drive, Memphis, Tenn. 38116. Include a s.a.s.e. if eligible for a certificate.

6 Meter Ground Wave Contest

0300 to 0700 GMT Sunday, April 3
(9 P.M. to 1 A.M. CST Sat. April 2)

The Global Research Radio Club is sponsoring this contest for the preservation and encouragement of 6 meter activity. Contacts may be made on any mode allowed in the 6 meter band. It is suggested you write to K9DTB for more details.

Scoring is determined by the distance of the contact from your QTH. The areas are divided into zones as follows: Zone 1 stations within 25 miles, 1 point. Zone 2, 25 to 50 miles, 2 points. Zone 3, 50 to 75 miles, 3 points. Zone 4, over 75 miles, 4 points. (In the event of a band opening however skip contacts will be worth only ½ point regardless of the distance.)

Awards will be made in the following categories: Mobile, Portable, High Power, 100 watts and over. Medium Power, 51 to 99 watts. Low Power, less than 50 watts. (no repeater contacts permitted)

The Society for the Preservation and Encouragement of Six Meters will issue certificates to all submitting a log. Prizes to the 3 top scores.

Score your log and include a summary sheet indicating your power, classification etc.

You are invited to join the SPESM 6 meter net every Sunday morning, 9 AM CST on 50.125.

Mailing deadline is May 31st to: Global Research Radio Club, Att: Phil Caruso, K9DTB, P.O. Box 271, Lombard, Ill. 60146.

Zero District QSO Party

Starts: 2000 GMT Saturday, April 2
Ends: 0200 GMT Monday, April 4

This year's Party is sponsored by the Mississippi Valley Radio Club. This one covers a lot of territory and should create a lot of activity.

Stations outside the Zero District will work Zero stations only, but Zeros may work both in and out of district stations. The same station may be worked on each band and mode.

Exchange: QSO no., RS(T) and QTH. County and ARRL section for Zeros, ARRL section only for all others.

Gary Cervo, WB6EXW, operating Northern California DX Club Contestpedition station FOØGC, from the island of Moorea during the 1976 CQ Worldwide Phone Contest. Gary passed out many additional 80 meter contacts before and after the contest. His rig included an FT-101B terminated in a coconut palm. QSLs go to WA6AHF.

Scoring: *For Zeros:* Total QSOs multiplied by (ARRL sections + Zero counties + DX countries) worked. *For others:* Total QSOs multiplied by (Zero counties + Zero sections)

Frequencies: C.W. — 3560, 7060, 14060, 21060, 28060. Phone — 3900, 7270, 14300, 21370, 28570. Novice— 3725, 7125, 21125, 28125.

Awards: Attractive four color certificates will be given to the top scorers; both general and novice/technicians, in each ARRL section.

Mailing deadline May 15th to: Mississippi Valley Radio Club, 3518 W. Columbia, Davenport, Iowa 52804. Include a s.a.s.e. for results.

Wisconsin QSO Party

Starts: 0000 GMT Sunday, April 3
Ends: 2359 GMT Sunday, April 3

This year's party is jointly sponsored by the Neenah-Menasha and the Yellow Thunder Amateur Radio Clubs. The same station may be worked on each band and mode, and county change for mobile/portable operation. Wisconsin stations may work other Wis. stations for QSO and multiplier credit.

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

Scoring: For Wis. — W/K and VE QSOs, 1 point. DX QSOs, 3 points. Multiply total QSO points by ARRL sections and Wis. counties worked. (max. 146)

KP4, KH6, KL7 and KZ5 count as DX and also as a section multiplier.

Out-of-state—Multiply Wis. QSOs by number of Wis. counties worked. (max. 72)

Frequencies: 1810, 3550, 3735, 3900, 7050, 7135, 7235, 14050, 14280, 21050, 21135, 21300, 28050, 28600. Also 50-50.5 and 144-148.

Awards: Certificates for the top scoring Fixed, Mobile, Portable, Novice and VHF stations in Wis., each ARRL section and DX country. There is a Trophy for the Wis. club entry with the highest combined score of its members.

Indicate each multiplier the first time worked and include a summary sheet with your entry.

Logs must be received by May 6th (May 20th for DX) and go to: Kenneth A. Ebneter, K9EN, 822 Wauona Trail, Portage, Wis. 53901. Include a large s.a.s.e. for results.

Bermuda Contest

Starts: 0001 GMT Saturday, April 16
Ends: 2400 GMT Sunday, April 17

There are a couple of major changes in this year's rules.

1. The contest period has been extended to a full 48 hours. However the operating period for scoring is limited to 36 hours. Off periods to be clearly logged, and each period to be not less than 3 consecutive hours.

2. Phone and c.w. have been combined into one contest. The same station may be worked once per band, either on phone or c.w., but not on both modes on the same band, for QSO and multiplier credit. (cross band or cross mode not permitted)

1976 Winners

YL Anniversary Party

C.W.			Phone	
DJ0EK	860	Gold Cup	YN1KG	12,717
I3MQ	817	Certificate	HC2YL	12,152
VE1AMB	646	Certificate	FG7XL	8,910

Combined CW & Phone

HC2YL	12,385	Hager Award
VE7DTO	5,648	Hager Award
K6DLL	4,955	Corcoran Award
DK5TT	1,168	W6NZP Memorial

Lloyd and Iris Colvin operating from the Virgin Islands during the 1976 CQ Worldwide Phone Contest. Lloyd and Iris were recently inducted into the CQ DX Hall of Fame, see February issue. At W6KG/AJ3 they made 6,800 QSO's with 125 countries, including nearly 2,000 QSO's in the phone section of the contest. During the c.w. weekend they made a 2nd 2000 contacts from VP2VDJ in the British Virgin Islands.

Stations in the U.S. and Canada may work the United Kingdom and VP9s only. While U.K. stations may work W/K, VE and VP9s.

Participation is for single operator stations only, and operation must be from their own private residence.

Exchange: RS/RST report and QTH. State for W/K, province for VE, county for the U.K., and Parish for the VP9s. (Parish *not* used in the multiplier)

Scoring: Each completed QSO, phone or c.w., now is worth 5 points. Multiply total QSO points by the number of different VP9 stations worked on *each* band, 3.5 thru 28 MHz., for your final score.

Awards: The top scorer in each State, Province and U.K. county will receive a printed award. The over-all winner in the U.S., Canada and the U.K. receives a Trophy to be awarded at the Society's Annual Dinner held in October. Round trip air transportation plus accommodations will be provided to overseas winners to accept their award in Bermuda. (Trophy winners in the 1975 and 1976 contests are not eligible for Trophies, only area certificates.)

Check your log for duplicates, compute your score and sign a declaration that rules and regulations have been observed.

All entries must be received before June 30th by the Radio Society of Bermuda Contest Committee, P.O. Box 275, Hamilton 5, Bermuda.

