CQ

October 1973
$1.00

Advance Report:
Hewlett-Packard 970A
Digital Multimeter. page 41

SSTV Scan Conversion Using Hughes MSC-1 page 28

The Radio Amateur's Journal
08240

More 2-Meter Action for your money-- Heath has it!

Build the Heathkit "202" Series and run with the best money can buy — at a fraction of the cost.

HW-202 shown above with Tone Burst Encoder installed.

Push-to-talk mike included

Start with the HW-202 2-Meter FM Transceiver. It's an all solid-state design that you can build and completely align without special instruments. And this compact little beauty gives you 36 channel capability with independent pushbutton selection of 6 transmit and 6 receive crystals. 10 watts minimum output into an infinite VSWR without failure. And for the ultimate in convenience there's the optional tone burst encoder for front panel selection of four presettable tones. The HW-202 kit includes two crystals for set-up and alignment and simplex operation on 146.94; push-to-talk mike; 12-volt hook-up cable; heavy duty clips for use with temporary battery; antenna coax jack; gimbal bracket, and mobile mounting plate.

Kit HW-202, 11 lbs, mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. **24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. **29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95***

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5μV or less. **Squelch threshold:** 3 μV or less. **Audio output:** 2 W at less than 10% total harmonic distortion (THD). **Operating frequency stability:** Better than ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious rejection:** Greater than 60 dB. **IF rejection:** Greater than 75 dB. **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequency:** 455 kHz (adustable). **Receiver bandwidth:** 22 kHz nominal. **De-emphasis:** −6 dB per octave from 300 to 3000 Hz nominal. **Modulation acceptance:** 7.5 kHz minimum. **TRANSMITTER — Power output:** 10 watts minimum. **Spurious output:** Below −45 dB from carrier. **Stability:** Better than ±.0015%. **Oscillator frequency:** 6MHz, approximately. **Multiplier factor:** X 24. **Modulation:** Phase, adjustable 0-7.5 kHz, with instantaneous limiting. **Duty cycle:** 100% with ∞ VSWR. **High VSWR shutdown:** None. **GENERAL — Speaker impedance:** 4 ohms. **Operating frequency range:** 143.9 to 148.3 MHz. **Current consumption: Receiver** (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. **Operating temperature range:** −10° to 122° F (−30° to +50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VDC nominal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD = $\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

. . . and here's 40 watts out for your 10 watts in

The Heathkit HA-202 2-Meter Amplifier works with any 2-meter exciter delivering 5-15 watts, while pulling a meager 7 amps from any 12 VDC system. No additional power supplies are required. All solid-state components mount on a single circuit board for easy two-evening assembly. Manual shows exact alignment procedures using a VOM or VTVM. Connecting cable and antenna cable are included.

Kit HA-202, 4 lbs. **69.95***

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3" H x 4¼" W x 5½" D.

. . . then there's this perfect 2-meter tune-up tool

The Heathkit VHF/SWR Bridge tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity.

Kit HM-2102, 4 lbs. **29.95***

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** Less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO 239. **Dimensions:** 5¼" W, 5⅛" H and 6½" D, assembled as one unit.

*Using a 50 Ω noninductive load.

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- Power Output: 125 Watts P.E.P. (Nominal) into 50 ohms
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- Internal Receiver Spurious: Less than equivalent 1 Microvolt Signal
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- CW Sidetone
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- AGC Figure of Merit: 60 db minimum
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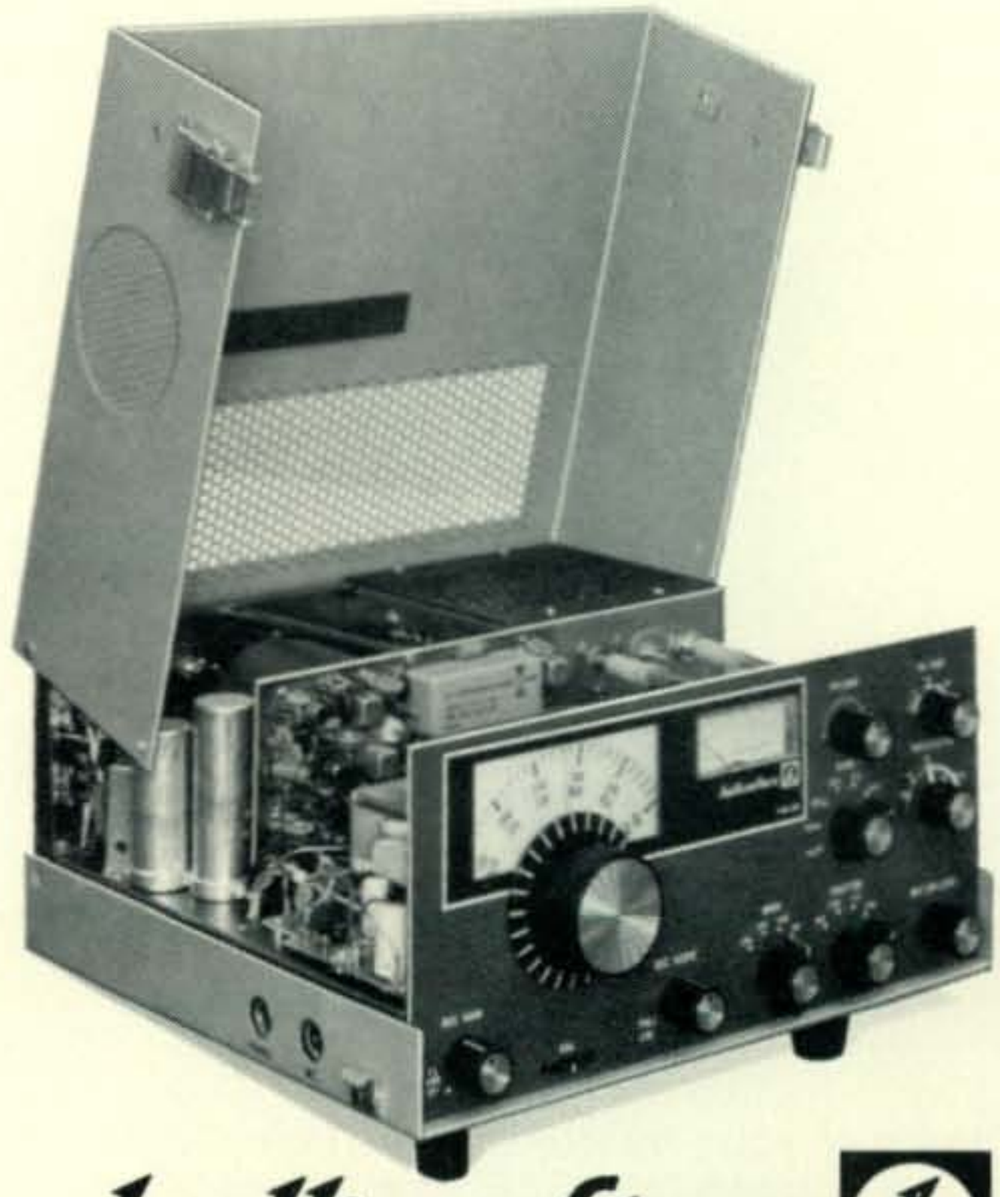
- Optional Accessories: MR-300 Mobile Installation Kit; HA-60 Blower Fan Kit, works on AC or 12VDC



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CQ

OCTOBER, 1973 VOL. 29, NO. 10

The Radio Amateur's Journal

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ZERO BIAS

By the time you read this, the Sept. 20 filing date for comments on the proposed 224 mHz Class E Citizens Band will have passed. A petition by ARRL for an extension of the deadline was denied by FCC on Sept. 11, and barring any unusual reversal of this denial, Sept. 20 is "it."

Perhaps the time is right for a little Monday morning quarterbacking. We've received copies of hundreds of letters commenting on Class E, and all but a very few have been of a totally useless nature, ignoring the basic situation facing the amateur, and reeking heavily of righteous indignation. "How could such a thing happen to us, the White Knights of the radio spectrum?"

While indignation may be a perfectly natural reaction to the situation, realistically, it's a fruitless one. Anger and indignation carry no weight in decisions of the sort facing FCC on 224 mHz and Class E. No good can come from any angry discourse - and 14 copies detailing the countless CB rule violations on 27 mHz, the phoney call signs, the v.f.o.'s, the illegal power and proceedure. FCC hardly needs to be reminded of these things. They live with them the year 'round. But more important, they have no bearing on the problem at hand.

How then should the problem have been approached?

We feel that the most fruitful course of action was to 1. Document amateur radio's need for the continued full use of the entire 220-225 mHz band, and 2. Present honest, well thought out ideas about where a service like Class E CB might be placed other than 224-225 mHz, and why. Few amateurs took this course.

The first item required some soul-searching. Looking through the eyes of an FCC commissioner, what questions might you want answered? Is the band so crowded that a 20% reduction of it's width would create overcrowding in the remaining 80%. If this band has been so unused and uncrowded up until now, why now is it considered to be such a valuable piece of real estate? Are you not saying that you want it to remain an amateur band simply because it has been an amateur band? Are you saying that you want that top mHz to remain amateur simply because its been proposed to transfer it to Citizens Radio? What if FCC had proposed that 224-225 mHz be re-located to, say, Volunteer Fire Department or Police Auxilliary communications? Would the objections be as vehement?

These questions were answered satisfactorily by only a few of the comments filed with FCC objecting to Class E on 224. The satisfactory answers were those based on fact and sound logic rather than on emotion and wishful thinking. It was recognized that present and recent activity on 220 is minimal, but that the future need for 220 is inextricably tied to the fantastic growth of 144 mHz, which is approaching its saturation point for new activity in some areas.

A viable argument in favor of retaining the entire 220-225 mHz band for amateur use could certainly have been mounted, but we feel it was not.

Convincing the Commission that Class E should not be on 224 mHz, however, was only one phase of the situation. A Commission so convinced is left to decide where Class E could go, and here, too the amateur could have provided useful comment. Simply saying "I don't care where you put it as long as it's not here," was no help at all.

Many alternatives were proposed by amateurs, but two seemed to hold interesting possibilities. One was placing the Class E service elsewhere in the 225 to 328 mHz region which is currently allocated to fixed mobile and/or space communication. Careful monitoring of this region by competent observers using sophisticated equipment revealed that utilization of these frequencies is extremely low, at least in the New York area. Hopefully, FCC will further investigate the possibilities of this region.

Another interesting alternative was to reallocate UHF TV Channel 14 - now allocated for Broadcasting and Land Mobile Radio Services - for Class E. Allowing a 2 mHz interference buffer between Class E and Channel 15 would leave 4 mHz to be opened up a mHz at a time as needed to meet the needs of a growing universal communications service for the public - a real Citizens Band.

So much for hindsight. Now look ahead. Five years from now how will you justify the continued allocation of 420-450 mHz to the amateur service? Or will amateurs again wait until the wolf is at the door before acting?

73, Dick, K2MGA

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SPECIFICATIONS

GENERAL: • **Frequency Coverage:** 144 through 148 MHz. 12 Channels, 2 supplied: (1) Receive: 146.52 MHz, Transmit: 146.52 MHz; (2) Receive: 146.94 MHz, Transmit: 146.34 MHz • **Power Requirements:** 13.0 Volts DC±15% • **Current Drain:** Transmit: 450 mA, Receive: 45mA • **Antenna Impedance:** 50 Ohms • **Dimensions:** 5⅜" x 2 5/16" x 7½"(13.6 x 5.8 x 19.1 cm) • **Weight:** 3.75 lbs (1.7 kg)

RECEIVER: • **Sensitivity:** Typically .5 microvolt for 20 dB quieting • **IF Selectivity:** 20 kHz at 6 dB down; ±30 kHz channel rejection greater than 75 dB down. • **First IF:** 10.7 MHz with 2-pole monolithic crystal filter. • **Second IF:** 455 kHz with ceramic filter. • **Intermodulation Response:** At least 60 dB down. • **Modulation Acceptance:** ±7kHz. • **Audio Output:** At least 1 Watt at less than 10% distortion. • **Audio Output Impedance:** 8 Ohms

TRANSMITTER: • **RF Output Power:** 1 Watt minimum • **Frequency Deviation:** Adjustable to ±10 kHz maximum, factory set to 6.0 kHz. • **Multiplication:** 12 Times

ACCESSORIES

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OUR READERS SAY

Old Time Radio

Editor, *CQ:*

The W6SAI Golden Thirties National FB-XA nostalgia feature in July *CQ* reminded me I became in 1934 a confirmed RX plug-in-artist thereafter. With the FB-XA and hamdom's first high-powered ECO TX, a single stage exciter to a two-tube kw final, in 1934 ARRL world contest we racked up 588 contacts from Honolulu, Hawaii, with the then legitimate Hawaii call, W6HLP, primarily on 7 mHz. I doubt the record from Hawaii has since been excelled.

Cliff Evans, K6BX
Bonita, California

Editor, *CQ:*

Better late than never, I was just given a copy of your July 1971 issue and found a very interesting article of the old SW-3 radio. I recently found one of these in some old radio goodies that I had stored away in our house when we recently moved. It brought back old memories and a desire to make it workable. Also found an old 10 watt transmitter. After 40 years, I am getting all excited about getting back on the air. I wish there were more home brew projects discussed as well as the downward trend in power -- QRP, antenna projects and more help to the Novice and newcomers. Your SW-3 article even pried a subscription out of me. Keep up the good work.

W. H. Klett,
Lombard, Illinois

Mice Type

Editor, *CQ:*

Hold it, hold it!! The size of printing in the July Ham Shop Ads is unreasonable!

If you're going to continue its use, I suggest takinga poll to see who will read 'em! (Or who can!)

R. Black, WB6APX
Van Nuys, CA

We made a BIG mistake by not explaining to our readers why the very small type was used in *CQ*'s Ham Shop for July and August. The number of Free Ham Shop ads we receive occasionally becomes greater than the space we can fairly allocate to them. This results in a backlog of unpublished ads which has to be cleared up somehow. By reducing the type-size by 1/3, we were able to run more than twice as many ads in the same space, bringing Ham Shop exactly up-to-date. We got a number of complaints that the type-size was too small, but not one complaint that there was too much Ham Shop to read! If the volume of Free ads continues at the current pace, we *might* have to do the same thing a month or two next summer, but we think that in the long run, most hams would rather have the ads up-to-date than big.

Editor

Hall of Science

Editor, *CQ:*

The Hall of Science, in Flushing Meadow Park, New York City, and its fairly recent Amateur Radio Station WB2JSM has been on the air with a complete Drake Line for several months demonstrating ham radio as a science exhibit to literally thousands of school children, their teachers, and regular museum visitors.

Mr. Bob Riley, also a ham, is Director of the Hall of Science and got the necessary funds to purchase the Drake Line, Telrex Tribander and necessary building equipment, rugs, etc., to make the shack possible.

We allow teachers, some children and visitors to talk to our contacts and they are thrilled to discover that they've talked to England, France, Italy or Africa.

The Museum also has radio classes for Novices and those who wish to upgrade their licenses at practically no cost, except for equipment and books.

There are several other operators besides me, but being retired, I can spend more time there than the others, although Martin Schwartz, W2EPZ (also retired) spends 2 or 3 mornings per week operating. He's also a fine photographer and took the enclosed photos.

Jacob Dubinsky, W2LVR
Flushing, NY

millihertz?

Editor, *CQ:*

mHz is millihertz
and that's a very low frequency indeed,
MHz is megahertz
which in your magazine we'd like to read.

Donald J. Stenz, K9KSA
Wausau, Wisconsin

Precisely speaking, Don's right. We doubt, however, that too many people are confused by that little quirk of our style, which incidentally, is more logical and exact than that of any amateur/hobbyist electronics publication in the U. S.

Editor

TTL Test Probe

Editor, *CQ:*

The article by VE3FEZ in the July 1973 issue contains a couple of errors. First, in his hypothetical circuit in Fig. 1, he talks about using a three input TTL and gate with zero volts on all inputs to complete the gate. Not so -- it requires all three inputs to be at true level to complete the gate and turn on the transmitter light. Also, he says a meter connected to a floating TTL input will read zero

[*continued on page 77*]

2 METER FM

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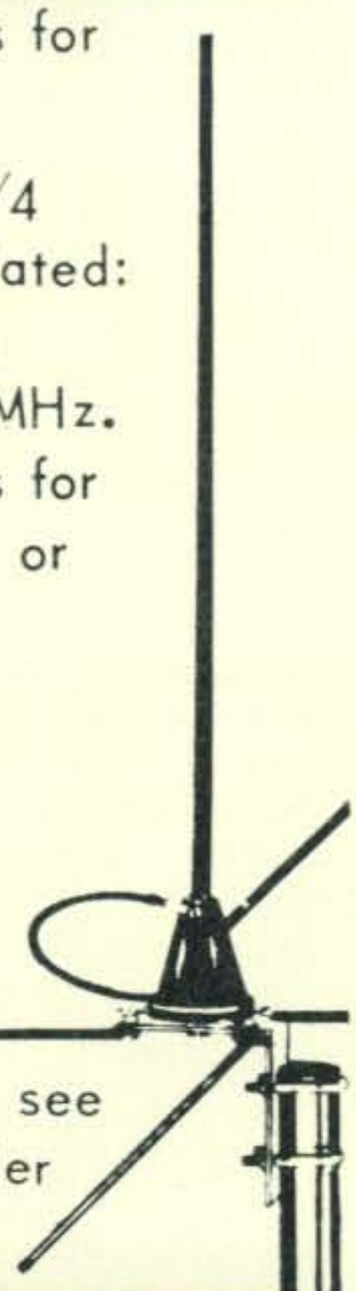

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Announcements

Nashville, Tennessee

The "Music City Hamfest" of the Nashville Amateur Radio Club will hold many activities including drawing for prizes on October 21st. Contact George L. Brian, WA4WJD, Sec.-Tres., P.O. Box 4564, Nashville, TN 37216.

Erie, Pennsylvania

The Radio Association of Erie will be having its annual dinner banquet on October 6th. Info requests should be sent to the RAE as follows: Michael D. Hall, WA3HSR, 3412 Hampshire Rd., Erie, PA 16506.

Bemus Point, New York

The 3rd Annual Chautauqua County Amateur F.M. Association Auction will be held Saturday, October 13th, at 12 noon. Come to the Shore Acres Boatyard, Bemus Point. For further info: Robert D. Greenwald, WB2YQO, Rt. 2, Box 176, Jamestown, New York 14701.

Rome, Georgia

The Northwest Georgia Amateur Radio Club and Repeater Association, is having its annual hamfest on Sunday, October 7, 1973 at the Coosa Valley Fair Grounds in Rome, Georgia. Everyone is invited to attend. Gates open at 9:00 a.m.

Kalamazoo, Michigan

The 19th Annual VHF Conference will be held on October 13th at the Western Michigan University in Kalamazoo. Flea market, speakers, dinner. For details, write to W8DF, VHF Conf., P.O. Box 934, Battle Creek, MI 49016.

Tampa, Florida

The Tampa Bay Area Hamfest will be held on October 6th and 7th at the Electrical Bldg., Florida State Fairgrounds on N. Boulevard, 2 blocks N. of Kennedy Blvd., beginning at 8 a.m. local time. Prizes, swap area, air-conditioned; free parking, dancing Sat. evening. $2 registration includes XYL and children. Inquiries c/o George Dixon, WA4-VQT, 12915 Veronica Ave., Tampa, FL 33612.

Worked All El Paso Contest

The Worked All El Paso (WAE) Contest is for stations in the El Paso County area but will allow others to make 15 El Paso contacts making them eligible to receive the WAE Certificate. Endorsements are available for 50, 75, and 100 El Paso contacts. The contest will run for a 24-hr. period, 2300 GMT 3 November 1973 to 2300 GMT 4 November 1973 and will be on 10 meter phone only.

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

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Q AND A

BY CHARLES J. SCHAUERS,*
W6QLV

THIS month's column is devoted to the Novice or the radio-amateur-to-be. They may be beginners, but you'd be surprised at some of the questions they ask! It's heartening to find so many bright young people interested in amateur radio, for it's truly a fine hobby offering much satisfaction. It's not only a challenge but it enables one to make friends in most parts of the world. And today, hams can even see each other via slow-scan TV, adding still more enjoyment to an already enjoyable hobby.

Some of the questions asked by the newcomer may seem quite basic but to those who ask them, they *are* important! Let's all help any young ham we can!

*c/o *CQ*, 14 Vanderventer Ave., Port Washington, N.Y. 11050

Becoming A Ham

"I got my inspiration for becoming a ham by visiting a doctor friend who has had his license for about four years. At his home I enjoyed hearing him talk to the world (literally), contacting stations in Europe, the Far East and even Africa.

"I thought to myself, if this busy person could take the time out to learn enough to take an examination, then certainly I, a high school student, could too. So I borrowed and bought books (ARRL publications), got myself a code practice oscillator and started to work. Doc helped me learn to use a telegraph key and I acquired a receiver which is very important to learn the code well.

"Four months after I started I went to an FCC office and took the General exam—and I flunked. I passed the code but the theory threw me. I went home unhappy but

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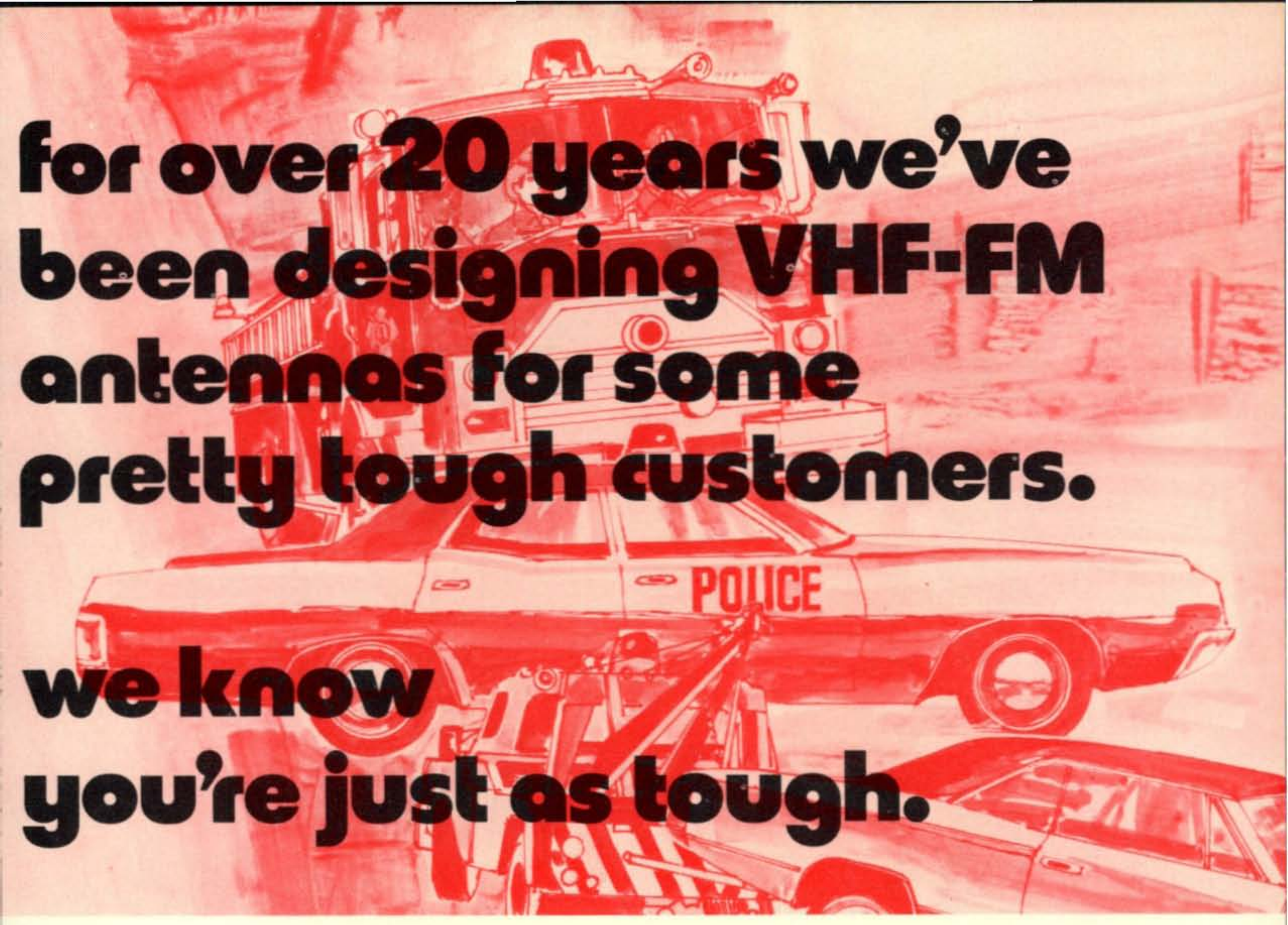

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Fig. 1—Device for detecting zero beat to very close tolerances. Depending on the audio response of the receiver beats down to 5 Hz or less can be detected. LED's may be Monsanto MV-5094 or Fairchild FLV-100, or equivalent.

with a resolve to pass the next time. I studied for another sixty days, went back for my exam, and I passed. What a great feeling!