County Hunters SSB Contest

Three Periods (GMT)
0001 to 0800 Saturday, April 16
1200 Sat. Apr. 16 to 0800 Sun. Apr. 17
1200 to 2400 Sunday, April 17

This is the 6th annual contest sponsored by the Mobile Amateur Radio Awards Club to increase activity for the County Awards program.

Emphasis is on mobile and portable operation. Fixed stations may work other fixed stations but *once only*. Mobile and portables may be worked for each county or band change.

Exchange: Signal report, county and state. Country for DX stations.

Points: Contacts with a fixed W/K or VE 1 point, 5 points if its a DX station. (KH6 & KL7 are DX) 10 points if its a mobile or portable.

Multiplier: Total U.S. counties plus VE stations worked. Counties are counted *once* only, but VE's each time worked on each band.

Final Score: Total QSO points × (counties + VE stations) worked.

Frequencies: 3920 — 3940, 7220 —7240, 14275 — 14295, 21375 — 21395, 28575 — 28595. This year there will be a "Mobile/Portable Window" of 10 kHz as follows: 3925 — 3935, 7225 — 7235, 14280 — 14290. This space has been set aside for working M/P only.

Awards: Certificates to the Top 10 fixed and mobile stations in the U.S. and Canada, and in each DX country. Four plaques, to the top fixed U.S. or Canadian, DX station, and 1st and 2nd Mobile stations. Only single operator stations eligible.

It is suggested you write W0QWS for detailed rules, log and summary sheets. Include large s.a.s.e.

All entries go to: John Ferguson, WØQWS, 3820 Stonewall Ct., Independence, Missouri 64055.

Florida QSO Party

Three Periods (GMT)
1500 to 2000 Saturday, April 16
0000 to 0500 Sunday, April 17
1400 to 2400 Sunday, April 17

This is the 12th annual QSO Party sponsored by *Florida Skip*.

Phone and c.w. are separate contests. The same station may be worked on each band for QSO and multiplier credit. Floridians may work in-state stations but for QSO points only.

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

Scoring: *For Florida*—1 point per QSO. Multiply total by sum of states (49), provinces (12), and DX countries (max. of 12) worked.

(Fla. mobiles and portables using emergency power, 200 w. or less, can multiply their total score by 2.)

Out-of-state—1 point for each Fla. QSO, 2 points if its a mobile or portable. Multiply total QSO points by number of Fla. counties worked. (max. 67)

Frequencies: C.W. — 3577, 7077, 14077, 21077. Phone — 3977, 7277, 14317, 21377.

Awards: Certificates, phone and c.w., to the top single operator score in each state, province, DX country, and each Fla. county. There are also 5 plaques to be awarded as follows: Top single operator in Fla. and out-of-state, both phone and c.w., and to the Fla. Club with the highest aggregate score.

There is a disqualification clause for excessive dupes, multipliers and other obvious reasons. Stations disqualified will be barred from next year's Party.

Include a summary sheet showing the scoring and other pertinent information. Also a signed declaration and your name and address in Block Letters. Include a 13¢ stamp for *Florida Skip* issue with results.

Mailing deadline is May 30th to: Florida Skip Contest Committee, P.O. Box 660501, Miami Springs, Florida 33166.

P.A.C.C. Contest

Starts: 1200 GMT Saturday, April 23
Ends: 1800 GMT Sunday, April 24

Its the world working the Netherlands, all bands 1.8 thru 28 MHz, both phone and c.w. The same station may be worked *once only* on each band, either phone or c.w.

Exchange: RS(T) plus a QSO number starting with 001. PA/PI/PE stations will include two letters indicating their province. (579001/GR)

There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, ZL. Making a possible multiplier of 72.

(Continued on page 74)

QRP *(from page 36)*

"I suppose I am laying myself open to the rankest kind of criticism, but the rankest kind of criticism is of more value than no criticism at all. The amateurs who are using well designed and carefully operated high-power transmitters will agree with me, in all probability. The ones who are using haywire and makeshift high-power transmitters and who are forever kicking about rotten results will yell the loudest. I've seen one or two of these petitions that have been going the rounds lately and the instigator of them will have another job of petitioning—but let him petish to his heart's content. Surely no sane and independent thinking amateur will swallow such rot and forsake the sound principles under which he has been operating these many years.

"Remember, this is only a suggestion—it doesn't mean that we have to do it. It doesn't even have to be decided today or tomorrow—or ever, for that matter. Let's think it over for a couple of months. Let's talk about it at our conventions and let's find out if we think we ought to try it. *QST* is the place to express ideas—I know of no better place for such expression, and *QST* doesn't have to be crammed full of technical dope each month, either. If you have any ideas, express yourself and don't wait for George to do so. George may be waiting for someone else. Do you have a card? Would you be so extravagant and go so far as to risk one? Well, do as you see fit — after all, you are the doctor and as you go, so goes amateur radio."

"F. H. Schnell W9UZ"

Well, there it is. A masterpiece in the literature of ham radio. Of course, back in those days, ham radio had a grand tradition—which included the mythical Old Man who administered his mythical tool, the "Wouf hong," whenever some errant ham lost sight of the gentlemanly principles upon which ham radio must be based. I just wonder what W9UZ and The Old Man would think of these new fangled high power contest boys who use a pre-programmed keyer to do all the transmitting in racking up 250 QSO's per hour? Somehow it just doesn't seem like what they had in mind . . ."

C. F. Rockey W9SCH

And I might as well stick on my own "Well, there you have it fellas." It's been about half-a-century since W9UZ penned his remarkable letter. A lot of years since gone by. I wonder if things have changed at all? I suppose it's just this gloomy January day, but I'd sure like to sit in front of a fire with W9UZ, The Old Man, Rockey, and some others, and just chew the rag about Schnell's letter. Seems to me that we'd all be talking the same language.

73, Ade, K8EEG

Math's Notes *(from page 32)*

tion figures of anywhere from 450 to 1500 db per km are commonly available from some of the surplus sources. As a result, the choice of a particular fiber is a function of the length of the communications link desired, the power of the input modulated light source, and the sensitivity of the detector. In familiar "radio language" the length of the path to be covered functions of the power of the transmitter-antenna combination, and the sensitivity of the antenna-receiver combination.

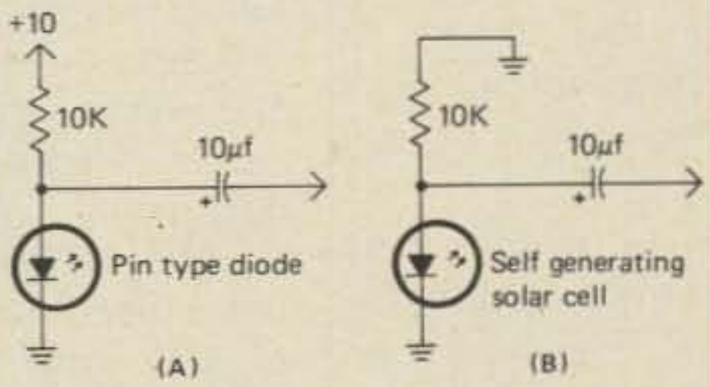


Fig. 4—Two simple "receivers" for light modulated signals. Both should be fed to audio amplifiers to recover the signals.