"My advice for every young ham is to acquire a licensed ham friend who can help him over the 'bumps.' No ham-to-be is ever alone if he will just seek out a local ham to help him.

"Now I have a question for you. I hope you can give me another lift."

Thanks for your letter Robert. Your question is the first one this month. I hope my answer helps you.

Crystal Calibrator Intermittent

"I have a used transceiver that contains a 100 kHz calibrator. The calibrator does not work when first switched on, but by turning the 'on-off' knob, it finally comes to life. I note also that after the set is warm that the calibration seems to change slightly. Any answers to my problem?"

Yes, first check for a loose wire to the switch. Check the switch itself with an ohmmeter. Next check the 100 kHz oscillator tube or transistors. Last, you may have a defective (slow starting) crystal.

Don't worry about the slight difference in frequency when the set is cold and warm. During an operating cycle, one should check calibration a couple of times, especially those who operate near the band edges.

Precise Zero Beat Device Using LED's

Robert W. Stankus, W1GEY, Director of Engineering Services for Totel Systems (Letot Inc.) has come up with a little gadget to precisely align crystals to an exact frequency. It enables exact visual alignment of 100 kHz crystals to WWV simply and inexpensively.

See fig. 1. Two light-emitting diodes connected in parallel, but with opposing polarities make an inexpensive display for indicating zero-beat frequency.

The display can be driven by an a.f. voltage from the receiver's low impedance speaker terminals (usually 8 ohms). A current-

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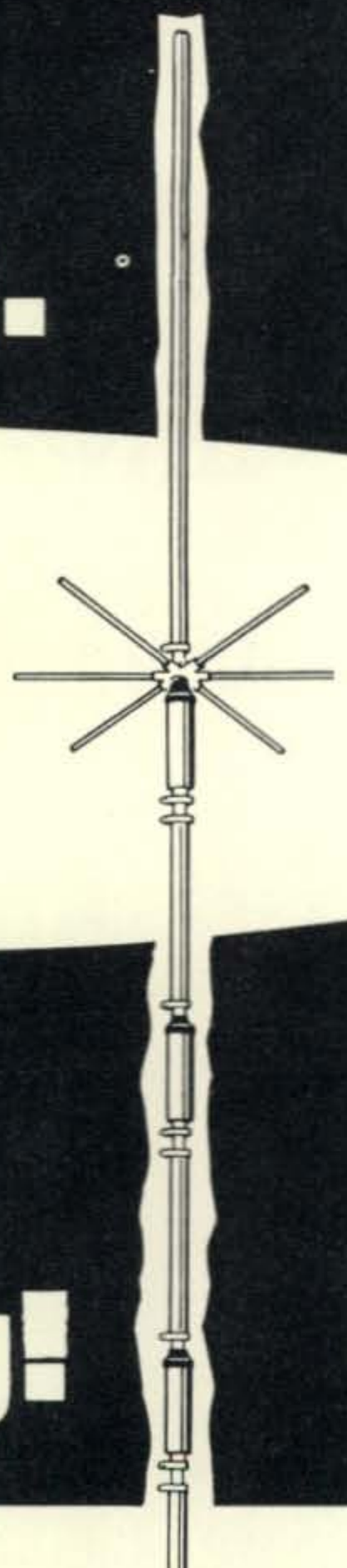

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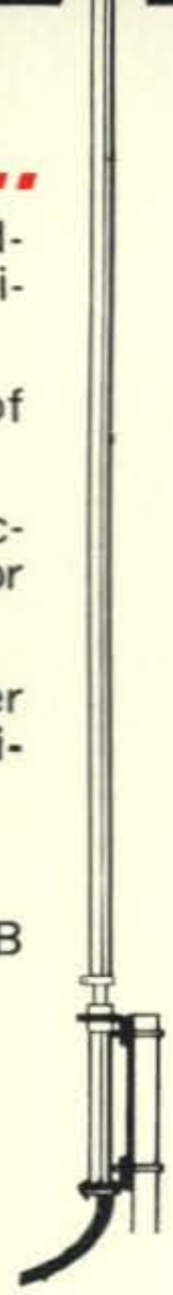

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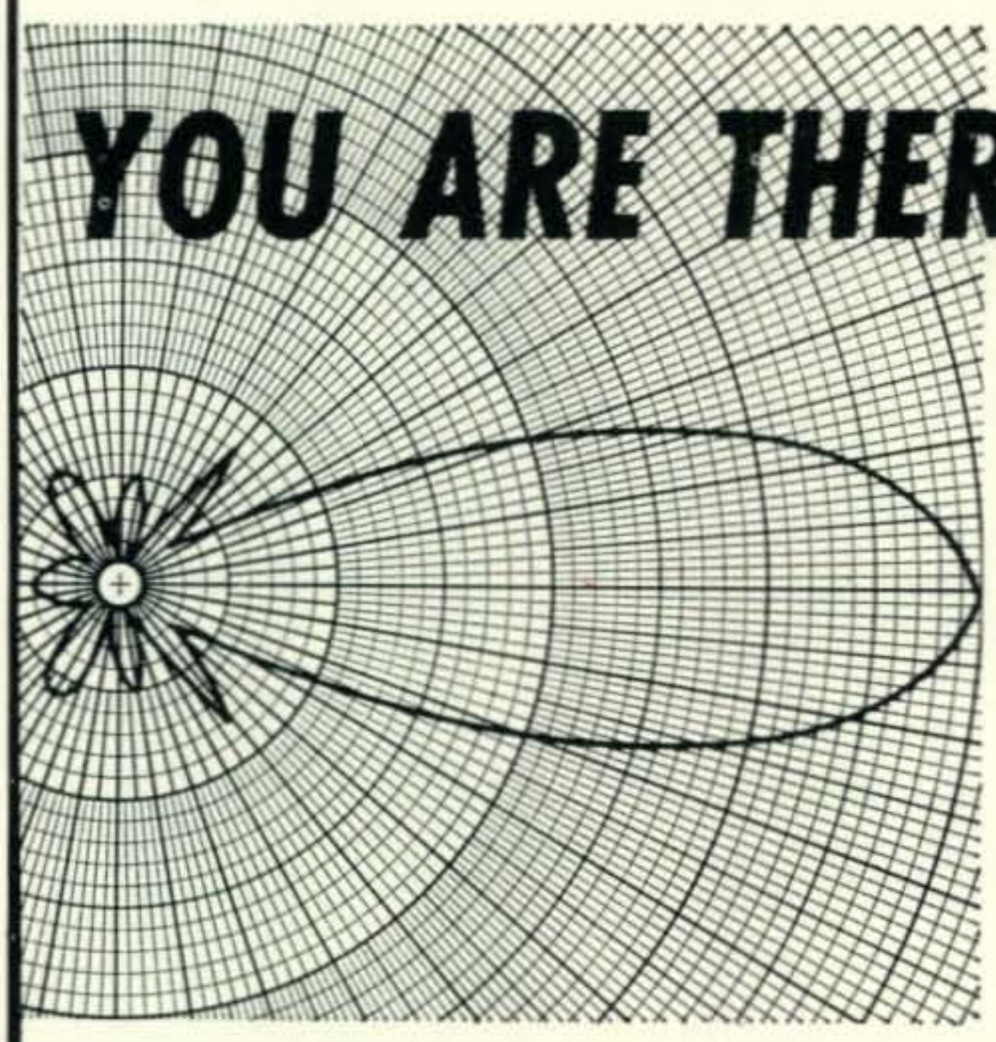

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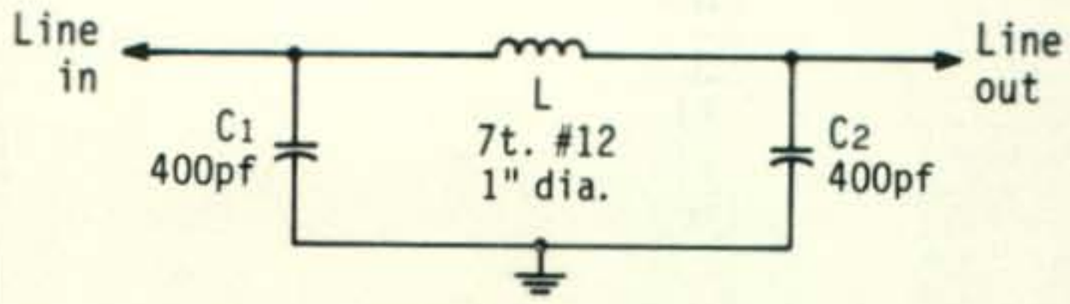

Fig. 2—7 mHz low pass filter for wireless intercom.

limiting resistor is included in the circuit and its value is not critical.

When the input frequency is more than 1 kHz away from the zero beat frequency, both LED's appear to be on all the time. Each one is correctly biased for half a cycle of the input and shut off for the other half. As the input frequency comes within about 20 Hz of zero beat, the LED's will flicker until exact zero beat is reached. Both LED's then go out and will remain out over the width of the zero beat frequency notch which usually is a + or −5 Hz. While the display is being used, the LED intensity will vary depending on the low frequency response of the receiver being used.

Thank you Bob, I tried your gadget and it works *fine!*

Wireless Intercom Interference

"When operating on 40 meter phone, and one of my three wireless intercoms is operated, my signal comes through. What's the cure?"

Wireless intercoms are a.c. line carrier type devices and these operate on very low frequencies and generally are not bothered with h.f. interference, but it can happen. The only thing you can do is to make up a little filter for 40 meters and install it in the *line* in each of the intercoms. The filter will allow the low frequencies through but stop (we hope) your 40 meter signals. You can try the little filter shown in fig. 2. The coil is 1.1 microhenries (7 turns #12 enameled 1" diameter) and the two capacitors should be 400 pf. Using a grid dip meter adjust the coil for resonance before installing the filter.

Burying Coax Line

"Any reason why I cannot bury the coax line coming down from my beam? The soil is fairly dry in my area, so I'm not too worried about moisture damage."

No reason why coax cable cannot be buried if you use a good grade of cable. You will seldom have leakage with coax except at the ends of the cable. The average life of buried cable will approach shelf life.

73, Chuck, W6QLV

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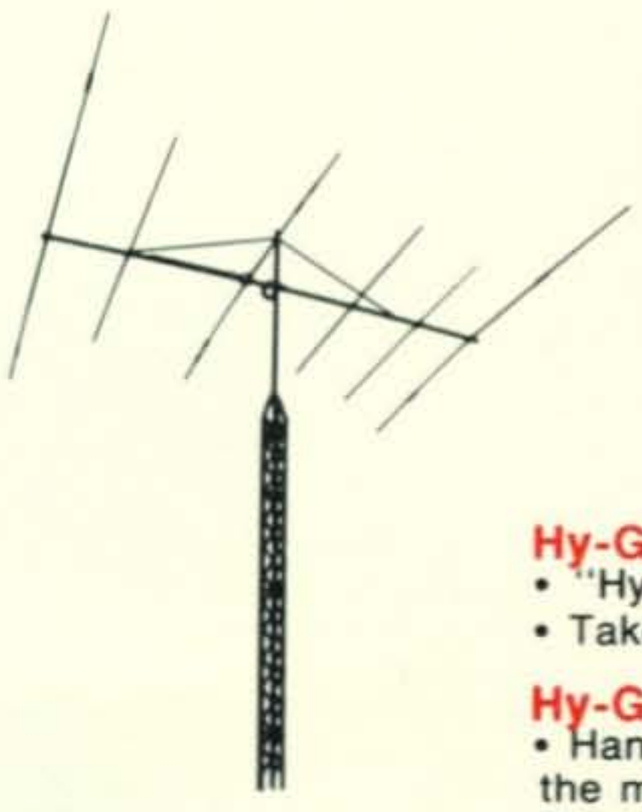

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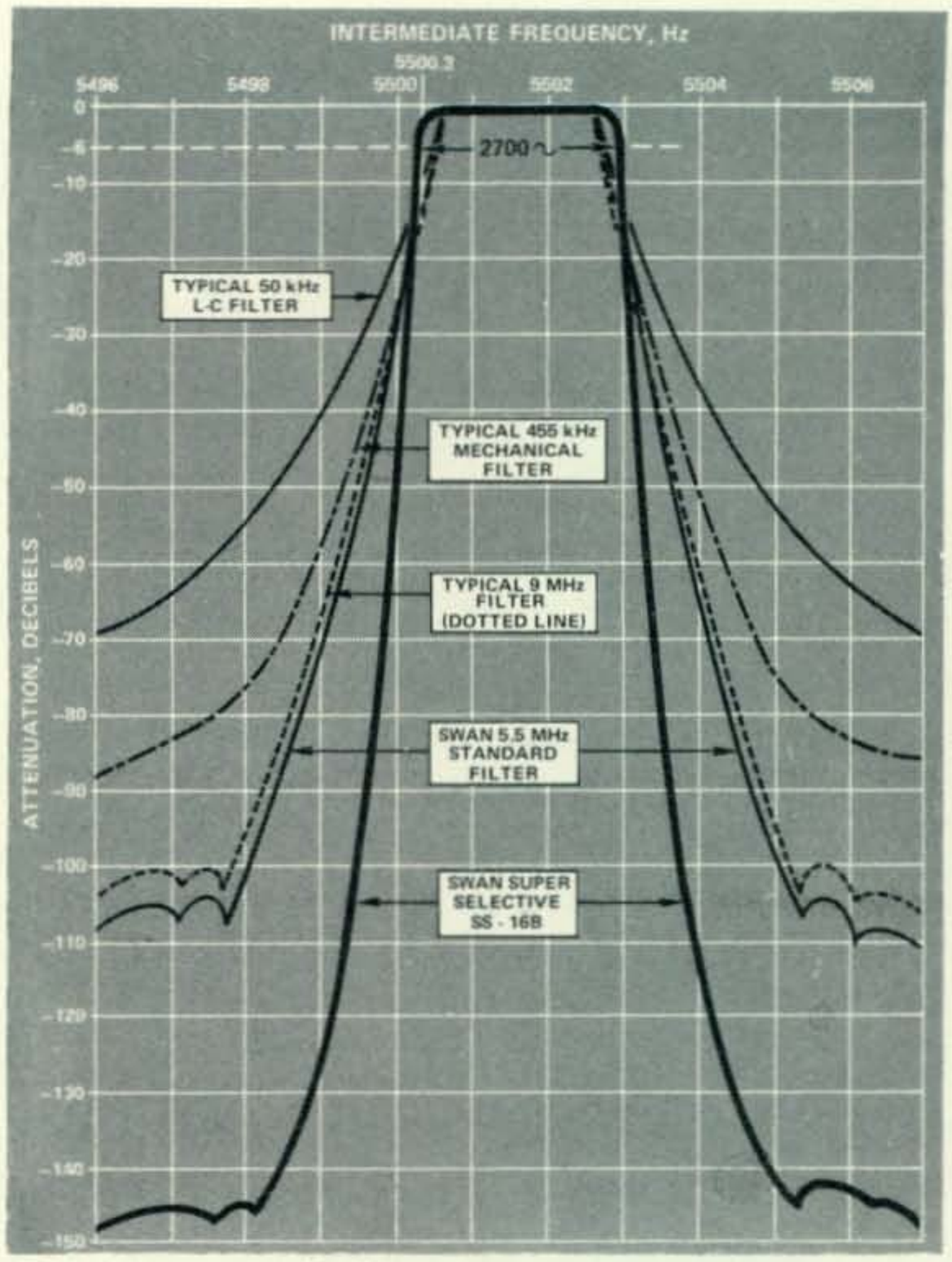

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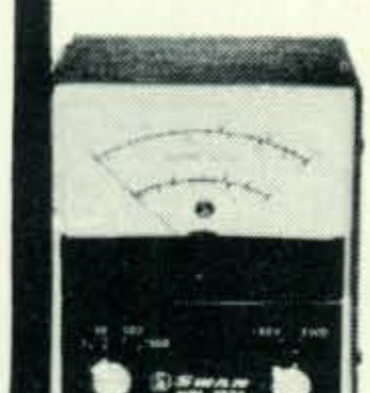

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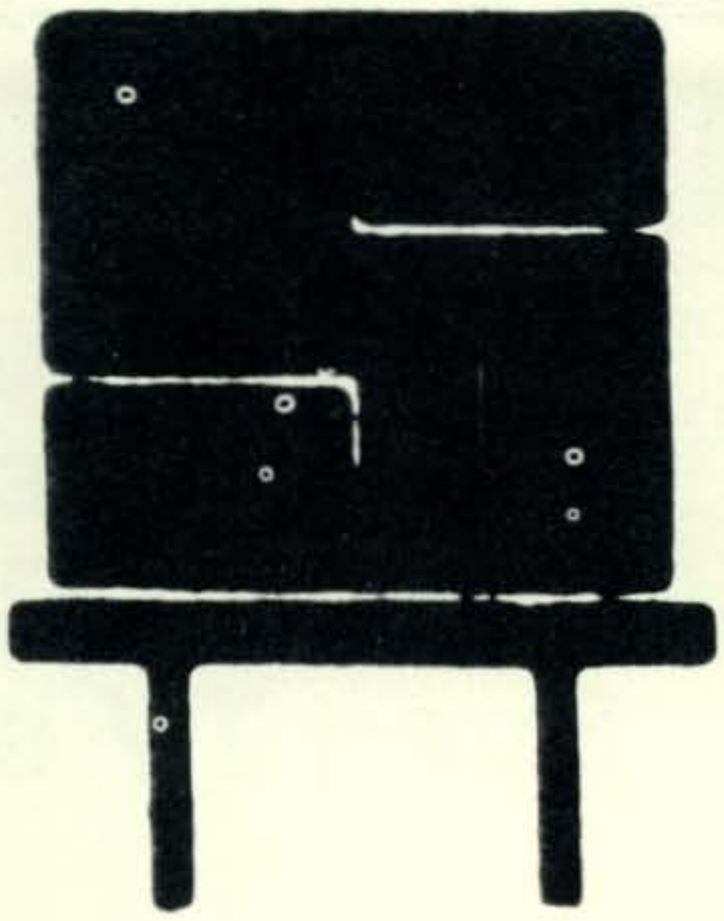

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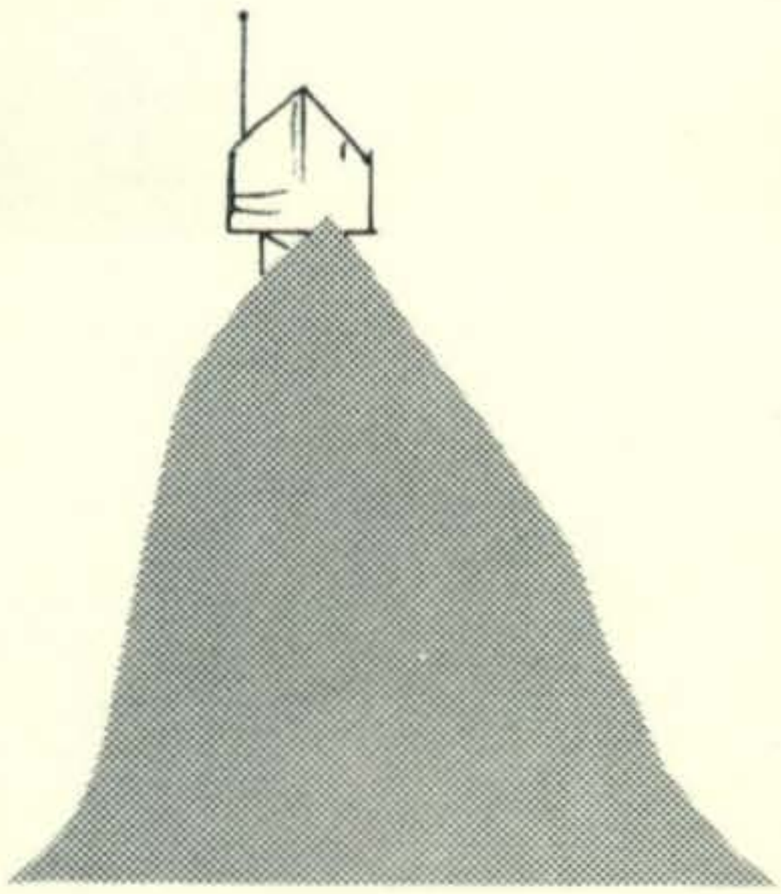

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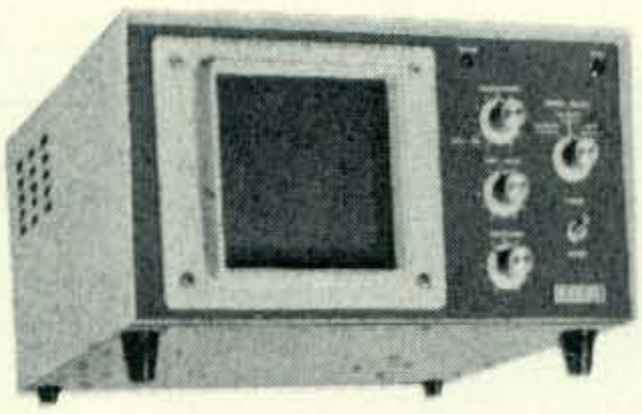

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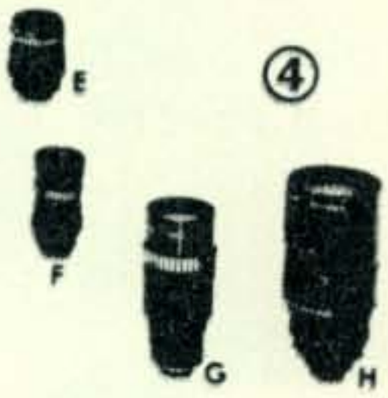

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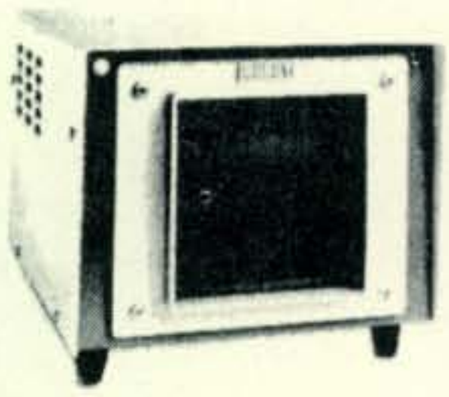

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SLOW scan television provides a "round the world" picture transmission capability unequalled without the use of satellites or cables, but it must be combined with either photography or electronic storage to present a steady, complete picture for viewing. The Hughes Scan Converter Unit, Model MSC-1[1] uses a storage tube as the heart of a device that will permit viewing SSTV on a conventional TV monitor. Pictures can be held for viewing for prolonged periods of time.

How does the scan converter work? The storage tube is in effect an electronic blackboard. It can be used to Write, Read, or Erase. Single frames of SSTV can be written on the blackboard, can be read (viewed on a fast scan monitor), and can then be erased to make way for the next picture. The control of these functions can be automatic or manual. More about the design features of the MCS-1 later in this article.

than needed for amateur slow scan work. It is aimed at the commercial, industrial, and other fields of television—not the amateur market. In spite of this, we feel that its existence and capabilities should be known by Hams because some form of storage and playback is needed to maximize the usefulness of our slow scan system. The MSC-1 with its storage tube demonstrates one approach to the problem. In addition, it is the writer's feeling that the increasing use of storage tubes in commercial and industrial applications will result in their availability in a lower price range. We can anticipate articles on the design of much simpler scan converters using storage tubes in the months ahead.

Let's take a closer look at the MSC-1. The video picture storage is performed by a Hughes Type H-1268 Vidicon-size scan converter tube. (Not to be confused with direct viewing storage tubes.)

Storage Tube Scan Conversion

BY W. H. De WITT,* W2DD

During the past few months, the author has been viewing SSTV on a conventional TV monitor using the Hughes MSC-1 unit in conjunction with a Robot Research Model 70 Monitor. The accompanying photos tell part of the story but we are driven to comic book superlatives for our subjective reaction —"WOW"—"AMAZING"—"COOL"! ! ! Seeing those SSTV pictures W-H-O-L-E gives you the feeling that it's Picturephone time on the slow scan frequencies!

Viewing a bright, steady, complete, black and white picture is bound to increase anyone's enthusiasm for SSTV. More importantly, this capability lifts the usefulness of slow scan from amateur to commercial (Medical, Data Handling, Police Identification, etc.).

The Hughes MSC-1 unit is intended for applications requiring design sophistication and operational flexibility much greater

The basic functions of the Scan Converter Unit are to write, store (and erase) externally generated video information, and to read this information out in the form of a 525, 2:1 interlaced raster format suitable for display on a conventional TV monitor. The input can be raster scanned or just plain X, Y positioned material. You can feed just about anything into this little beasty and get conventional TV (as we know it here in the States) out. For example, this type of device is used to convert from British 625 line TV to U.S. standard. In this application, gating signals switch the functions very rapidly, but for single frame slow scan use, the function switching can be done manually. It's possible to "write over" a stored frame with another if some information is missing in either or both frames. This Signal Integration method was used by the writer in receiving color SSTV and is described in an earlier issue of *CQ*.[2] Sometimes a remarkable improvement

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

[1]Manufactured by the Hughes Aircraft Co., Oceanside Ca. 92054

[2]DeWitt, W. H., "Slow Scanning Color," *CQ*, Sept. 1972, p. 18.

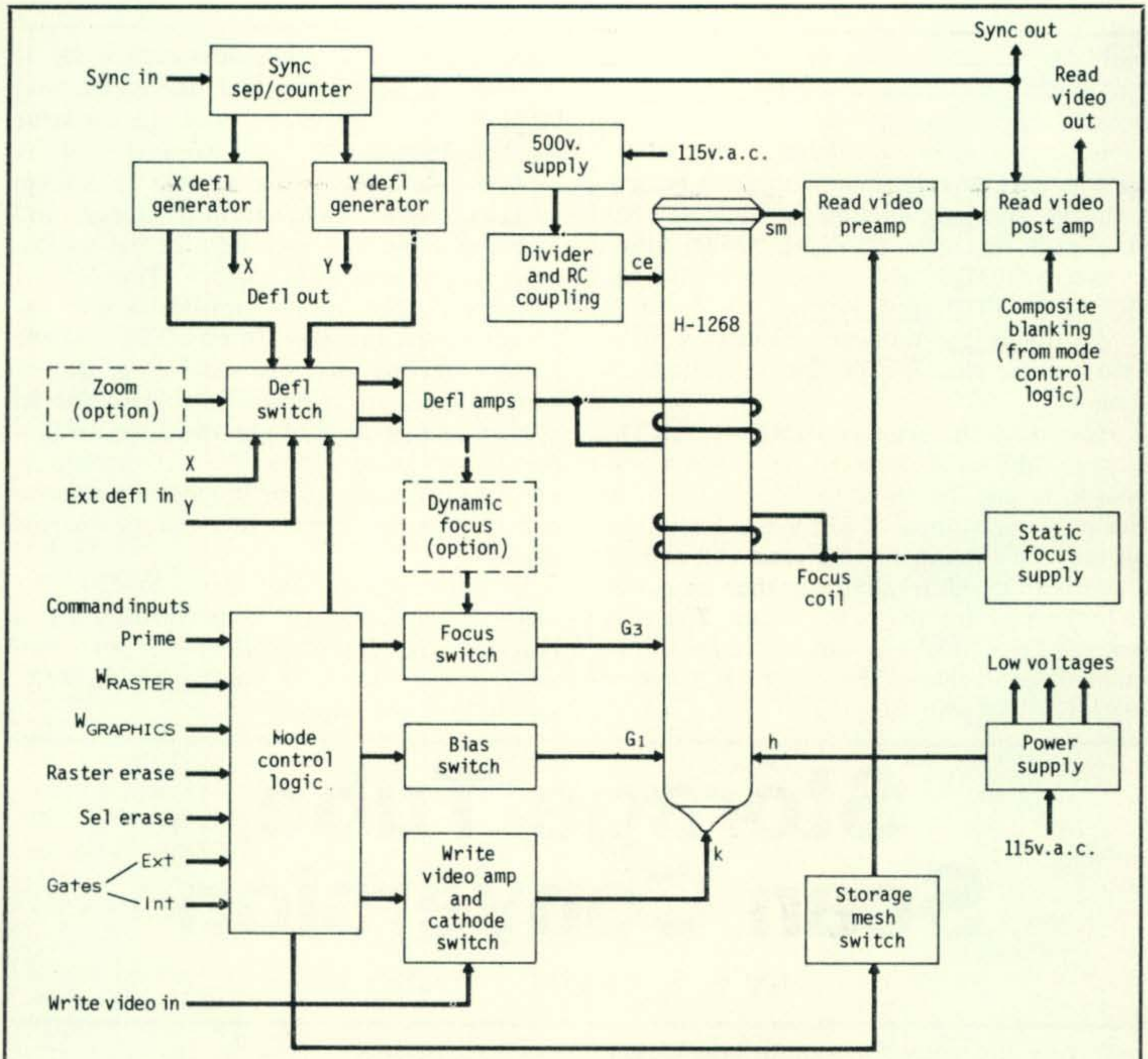


Fig. 1—Functional block diagram of the Hughes model MSC-1 scan converter unit.

in picture quality can be made by this method.

Before the days of transistors, ICs, and all the other solid state goodies, the capabilities built into this little desk-top box (4" × 8½" × 11") would probably have filled a couple of six foot racks. There are seven circuit boards. A "mother" board, and six others that plug into the mother board. The basic power supplies feed the individual boards. Regulated voltages are developed in each board where needed. The storage tube is installed as a modular unit so that it can be removed if necessary for service operations without disturbing critical focus adjustments. (Smart engineering!)

Figure 1 makes it apparent why a sixty-eight pin plug is provided to handle the variety of inputs and outputs of the MSC-1. The video signals are handled by separate BNC connectors. However, as we used the Scan Converter with our Robot Monitor, there were just three input leads. See fig. 2.

We mentioned earlier that the heart of the MSC-1 is the Type H-1268 storage tube. With all this capability, why haven't we been hearing more about storage tubes? How long have they been around? Who invented the storage tube principle? How does it work?—And why haven't SSTV oriented hams been using them?

Let's take the last question first. Cost and availability (virtually no surplus) have greatly limited the use of these tubes by hams. An *Electronics World* article in May of 1963 referred to Dr. R. C. Hergenrother and Mr. B. C. Gardner as the discoverers of the recording-storage tube principles. Storage tubes have been commercially available for over fifteen years. Although there must be many hams involved in space technology, radar, or other electronic display work that

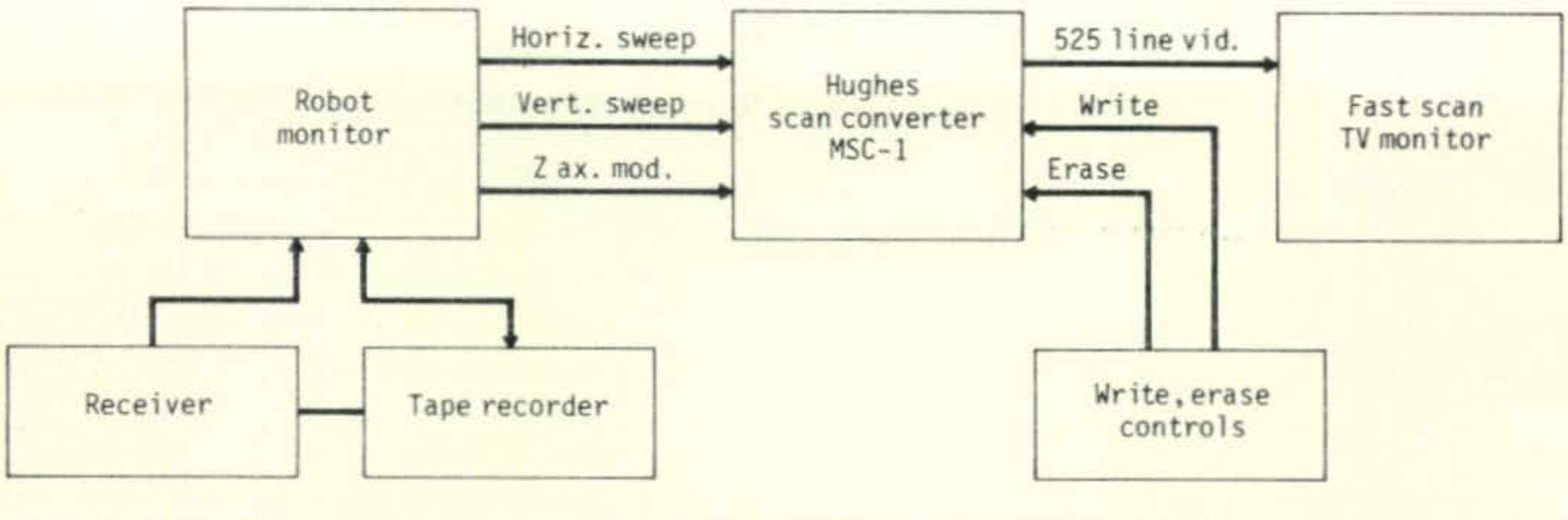


Fig. 2—Block diagram showing interconnections between the Hughes MSC-1 scan converter and the typical amateur Slow Scan setup.

are familiar with these tubes, little seems to have been written about them in ham publications.

The Type H-1268 Scan Converter tube is an electromagnetically focused and deflected cathode ray tube that functions much like a picture tube or a Vidicon. (See further details and diagram elsewhere in this article.) However, in this tube the electron beam is directed toward a solid state charge-storage target (called a storage-mesh) rather than a phosphor viewing screen. It is this storage-mesh that acts like an electronic blackboard, storing and playing back video information. Its read-out voltage is in proportion to the brightness of the televised object.

A controlled (scanning) electron beam "Writes" information on this storage-mesh target, "Reads" it, or "Erases" it depending upon the energy level of the beam. The energy level of the beam is governed by the electron gun cathode-to-storage mesh voltages. Shifting the cathode and/or storage-mesh voltages among pre-determined values determines the operating mode (Write, Read, or Erase). If we relate these functions to the conversion of SSTV to fast scan, here's what happens.

While in the Write mode, the target is scanned at the SSTV rate and the electron beam is modulated by the brightness element of the slow scan signal. Result, the slow scan picture is written on the target.

In the Read mode, scanning is switched over to the fast scan rates and the output is modulated in accordance with the stored information, point by point. Result, the slow scan original will appear on the fast scan screen. "Reading" does not destroy the stored information.

In the Erase mode, all previously stored information is destroyed by bringing the storage-mesh to the black level voltage. Result: no picture!

The built-in flexibility of the MSC-1 made it easy to use in conjunction with the Robot monitor and a conventional TV monitor for viewing SSTV. (See fig. 3 showing use of scope to set deflection sweeps.)

We fed vertical and horizontal sweep signals from the emitters of Q_{20} and Q_{10} in the Robot into the Graphics input of the MSC-1. The video input for the scan converter was picked up at the emitter of Q_3.

With the Robot set up for normal operation, we adjusted the internal controls of the MSC-1 to establish the correct video signal level, the desired picture size, and correspondence between the writing and reading scans of the storage tube target. Manually operated switches were used to switch the scan converter from Read to

Fig. 3—Interior view of the Hughes MSC-1 scan converter, shown here with an extender board in use to permit access to internal deflection sweep adjustments here being made with a scope.

Write or Erase. (It was set up to revert to the Read mode *from* Write or Erase automatically.)

The sequence of operations for viewing SSTV is simple. At the start of a frame, the MSC-1 is commanded to Write. At the end of the frame, the Write control is released and the MSC-1 reverts to Read. At this point, the received picture appears on the fast scan monitor screen. It will remain there for about a half an hour with essentially no change. It will fade away gradually over a period of time. It can be erased at any time by operating the Erase control. (If an image is stored and not erased before turning off the converter, it will reappear even days later when the equipment is again turned on. The unit we tested had a picture stored on it when we received it from California! Kinda shakes you up!)

Fig. 4—Slow Scan photo of YV1AQE taken from the screen of a fast scan monitor.

What happens when you scan information stored electronically at 128 lines with a 525 line read out? Do you get a moiré pattern? Is there a significant loss of definition? These are some of the questions we had in mind when we fired up the MSC-1. The read-out line frequency of 4.1 times the input did not cause a moiré pattern. Using the same picture size for comparison between slow scan and fast scan viewing, our subjective reaction was that any loss of definition must be very slight. Time prevented any quantitative measurements. We can only say that viewing the picture in its entirety and for as long as one wished overshadowed any other quality changes. This comment should not be interpreted as critical of SSTV, for without slow scan, there would be no picture to look at!

Knowing that the MSC-1 unit would be in our possession for a limited time, we couldn't bear the thought of returning it without learning something of its possibilities for color slow scan work. The picture of the little yellow bird (received from Jean Nicolas, F6BDJ in Grenoble, France) clearly demonstrates a potential use of scan converters in this connection. On the other hand, why not go electronic all the way? Pulsed or simultaneous feed of red, green, and blue video signals into one or more scan converters could provide drive for the three guns of a color picture tube. Result, a visible color image versus the photographic approach. Not a likely proposition for ham circles at present, but perhaps worth looking at from a commercial point of view.

Fig. 5—Station identification of YV1AQE.

Incidentally, the use of the scan converter made it possible to reduce the time required for the photographic exposures (necessary to produce a color slow scan photo) by about 50 per cent.

While we're on the subject of photography, figures 4, 5, and 6 demonstrate one of the little tricks you can play with a storage system. The portrait picture of YV1-AQE (fig. 4) was combined with his station identification (fig. 5) to make the "Mug Shot (fig. 6). This was done by not "Writing" the entire portrait picture on the storage tube and then filling in at the bottom with a playback of the station identification. This is a simple illustration of what can be

[*Text continued on page 78*]

The Hughes Type H-1268 Scan Converter Tube

The essential parts of the Type H-1268 tube shown in figs. 7 and 8 are the electron gun, collimator collector, and storage target assembly, plus the associated focus coil and deflection yoke. The metallic grid-like portion of the storage target is called the mesh. This element provides the output signal.

The storage medium consists of a myriad of tiny capacitors formed by dielectric material extending across each opening in the mesh. One side of the capacitor is the surface of the element, the other is the immediately adjacent mesh region. The stored signal at each element is the difference in potential between the storage element surface and the d.c. potential applied to the storage mesh.

The beam energy levels necessary for the various modes of operation of this tube can be obtained by switching electron gun cathode and/or storage mesh d.c. levels.

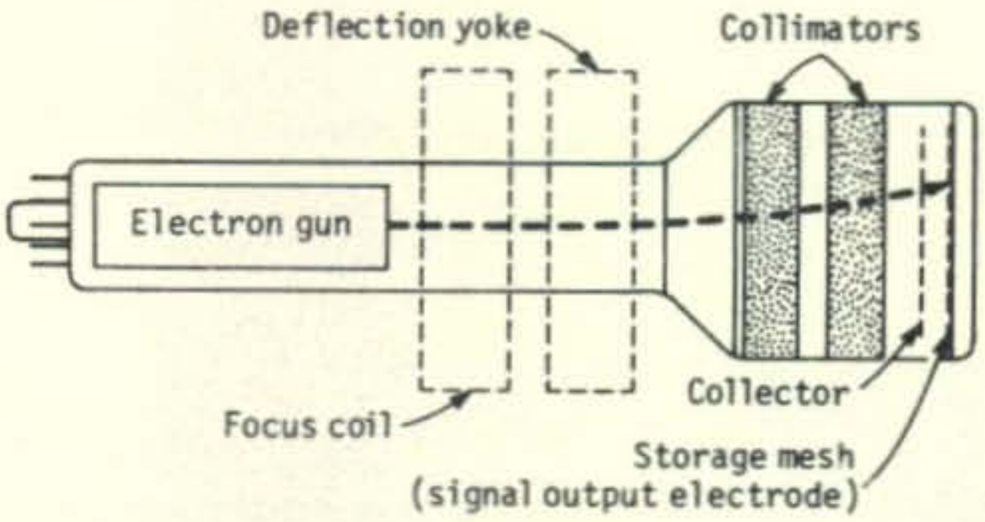


Fig. 7—Essential elements of the Hughes H-1268 storage tube used in the Hughes MSC-1 scan converter.

For the Write mode the cathode is at zero volts reference, while the storage mesh is raised to about +235 volts. For reading and erasing, the storage mesh is held at zero volts. In Read mode, cathode voltage is —5 volts, while in Erase mode, cathode voltage is dropped to about —15 volts. In all modes, the collector is at +485 volts. The collimating electrode operates at +320 to +420 volts. (This electrode makes the electrons approach the target othogonally.)

The Write Cycle

During a Write cycle the video modulated beam scans the target causing secondary electrons proportional to the beam intensity to be emitted from the storage surface toward the collector. This leaves similarly proportional positive charge potentials in the beam wake. The varied charge pattern remaining corresponds to the original scene.

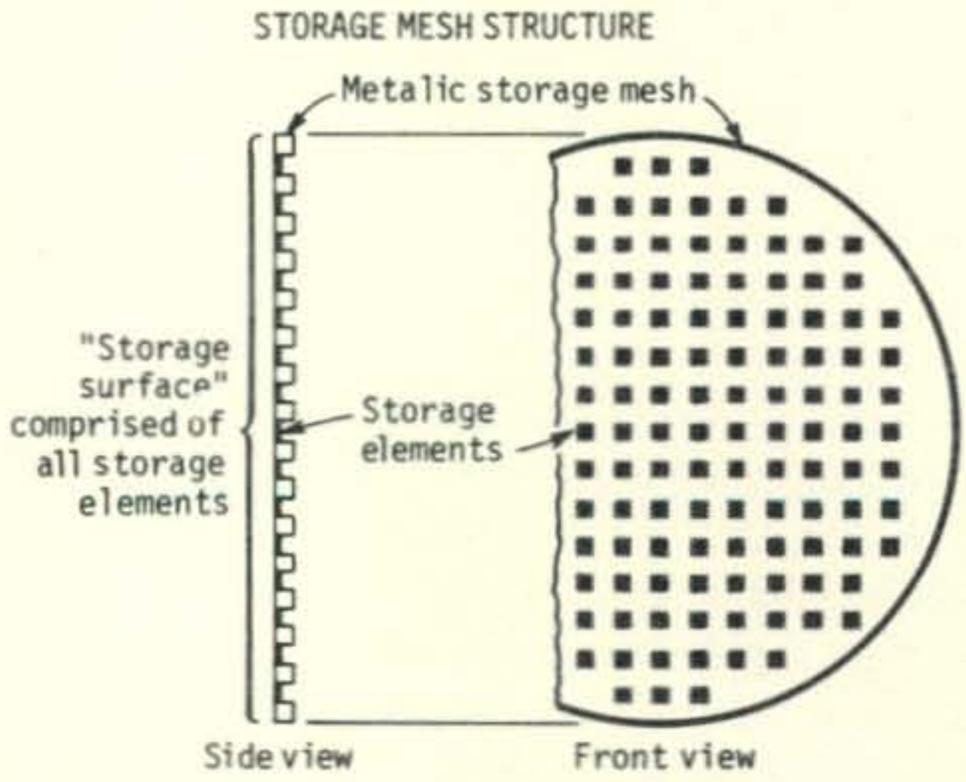


Fig. 8—Construction of the storage mesh structure of the H-1268.

In the Read mode, the electron beam again scans the target but the number of electrons reaching the storage mesh is proportional to the written charge potential at each storage element scanned. The resultant storage mesh current varied in correspondence with the charge pattern scanned. In this way a varying voltage is developed across a load resistance to provide the output signal (from the storage mesh).

In the Erase mode, with the cathode voltage dropped to —15 volts, scanning the storage surface with the electron beam brings it toward the electron gun cathode level. The storage surface voltage is negative with respect to the cathode. When the unit switches back to Read, no electrons will be able to land at the storage mesh and there will be no output signal. ■

OSCAR-6 News and Orbital Predictions

BY GEORGE JACOBS,* W3ASK

ON October 15, at 1719 GMT, the OSCAR-6 radio amateur satellite will celebrate its first successful year in orbit. Happy Birthday!