One very interesting fact concerning this type of transmission system is that the "carrier" is light. Therefore, by the proper modulating methods, very wide bandwidths of several hundred megaHertz can be achieved. Compared to coaxial cable, where even 10 MHz video signals suffer degradation over runs of a few hundred feet, fiber optic cables can achieve very low loss runs far in excess of even the highest quality coax. In addition, since the basic fiber material is glass or fused silica, the cables are generally impervious to water, temperature extremes, hazardous environments and animals when buried in the ground.

As just mentioned however, to gain the full advantage of an optical fiber system, high speed modulation systems are a must. The most common source in use at present is the light emitting diode. Special types have been fabricated and are available which will switch from full on to full off in several nanoseconds. This allows modulating speeds into the hundreds of megaHertz and will no doubt be improved upon in the future. Solid state laser diodes are also used to drive optical fibers but here pulse type modulation schemes are employed as the peak power out of such devices can easily reach into the 10's and even 100's of watts.

Naturally, to utilize such high speeds, photodetectors have also been developed to receive and demodulate the incoming light signals.

Because of the obvious advantages of optical fiber systems over the more conventional "hard wired" approach, the use of these unique cables will undoubtedly become more and more common as time goes on.

In the event that the many experimenters reading this column wish to do some of their own investigations we are including the schematics for a simplified LED "transmitter" and photodiode "receiver". These may be coupled to the various low-cost "experimenters optical fibers" currently available from the various surplus houses.

If there is enough interest we will be glad to make a simple kit including a length of low-loss cable, a medium speed LED and matching photodetector available — please let us know.

In conclusion, this column begins the sixth continuous year of Math's Notes. I wish to personally thank all of my readers for their encouragement, support and comments both kind and constructive and promise to maintain the general format and wide range of topics covered.

73, Irwin, WA2NDM

In Focus *(from page 31)*

undesirable. You can get just so much out of a 65K memory.

L'Image D'Aprile?

Every year at about this time, I notice queer happenings with my slow scan gear. An example of the problems I have experienced is shown in fig. 15.

If you can suggest what might be happening each year on the day after March 31st, please drop me a line. Same old address, 2112 Turk Hill Road, Fairport, N.Y. 14450.

Regards, Bill, W2DD

Antennas *(from page 27)*

antenna measurements were back to normal."

"That sounds like a psychological crutch to me," laughed my friend, as he prepared to depart. "If the DX doesn't come back, simply rerun all your antenna measurements. Then when you call again, you can't miss."

"Too bad life isn't that simple," I replied.

Zero Bias *(from page 5)*

timer aware of what topics are covered each month. Sometimes we take for granted that a catch word or phrase will be meaningful to all those who see it. Rather than appear or in fact to be an exclusionary block, we felt that the titles of the columns should do more to promote a better understanding of the material. After all, as I said last month, we cater to some of the busiest people in the world, the most active bunch of amateurs anywhere. We also have the best (and I mean best) group of columnists writing today on amateur radio. We want more of you to take a second look and many of you to take that first look at what's being offered.

One of the things we have in the works for '77 is to increase the number of Reviews of amateur products and products of interest to amateurs. This month for instance Bill DeWitt delves into the Radio Shack SCT-11 stereo cassette tape deck and we have a review coming up by Adrian Weiss on the Heathkit HW-8 QRP c.w. transceiver. Hugh Paul is hard at work generating a number of Reviews for the next several months. Anything you'd like to see? Let me know and I'll try to arrange it.

We have a number of great articles in the works for '77 and my second year as Editor looks even busier than my first. We are looking for new material for *CQ* so why not take some time and send in that article. Give us all a chance to see what you've been doing lately and perhaps get paid for it at the same time.

April is also the month for Dayton. Just the mention of Dayton to most of us is enough to kindle the imagination and produce a roaring fire. For the uninitiated or newcomer, for the old timer who never found the time, for those who just settle for hearing about Dayton from people who have been there let me tell you that it is amateur radio personified and worth the effort to get there. This year marks their 20th Dayton Hamvention and for three solid days and nights you are inundated with amateur radio. There are programs for every interest, an arena full of exhibits, forums, technical sessions and the best flea market I've ever seen with acres and acres of all sorts of marvelous things guaranteed to capture your interest and wallet. Bring an extra suitcase to carry home all the goodies.

CQ will have their booth set up and I look forward to meeting many of you and getting the chance to exchange some ideas. Dick Ross, K2MGA will be out there to help with the booth and we'll probably be joined from time to time by many of the *CQ* columnists who show up each year. It's a lot of fun so why not come on out and join us.

73, Alan, K2EEK

Palomar Noise Bridge *(from page 33)*

only fuse employed is in the cathode circuit of the 8873 to prevent over driving and thus damaging the amplifier tube. A time delay circuit insures proper warmup of the 8873 filament prior to plate voltage being applied.

The amplifier input circuit consists of fifteen 1500 ohm, 2 watt resistors in parallel, which form a 100 ohm, 30 watt resistance. This resistance, in parallel with the 8873's cathode circuit impedance, causes the exciter to look into the desired 50 ohm load on all bands. This resistive network also dissipates a portion of any excess driving power. The 75 to 90 watt output of most transceivers will drive the amplifier to full output on all bands.

The output circuit of the amplifier is a pi-network with additional fixed padding capacitors across the tuning and loading capacitors on the 80 meter band. Ferrite beads are used in the plate lead for parasitic suppression. Metering functions monitor grid and plate current, high voltage and relative power output.

Power output on c.w. ranged from 630 watts to 570 watts, depending on the band in use. Rated input for s.s.b. is 1200 watts PEP on a continuous duty cycle. The c.w. duty cycle is rated as continuous as long as maximum key down time does not exceed 30 seconds. At the reduced input level of 400 watts for RTTY and SSTV the maximum transmit time must not exceed 10 minutes. These ratings are adequate for most operators. Keep in mind the fact that the protection circuits in the amplifier will prevent damage should these ratings be exceeded. Other amplifiers in this power class may not fair as well if their ratings are exceeded.

The slightly higher cost of the SB-230 ($369.95) is justified by the use of the more expensive Eimac 8873. It's other design features are a bonus.

The SB-230 is a clean amplifier. Third order distortion products are better than a −30 db down from the rated output, provided the driving transmitter is at least that good with regard to third order products. A dirty driver signal is going to give you a dirty output signal. Primary power for the amplifier can be either 120 v.a.c., 50/60 Hz at 14 amps or 240 v.a.c., 50/60 Hz at 7 amps. ■

The Heathkit SB-230 *(from page 37)*

plete details for using the bridge in this manner can be found in most good antenna books written for the amateur.

The bridge can also be used to determine the resonant frequencies and impedance of tuned circuits or to assist you in cutting transmission lines to the proper length.