By mid-August, the satellite continued to orbit the earth every 115 minutes. Its 2-to-10-meter repeater is functioning normally (145.90 to 146.00 mHz uplink passband; 29.45 to 29.55 mHz downlink passband), and more and more stations in all parts of the world are making use of it. All indications are that OSCAR-6 will continue to operate in space considerably beyond its first birthday.

Although operating at an output power less than originally intended, the 29.45 mHz beacon signal continues to provide useful telemetry data. The 435.1 mHz beacon transmitter remains inoperative, having failed earlier this year.

By early August, some 1400 stations in more than 60 countries had made one or more contacts via OSCAR-6. About half these stations are located in the USA. Every state is represented, with the heaviest concentration in California, where more than 100 stations are active.

Overseas, amateur satelite stations are active on all continents, including Antarctica. The greatest activity is in Germany with 126 stations, followed by the United Kingdom with 83, Japan with 72 and France with 63. There are several dozen active OSCAR-6 stations in Australia, Canada, New Zealand and Sweden. At last count, at least 23 radio amateur satellite stations were operating in the Soviet Union.

Several stations, including K7BBO, F9FT, VE2BYG, W3TMZ and GW3FSP have passed the 4000 QSO mark via OSCAR-6, and F9FT unofficially leads the most countries worked list with at least 41.

Some of the rarer DX locations AMSAT reports as being worked through the satellite's repeater are Aland Island (OHØ), Antarctica (VKØ), Armenia (UG6), Asiatic SSR (UW6), Barbados (8P6), British Virgin Is. (VP2), Cook Islands (ZK1), Corsica (FC6), Grand Turk Is. (VP5), Greenland (OX), Iceland (TF), India (VU), Jamaica (6Y5), Luxembourg (LX), Philippines (DU), Rhodesia (ZE), St. Pierre Is. (FP), Tadzhik SSR (UJ8), and many others.

Marc Pressman, WB4DRB, who compiles much of AMSAT's statistics has developed a computerized information retrieval system which lists all stations that have reported contacts through OSCAR-6. All users of the satellite are invited to send an alphabetized list of all QSL cards received verifying QSOs so that the computer listing can be kept up to date. Reports from stations in IARU Regions 1 and 3 are particularly needed (Europe, Africa and Asia). Send lists to AMSAT, P.O. Box 27, Washington, D.C. 20044, USA.

W.A.S.

OSCAR-6 activity has now been reported in each of the fifty states, and W3TMZ is the first to have worked them all!

Jack accomplished this from his Maryland QTH by working Hawaii, his fiftieth state on July 7th. On the other end of this history-making QSO was KH6HLK. W3TMZ will be the first to receive the AMSAT-OSCAR-6 WAS trophy for this feat.

Right behind Jack is VE2BYG, who needs only Hawaii to complete his WAS. It may be a bit more difficult for Randy, however, since Hawaii seems to be just beyond normal satellite range from his Quebec QTH. Several others are also getting very close to WAS, including K2GUG, K4TI and K1HTV.

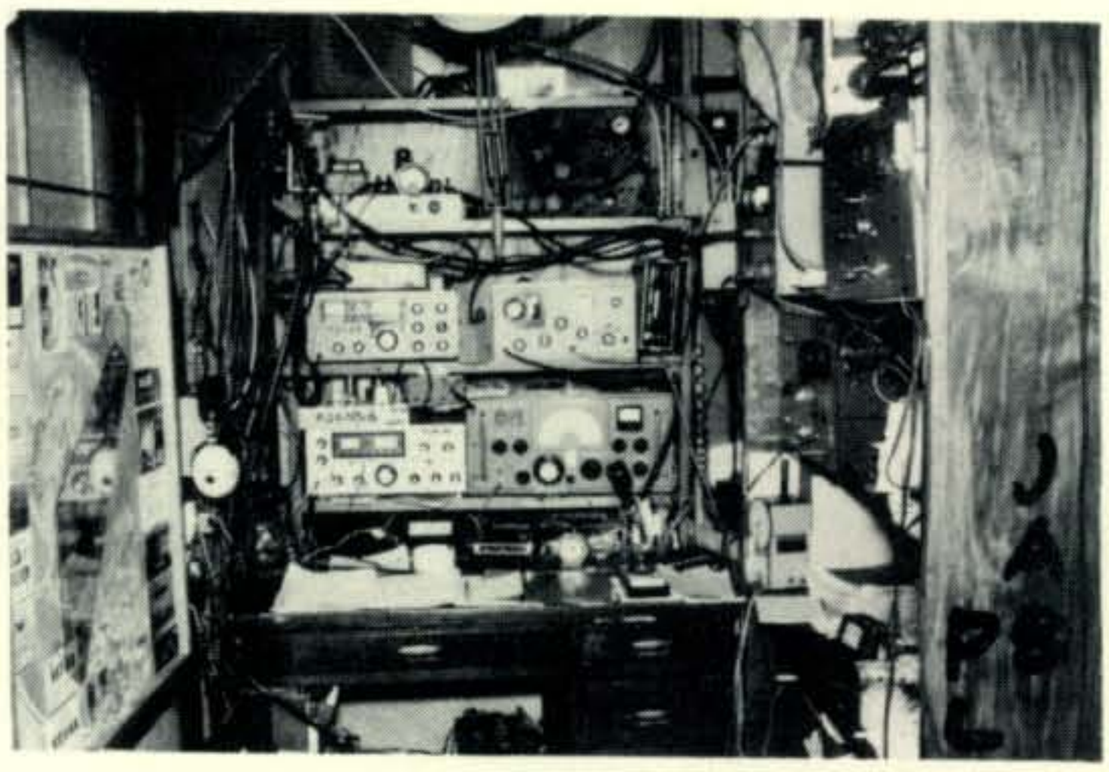
Speaking about Hawaii, Katashi Nose, KH6IJ won the first ARRL *Satellite DX Achievement Award* from Oceania, working KH6, KL7, W, VE and JA stations. He is purposely keeping his equipment as simple as possible, using ten watts maximum power and a crossed 11-element Yagi antenna on azimuth and elevation mounts. Nose's antenna is described in "A Simple Az-El Antenna System for OSCAR," which appears on page 11 of the June, 1973 issue of QST.

*Space Communications Editor, *CQ*, 11307 Clara Street, Silver Spring, Md. 20902

Activity is picking up in some of the rarer states. W1MEP is reported to be ready to go from Vermont, and W2GN is also planning some more mobile DXpeditions to this state.

Steve Kimber, W7VEW reports that he is now very active from Lander, Wyoming using 145.95 mHz as his up-link frequency and looking around 29.5 mHz for calls.

AMSAT is encouraging greater participation in the still rather rare states of Idaho, Louisiana, Kentucky, Montana, Nevada, Vermont and Wyoming.



Here's a view of the crowded operating position at JA8PL's OSCAR-6 ground station at Sapporo in northern Japan. Sato runs about 50 watts into a five-element crossed-dipole array on the 2 meter up-link.

OSCAR-Mobiling

For the past few months W2GN has been conducting mobile DXpeditions to "scarce" states from his car. Now comes word of the first reported aeronautical mobile communications via OSCAR-6. It took place on April 27, when W6OAL, operating from an aircraft 7,000 feet above the Pacific west of Hawaii worked K7BBO in the state of Washington on s.s.b. The transmitter aboard the aircraft was operating with five watts p.e.p. to a simple whip antenna.

There still may be time for some intrepid sailor to make the first maritime mobile QSO through OSCAR-6. This honor may well go to OZ7DX who planned to operate maritime mobile through the satellite from aboard the Danish scientific research vessel *DANA*, in the waters off Greenland late this summer.

New Oscar-6 Operating Schedule

During the first week of May, OSCAR-6's operating schedule was modified to achieve a better balance between ON and OFF times, so that the on-board nickel-cadmium battery would have sufficient time to recharge from solar energy.

According to AMSAT, the new schedule is working very well, and it is now very likely that the satellite's operating life will extend well beyond its first birthday on October 15th.

The regular operating schedule for OSCAR-6 is now as follows:

Day (GMT)	*Operational Status*
Thursday	ON
Friday	OFF
Saturday	ON
Sunday	OFF
Monday	ON
Tuesday	OFF
Wednesday	OFF

In terms of EST, the satellite's repeater will operate from 7 P.M. Thursday; 7 P.M. Friday to 7 P.M. Saturday; 7 P.M. Sunday to 7 P.M. Monday.

The satellite will be ON for about three minutes during each scheduled OFF day, beginning about ten minutes after the first orbit of the day (GMT) crosses the equator in a south to north direction. This operation is to collect telemetry data from the 29.45 mHz beacon signal, and two-way contacts *should not* be attempted. AMSAT requests that those copying telemetry data send the *raw* numbers to AMSAT Telemetry Data Dept. P.O. Box 27, Washington, D.C. 20044 USA.

AMSAT has also begun the transmission of officlial bulletins through OSCAR-6's repeater. They are given daily on about 29.5 mHz by several selected bulletin stations, including days that the satellite is normally OFF for two-way communications. These transmissions begin as the first orbit of the day (GMT) crosses the equator in a south to north direction, and they include reports of special experiments and any changes in the satellite's operating schedule.

Updated schedule information, special test and other pertinent data concerning OSCAR-6 can be obtained from:

Official transmissions given daily on the satellite's initial orbit.

The AMSAT Hot-line, Area Code 703-938-5678.

W1AW official bulletins. (See *QST* for latest operating schedules.)

The following AMSAT h.f. nets:

North American East Coast 75 Meter AMSAT Net—Mondays 9 P.M. EDT (0100

Z — Tues.)-3855 kHz l.s.b.

North American West Coast 75 Meter AMSAT Net — Mondays 8 P.M. PDT (0300Z — Tues.)-3850 kHz l.s.b.

International 20 Meter AMSAT Net — Sundays 1800 Z — 14,280 kHz u.s.b.

International 15 Meter AMSAT Net — Sundays 1900 Z — 21,280 kHz u.s.b.

European 40 Meter OSCAR-6 Net — Sundays 0930 Z — 7070 kHz l.s.b.

European 80 Meter OSCAR-6 Net — After passes on ON days — 3780 kHz l.s.b.

Caution. There is now ample proof that, except under unusual conditions, 100 watts e.r.p. is an adequate level of power to permit satisfactory communications through the satellite. Higher power levels weaken *all* other signals in the repeater's passband, and can block the repeater entirely, so AMSAT urges that this level not be exceeded.

W3AWN-Silent Key

It was with great personal sadness that I learned of the death of my friend, professional colleague, fellow radio amateur, and an AMSAT mainstay, Cap Petry, W3AWN. Cap passed away suddenly while on vacation in Hong Kong on March 26.

Cap and I shared many an exciting moment at the nearly dozen international radio conferences that we attended together professionally during the past 20 years. I know first-hand of the great deal of pleasure he derived from amateur radio, and how much he had done to foster and protect it.

OSCAR-6 and AMSAT would not be a reality today, if it were not for the efforts of Cap. I remember vividly the encouragement he gave the small group of AMSAT "fathers," of which he was one, during those early, wobbly days. I also know the number of doors he opened quietly in high official places to get OSCAR-6 "off the ground."

All of us who had the pleasure of knowing Cap will miss his warm, smiling face, his understanding nature, and most important of all, his humanism. Let's hope that there will always be an amateur satellite up there to remind us that there was a Cap Petry here on earth that helped make it all possible.

Orbital Predictions October-December

The following is orbital information for the *initial*, or *reference* orbit for each day that OSCAR-6 is scheduled to be ON for communications during October, November and December. To produce orbital information for other than the referenced orbits, simply keep adding 115 minutes and 28.75 degrees for each succeeding orbit.[1]

South-North Orbit No.	Date	Equatorial Crossing Time (GMT)	Long. of Equatorial Crossing (°W)
4387	Oct. 1	0031	55.1
4425	4	0120	67.6
4450	6	0115	66.3
4475	8	0110	65.0
4512	11	0005	48.7
4538	13	0155	76.2
4563	15	0150	74.9
4600	18	0043	58.6
4625	20	0039	57.3
4650	22	0034	56.0
4688	25	0124	68.0
4713	27	0119	67.2
4738	29	0114	65.9
4775	Nov. 1	0008	49.6
4800	3	0003	48.3
4825	5	0153	75.7
4863	8	0048	59.4
4888	10	0043	58.2
4913	12	0038	56.9
4951	15	0127	69.3
4876	17	0122	68.0
5001	19	0117	66.7
5038	22	0012	50.4
5063	24	0007	49.2
5088	26	0002	47.9
5125	29	0051	60.3
5151	Dec. 1	0046	59.0
5176	3	0041	57.7
5214	6	0131	70.2
5239	8	0126	68.9
5264	10	0121	67.6
5289	13	0015	51.3
5326	15	0010	50.0
5351	17	0005	48.7
5389	20	0055	61.2
5414	22	0050	59.9
5439	24	0045	58.6
5477	27	0134	71.1
5502	29	0129	69.8
5527	31	0124	68.5

Save the above list so that it can be used for the next three months, since new orbital data will not appear in *CQ* again until December. ■

[1]See "OSCAR-6 News," *CQ*, Feb. 1973, p. 38, for a method to determine what orbits will be within communication range of a specific QTH.

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

160 Meter AM from a Motorola -80D Transmitter Strip

BY BYRON H. KRETZMAN,* W2JTP

THIS might look like an ordinary surplus conversion article, but people tell us that converting a v.h.f. f.m. transmitter strip to a remote controlled, diode tuned, 160 meter *a.m.* transmitter *is* a little unusual. Truthfully, this "conversion" was made to fit in with the other commercial surplus Motorola-80D sets we use on 10, 6 and 2 meters, plus 225 mHz. All of these are remote controlled, with each set (transmitter and receiver) powered from a standard design a.c. power supply.[1] We will eventually use this 160 meter transmitter strip with a Motorola PA-9077 h.f. receiver strip, available for $10 on the surplus market[2], but for the time being we are using it with a tunable communications receiver.

It all began when a local ham presented us with a somewhat butchered PA-8671-A low band transmitter strip. This was originally "M" range, meaning, it was set up to operate in the 30 to 40 mHz range. The strip was missing oscillator decks and the three octal sockets for the 2E26's were broken. It was of early design, having a microphone transformer and a pi-network for r.f. output. (Later design eliminated the microphone transformer and used the more common r.f. tank with a variable antenna coil, plus a built-in low pass filter.)

Design for 160

Like it was 35 years ago, the 160 meter band is ideal for local rag-chewing. Because single-sideband transceiver kits don't cover 160, and because very few of the commercial "amateur" transceivers do, s.s.b. is less widely used on 160 than amplitude modulation. Another factor, of importance to those who build, is that an a.m. transmitter is easy to put together. And, a.m. also simplifies the receiving problem. Old table-top "a.c.-d.c." radios can usually be adjusted to cover 160; quite satisfactory when cold hard cash is not available for ham gear.

Our design requirements for a 160 meter a.m. transmitter included a v.f.o. which could be remotely tuned since we like to put most of our ham gear out of the way in another part of the house. This leaves the ham shack, or operating position, relatively uncluttered. It therefore follows that the transmitter should be rack mounted. A Motorola-80D transmitter strip is made for rack mounting, with the addition of a simple "L"

*431 Woodbury Road, Huntington, N.Y. 11743

[1]Kretzman, B. H., "Putting the Motorola FMTRU-80D on 2 Meter F.M.," *CQ* March 1966, p. 33.

[2]Gregory Electronics Corp., 249 Route 46, Saddle Brook, N.J. 02662.

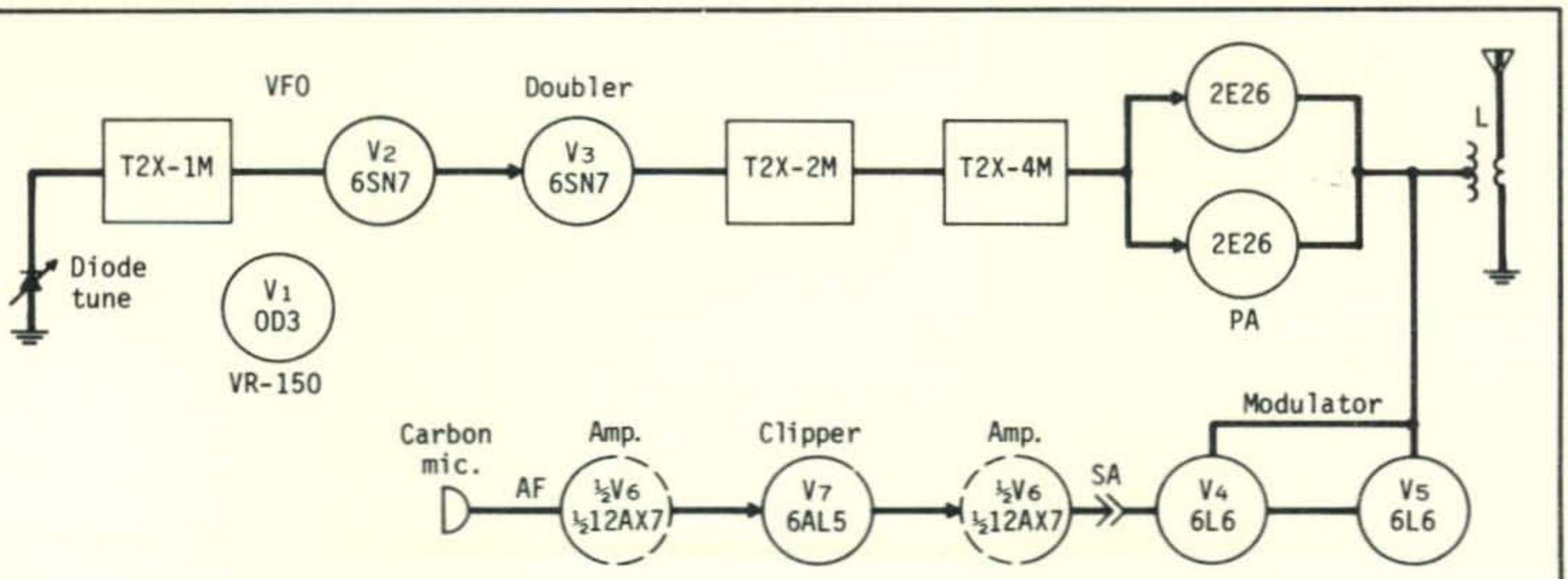


Fig. 1—160 meter a.m. Transmitter strip, block diagram. The square blocks are original coils in shield cans. The speech amplifier V_6 and the clipper V_7 stages are unmodified.

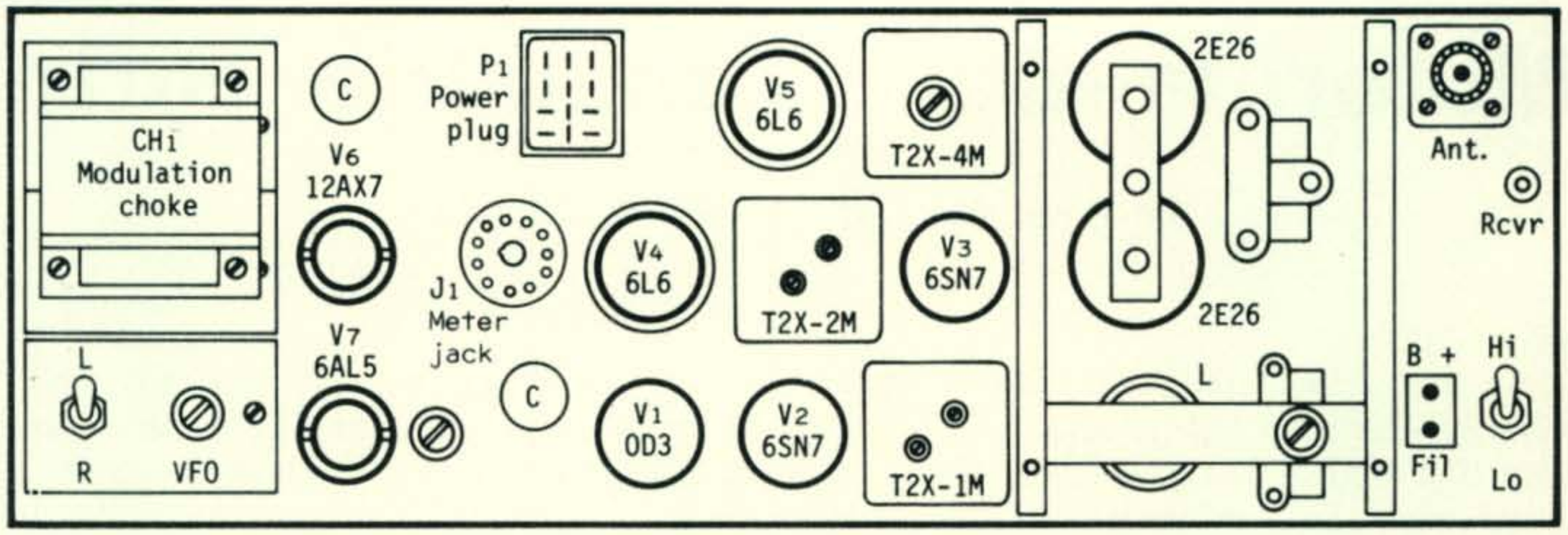


Fig. 2—Parts location, top of chassis. Not shown are the rack mounting brackets on each end of the chassis. (See CQ, February 1966, fig. 1, page 66.)

bracket on each end. Also, the -80D strip lends itself nicely to re-construction with very few additional holes to be drilled. Furthermore, nearly all of the slug-tuned coils, in shield cans on the chassis, could be used without modification, except for their padding capacitors. Consequently, as the picture shows, the appearance of the transmitter strip, as rebuilt for 160, is hardly changed.

Figure 1 is a block diagram of the 160 meter strip. Figure 2 shows the specific locations of tubes and parts on top of the strip. In accord with present 160 meter regulations for our east coast area, the transmitter is v.f.o. tunable over the frequency range of only 1800 to 1850 kHz. The oscillator, an octal based dual triode, operates at half the transmitter output frequency. It is diode tuned. A local-remote switch on a blank oscillator deck switches the control from either a potentiometer next to the switch or to a similar pot on the control panel at the remote operating position. The slug-tuned coils from a former doubler stage are used as the oscillator inductance. The oscillator is followed by another dual triode, connected as a push-push doubler. Its tank coil also uses the shielded slug-tuned coils from an original doubler stage.

The final, or power amplifier (PA), utilizes the original pair of 2E26 tubes. Of course the tank coil is bigger and a large variable capacitor was added for padding. Heising modulation is used to modulate the PA. Two metal 6L6 tubes are connected in parallel as the modulator. They are driven from the unmodified speech amplifier/clipper. Figure 3 is the schematic diagram of the transmitter as rebuilt for 160 meters.

Construction

The conversion, or to be more accurate, the construction, is begun by removing (carefully) all of the shield can assemblies. If there is an oscillator deck, it should be removed. The final tank coil should be unsoldered and removed, as well as the output (antenna tuning) capacitor and its mounting bracket. Under the chassis, all resistors and capacitors should be carefully unsoldered and saved for future use; *except*, those components associated with the speech amplifier/clipper. This includes tubes V_6 and V_7. Also, do not disturb, for the time being, the two components boards, one on each side of the chassis. Once the components and the wiring have been removed from around the loctal sockets for V_1, V_2, V_3, and V_4, their mounting rivets should be drilled out from the bottom. These loctal sockets are then replaced with a good grade of octal sockets.

The Oscillator

A 6SN7GT, V_2, is connected as a push-pull oscillator, operating on 900 to 925 kHz, half the transmitter output frequency. The two coils in the can marked T2X-1M are wired in series by connecting the top of one to the bottom of the other. Two 300 pf silver mica capacitors in series, and a 50 pf negative temperature coefficient (N750) capacitor, are mounted inside the coil assembly to pad the oscillator inductance. Tuning is accomplished by the diode D_1. While a diode made especially for this purpose could be used, we used the ordinary inexpensive 1N-4002 silicon rectifier. The 120 pf silver mica capacitor in series sets the actual tuning range. If the tuning range cannot cover the

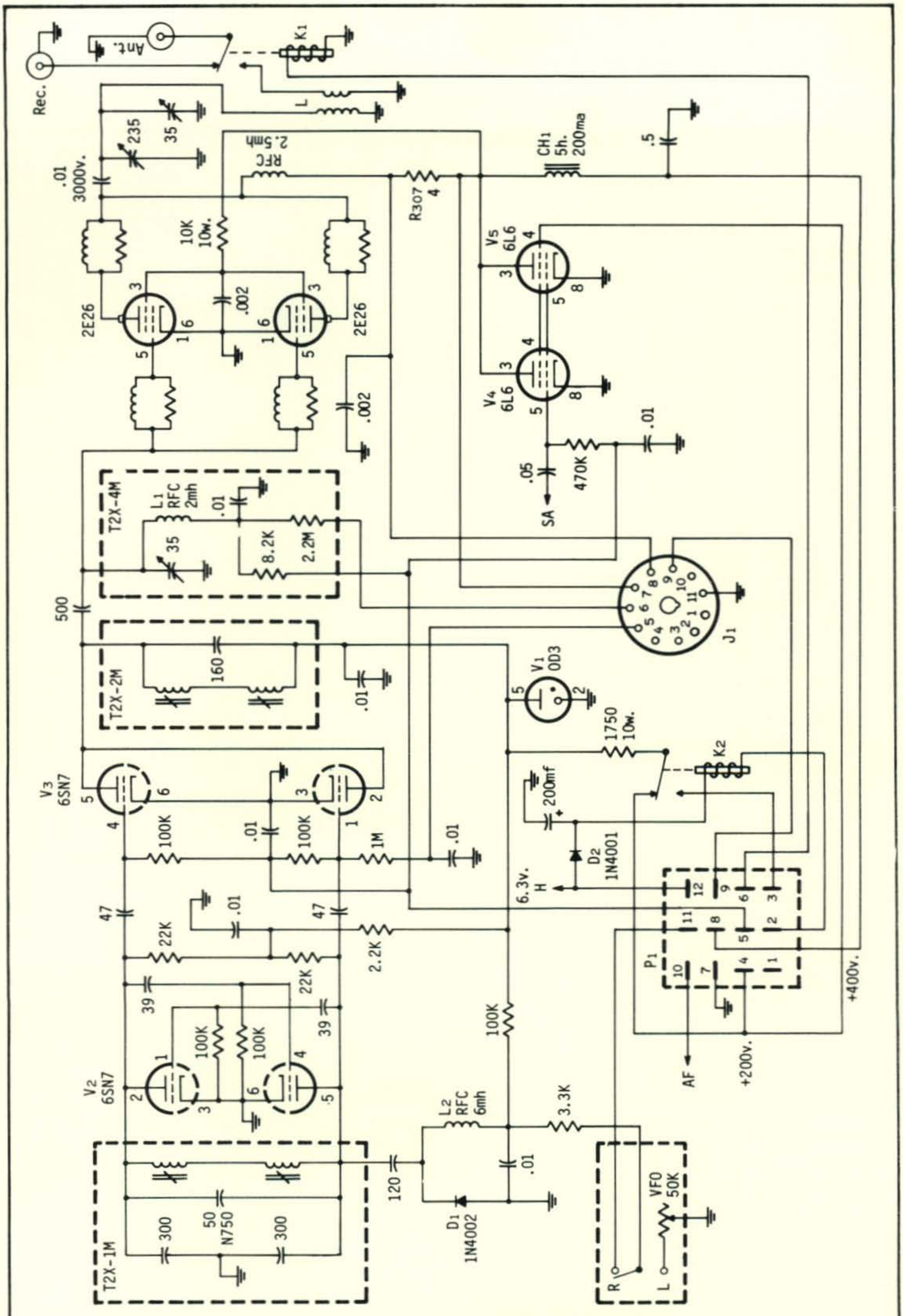


Fig. 3—160 meter a.m. transmitter, schematic diagram. Capacitor values are in picofarads unless otherwise indicated. *SA* connects to the output and *AF* to the input of the original speech amplifier/clipper, V_6 and V_7.

The Motorola low band transmitter strip, as modified for operation on 160 meter a.m. Built-in is a v.f.o. which is remotely tuned for operation from 1800 to 1850 kHz. Note the modulation choke mounted over two blank oscillator decks. The third blank oscillator deck is used to conveniently locate the local-remote switch and local v.f.o. control used for testing.

required 50kHz, a slight variation of the value of this capacitor will adjust the range. The 6mh r.f. choke L_2 was obtained from one of the component boards underneath the chassis. A blank oscillator deck was drilled for a s.p.d.t. switch and for the 50K pot used for local control (L) when testing. Remote control (R) is via a connection of the switch to pin 11, originally unused, on the power connector P_1.

The Doubler

Another 6SN7GT, V_3, operates as a push-push frequency doubler. Driven in push-pull from the oscillator, its two plates are connected in parallel. The two coils in the can marked T2X-2M are wired in series by connecting the top of one to the bottom of the other to serve as the doubler tank coil. A 160 pf silver mica capacitor mounted inside the can is used to pad the coils. The grid circuit assembly for the PA, T2X-4M, originally had a small air wound coil tuned by an air variable capacitor at the top of the can. This coil was disconnected and in its place a 2 mh r.f. choke, L_1, taken from one of the component boards under the chassis, was installed. This assembly is then connected in parallel to the doubler tank assembly T2X-2M through a 500 pf ceramic capacitor. The air variable, about 35 pf maximum, then is used as a vernier tuning device for the doubler tank; unnecessary perhaps, but mechanically convenient.

[*Continued on page 76*]

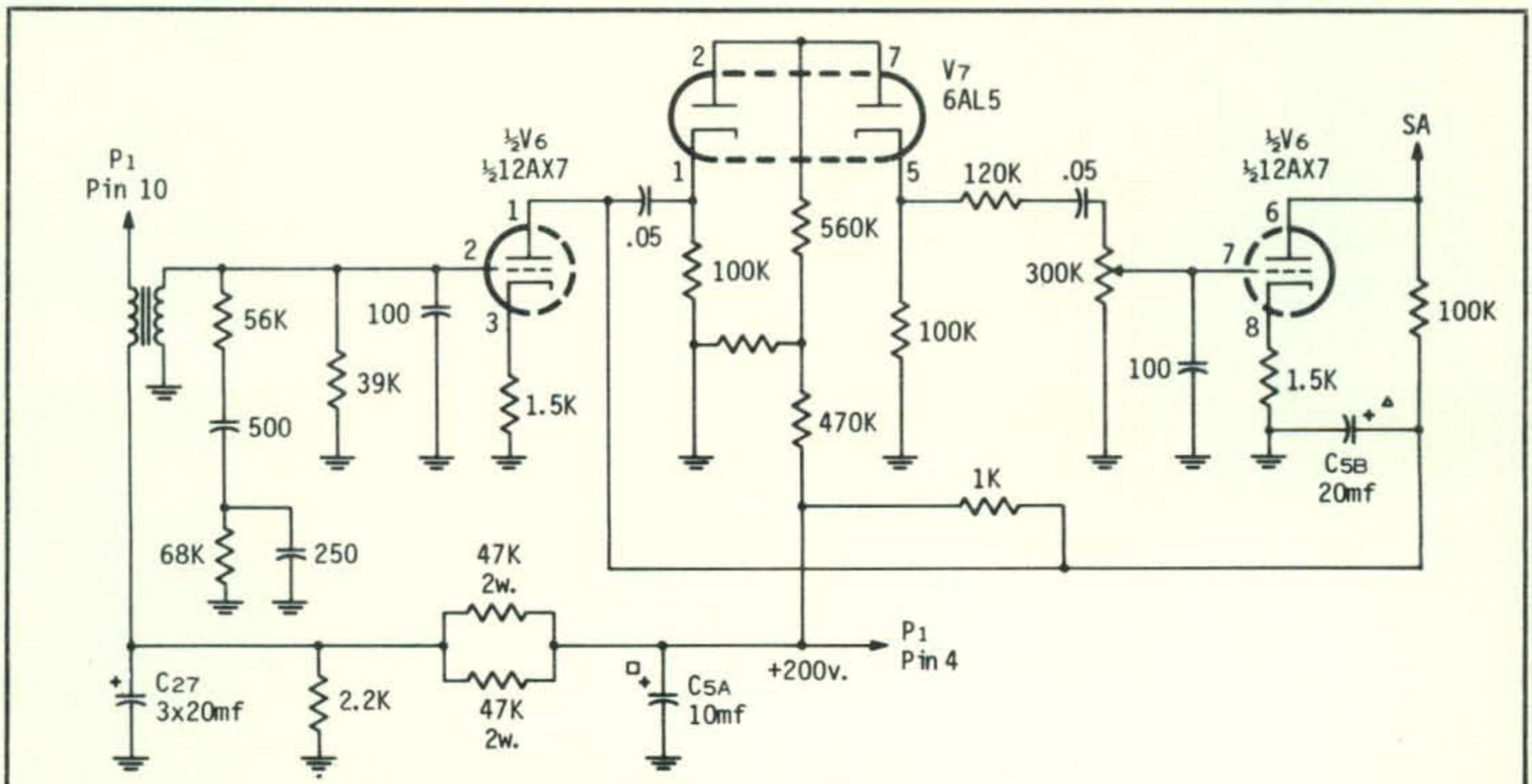


Fig. 4—Speech amplifier/clipper, schematic diagram. Capacitor values are in microfarads unless otherwise indicated. A later version of these stages has no microphone transformer and a different circuit.

Hewlett-Packard Digital Multi-Meter Fits In The Palm of Your Hand

Seems that we just get accustomed to a new concept when someone comes along and introduces still a newer concept. At least that's the way it seems in the area of digital multi-meters which amateurs have begun to accept and use. Just recently, however, Hewlett-Packard broke the multi-meter market wide open by introducing their Model 970A DMM, a palm-sized probe/meter tagged at a relatively modest $275.

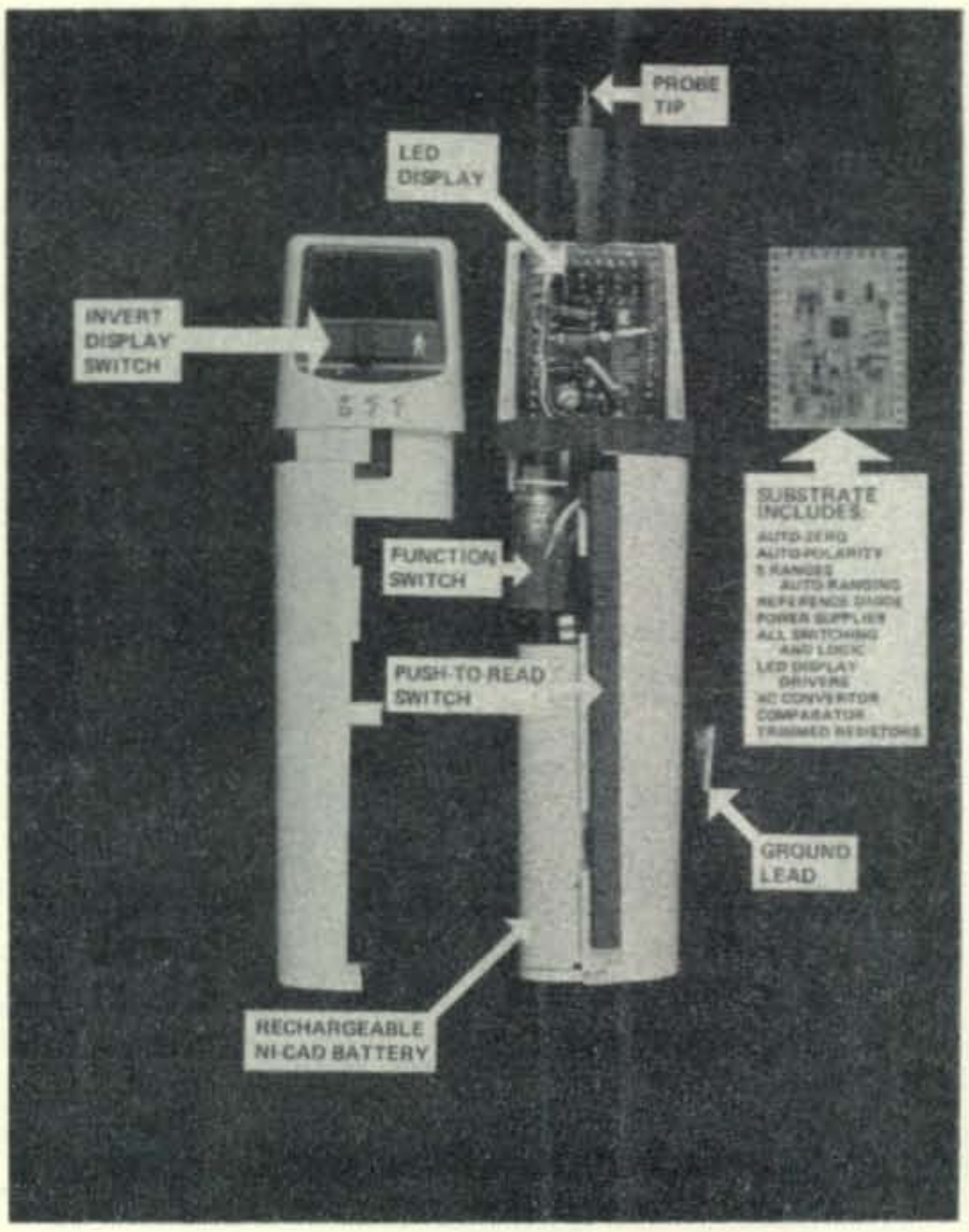
The Model 970A is an auto-ranging-type instrument measuring a.c. or d.c. volts, and ohms over five ranges. All electronics including the display and rechargeable battery pack are contained in a small, rugged hand-held package. Only one function control need be set, to select the parameter to be measured, and only two terminals are used for all functions.

HP uses a five-digit LED (Light Emitting Diode) cluster to provide a 3-1/2-digit DMM, so that all probe voltage readings are in volts, and resistance readings in kilohms. There are no scales to misinterpret. Decimal placement is automatic.

From an operational standpoint, automatic decimal placement and automatic polarity indication save time and increase accuracy. After setting the function selector (ac V, dc V or kΩ), the user simply touches the probe tip to the test point, presses a Push-to-Read bar, and the solid-state LED readout automatically displays the correct reading and polarity. When measuring ohms or d.c. volts it takes typically less than 2 seconds to range and settle to a proper reading.

Since the display is close to the point of measurement, a user working in closely-packed circuits can hold the probe in one hand without having to look away from the circuit to read the meter. The display can even be electronically inverted, so the operator needn't worry about reading 6's for 9's, or misplacing the decimal point if the probe is used upside down.

D.c. voltage from 0.1000 v. full scale to 500 v. is read to an accuracy of ±(0.7% of reading + 0.2% of range). Full scale ranges are 0.1, 1, 10, 100, 1000 v. (500 v. maximum input).



A.c. voltages from 1 volt through the highest range, (500 volts r.m.s. maximum) from 45 Hz to 1 kHz, are read to ±(2% of reading +0.5% of range). Accuracy from 1 kHz to 3.5 kHz is ±(3% of reading +0.5% of range). On the 0.1 volt range and below, accuracy from 45 Hz to 1 kHz is ±(2% of reading +0.5% of range).

Resistance measurement accuracy is ±(1.5% of reading +0.2% of range). Ohms ranges are 1 kilohm full scale (1 ohm resolution) through 10 megohms. Maximum test current does not exceed 10 ma.

Nickel-cadmium rechargeable batteries and a battery charger come with the Model 970A. More than 2000 measurements can be made using the 'Press-to-Read' switch with a full charge. Batteries can be recharged in about 14 hours. The probe case is made of high-impact plastic with built-in stress reliefs to improve its resistance to an accidental drop. The probe is 6-1/2 inches long by 1-5/8 inches wide. The instrument weighs 7 ounces.

For full color brochure and more detailed information, circle A on the Reader Service Coupon on page 94.

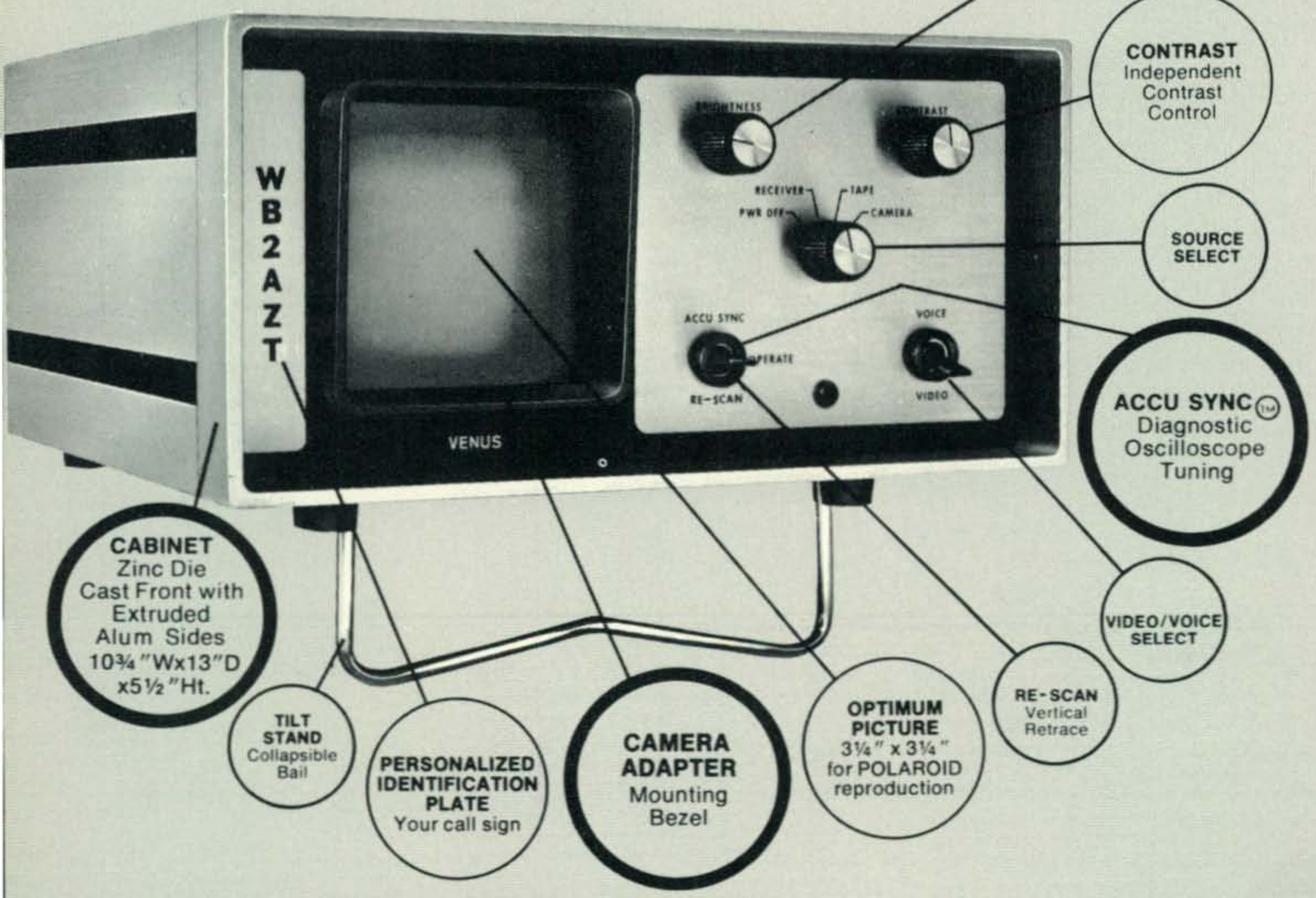
2nd generation slo-scan

Venus Scientific brings ten years of space-age technology development to the production of the latest breakthrough in HAM Equipment . . . the SS2 Slo-Scan Monitor. The following unique features of the SS2 have been designed to offer the HAM operator the maximum functional performance in SSTV.

These advances include: **ACCU SYNC,**™ a diagnostic and tuning aid which converts the SS2 Monitor to an oscilloscope by the flip of a switch that monitors incoming and outgoing video; **LED SWEEP INDICATORS,** go-no-go lights for ease of servicing; **CAMERA ADAPTER provision to accept Polaroid Color Pack Camera or Polaroid Square Shooter,** which enables you to take pictures right off the air; **SIMPLIFIED INDEPENDENT CONTROLS.**

For the full story on how VENUS' SS2 monitor has become the 2nd Generation of Slo-Scan and a list of accessories, write or call today.

Amateur net price $349 *N.Y. State residents add sales tax.*



Venus Scientific Inc.

The company that put high voltage on the moon, now brings you expanding amateur radio technology.

399 Smith Street
Farmingdale, N.Y. 11735
Phone 516-293-4100
TWX 510-224-6492

Slow Scan TV

BY COPTHORNE MACDONALD,* WØORX

SSTV From The S.S. Hope

Gene Fuller, W2FZJ, reports a very considerable effort on the part of Rochester, N.Y. radio amateurs to provide communication backup for the city's recent "Hike for Hope." Over 50 two-meter operators were involved, in 15 locations, plus direct 15 meter SSTV contact with Dave Veazey, PY7ZAG, on the *Hope* in Maceio, Brazil. Equipment in Rochester included a home-brew monitor built by Dave Halliday, WB2ZEA, and a Robot camera and monitor loaned by Paul Evans, W2YYW. Gene says, "The system worked exceptionally well—thinks to excellent band conditions and *outstanding cooperation* of other operators on the band! We exchanged about 20 photos of teenagers, patients, and staff members of the *Hope*, and hikers here in Rochester, in addition to several dozen audio patches."

Can you think of any activities in *your* community to which SSTV could make a contribution?