The bridge is accurate enough for most amateur uses up to 100 MHz and with a little practice you will become proficient in its use and wonder how you ever got along without it. ■

Multi Band *(continued from page 50)*

first monopole section always "theoretically" functions as a naturally resonant λ/4 monopole antenna (later we will modify that word "naturally" just a little bit). By defining $h°_{(10)}$ as being naturally resonant at one quarter wavelength, we know instantly that $h°_{(10)}$ equals 90.000 degrees electrically at $f_{(10)}$. That does it for ten meters. We're finished (See, we said it would be easy).

However, from here on there will be no more naturally resonant λ/4 sections in our Morgan on any lower frequency band; just "coil loaded" monopoles whose *total* electrical length of *both* the conductor electrical lengths *and* that added by the traps below $h°_{(n)}$ will equal 90 degrees at $f_{o(n)}$. A "loaded" monopole is *not* naturally resonant when its *total* electrical length is 90 degrees: it is a monopole "forced" into resonance at $f_{o(n)}$ by lumped reactance!

The Fifteen Meter Band

When we snap the band switch of the rig to the fifteen meter band and spin the v.f.o. dial over to 21.225 MHz, the ten meter band trap goes out of resonance to present a reactance $X_{s(10)_{15}}$ ohms in series between conductor sections $h°_{(10)}$ and $h°_{(15)}$. But we know what $X_{s\ (10)_{15}}$ is because of our sweating a bit earlier. All we have to do is find out how long electrically to make $h°_{(15)}$ so that with the ten meter trap reactance in series, we still come out resonant at $f_{(15)}$. Reaching back to our earlier lists, we obtain the reactive value for $X_{s(10)_{15}}$ as equal to 353.801 ohms. That's neat, but what about the length of conductor $h°_{(10)}$ at $f_{o(15)}$? It's simple: we just put our factor M to work. We get M = 21.225/28.850 equals 0.736. Therefore $h°_{(10)_{15}} = 90° \times 0.736$ equals 66.213 degrees. On *all bands* the converted length of $h°_{(10)}$ will be the *same* for both the $K_{m(1)}$ and $K_{m(2)}$ monopoles. Now, we first list our known data for each monopole then hitch up our belts and begin climbing.

$a'_{(1)} = 4.245 \times 10^{-3}$ ft.	$a'_{(2)} = 1.667 \times 10^{-1}$ ft.
$K_{m(1)_{15}} = 456.32\Omega$	$K_{m(2)_{15}} = 236.10\Omega$
$h°_{(10)_{15}} = 66.213°$	$h°_{(10)_{15}} = 66.213°$
$X_{s(10)_{15}} = 353.801\Omega$	$X_{s(10)_{15}} = 353.801\Omega$

(We now use the steps shown on the left hand side of fig. 1 to climb the monopole to the height λ1.)

$\lambda_1 = h°_{(10)_{15}}/360° = 66.213°/360° = 0.1839\lambda$

$X_1 = \tan h°_{(10)_{15}} = \tan 66.213° = 2.2687\Omega$

$\lambda_1 = 66.213°/360° = 0.1839\lambda$

$X_1 = \tan 66.213° = 2.2687\Omega$

(We must now climb around the off-resonant ten meter trap reactance by adding its normalized reactance X_s/K_m to X_1.)

$$X_2 = X_1 + \frac{X_{s(10)_{15}}}{K_{m(1)}} = 2.2687 + \frac{353.801}{456.32}$$

$X_2 = 2.2687 + 0.7753 = 3.044\Omega$

$$X_2 = X_1 + \frac{353.801}{236.10}$$

$X_2 = 2.2687 + 1.4985 = 3.7672\Omega$

In this last step we have reached the base end of the last conductor section $h°_{(15)}$. We notice that the reactance X_2 now differs in value on our two monopoles. To find the needed length $h°_{(15)}$ in each of the monopoles, we take the next steps indicated in fig. 1:

$X_2 = 3.0440\Omega$

$$\lambda_2 = \frac{(\tan^{-1} X_2)°}{360°} = \frac{(\tan^{-1} 3.0440)°}{360°}$$

$$\lambda_2 = \frac{(71.8139)°}{360°} = 0.1995\lambda$$

$X_2 = 3.7672\Omega$

$$\lambda_2 = \frac{(\tan^{-1} 3.7672)°}{360°}$$

$$\lambda_2 = \frac{(75.1337)°}{360°} = 0.2087\lambda$$

(then:)

$h\lambda_{(15)} = 0.250\lambda - \lambda_2$

$h\lambda_{(15)} = 0.250 - 0.1995 = 0.0505\lambda$

$h°_{(15)} = 0.0505 \times 360° = 18.186°$

$h\lambda_{(15)} = 0.250\lambda - \lambda 2$

$h\lambda_{(15)} = 0.250 - 0.2087\lambda = 0.0413\lambda$

$h°_{(15)} = 0.0413 \times 360° = 14.866°$

Actually, we could have used another "lazy man's" step just after we had obtained the reactance X_2 at the base of the unknown length section $h°_{(15)}$. Because X_2 is in normalized ohms in both monopoles we would find $h°_{(15)}$ degrees immediately as:

$h°_{(15)} = (\text{cotan}^{-1} X_2)°$

$h°_{(15)} = (\text{cotan}^{-1} 3.0440)° = 18.186°$

$h°_{(15)} = (\text{cotan}^{-1} X_2)°$

$h°_{(15)} = (\text{cotan}^{-1} 3.7672)° = 14.866°$

You can only pull this lazy man's step* when you finally reach $X_{(n)}$ of the last conductor section whose length $h°_{(n)}$ *you need to find* in a given band. Also, you have to get the electrical height λ_n at the base of an intervening conductor of *known* electrical length to climb to its top end. As we haven't done that yet, this OM will stay in the QSO for one more band to make sure that the gang knows not only how to climb around non resonant traps but also shinny up a known conductor length. Bye the bye, notice how the conductor lengths between monopole $K_{m(1)}$ and $K_{m(2)}$ are changing.

(To Be Continued)

*Recall how we discovered this "lazy man's" trick back in our equation (1.0-5) back in part II when we were taking a λ/4 monopole apart to see what made it tick.

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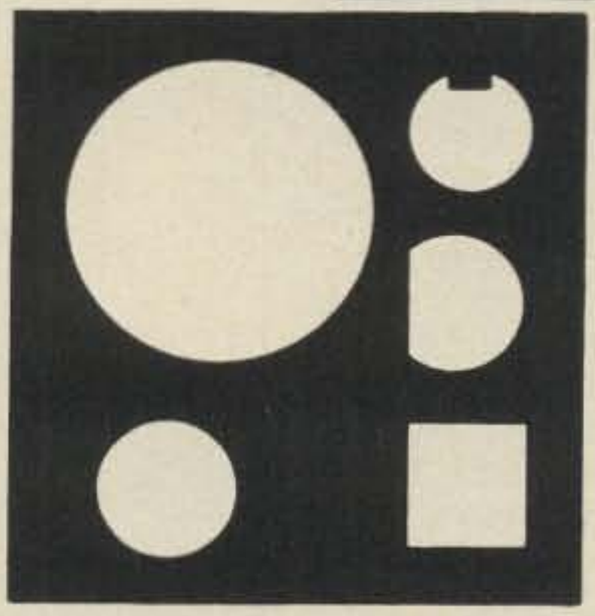

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Contest Calendar *(from page 68)*

Scoring: Each completed QSO counts 1 point. DX stations determine their multiplier by the number of provinces worked on each band. Final score therefore, total QSOs times the sum of provinces worked on each band.

There is also a s.w.l. section. Call of the Dutch station and serial number as well as the station being worked must be logged.

Awards: Certificates to the top scoring single operator, multi-operator and s.w.l. in each country and call areas in W/K, VE/VO, CE, JA, PY, UA9/UA0, VK, ZL, ZS.

Contacts made in the contest may be credited toward the PACC 100 Award in lieu of QSL cards.

Indicate the multiplier only the first time it is worked on each band. Include a summary sheet showing the scoring and other pertinent information, your name and address in Block Letters, and a signed declaration that all rules and regulations have been observed.

Mailing deadline for logs is June 15th to: VERON Contest Manager, PA0DIN, Schoutstraat 15, Nymegen 6805, Netherlands.

Swiss "H-22" Contest

Starts: 1500 GMT Saturday, April 23
Ends: 1700 GMT Sunday, April 24

If you are still looking for some of the hard to get Cantons required for the colorful "H-22" certificate, this offers an excellent opportunity to get them.

Contacts may be made on all bands, 1.8 thru 28 MHz, phone and c.w. The same station may be worked on each band for QSO and multiplier credit but only on one mode, either phone or c.w.

Exchange: RS(T) plus a contact number starting with 001. Swiss stations will include two letters indicating their Canton. (57(9)001/ZH)

There are 22 Cantons: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each QSO counts 3 points. The multiplier is the sum of Cantons worked on each band. Final score, total QSO points times the sum of Cantons worked on each band. (Possible 22 per band)

Awards: Certificates to the top scorers in each country and each W/K and VE/VO call areas.

Indicate a Canton in a separate column for each band only the first time it is worked. Check your log for duplicate contacts, include a summary sheet showing the scoring and etc., and your name and address in block letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, HB9AHA, im Moos, 5707 Seengen, Switzerland.

Applications for the "H-22" Award go to: Walter Blatter, HB9ALF, Post Box 450, CH 6601 Locarno, Switzerland.

Awards *(from page 63)*

Net had *all* 50 states checked in at the same time! NCS, WA4WPZ recalled the list of check-ins to ensure the fact, and indeed I copied all the stations responding to the roll—Fantastic! 120 stations responded to the roll-call, from the 50 states."

The MARAC-ICHN 1977 Convention is scheduled for June 30 through July 3 at the Holiday Inn (downtown) in Rochester, Minnesota. The Minnesota County Hunting Gang, led by Bill, W0OWY are making plans for this to be one of the best, if not the best and biggest, convention ever. More details soon, but remember that all County Hunters are very very welcome whether or not they are MARAC members and all details can be obtained from Bob Hanson, W0KMH, 9 Hillside Court, Northfield, Minn. 55057. Make your plans now. . . .

Don't forget to write and tell me, how was your month? 73, Ed., W2GT.

Propagation *(from page 65)*

April 15-June 15, 1977
Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

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

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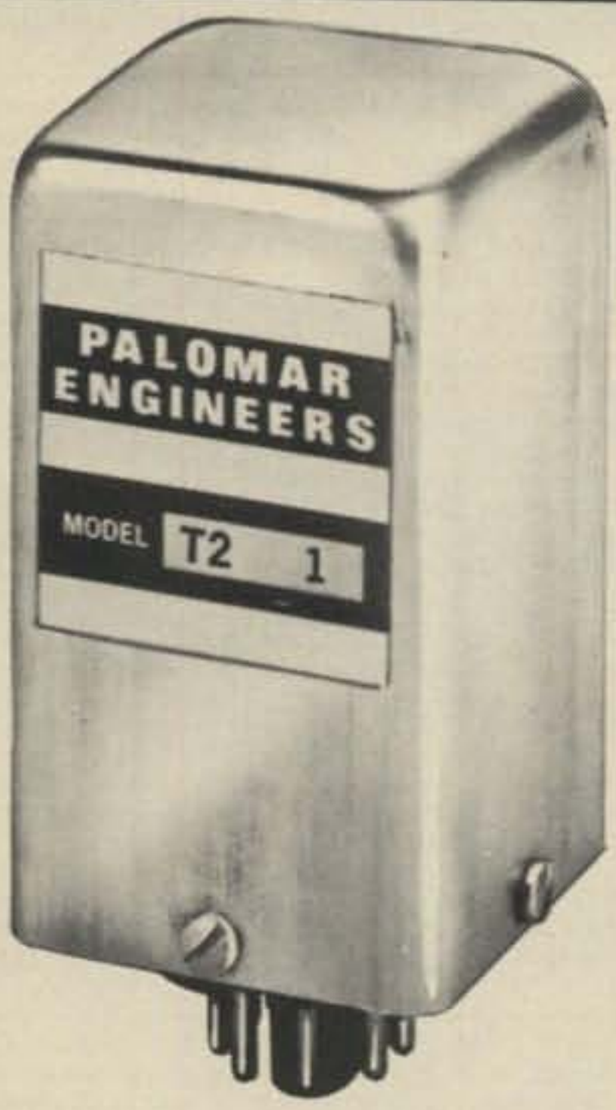

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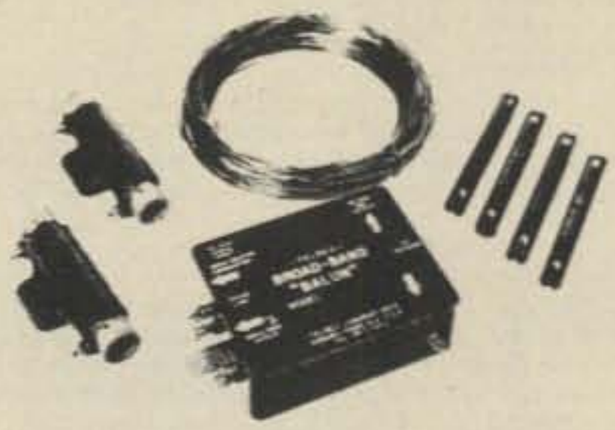

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26th. Dayton Hamvention at Hara Arena April 29, 30, May 1, 1977. Technical forums, exhibits, and huge flea market. Program brochures mailed March 7th., to those registered within past three years. For accommodations or advance flyer, write Hamvention, P.O. Box 44, Dayton, OH 45401.