Human Engineering The SSTV Station

We hams tend to be "grey box" oriented rather than system oriented. We usually think of our station hardware—transmitter, receiver, antenna, etc.—as an end in itself rather than a means of extending our senses of sight and hearing. Those grey boxes are necessary components in the communication environment we are trying to create. But it's the sharing of words and images and ideas with other human beings that we're trying to bring about, isn't it? We have to build (or buy) those grey boxes, one by one, and this tends to focus our attention on one piece of the problem at a time. Let's not forget that our larger goal is putting together a human/hardware system that satisfies certain *human* requirements for making pleasurable and enlightening contact with other human beings.

Back in pre-SSTV days the list of "human factors" was fairly short, and the problem fairly simple. One needed a comfortable chair, and a desk of the proper height. The receiver tuning dial had to be conveniently located. The audio had to be loud enough, and without too much distortion. A simple transmit/receive procedure had to be worked out. (As an example of total lack of human engineering I need only think of my high school days and first high power—150 watt—Command Set rig. An antenna relay, with or without extra contacts, was a luxury hopelessly out of financial reach. My transmit/receive procedure involved throwing three switches, including one thrown with my left foot!)

Making the system meet human requirements still takes extra money. If you are serious about using your station for communication with other people it can be money well spent—not only in terms of personal comfort, but in the effectiveness of the communication. It is also an excellent opportunity for personal creativity. Each ham's situation is different. Each has a different set of communication goals and a different set of grey boxes. The challenge is to create the kind of communications environment that allows you to realize *your* communication goals as effectively as possible. (If "appliance operator"

One of the SSTV pictures transmitted by PY7ZAG on the S.S. Hope, to W2FZJ during Rochester, N.Y.'s "Hike for Hope."

*P.O. Box 483, Rochester, Minn. 55901

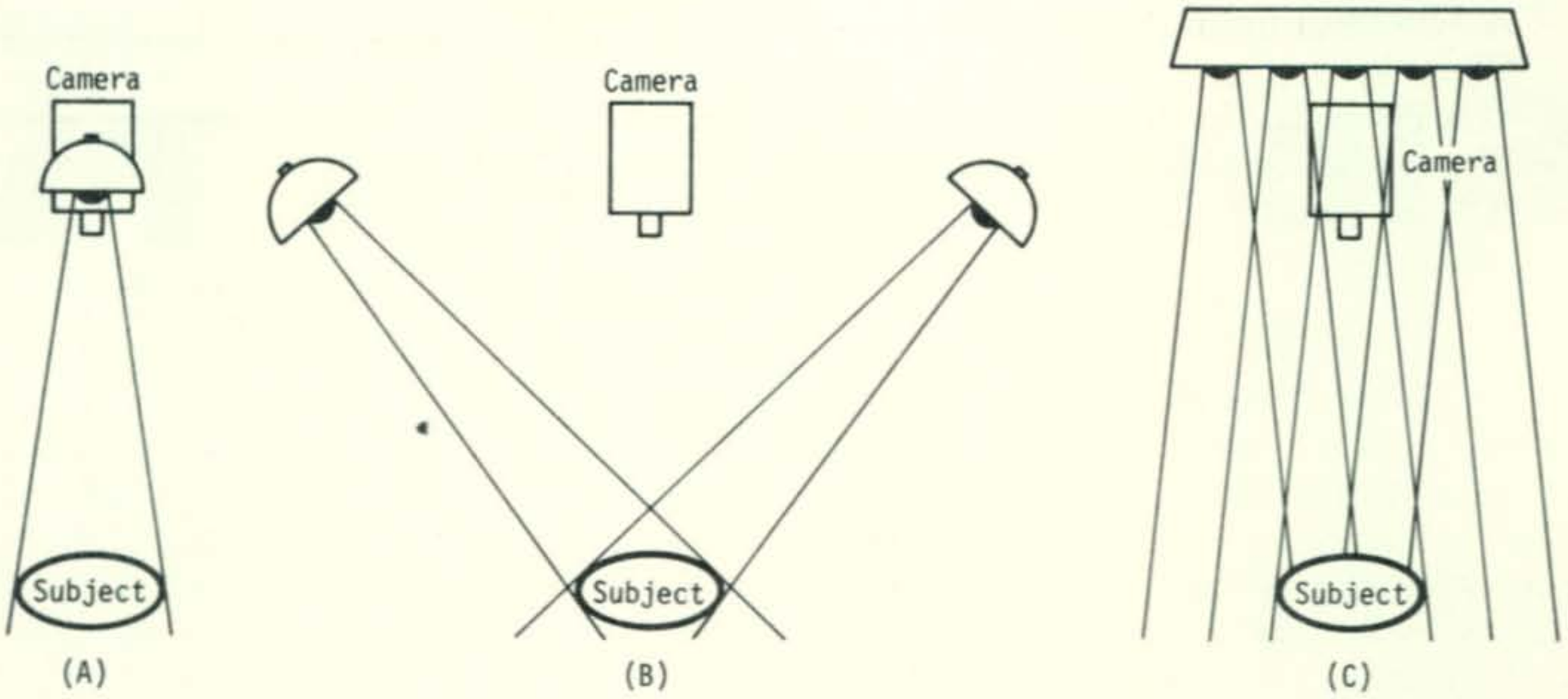


Fig. 1—Three simple lighting schemes for SSTV. (A) Single lamp. (B) Two lamps. (C) Large area source. See text for advantages and disadvantages of each.

taunts have been getting to you, here's a chance to get your soldering iron hot and make a "whole thing" of your station. You can't buy a complete human engineered SSTV station off-the-shelf.)

This month let's go over some of the things that we need to consider. Later I'll describe the more interesting parts of my own personal solution. I hope that you will share your solutions too, either through this column, or in complete articles.

Communication Goals

A solution is a response to a problem, and the more clearly we can define the problem, the better the chance of coming up with a good solution. What sort of communication activities do you want to carry on via your station? "Ragchewing." "Working DX." "Contests." Answers like these may pop into our minds. But each of these answers is really just the heading for a long list of very specific things that we do, or would like to do, when we ragchew, work DX, or participate in contests. It is important to get into these details.

I'm no expert on contests or DX, but as an example, I can run through the analysis of my own situation. My general goal was to allow small groups of non-hams to become involved in audio/SSTV QSO's at my station, and get ready for some serious audio/visual dialogue on the New Directions Roundtable and with individual hams. Getting into the details, I realized that I wanted:

A—To put participants on camera easily; individually, or 2 or 3 people at a time.

B—Get clear audio from each participant without passing a mike around, and without excessive noise pickup from my final amp blower.

C—Several people to be able to view the SSTV monitor pictures simultaneously.

D—To put prepared SSTV tapes on-the-air conveniently, and to record the transmissions of others.

E—To monitor my own transmitted video as well as received video signals for proper sync, subcarrier swing, etc.

F—Audio and video phone patching facilities arranged so that the person at the other end of the phone line would feel part of the "group."

G—A 10 minute station identification reminder.

H—To use a number of video sources, and be able to switch conveniently between them.

I—A lighting scheme that did not reduce the contrast of the slow-scan monitor picture during reception, and produced well lit pictures when transmitting.

J—Means to automatically reduce the speaker volume when an SSTV signal is being received.

K—Enough switching options to allow easy production of tapes.

L—Easy removal of camera, monitor, tape recorder, and lights for making SSTV tapes away from home.

M—All this in voice only, voice alternated with SSTV, and simultaneous voice/SSTV (ISB) formats.

Human beings interact with a slow-scan TV station primarily at four interfaces:

Visual—seeing and being seen
Aural—hearing and being heard
Control—pushing buttons, throwing switches, threading tapes, etc.
Physical comfort—temperature, bodily support, etc.

Let's examine these one by one.

The Visual Environment

A major problem in the SSTV station is proper lighting. The same lighting problems existing in conventional TV, and film-making, exist with SSTV too. In addition, there is the need for viewing the monitor screen in subdued light. The desired lighting for transmission is not usually the best lighting for reception. There are books written on movie making, and TV production that could be useful resources, since their basic approach to lighting a scene is similar to that required for SSTV. You probably don't want banks of Kleigl lights in your shack, nor do most shacks have enough room for "movie set" lighting approaches. Compromises will be necessary with perfection, but by observing a few basic rules the worst problems can be avoided.

First, avoid shadows. To avoid facial shadows with one small lamp (or several closely spaced lamps such as a "movie bar") the lamps must be near the camera. Mounting the light under the camera, perhaps on the tripod head, or just above the camera should be satisfactory. The two disadvantages with this arrangement are specular reflections from flat glossy surfaces, and a blinding effect on human subjects looking directly at the camera. (See the recent columns on FSS optics for a discussion of specular reflections.)

A second approach that doesn't do quite as good a job of eliminating visible shadows, but eliminates these two other problems is shown in fig. 1(B). Here the subject is illuminated by two lamps, one on either side of the camera and at some distance from it. The third approach involves using large area light sources such as long fluorescent lamps, or indirect lighting where a whole wall or ceiling is flooded with light. Another possibility is putting a number of small lamps behind a large diffusing surface such as a sheet of translucent plastic, paper, or fabric. A large picture window could do the job in the daytime. An office type lighting scheme with several fluorescent ceiling fixtures might work well enough. Large area light sources allow the subject to look directly at the light source

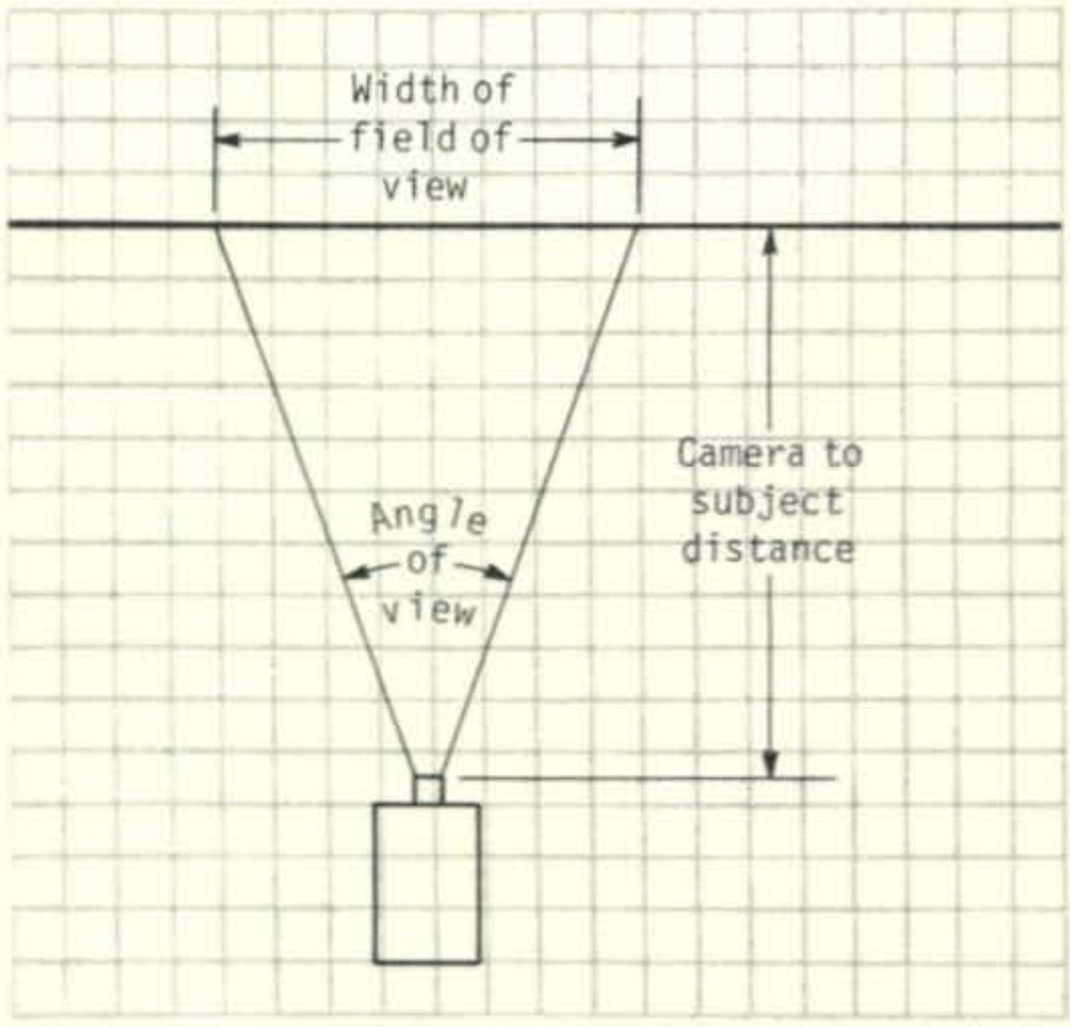


Fig. 2—Angle of view determined by plotting camera performance "to scale" on graph paper.

without discomfort, but specular reflections may still be a problem.

Another requirement is that the subject be uniformly illuminated. Ceiling lights could produce top to bottom shading, for example. A spotlight might produce a "hot" center and dark edges. With proper lighting, a uniform grey surface would generate a uniform video level at the output of a perfect camera. Your monitor is a good guide to this, but perfectionists will want to check the uniformity of video level with a scope. Large area light sources generally help the shading problem.

The final requirement is that the subject be illuminated with a sufficient quantity of light to get a good signal-to-noise ratio from the camera. Even if the camera has automatic light level control, there is a lower limit. It's possible to make rough extrapolations on the basis of wattage and distance. Take a single lamp and move it to a distance that gives adequate light. As an example, let's assume that a 100 watt bulb at 3 feet from the subject is sufficient. Since the light level falls off as the square of the distance from the source, 400 watts would be needed at a distance of 6 feet, 1600 watts at 12 feet, etc. This only applies when comparing the same general type of bulb. Photo-flood lamps (particularly the tungsten-halogen "Sun gun" type) and fluorescent lamps give considerably more light per watt than ordinary household bulbs.

Room lighting during reception is the other major division of the lighting problem. For years I kept the room lights on and used a

[*Continued on page 78*]

Rules: 1973 *CQ* World-Wide DX Contest

Phone: October 27-28 & C.W.: November 24-25
Starts 0000 GMT Sat. Ends 2400 GMT Sun.

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 thru 28 mHz.

III. TYPE OF COMPETITION: 1. Single Operator. Single Band & All Band.

2. Multi-Operator (all band operation only).

a. Single Transmitter (only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception*: Stations may be worked on different bands during the same time period only if they are new multipliers.

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

IV. NUMBER EXCHANGE: PHONE: RS report plus zone (i.e.: 5705). C.W.: RST report plus zone (i.e.: 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. (*Exception*: For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: The final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, Australia and Asiatic USSR.

All scores will be published. To be eligible for an award a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES: Handsome trophy awards will be made to the highest scoring stations in the following categories.

Single Operator, Single Band Trophy Donors

1. World—Phone (*Dr. Harold Megibow, K2HLB Memorial—N. Jersey DX Assoc.*)
2. World—C.W. (*Earl Lucas, W2JT Memorial—N. Jersey DX Assoc*).
3. Canada—Phone (*Gene Krehbiel, VE6TP*)
4. Carib./C.A.—Phone (*G. Kuether, HR2GK*)
5. So. America—Phone (*Brazil DXers*)
6. Europe—14mHz—C.W. (*Tom Martin, G2LB Memorial-From his friends*).

Single Operator, All Band Trophy Donors

7. World—Phone (*Bill Leonard, W2SKE*)
8. World—C.W. (*Larry LeKashman, W8AB*)
9. USA—Phone (*Potomac Valley Radio Club*)
10. USA—C.W. (*Frankford Radio Club*)
11. Canada—Phone (*Jack Baldwin, VE3BS*)
12. Europe—Phone (*W4BVV Operators*)
13. Europe—C.W. (*W3AU Operators*)
14. Carib./C.A.—Phone (*Harold Fox, W3AA*)
15. Carib./C.A.—C.W. (*Harold Fox, W3AA*)
16. Africa—Phone (*Gordon Marshall, W6RR*)
17. Africa—C.W. (*Gordon Marshall, W6RR*)
18. Asia—Phone (*Japan CQ Magazine*)
19. Asia—C.W. (*Japan CQ Magazine*)
20. Oceania—Phone (*No. Calif. DX Club*)
21. Oceania—C.W. (*Maui A.R.C.*)

Multi-Operator, Single Trans. Trophy Donors

22. World—Phone (*John Knight, W6YY*)
23. World—C.W. (*Anthony Susen, W3AOH*)
24. Canada—Phone (*Calgary A.R.A.*)

Multi-Operator, Multi Trans. Trophy Donors

25. World—Phone (*Radio Club Venezolano*)
26. World—C.W. (*Hazard Reeves, K2GL*)

Contest Expedition Trophy Donors

27. World—Phone (*Stuart Meyer, W2GHK*)

CQ World Wide DX Contest CQ

Last Full Weekend of October (Phone) & November (CW)

Page 8 of 15 Pages

Call Sign: W1MDO ☐ Phone ☒ CW Leg for: 21 MC Band

(use separate log for each band)

DATE GMT	TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RECEIVED	INDICATE MULTIPLIERS ONLY ZONE	INDICATE MULTIPLIERS ONLY COUNTRY	QSO POINTS
NOV 24, 1973	1405	G3HCT	58905	57914	14	ENGLAND	3
	08	DL9PP	579	58914		GERMANY	3
	11	DM2ATD	579	57914		EAST GERMANY	3
	20	UB5WP	599	59916	16	UKRAINE	3
	23	W1WY	579	59905	05	U.S.A.	0
	25	G4RJ	569	57914			3
	32	OH8RC	579	59915	15	FINLAND	3
	40	VE5US	599	59904	04	CANADA	2
	45	DL0WX	589	58914			3
	47	YO8DD	579	57920	20	ROMANIA	3
	1500	4Z4HF	589	58920		ISRAEL	3
	2215	WA6GLD	599	59903	03		0
	17	KV4FZ	599	59908	08	VIRGIN ISLANDS	2
	19	YV5BPJ	599	59909	09	VENEZUELA	3
	28	W4WSF	589	58904			0
	31	KH6IJ	589	59931	31	HAWAII	3
	46	JA8MM	569	57925	25	JAPAN	3
	48	JA3WCZ	579	56925			3
	52	JH1RCJ	579	57925			3
	2300	KL7MF	589	57901	01	ALASKA	2
NOV 25, 1973	1315	OH2BM	599	58915			3
	17	HB9AG	579	58914		SWITZERLAND	3
	24	UA1DZ	579	57916		EUR. RUSSIA	3
	29	~~4Z4HF~~	~~589~~	~~57920~~		DUPLICATE	0
	32	G3FXB	599	59914			3
	1600	PJ0CC	599	59909		NETH. ANT.	3
	05	ZD3Z	589	58935	35	GAMBIA	3
	17	CR6CA	579	59936	36	ANGOLA	3
	1820	F9FF	579	57914		FRANCE	3
	22	~~KV4FZ~~	~~599~~	~~59908~~		DUPLICATE	0
	28	OK2TA	579	57914			3
	32	KG1JA	579	58940	40	GREENLAND	2
	35	TF2WFZ	589	57940		ICELAND	3
	50	ZS5QU	599	58938	38	SOUTH AFRICA	3
	2130	JA5SZ	579	57925			3
	35	~~PA9WCZ~~	~~569~~	~~58925~~		DUPLICATE	0
	38	JA9MF	569	57925			3
	2200	VK2EO	589	58930	30	AUSTRALIA	3
	24	KA2AB	599	57925			3
	58	VS6DO	569	57924	24	HONG KONG	3
		37	TOTALS (This Page Only)		18	25	98
		QSO's (minus duplicates)			(Zones)	(Countries)	(Points)

Note: Duplicate QSO's can cause disqualification!

CQ Form 10568 (Rev. Aug. 1969)

A sample log page—40 QSO's to a page. You may work your own country for multiplier credit, but receive NO QSO points. Logs must be checked for duplicate QSO's.

Year: 1972

CQ World Wide DX Contest CQ

Last Full Weekend of October (Phone) & November (CW)

Call Sign: W6DGH Country: U.S.A.

Single Operator: ☒ Phone ☐ CW ☐ Single Band ☒ All Band

Multi-Operator (All Band Only): ☐ Single Transmitter ☐ Multi-Transmitter

	QSO's (minus duplicates)		QSO Points		Zone Multiplier		Country Multiplier		Score	
1.8 mc	1	→	0	×	1	+	1	=		1.8 mc
3.5 mc	46	→	116	×	19	+	30	=		3.5 mc
7.0 mc	49	→	130	×	18	+	23	=		7.0 mc
14 mc	164	→	458	×	33	+	67	=		14 mc
21 mc	578	→	1714	×	31	+	69	=		21 mc
28 mc	175	→	495	×	27	+	59	=		28 mc
All Bands	1013	→	2913	×	129	+	249	=	1,101,114	All Bands

How to score: QSO Points x (Zones + Countries) = FINAL SCORE

EXAMPLE: 1000 QSO Points x (30 Zones + 70 Countries) = 100,000 points

Station Description: KWS-1 75A-3

Antennas: 2-L(40) 4-L(20) 7-L(15) 5-L(10) DIPOLES (80-160) 2-L QUAD 10-15-20

Operators:

Remarks (Biggest thrill in Contest, funniest story, comments, etc.): TOUGH GOING HERE ON THE WEST COAST!

Club Competition (Minimum 3 logs): SOUTHERN CALIFORNIA DX CLUB

This is to certify that in this contest I have operated my transmitter within the limitations of my license and have observed fully the rules and regulations of the contest.

Type or Print (Signature): Richard J. Norton

Name: RICHARD T. NORTON Call: W6DGH

Address: 21290 WEST HILLSIDE DRIVE

City: TOPANGA

State or Country: CALIFORNIA (Zip): 90290

Logs must be postmarked no later than December 1st for PHONE and January 15th for CW. Indicate PHONE or CW on envelope.

Mail to: CQ Contest Committee, 14 Vanderventer Ave., Port Washington, N.Y., U.S.A. 11050

Note: Duplicate QSO's can cause disqualification!

CQ Form 10574 (Rev. 1969)

A sample summary sheet. Free summary sheets, log pages and zone maps may be obtained upon receipt of a large s.a.s.e. or, if outside the U.S., sufficient IRC's

28. World—C.W. *(Donald Miller, W9WNV)*

CQ will award championship plaques to stations ineligible for a trophy.

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the *CQ* plaque awards).

The Canadian, Carib. C.A. and the African awards are for residents *only*.

X. CLUB COMPETITION: *CQ* will award a handsome plaque to the club submitting the highest aggregate score of the phone and c.w. scores submitted by its members.

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area, (except for DX-peditions especially organized for operation in the contest and manned by members.

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

4. Participating members must indicate the name of their club on their Summary Sheets.

XI. LOG INSTRUCTIONS: 1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers, and recopied logs must be in their original form with corrections clearly shown.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary Sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

6. Official log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available, make up your own by following the samples shown, 40 contacts to the page on 8½" x 11" paper.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct; taking credit for duplicate contacts; incorrect QSO's or incorrect multipliers will be deemed sufficient cause for disqualification.