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SELL— KWM2A and 516F2 with speaker both Round Emblem . . . CP1 Xtal pack $175.00. DX eng RF Compressor for Collins $75.00. MP1 DC supply, like new, $50.00. 312B5 round emblem $425. All prepaid UPS in 48 states. Call Marty WA3IFQ, 215-884-6010 (24 hr. ans. machine) all calls returned.

HY-GAIN 6 METER, 6 element beam, new elements, new Boom-Mast Clamp and hardware. $45. Dick Shideler, 3731 Evergreen, Visalia, CA 93277.

WANTED: HQ-180A in excellent condition. Ron Sibbitt, 849 Devine no. 12, Sarnia, Ont. N7T1X4 Canada.

SELL: Heathkit Electronic Keyer. HD-1410. New in perfect condition. $45. J. Hamilton, WB8YWO, 414 Augusta St., Elmore, OH 43416.

FOR SALE OR TRADE for an HW-7: Old Morrow FTR Receiver with slide rule dial collectors item. Contact Larry Price, 1005 15th St., Bellingham, WA 98225.

FOR SALE: Gotham 10-15-20 meter quad $40.00 and shipping. Palomar RX Noise Bridge. New $35.00. Ken Diebel, 1207 Louisa Rayville, LA 71269.

SWAN 350 XC Sup. $265., SX43 Gen Cov Rvr. $65. (WB6VNR) 7104 Deveron Ridge, Canoga PK, CA 91307 (213) 346-5871.

HEATH - Digital Multimeter Model 1M-1202 Assembled and Calibrated. $60. (805) 966-2126. George E. Clark, M.D., W6GAW, 1741 La Coronilla Dr., Santa Barbara, CA 93109.

WANTED: Heath HG-10B VFO in Mint Condx., Tom Webb, P.O. Box 6, Morganton, N.C. 28655.

TWO METER TCVR HW17 with HG10B V.F.O. Mint. $75. K.C. Jones 5772 Garden Grove BL. Westminster, CA 92683. (714) 898-5778.

SELL: Swan 250C, 117XC, 510-X, VX-2, Noise Silencer - Excellent Condition. WB8-ONG - 236 S. Beverly Ave., Youngstown, OH 44515. Tel. - 216-799-6268.

CALL LETTER LICENSE PLATES: Wanted for collection. Will pay postage. Art Phillips, WA7NXL, Rt. 4 Box 720, Flagstaff, AZ 86001.

FOR SALE 47 MFD 3000 VDC Oil Filled Capacitors Brand New. R. Marusich, W9PZT, Box 73, Ladd, IL 61329.

WANTED: Manual and Schematic for receiver Navy Model RAO-2 (Navy No. CNA-46187) National Type NC-120). Dave Larson, 1301-1/2 South First, Harlingen, TX 78550.

NOVICE ALL-AMERICAN certificate: Work a novice in all 10 call areas. Send list and $1. WB6QBJ, 25 Rudnick Ave., Novato, CA 94947.

WANTED: Drake spkr cabinet. Good condition. Also Drake AC-4 P.S. (non-operational). Reasonable. Merton Ward, 52MMS, Box 1759 APO, N.Y. 09123.

FOR SALE: Heathkit 6M "lunchbox" $20, Bearcat III Scanner $100. Dale Hammer, Colonial Crest Apt 222, Muncie IN 47304.

SELL - Heath 1B-102 Extender $80.00, HQ 110A Receiver - Good $120. Ameco VHF Pre-amp - 6 meters $10. WB2YBA, 201-485-3298.

NOVICE SPECIAL. "Double-D" Multiband Antenna. A bomb on 40-80 Meters! Meets or beats competition at less the cost. 1.1 SWR, Phone or CW. Reg $54.95, Limited Offer $34.95. Dealers welcome. Yaesu's too! Bill, WB7BFK, Sideband Specialty, Box 573-Q, Oak Harbor, WA 98277.

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SELL: 75A4 serial 4729 with 1.5, 2.1, 3.1 and 6 KHz filters. Mint condition. $410 firm. Bill Smith, Route 2 Box 2281, Mckinney, TX 75069. 214-442-5062.

SELL: 75A2 with speaker, calibrator and 75A4 spinner knob. Absolutely perfect. $250 firm. Bill Smith, Route 2 Box 2281, Mckinney, TX 75069. 214-442-5062.

NEEDED INEXPENSIVE RADIO EQUIPMENT for University of Georgia Radio Club. Contact Dr. Uzes U.GA. Dept. Physics, Athens, GA 30601. (404) 542-2487.

SENCORE FS-134 Field Strength Meter with ni-cad battery, $75. FINCO 75-ohm MATV VHF & UHF amplifiers in mint condition write for detailed list G. Alfred Dodds, Jr., 874 Pepperwood Lane, Brunswick, OH 44212

SIX METERS Complete 16 Watt FM station. RT-68, AC Power, Microphone, All Cables/Connectors. $150. W6BKY, Box 1633, Palo Alto, CA 94302.

WANTED: Old Radio receivers, books, catalogs, magazines, Handbooks before 1930. Will trade magazines or pay cash. Have some tubular Audions to trade as well as DeForest tubes. I have early call books from 1920. Erv Rasmussen, W6YPM, 164 Lowell Street, Redwood City, CA 94062.

WANTED: 1 KW Linear SB-200 FL 2100B etc. or other good linears. Will Roberst, WA4-PSL, P.O. Box 907, Roseboro, N.C. 28382. (919) 525-4431.

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FOR SALE - - XMTG. & RCVG. Gear for low bands plus 50 - 144 - 432 and 1296 MHz. Send S.A.S.E. for list to K0JHW, 7061 Idlewild Avenue, Jennings, MO 63136.

FORD V-8 Hallett Ignition Shielding System $30.00. Collins MP-1 $75.00 Mobile Mount 35ED-2 $55.00. Heinlein, 107 Wyoming, Boulder City, NV 89005.

HEATH HR-10B receiver 2nd calibratior. 1 year old, $60. Robert Pazak, WB3CAZ, 9802 Churchill Dr., Upper Marlboro, MD 20870. (301) 868-1430.

FISHERMEN - Transistorized Electronic Fish Caller - Helpful Fishing Tips included $3.95 postpaid. J.R. Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

WANTED: Jennings vacuum variable capacitor type UCSL 5-750 pf. L. Dickinson, 633-40th St., Richmond, CA 94805.

MAGAZINES FOR SALE - CQ, 1970 thru 1975 $30.00, QST, 1970 thru 1975 - $35.00, Ham Radio 1971 thru 1973 $15.00, 73 Magazine 1973 plus 12 misc. issues $3.00. All prices prepaid. J.R. Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

1976 US CALLBOOK $4.00. Apelco Marine Band Xcvr - can be mod for 160M $15.00. AVT-112A XMTR $4.00. D.B. Haworth, W2HTR, 14 Phyllis Dr., Succasunna, N.J. 07876. (201) 584-7082.