Disqualification can also result in the disqualified operator(s) being barred from competition in all *CQ* contests for a period of up to three years.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1973, for the Phone section and January 15, 1973 for the C.W. section. In rare isolated areas the deadline will be made more flexible. Indicate phone or c.w. on envelope. Logs go to:

CQ WW Contest Committee
14 Vanderventer Avenue
Port Washington, L.I., N.Y. USA 11050

(Please circulate this information to your DX friends and radio clubs)

CQ World-Wide DX Contest
ALL-TIME PHONE RECORDS

BY FRED CAPOSSELA, JR., W2IWC

In the records listed below, boldface listings denote world records. Number groups after calls are: year of operation, total score, contacts,

Single Operator/Single Band
WORLD RECORD HOLDERS

1.8	**KV4FZ ('72)**	**8,050**	**168**	**8**	**15**
3.5	**VE3MR/4X ('71)**	**197,106**	**742**	**22**	**69**
7.0	**HR1RF ('72)**	**399,542**	**1349**	**28**	**93**
14	**KV4FZ ('71)**	**1,208,180**	**2680**	**40**	**153**
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	**KG6SL ('72)**	**933,577**	**2467**	**33**	**94**

AFRICA

1.8	No Entrant				
3.5	CN8HD ('72)	55,366	303	13	49
7.0	ZS6DW ('69)	1,144	20	12	14
14	ET3DS ('71)	1,026,480	1957	35	147
21	9F3USA ('71)	455,400	1035	33	117
28	CR6CN ('72)	650,160	1737	31	95

ASIA

1.8	No Entrant				
3.5	**VE3MR/4X ('71)**	**197,106**	**742**	**22**	**69**
7.0	VE3MR/4X ('72)	215,840	643	27	88
14	UA9DN ('69)	699,105	1478	39	126
21	JA1RJW ('69)	379,136	1197	37	91
28	4X4JU ('69)	570,836	1522	34	99

EUROPE

1.8	GM3YCB ('71)	4,590	253	4	14
3.5	LAØAD ('70)	80,754	757	20	66
7.0	SM5BPJ ('69)	138,061	622	30	91
14	G5AAM ('67)	824,344	1634	39	144
21	G3HCT ('69)	832,016	2124	37	112
28	DL4PM ('68)	614,544	1858	34	84

NORTH AMERICA

1.8	**KV4FZ ('72)**	**8,050**	**168**	**8**	**15**
3.5	VE3ZZZ ('71)	83,997	491	26	55
7.0	**HR1RF ('72)**	**399,542**	**1349**	**28**	**93**
14	**KV4FZ ('71)**	**1,208,180**	**2680**	**40**	**153**
21	VE3MR ('69)	550,212	1292	39	117
28	KP4AST ('70)	630,180	2010	31	104

OCEANIA

1.8	No Entrant				
3.5	KH6EPW ('66)	5,040	82	10	11
7.0	VK6CT ('71)	96,050	397	27	58
14	VK6HD ('72)	706,251	1483	37	132
21	KG6AQY ('70)	749,529	2353	32	72
28	**KG6SL ('72)**	**933,577**	**2467**	**33**	**94**

SOUTH AMERICA

1.8	No Entrant				
3.5	YV4AGP ('72)	72,666	388	18	48
7.0	4M1BI ('72)	155,664	604	26	69
14	PY4AP ('71)	1,012,506	1979	36	138
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	YV1LA ('68)	664,560	1898	33	87

Single Operator/All Bands

AF	ZD8Z ('68)	4,184,680	3210	122	327
AS	UW9WR ('72)	2,531,694	2207	108	323
EU	EA4LH ('72)	2,744,119	2399	125	344
NA	KV4FZ ('70)	4,961,551	4362	128	369
O	KH6RS ('72) (Opr: K2SIL)	5,331,072	4739	128	256
SA	4M4UA ('72) (Opr: W6BHY)	5,409,315	4104	128	331

WORLD RECORD

Station	Band	Contacts	Zones	Countries
4M4UA Opr. W6BHY (1972) 5,409,315	1.8	2	2	2
	3.5	128	13	28
	7.0	366	22	58
	14	1017	35	99
	21	1388	29	68
	28	1203	27	76
	Total	4104	128	331

Multi-Operator/Single Xmtr*

AF	IG9BAF ('72)	3,118,072	2792	95	293
AS	UK9ABA ('72)	3,813,066	2219	144	434
EU	UK3AAO ('72)	3,883,008	2939	137	375
NA	VE1ASJ ('72)	2,574,318	2521	121	305
O	KH6EDY ('72)	1,814,400	2956	84	126
SA	**PJ1AA ('72)**	**4,206,341**	**3405**	**115**	**304**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJ1AA (1972) 4,206,341	1.8	—	—	—
	3.5	172	11	28
	7.0	371	21	46
	14	1148	35	86
	21	607	25	75
	28	1107	23	69
	Total	3405	115	304

Multi-Operator/Multi-Xmtr

AF	ZD3X ('72)	14,501,872	8571	141	455
AS	4Z4HF ('71)	6,106,290	3994	125	409
EU	OH5SM ('69)	11,593,925	6771	153	526
NA	PJØMM ('68)	7,037,658	6406	134	343
O	KS6DH ('72)	5,488,856	5304	116	242
SA	**PJØDX ('69)**	**17,613,400**	**9270**	**156**	**488**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJØDX (1969) 17,613,400	1.8	36	4	8
	3.5	452	22	60
	7.0	929	24	70
	14.0	2739	39	146
	21.0	2699	35	116
	28.0	2415	32	88
	Total	9270	156	488

Club Record: Potomac Valley Radio Club ('69) 44, 441, 644

CQ World-Wide DX Contest
ALL-TIME C.W. RECORDS

MEMBER, CQ CONTEST COMMITTEE

zones, and countries. All-band and Multi-Operator records include a band-by-band breakdown of the world leader in each category.

Single Operator/Single Band WORLD RECORD HOLDERS

1.8	**ZF1GS ('72)**	**11,124**	**203**	**10**	**17**
3.5	**DL7AV ('72)**	**110,424**	**759**	**23**	**63**
7.0	**KV4FZ ('71)**	**420,546**	**1440**	**28**	**91**
14	**KV4FZ ('70)**	**908,514**	**2315**	**36**	**117**
21	**CW9BT ('72)**	**696,133**	**2068**	**31**	**82**
28	**CX1AAC ('70)**	**681,636**	**1711**	**36**	**93**

AFRICA

1.8	No Entrant				
3.5	CN8DW ('70)	15,759	153	9	26
7.0	5A1TW ('64)	227,814	918	22	64
14	1G5A ('66)	792,370	1594	37	133
21	TJ1AW ('70)	549,888	1447	35	93
28	CR6IK ('69)	498,800	1439	36	80

ASIA

1.8	ZC4RB ('67)	4,335	86	3	14
3.5	UG6AD ('70)	76,012	436	13	49
7.0	4X4FA ('64)	174,505	781	25	60
14	HL9KH ('63)	339,920	910	37	103
21	KA6AY ('72)	284,688	920	30	78
28	HZ1AB ('68)	132,390	578	21	55

EUROPE

1.8	GM3WDF ('72)	5,280	206	6	15
3.5	**DL7AV ('72)**	**110,424**	**759**	**23**	**63**
7.0	LAØAD ('71)	177,450	851	31	74
14	SM4CMG ('71)	367,356	1172	38	100
21	G3HCT ('70)	317,312	924	38	96
28	DL4AAP ('57)	253,680	728	36	84

NORTH AMERICA

1.8	**ZF1GS ('72)**	**11,124**	**203**	**10**	**17**
3.5	W1MX ('72)	80,410	329	22	64
7.0	**KV4FZ ('71)**	**420,546**	**1440**	**28**	**91**
14	**KV4FZ ('70)**	**908,514**	**2315**	**36**	**117**
21	WA8LYF ('70)	286,767	756	35	94
28	K1JGD ('68)	158,510	520	28	82

OCEANIA

1.8	KH6CHC ('72)	1,458	54	5	4
3.5	KH6HCM ('70)	11,286	200	10	6
7.0	VK3ANP ('72)	126,996	559	25	51
14	VK3APJ ('67)	422,240	1150	35	95
21	VK6HD ('71)	531,354	1576	32	82
28	VK8UG ('67)	320,008	1048	32	72

SOUTH AMERICA

1.8	YV1OB ('70)	1,656	63	4	5
3.5	YV5AW ('72)	65,000	426	15	37
7.0	YV5AW ('70)	87,730	476	17	45
14	PY4AP ('71)	836,250	1874	37	113
21	**CW9BT ('72)**	**696,133**	**2068**	**31**	**82**
28	**CX1AAC ('70)**	**681,636**	**1711**	**36**	**93**

Single Operator/All Bands

AF	**ZD3Z ('72) (Opr: OH2MM)**	**3,504,492**	**3518**	**99**	**234**
AS	UK9ABA ('70)	1,719,663	1366	124	327
EU	OH5SE ('69)	1,419,186	1374	124	298
NA	KV4FZ ('69)	2,719,152	2867	127	287
O	KH6RS ('72) (Opr: W6MAR)	2,748,307	2990	121	190
SA	9Y4AA ('69)	3,088,968	2623	123	279

WORLD RECORD

Station	Band	Contacts	Zones	Countries
ZD3Z Opr. OH2MM (1972) 3,504,492	1.8	—	—	—
	3.5	127	13	24
	7.0	355	13	30
	14	989	30	65
	21	997	25	55
	28	1035	18	60
	Total	3518	99	234

Multi-Operator/Single Xmtr*

AF	No Entrant				
AS	UK9AAZ ('72)	1,102,960	1137	96	244
EU	UK5IAZ ('72)	2,112,240	1885	140	380
NA	K1DIR ('72)	1,985,310	1401	133	353
O	VK4VU ('72)	621,712	1094	72	124
SA	**PJ2VD ('72)**	**2,400,664**	**2489**	**98**	**228**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJ2VD (1972) 2,400,664	1.8	—	—	—
	3.5	295	12	27
	7.0	340	18	39
	14	660	28	61
	21	706	20	51
	28	488	20	50
	Total	2489	98	228

Multi-Operator/Multi-Xmtr

AF	ET3FMA ('67)	1,387,680	1476	105	231
AS	VU2IRA ('70)	2,273,616	2128	125	307
EU	OH2AM ('68)	4,118,688	3277	155	412
NA	W4BVV ('70)	5,552,352	3056	158	456
O	KS6DY ('72)	1,335,565	2153	87	127
SA	**PJØFC ('70)**	**11,586,428**	**7090**	**150**	**401**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
PJØFC (1970) 11,586,428	1.8	92	8	8
	3.5	668	17	46
	7.0	1338	26	75
	14.0	1974	34	109
	21.0	1641	34	84
	28.0	1377	31	79
	Total	7090	150	401

*Because of significant changes in rules for Multi-Op./Single Trans. stations, records date from 1972 test.

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

WITH apologies to Copthorne Mac Donald, we would like to slightly infringe on his area this month. Several readers have written to us regarding the suitability of various surplus CRT's for their SSTV setups, flying spot scanners, and oscilloscopes, and the questions almost always wind up with phosphor characteristics. We have therefore compiled a list of as many of the registered phosphors as we can find and hope that this list will answer all current and future phosphor questions. Since most amateurs have no real interest in the material used for the phosphors and other sundry data, we have listed only those parameters of most interest.

In the following chart, the initial color is the color shown at the exact point that the electron beam is hitting the screen and the persistent color is the one shown after the beam has left the point of contact. The class is a general description of persistence with "Very Long" being more than one second, "Long" being .1 to 1 second, "Medium" being .001 to .1, "Medium Short" being 10 micro-seconds to .001 seconds, "Short" being 1 to 10 micro-seconds, and "Very Short" being less than 1 microsecond. Persistence time is the time for the trace to drop to 10% of the initial value. Now to the data! See chart on opposite page.

I sincerely hope the data will be of use to prospective CRT purchasers and should cover about 99% of the tubes offered on the surplus market.

New Literature And Devices

We have received two new publications from International Rectifier Corporation, Semiconductor Division, 233 Kansas Street, El Segundo, California, 90245, that will be of interest to our readers. One of these, *#JD558* is IR's 1973-1974 commercial products catalog which lists, with prices and technical information, all semiconductors and components made by the company, including their 66 piece TR-series designed to replace up to 40,000 listed transistors. Included in this catalog is also a line of fiber-optic kits and accessories, component assortment kits, $1.10 (single quantity) 5 watt zeners, and a host of other devices.

The second International Rectifier publication is *#JD559*. This is a complete—and we mean complete!—cross reference/interchangeability guide listing over 43,000 domestic and foreign semiconductors and their IR equivalent. If you have ever tried to find a substitute for "odd-balls" such as NEA15X133's or ERV-02F-2150's, this is the place to look!

Both books are available at no charge from the company (mention *CQ*) or from International Rectifier distributors.

On the semiconductor market, there are several interesting items to report on this month. Exar, 733 No. Pastoria Avenue, Sunnyvale, California, 94086, has a new VCO DIP IC, their XR-2207, which can produce square, triangular, pulse or sawtooth waveforms at frequencies of from .01 Hz to 1 mHz. This makes them ideal for tone generators, FSK generators and waveform synthesizers. The chip may be switched by TTL inputs, and can also be used as a linear f.m. generator (up to 1 mHz), precision sweep generator, or linear voltage to frequency converter. Details are too numerous to go into at this time but a data sheet will explain all. Price, incidentally, in 100 quantities, is as low as $2.50 for a commercial plastic package.

RCA has introduced a new power operational amplifier which is quite unique. With an output of 100 watts (the device is actually designed for audio amplifier use, but think of the op-amp circuitry you could build). The TA-8651A comes in a special 10 lead heat sink compatible package and costs $12.90 in lots of 100.

Also from RCA (Solid State Division, Route 202, Somerville, New Jersey 08876) are several other devices. The CA3095E is a high-beta unit with an h_{FE} rating of over 1000 and three independent 50 ma NPN transistors is a single chip for $3.75 each (100 quantity). The CA3096E is a transistor array consisting of 5 transistors with all leads brought out separately. Three are NPN and two are PNP. All five are general purpose devices. Cost for the CA3096E in 100 quantity is $1.50.

A final offering from RCA is in the TV area. Their CA2111AE is an f.m. i.f. amplifier, limiter and quadrature detector that may be of use for general purpose amateur f.m. detection, as cost is only $1.05 for 100 piece quantities and full limiting occurs at 2.5 μVolts when the i.f. is 4.5 mHz. A.m. rejection is 45db and provision is made for low drift a.f.c. Our final item this month is a good example of Large Scale Integration. SGS-ATES Semiconductor, 435 Newtonville Ave., Newtonville, Mass. 02160 has introduced a 40 pin DIP, their M003, which contains a four decade up-down counter internally connected as two

[*Continued on page 74*]

*5 Melville Lane, Great Neck, N.Y. 11023.

Phosphor Number	Initial Color (Fluorescent)	Persistent Color (Phosphorescent)	Class	Persistence Time	Applications
P1	Green	Green	Medium Short	24 msec	Scopes
P2	Yellow-Green	Yellow-Green	Medium Short	36 μsec	General Purpose
P3	Yellow	Yellow	Medium Short	20 msec	General Purpose
P4	White	White	Medium Short	60 μsec	Television
P5	Blue	Blue	Medium Short	16 μsec	High Speed Photography
P6	White	White	Medium Short	.8 msec	Rotating Filter Wheel color TV
P7	Blue-White	Yellow-Green	Long	.3 sec	RADAR, SSTV
P8) P9)	Similar to P7 but never designated for commercial tubes				
P10	—	Magenta	Very Long	5 sec	Special Purpose Radar
P11	Blue	Blue	Medium Short	80 μsec	CRT Photography
P12	Orange	Orange	Long	.2 sec	Radar
P13	Red	Red	Medium	50 msec	Night Radar
P14	Purple-Blue	Yellow-Orange	Medium	5 msec	Radar
P15	Blue-Green	Blue Green	Short	3 μsec	Flying spot Scanners, Scopes
P16	Blue-Purple-UV	Blue-Purple-UV	Very Short	.5 μsec	Flying Spot Scanners
P17	Green-Yellow	Yellow	Long	.5 sec	Radar SSTV
P18	White	Blue	Medium	13 msec	Radar TV Scopes
P19	Orange	Orange	Long	.2 sec	Night Radar
P20	Yellow-Green	Yellow-Green	Medium Short	.4 msec	CRT Photography
P21	Yellow	Yellow	Very Long	3 sec	Radar
P22	Tri-Color	Tri-Color	Medium Short	25 msec	Color TV
P23	White	White	Short	10 μsec	Color TV, Flying Spot Scanners
P24	Green	Green		1.5 μsec	Color TV, Flying Spot Scanners
P25	Orange	Orange	Medium	45 msec	Night Radar
P26	Orange	Orange	Very Long	1.8 sec	Radar
P27	Red-Orange	Red-Orange	Medium	27 msec	Color TV Monitors
P28	Yellow-Green	Yellow-Green	Long	70 msec	Radar
P29	Data not available				
P30	Data not available				
P31	Green	Green	Medium Short	30 μsec	Scopes
P32	Purple-Blue	Yellow-Green	Long	.7 sec	Radar
P33	Orange	Orange	Very Long	3.8 sec	Radar
P34	Blue-Green	Yellow-Green	Very Long	100 sec	Visual Storage
P35	Data not available				
P36	Yellow-Green	Yellow-Green	Very Short	.25 μsec	Photographic Recording
P37	Blue	Blue	Very Long	.16 μsec	Flying Spot Scanners
P38	Orange	Orange	Very Long	1 sec	Radar
P39	Yellow-Green	Yellow-Green	Long	.15 sec	Radar
P40	White Green	Yellow-Green Green	Long	.5 sec .2 sec	Displays Radar
P41	Yellow-UV	Yellow	Very Short	.12 μsec	UV CRT Applications
P42	Yellow-Green	Yellow-Green	Medium	8 msec	Computer Displays
P43	Yellow-Green	Yellow-Green	Medium	1.2 msec	Radar
P44	Yellow-Green	Yellow-Green	Medium	1.2 msec	Radar
P45	White	White	Medium	1.8 msec	Radar

Range Effects During Oscar Passes

BY DALE W. COVINGTON,* K4GSX

A RICH variety of physical phenomena operate upon signals received from orbiting satellites such as OSCAR 6. Amplitude fluctuations in signal strength may arise from such factors as:

(1) Satellite traversal of the lobes in the ground station antenna pattern.

(2) Changes in the slant range distance.

(3) Satellite rotation.

(4) Faraday rotation.

(5) Variations in the physical parameters describing the signal path through the atmosphere and ionosphere.

The following discussion specifically concentrates on item 2, signal modulation produced by range effects and related compensation techniques. It should be noted that the general characteristics of the ground station antenna pattern associated with item 1 can be estimated from the antenna type, orientation and height above ground. Items 3, 4 and 5 involve a detailed knowledge of the relative satellite motion and the physical properties of the media along the signal path.

*281 Vance Circle, N.E., Marietta, Ga. 30060

Slant Range Effects

Figure 1 shows part of the circular orbit of satellite *S* passing directly over a ground observer *O*. Orbit and Earth radii are indicated by *R*S and *R*E, respectively. During a pass the slant range distance *R* between *O* and *S* varies from a maximum value when the satellite just appears on the horizon to a minimum value R_{min} at the zenith point directly over the observer. Since the Earth and orbit radii are known, the exact value of the slant range distance can be computed for any angle of elevation measured between the satellite and the horizon.

The far field power density of the radio wave emitted by the satellite antenna decreases inversely as the square of the distance from the satellite. Therefore the change in range distance as the satellite passes by causes signal levels to fluctuate. The received

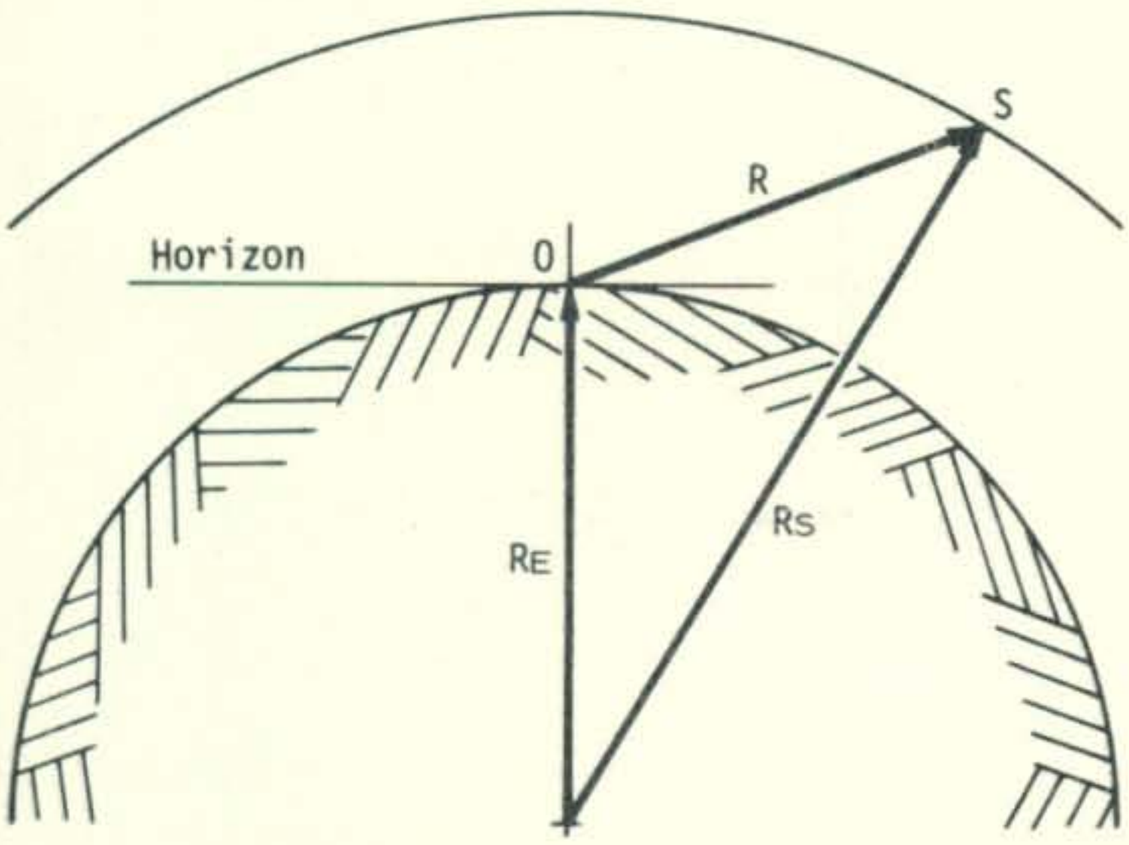


Fig. 1—Schematic view of satellite S in a circular orbit passing over a ground based observer at 0. R_S and R_E denote the orbit and Earth radii, respectively.