NEEDED FOR UNIVERSITY OF GEORGIA Amateur Radio Club, Inexpensive Radio Equipment. Contact Dr. Uzes UGA Physics Ept., Athens, GA 30601.

WANTED: Drake RV-3 Remote VFO - Sell or Swap: Six 813 Tubes. Larry Kellough, WB9-AZQ, Box 144, Robinson, IL 62454.

YAESU FTDX-100/Spkr AC/DC Xcvr. $300. Yaesu FTV-650 6M Xvtr/AC PS. $100.00 Want Any HRO receiver. WA8MLV 1008 Englewood, Parma OH 44134.

SELL: Hallicrafters SX100 - Manual $100. Plus Postage. Write Harry WB2FZE, 4 Wedgewood Court., Miller Place, L.I. N.Y. 11764.

WANTED: Hy-Gain 400 rotator regardless of condition ROD W7YBX 5632 47th Ave., S.W. Seattle, WA 98136.

FOR SALE: DX-160 rcvr. Excellent cond. $90.00: Realistic Pro 77A VHF Hi-Low Scanner, Excellent Cond., $100.00 Dale Nicholson WA6MVG, 910 W. Clay, Ukiah, CA 95482.

REPAIRS All Makes Tubes & Solid State., G.L. Myers, WB7AVO, 4417 E. Ash., Las Vegas, NE 89110.

WANTED: Knight TR-108 xceiver W/FM converter (preferred) Transfer relays with "N" connectors., Charles T. Huth, 1233 1/2 W. State, Fremont, OH 43420.

R-392, MANUAL, and RWR Transformer $169 FOB. Mike Bae, Box 246, Flagtown, N.J., 08821.

CRYSTAL BLANKS WANTED: for 80 mtrs. 3.5 to 3.750. 5x5 size. Lots of 100 or more. E. Taylor, W6DOR/W7BYF, 2921 Loyola Dr., Davis CA 95616.

SELL: Hammurlund HQ 170C and Speaker $150.00. Knight T60 6 Bands, 90 Watts CW and AM Xmtr $40.00. Gonset GC 105 2 Mtr. AM 10 Watts with Crystals $100.00; W2JBI Seymour Kreusky, 69 Judith Road, Little Silver, N.J. 07739. Tel (201) 741-4918.

MOTOROLA POWER AMPLIFIER, in cabinet, 4X150A's, 152/174 Mc's 300 watts output, works fine on 2 meters. Included power supply. $200.00. W0HLS, 109 South 7th, Sterling, KS 67579.

WANTED DEAD OR ALIVE Hallicrafters Receivers built before 1940 S1 through S-20. WA5YXA, 902 Creekdale Dr., Richardson, TX 75080.

FOR SALE: Heathkits SB220, SB610, and SB650. Wallace Domier, Buxton, North Dakota 58218.

NEED MANUAL/SCHEMATIC for Northern Radio FS Converter Type 107 Mod 2 W5FIL 726 Teal Drive, Grand Prairie, TX 75051.

WANTED: 220 MHz and 432 MHz Transverters and Converters. Write, W0DYK, P.O. Box 11, Otis, CO 80743.

WOULD LIKE TO EXCHANGE QSL Card with other "T" Calls. WT2AAE, 43-34 Union St., Queens, N.Y. 11355.

ROBOT SSTV RECEIVER, Mint, $175. HP Model 602 Scope, Offers. WA8VFK, 513-324-3065.

WANTED - BARKER AND WILLIAMSON HDVL coils, base and link. Bill Orr, EIMAC, 301 Industrial Way, San Carlos, CA 94070.

LOOKING FOR old Lionel trains. Interested only in "O" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

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WANTED: Heathkit SB-220 of National NCL 2000 Lin. Amp. in good condition. Keith Tate WA4SEZ, 5037 Boss Road, Kingsport, Tenn.

WANTED: Heathkit SB-401 w/manual. Will reply to all reasonable reports. J.W. Connery, Jr., 8 Thompson Rd., Berverly, M.A.

NO DX QSL? 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.

KENWOOD TS-5115 Transceiver with AC sup, and CW filter, Harold Tarallo, WB6VNR, 7104 Deveron Ridge, Canoga Park, CA 91307.

WANTED: Swan Mark II of Hunter Bandit, 2000C Amplifier. Please state condition, price in first letter. All replies will be acknowledged. E.F. Kennedy, WA3FSL, 502 So. Sterley St., Shillington, PA 19607.

WANTED: HRO receivers, any condition. Johnson Valiant II. Sell: Yaesu FTDX-100 5 Band AC-DC transceiver with SPKR. T.N. Colbert, WA8MLV, 1008 Englewood Dr., Parma, OH 44134.

WANTED: 1945 issues of CQ preferably bound volume; QST Jan., Feb., Mar., Apr., July 1916. Pse airmail, Jock, ZL2GX, 152 Lytton, Gisborne, New Zealand.

SELL OR TRADE: QST/CQ/73. SASE for list. Guimares, RFD 2, Box 480, Middleboro, MA 02346.

WANTED: Used Autek QF-1 audio filter, Will pay $30. Don Erickson, 6059 Essex St., Riverside, CA 92504.

RUBBER STAMPS: For hams, 3 or 4 lines. $2.00 each. Shipped prepaid. Les Belyea, WB7FBV, Box 327, Belgrade, Mont. 59714.

CLEANING SHACK: 5 pages ham and test gear for large self addressed stamped envelope. C.E. Spitz, W4API, 1420 So. Randolph St., Arlington, VA 22204.

WANTED: Complete fiberglass quad antenna or parts from damaged one. Also want aluminum tower in good condition. F.H. Kauppi, Rt. 1, Box 171, Gilbert, MN 55741.

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GLOBE: Chief Deluxe CW xmtr, 100 watts, new tubes, manual, ant., relay, $50. R. Voelker, WA2PCL, 101-23 Lefferts Blvd., Richmond Hill, N.Y. 11419.

SELL: All new parts for WA4DSY synthesizer, $75, shipped. John Teles, 10511 Tenneco, Houston, TX 77099.

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SELL: Collins 32V3 and R392 with P/S and RTTY Converter. Joseph Schwartz, 43-34 Union St., Flushing, N.Y. 11355.

WANTED: Millen Variarm ECO Model 90700 and WD-11 tube. G.F. Marts, 4201 Colvin Dr., St. Louis, MO 63123.

WANTED: Collins FA-60 Mech. Filter 6.0 kHz. Don Longacte, 16 North St., Caledonia, N.Y. 14423.

MOBILE MONITOR: Rec. Sheriff, Fire, H/Patrol, G.E.30-50mc, 12 vdc. 10 clean $100. Trade for HR-2A or whatever! Walter Davis, K6KZT, 2255 Alexander Ave., Los Osos, CA 93401.

TWO METER TRANCEIVER, (AM). Knight TR-108 with VFO and manual condx like new. Prepaid $75. Jack Walker, W3YW, 17620 Queen Eliz. Dr., Olney, MD. 301-774-7133.

FOR SALE: Collins KWM-2A and 516-F2 Power Supply both round emblem $875 firm. Jim Dawson, W9NNE, 119 Reno, East Alton, IL 62024.

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TV RECORDER: AKAI VTS-110, camera, RF tuner, Leitz tripod. Less than 8 hrs use. $1,050 (1/2 retail price). L.P. Biese, RFD 1, Hill, N.H. 03243.

SALE: SBE 33 AC/DC 15-20-40-80 Meters - $185.00. HW 12A Homebrew AC Supply $125.00. HW 22A DC Supply $125.00. All postpaid F.B. Rigs. WB4JGQ, 1714 Clinton Ave. S.E. Roanoke, Virginia 24013.

WANTED: Inexpensive used ham receivers covering 1.5 - 30 mHz. Please write to Herman Fuseuer SWL 5 HF 755, 445 So. Lombard, Opelousas, LA 70570.

WANTED: Harvey Wells Bandmaster also 2 meter tranceiver. Wayne C. Davis, WB4FNC, 2258 Royal Palm Ave., Ft. Myers, FL 33901. Ph. 813-332-3879.

WANTED CRYSTAL BLANKS. 3.7 and 7.1 MHz. In large lots. .5 x .5 and .5 x .7 sizes. W6DOR, 2921 Loyola Dr., Davis, CA 95616.

MOTOROLA 30-50mc Monitor Rec 110 vac very clean $30., G.E. 30-50mc Mobile Rec 12 vdc Mod 4er6d clean $10. W. Davis, 2255 Alexander Ave., Los Osos, CA 93402.

POLICE SCANNER BY PACE model 308 - HF, VHF, UHF, $110.00; Turner & 2 mobile mike $20; CX 7 power supply board $20; Round Collins 75S-3C, 32S-3; 30L-1; Winged 312B-4 & 516 F-2 $25.00. Bill Fulcher, 217 Bluegrass Dr., Hendersonville, TN 37075.

SELL: Heath HR-10B Receiver Excellent condition $80.00. Rev. Gary D. Hughes, WB8ZZP Box 27, Port William, OH 45164.

WANTED: Drake R-4C Filters. Sell 28/220 MHz 30 wt. Mixer $95. K8HWW, 33727 Brownlea, Sterling Hts, MI 48077.

RUBBER STAMPS: Custom made for Ham's Name, Call, Address $2;00 Sent prepaid anywhere. L.C. Belyea, WB7FBV, Box 327, Belgrade, MT 59714.

HAM SENTENCES in 54 languages on your card get DX QSLs! K3CHP's DX QSL Guide, still $3.95. Joe Mikuckis, 6913 Furman Pkwy. Riverdale, MD 20840.

SELL: 4-1000 A used, $30. Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch $16. UTC S-50 6 kv c.t. 300 ma, new, pick-up only, $75. OZ-PAK small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, N.Y. 11768.

THE BOOK "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June '76. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., N.W., Albuquerque, N.M. 87114. Please enclose $1.00 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

SELL: Excellent Collins KWM-2 (seated relays) with 516F-2 AC Supply $750; 312B5 $300. All for $1025. Want Prop Pitch Motor. Paul Bittner, W0AIH, 304 W. 17th St., Grand Island, NE 68801.

SSTV Overview *(from page 45)*

picture where there is say, dark clothing, or black hair. See figs. 9, 10, and 11.

Better than trying to make adjustments based on received pictures is the use of a "gray scale tape". Tapes can be secured that provide a step-wise progression between white and black. The monitor should be adjusted to show all steps — with the scan lines just disappearing at the black end of the scale.

Once the monitor is set up correctly, make camera and lighting adjustments to get good pictures *without changing the monitor controls.*

Should I Adjust My Monitor Brightness And Contrast Settings For Each Received Picture?

Emphatically NO! Once the monitor is set up correctly, it is best to leave it alone. Make sure that you tune in each SSTV signal correctly and avoid making tail-chasing adjustments!

If you DO wish to make compensation for an unfortunately light or dark picture, BE SURE that you have recorded the proper settings of your monitor controls so that they can be reset easily.

How Do You Contact Other SSTV Stations?

As is the case with other modes, you can answer a CQ, call CQ-SSTV—using both video and voice, OR, COURTEOUSLY ask if you may join an ongoing contact. In this last case, it is general practice among the more experienced SSTV operators to call in on *VOICE* at an appropriate moment, giving call letters. Blasting into someone's conversation with crunching video is considered VERY BAD FORM. (You wouldn't rudely interrupt a conversation between two friends sitting in your living room, would you?)

Is It OK To Run My Transmitter At Full Power On SSTV?

It's best not to for a variety of reasons. SSTV/videa does not vary in amplitude like your voice. There are no pauses in the transmission like the interruptions of breathing etc. during voice transmissions. In other words, SSTV presents essentially a 100% duty cycle to the transmitter—so, TAKE IT EASY and don't run everything full blast.

Is There Any Special Technique For Calling CQ On SSTV?

As indicated in Part 2 of this article, once you have a monitor and a "CQ Tape" with your call letters etc., you can join in the fun of SSTV contacts. See fig. 12.

It's desirable to give your call letters on voice at the start and finish of a CQ—voice, pictures, voice.

Long CQ's are a pain in the neck on any mode. SSTV is no exception! And, above all, remember that the courtesy of inquiring, "Is this frequency in use?" is always appreciated.

What About "TV" Sweep Tube Final Amplifier Tubes?

The finals in any amplifier using the so-called "TV sweep tubes" will be wiped out very quickly if you run them at more than their recommended a.m. capability on SSTV.

Will SSTV Video Make My Amplifier "Flat-Top"?

No. SSTV video, per se, will not make your amplifier "flat-top". However, if you have been overdriving your transceiver and/or final amplifier with super-audio input from a speech processor, you can be sure it'll be noticed more often when you start running the 100% duty cycle signal of slow scan!

Some Concluding Thoughts— Dollars And Sense

Getting into a phase of amateur radio with which one has no experience generally involves some degree of risk so far as funds are concerned. It's natural to wonder, "What if I get the apparatus and then find that the 'new mode' just doesn't appeal to me?" Or, perhaps you wonder if you will be bogged down in the complexities of new and strange equipment.

So far as interest or appeal is concerned, it is my hope that this overview of SSTV based on questions asked by non slow scan operators will make it easier to decide how strong your interest REALLY is BEFORE you spend any money.

So far as complexity is concerned, I believe that it is clear from the material presented here, that amateurs with a strong curiosity for new things and a reasonable level of technical know-how, can handle the operation of slow scan equipment with no trouble at all. SSTV's rapid growth during the past year bears out this point.

The major factor in the growth of slow scan during the past five years has been the availability of commercially built equipment. In my opinion, the future growth of SSTV is tied to the advent of commercially built scan converters such as the Robot Model 400. More information regarding "On the air" use of scan converters is included in my "In Focus" column this month elsewhere in this issue. ■

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