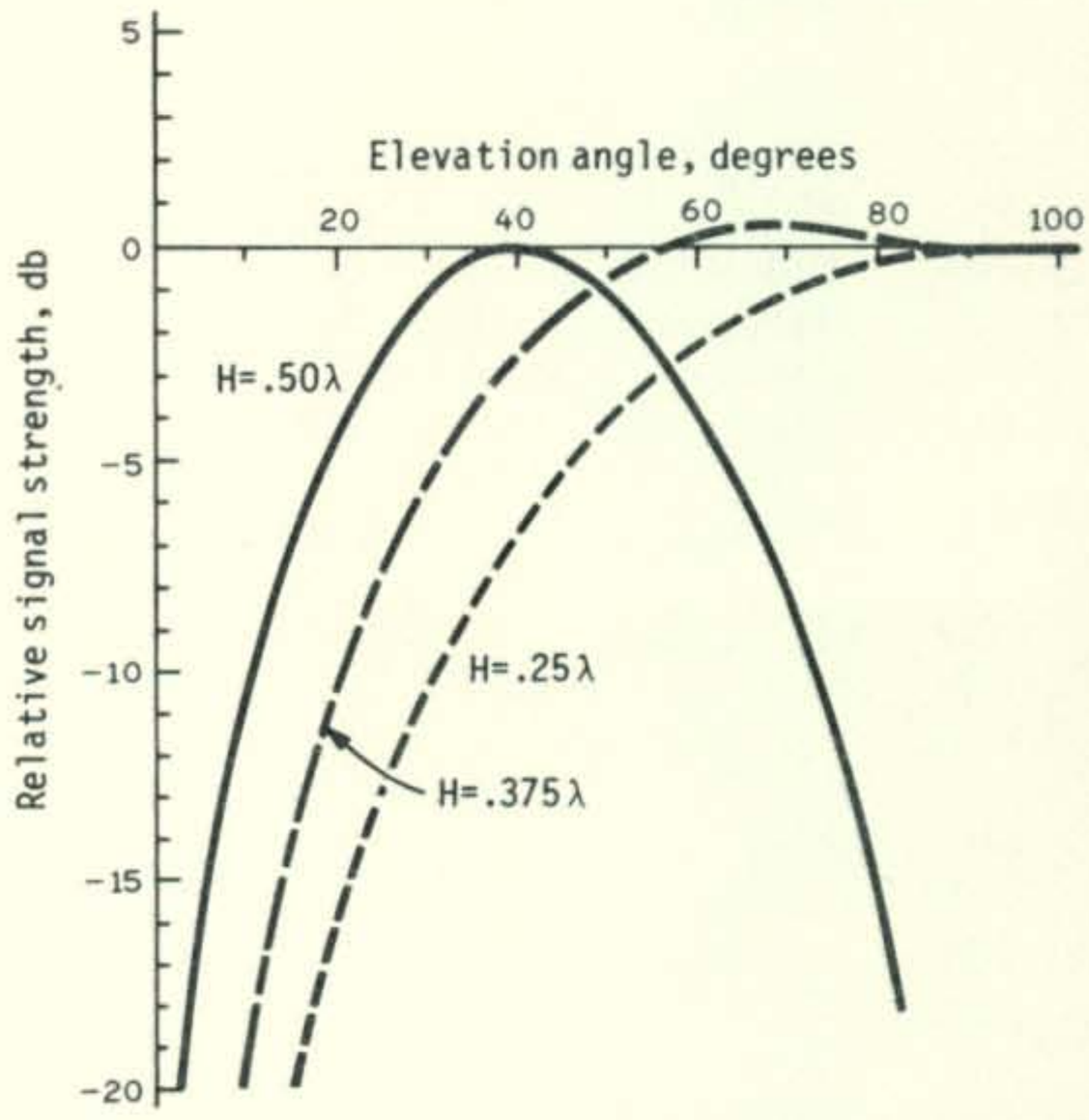


Fig. 2—Range effects upon signal strength (in db) versus the angle of elevation between the horizon and the satellite. The curve shown is applicable for Oscar 6 since the numerical calculation assumed a circular satellite orbit at an altitude of 910 miles.

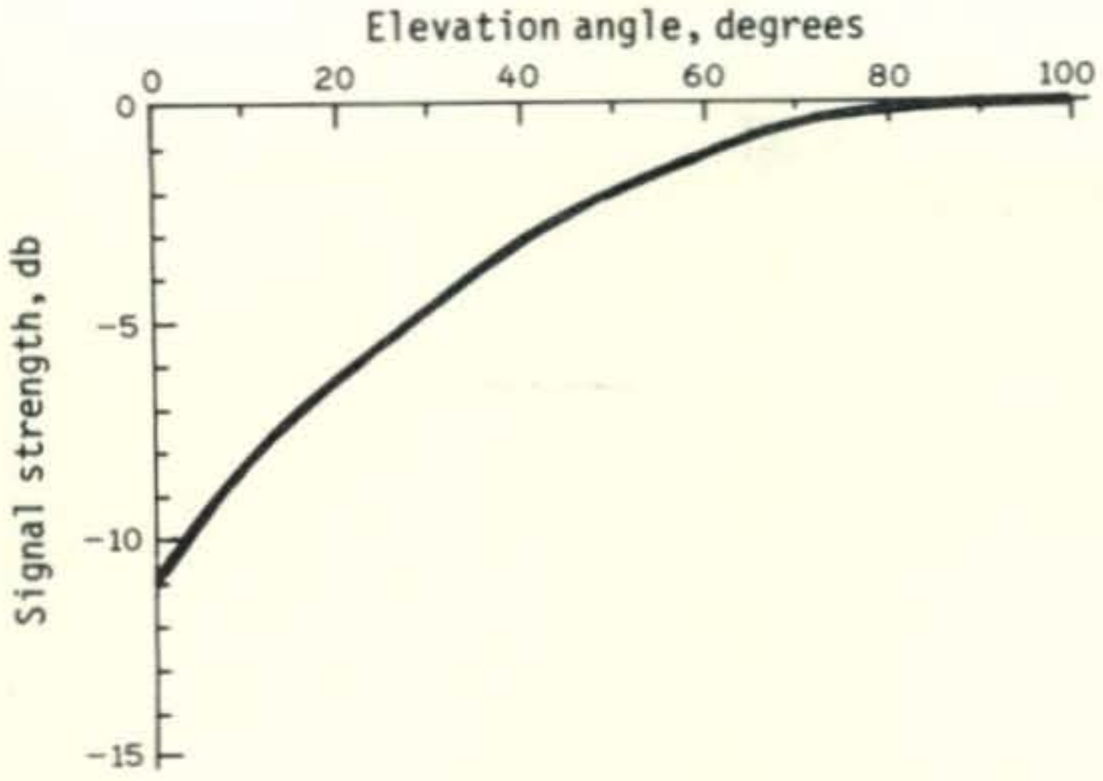


Fig. 3—Relative signal strength variation due to range and vertical plane pattern effects for horizontal turnstile antennas versus the angle of elevation between the horizon and the Oscar 6 satellite. Theoretical curves are drawn for antenna heights *H* of 0.25, 0.375 and 0.50 wavelength above perfect ground. The curves are useful for comparing the relative signal response as elevation angle varies during a pass but they do not purport to show absolute gains at different antenna heights.

power density P at range R is mathematically defined in terms of the maximum power density P_{max} at the minimum range R_{min} by the following equation:

$$\frac{P}{P_{max}} = \frac{R_{min}^2}{R^2}$$

Using this equation signal levels can be directly related to the slant range which in turn depends upon the angle of elevation. Graphical results of the numerical calculations are plotted in fig. 2 for orbital parameters similar to those of OSCAR 6.

Basically fig. 2 indicates that range effects cause signals to become louder as the satellite moves higher in the sky. The maximum signal change for an overhead pass is approximately 11 db. Effects are less pronounced on other passes. For example if the maximum angle of elevation for an orbit is 25 degrees, signals would peak approximately 5.5 db above signals acquired near the horizon.

Compensation Techniques

By combining the results of fig. 2 with the ground station antenna pattern, the composite effect of these two sources of amplitude modulation can be evaluated at various points along the path of an orbital pass. It is then possible with this information to explore compensation techniques. An illustration of the procedure is presented below for horizontal turnstile antennas.

Turnstile antennas formed by feeding two perpendicular dipoles in phase quadrature have vertical plane patterns which are largely independent of the satellite's azimuthal bearing.[1] Attention can thus be focused upon an average vertical plane pattern for any given antenna height. Figure 3 presents the composite curves which sum the vertical plane power density plots[1] and the range effect variation given in fig. 2. Theoretical curves are drawn for three antenna heights above perfect ground of 0.25, 0.375 and 0.50 wavelength. The decreasing antenna response and the increasing slant range at low elevation angles combine to yield a characteristic peaked on the zenith point for an antenna-height less than or equal to 0.25 wavelength. A height of 0.375 wavelength clearly extends the region of uniform signal strength during a pass. Even for an overhead pass, fig. 3 predicts that signal levels should remain constant within one S unit during that part of the pass defined by elevation angles larger than 28 degrees. Antenna heights of 0.50 wavelength or greater do provide a better DX capability at low angles of elevation. The high elevation angle nulls in the patterns for such antennas are partially compensated by a decreased slant range distance.

Conclusions

Slant range effects alone cause the level of OSCAR 6 signals to vary by almost 11 db during overhead passes. As shown in fig. 2, compensation of slant range attenuation requires a ground station antenna pattern which develops increasing gain as the elevation angle becomes smaller. The results of the study on horizontal turnstiles indicate that an antenna height of 0.375 wavelength does achieve this over a considerable portion of the sky above the antenna. More complete coverage can be obtained by switching in a higher antenna as the satellite approaches the horizon. ■

[1]Covington, D. W., "Satellite Turnstiles," *CQ* Dec. 1972, p. 22.

CQ'S DIAL-A-PROP

For the latest up to the minute propagation forecasts and special contest predictions call 516-883-6223 any time day or night for a recorded message on conditions.

CQ World-Wide DX Contest
ALL-TIME U.S.A. RECORDS

Tabulated below are the record-high scores achieved over the years by U.S. contesters in all the various divisions of competition in the *CQ* World Wide DX Contest. All-Time World-High scores are shown on pages 48 and 49. Number groups following calls and bands are: year of operation, total score, contacts, zones, and countries.

PHONE

Single Operator/Single Band

1.8	K1PBW ('69)	299	13	5	8
3.5	K8YWG ('66)	26,492	149	24	50
7.0	W3PHL ('72)	99,912	316	31	88
14	W4AXE ('70) (Opr: WA4PXP)	595,725	1068	39	156
21	W2AH ('72)	485,605	1129	34	111
28	W2SKE ('68)	429,976	1030	34	108

Single Operator/All Band

Station	Band	QSOS	Zones	Countries
W6RR (1972) 2,350,964	1.8	—	—	—
	3.5	50	18	28
	7.0	164	22	33
	14	297	32	87
	21	949	31	86
	28	360	31	81
	Total	1820	134	315

Multi-Operator/Single Xmtr*

Station	Band	QSOS	Zones	Countries
W7SFA (1972) 2,294,522	1.8	—	—	—
	3.5	69	16	24
	7.0	216	22	35
	14	406	36	88
	21	1004	34	74
	28	260	22	50
	Total	1955	130	271

Multi-Operator/Multi-Xmtr

Station	Band	QSOS	Zones	Countries
WA2ZAA (1969) 6,743,880	1.8	4	3	3
	3.5	127	19	46
	7.0	228	29	78
	14	936	39	138
	21	1183	38	126
	28	1012	33	103
	Total	3490	161	494

CW

Single Operator/Single Band

1.8	K1PBW ('71)	2,914	36	11	20
3.5	W1MX ('72) (Opr: WA1CQW)	80,410	329	22	64
7.0	K6EBB ('72)	228,786	774	31	71
14	W4AXE ('68) (Opr: WA4PXP)	396,414	836	39	123
21	WA8LYF ('70) (Opr: K8HLR)	286,767	756	35	94
28	K1JGD ('68)	158,510	520	28	82

Single Operator/All Band

Station	Band	QSOS	Zones	Countries
W3WJD (1972) 1,527,500	1.8	—	—	—
	3.5	138	20	46
	7.0	215	28	70
	14	295	36	88
	21	323	30	81
	28	150	20	51
	Total	1121	134	336

Multi-Operator/Single Xmtr*

Station	Band	QSOS	Zones	Countries
K1DIR (1972) 1,985,310	1.8	13	6	9
	3.5	110	20	47
	7.0	419	27	79
	14	334	33	84
	21	319	27	75
	28	206	20	59
	Total	1401	133	353

Multi-Operator/Multi-Xmtr

Station	Band	QSOS	Zones	Countries
W4BVV (1970) 5,552,352	1.8	14	4	5
	3.5	173	25	56
	7.0	665	33	86
	14	810	38	122
	21	909	37	107
	28	485	31	80
	Total	3056	168	456

Club Record: Potomac Valley Radio Club ('69) 44, 441, 644

*Because of significant changes in the Multi-Op./Single Trans. rules, records date from the 1972 contest.

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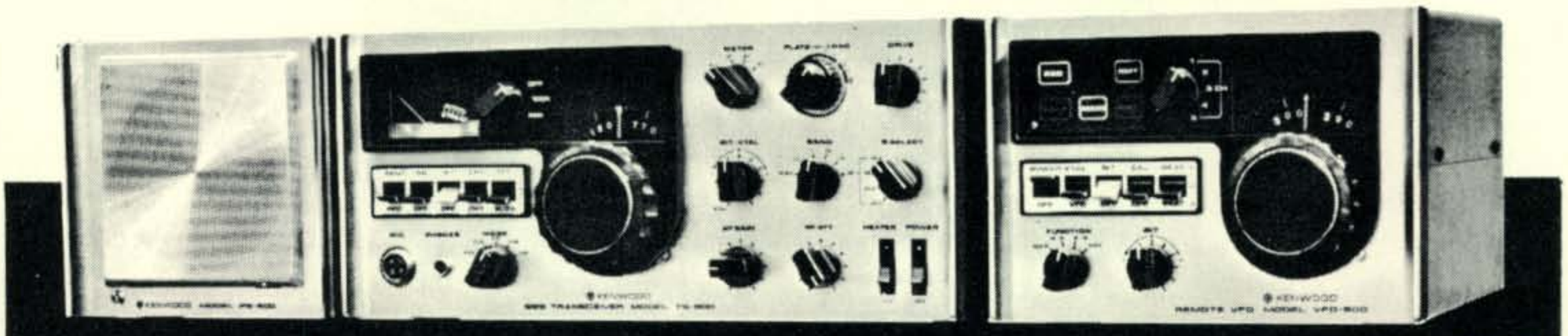

KENWOOD'S SUPERB NEW SOLID STATE SSB TRANSCEIVER

TS-900

FEATURES: • Break - in CW with sidetone • Built - in 100 KHz and 25 KHz crystal oscillator • Built - in RIT and RIT indicator light • Built - in RTTY frequency shift for FSK • Built - in noise blanker • Built - in VOX • Modular construction — repair in or out of equipment • RF AGC to prevent front end overload to strong signals • Completely solid state except final section • 1 KHz readout

GENERAL SPECIFICATIONS: Frequency Range: 3.5 - 30 MHz Amateur Bands and WWV • Mode: SSB, CW, or FSK • Power Output: 150 watts PEP nominal into 50 ohms for SSB, 100 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for FSK • Frequency Stability: Within 100 Hz during any 15 minute period after warmup. Within ± 2 KHz during the first hour after 1 minute of warmup • Receiver Sensitivity: 0.5 microvolts for a 10 db (signal + noise)/noise ratio • Receiver Selectivity: SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down), CW — 0.5 KHz bandwidth (6db down), 1.5 KHz bandwidth (60 db down), (with optional CW filter installed) • Dimensions: 12.6" wide × 5.5" high × 12.6" deep • Weight: 26.5 pounds (32.5 pounds shipping weight) • Price: TS - 900 $795.00, PS - 900 (AC Supply) $120.00, DS - 900 (DC Supply) $140.00, VFO - 900 (Remote VFO) $195.00.

THE KENWOOD R-599 RECEIVER . . . 1.8 to 29.7 MHz (Amateur Bands) • Dial readout to ½ KHz • Special detectors for SSB, AM, and FM • Transceive operation with T-599 • Built-in 100 KHz and 25 KHz calibrators • Built-in 500 cycle CW filter • Provision for 2 meter and 6 meter coverage with accessory self-contained converters • 120/240 VAC or 12 VDC operation • All solid state • R-599 — $389.00 Converters — $31.00 S-599 Speaker — $16.00.

THE KENWOOD T-599 TRANSMITTER . . . Clear, stable, selectable sideband, AM and CW • 4-way VFO flexibility plus RIT when used with the R-599 • Amplified ALC • Built-in VOX • Full metering • Built-in CW sidetone monitor and semi-automatic break-in CW • Built-in power supply for 120/240 VAC operation • Only 3 vacuum tubes • 200 watts PEP input nominal • Full amateur band coverage (3.5 to 30 MHz). T-599 — **$429.00**

✓ NOTE: The TS-511S still sells for the same low price... still the same high quality

THE KENWOOD TS-511S TRANSCEIVER . . . a powerful five band transceiver (3.5 to 30 MHz, amateur bands) for operation on SSB and CW • Built-in VOX • Built-in crystal calibrator • Built-in noise blanker • Receiver Incremental Tuning (RIT) • 1 KHz frequency readout • Eight pole filter • Exceptional stability • Provisions for installation of an accessory high selectivity CW filter • 500 watts PEP input for SSB • .5 μv sensitivity nominal • Full metering — Cathode current (IP), plate voltage (HV), ALC, and relative power output (RF) as well as an S-meter • Amplified ALC • Heavy duty 120 VAC external power supply. TS-511S — $415.00 PS-511S — $105.00 VFO-5SS — $105.00 CW-1 — $39.00

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DX

BY JOHN A. ATTAWAY.* K4IIF

CONTEST TIME is here again and the DX and Contest Departments are cooperating to promote more activity from the rare zones this year. There is particular interest in increasing activity on 40 and 80 meters to give a boost to those DXers working on Single Band WAZ on the low bands.

In July and August mailings were sent to active stations in the rarer zones enclosing log and summary sheets for the *CQ* Worldwide Phone Contest scheduled for the weekend of Oct. 27-28 and the *CQ* Worldwide C.W. Contest scheduled for the weekend of Nov. 24-25, 1973. They were encouraged to participate in the contests and asked to provide us with transmitting and listening frequencies they expect to use, particularly where 40 and 80 meter operation is planned.

A list of these frequencies is being compiled by station and zone and will be distributed to the weekly DX bulletins shortly before the contests. Keep a weather eye toward Geoff Watt's *DX News-Sheet, DX'Press, The DXers Magazine, Long Skip, The Long Island DX-Association Bulletin, The West Coast DX Bulletin* and the many active DX club publications for the appearance of this information.

Good luck in the contests! We hope you win your category and complete a Single Band WAZ as well.

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

WA6AHF and XYL Fern are still top QSL Managers on the California coast.

The Fresno Questionnaire

At the annual Fresno DX Convention an opinion questionnaire was distributed. The answers to some of the questions are quite interesting:

Question	Yes	No	Don't Care
Do you agree that separate listings for Phone DXCC should be dropped?	55	60	25
Do you favor including rocks and atolls on the Countries List?	78	46	9
Do you favor expanding the Countries List to include individual island groups, archipelagos, territories, etc. which are now part of a larger DXCC group, i.e. organizing the Caroline Islands into the 4 individually administered countries (as proposed by *CQ.)*	72	55	13
Would you favor gradual reduction of the present 225 mile limit between countries?	69	63	9
Contests: Would you leave ARRL Contests the way they are?	55	62	7
Would you leave *CQ* Contests the way they are?	86	17	6

Most Needed Countries:

1. FO8—Clipperton
2. YI—Iraq
3. SY1—Mt. Athos
4. AC3—Sikkim
5. 3Y—Bouvet
6. ZA—Albania
7. AC4—Tibet
8. BY—China
9. VP8—South Sandwich
10. TN8—Congo Republic

This column was a bit surprised by the number agreeing with the termination of Phone DXCC. It is now predicted that the minority will prevail and Phone DXCC will remain part of the "good ole days." However, we were pleased by the support of our proposal to subdivide the Carolines and other such island groups according to their actual administration, and were elated by the vote of confidence accorded the *CQ* contests. Contest Editor Frank Anzalone, W1WY, of this magazine remains unchallenged as the world's top man in this field. Regarding the most wanted countries, we are surprised that Sikkim outranks Tibet. Anybody care to explain this apparent anomaly?

Rare Prefix News

DF8—DF8SAR, operating from May 1-Oct. 31, 1973, commemorates 50 years of amateur radio in the Saar region of Germany. QSL to DL8FP.

WPX HONOR ROLL

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

MIXED

W4LRN 1225	W4CRW 900	W4WSF 830	WØAUB 785	K2ZRO 708
VE3GCO 1014	K1SHN 893	W4BYU 824	K6SDR 760	PAØVB 707
F9RM 1003	DL1MD 892	I6SF 814	SM7TV 752	W6NJU 706
W2NUT.. 967	PAØSNG 882	W9WHM 811	K8UDJ 750	WA2EAH 700
WA6MWG 962	YU1AG 881	G3DO 810	CT1LN 749	W9ZTD 700
DJ7CX 960	W4BQY 875	W6ISQ 803	WA5LOB 749	W8GMK 683
W8LY 959	DL1CF 872	WB4KZG 800	PY4AP 735	WAØCPX 656
W3PVZ 948	W9FD 860	W3GJY 797	KØBLT 733	
W8ROC 929	W6TCQ 855	K2AAC 793	JA1AG 730	
ON4QX 916	W4IC 850	WAØKDI 790	WA6EPQ 709	

CW

W8LY 953	VK3AHQ 809	G2GM 728	WA6MWG 674	W8GMK 628
W8KPL 910	W9FD 802	K1SHN 715	W6ISQ 666	WA6JVD 622
DL1QT 861	K7ABV 745	YU1AG 698	I6SF 658	W3ARK 620
W2HO 825	W4BYU 744	K2AAC 686	SM5BNX 652	K2ZRO 612
ON4QX 823	WB2FMK 740	OK2DB 693	W4IC 652	VE4OX 600
W2AIW 813	DJ7CX 730	VO1AW 681	K1LWI 629	OK2QX 600

SSB

W4NJF 1031	I8KDB 839	PA0SNG 758	G3DO 719	I8YRK 662
CT1PK 930	K2POA 833	W4IC 750	I4ZSQ 719	YU1AG 662
IØAMU 909	WØYDB 809	IT9JT 747	I1ZV 716	WB6DXU 631
DL9OH 890	DL1MD 805	WA5LOB 747	W6TCQ 709	CR7IK 613
W9DWQ 881	F2MO 780	K1SHN 737	ZL3NS 685	I4LCK 608
HP1JC 851	W3DJZ 761	W6RKP 725	OK1MP 680	

DFØ—DFØAFZ was reported on 14050 at 2250 GMT.

DK9—DK9SK was worked on 14020 at 2345 GMT.

DT—160 stations are active from East Germany with this special prefix during the interval May 1-Dec. 31, 1973.

DX1—DX1OR has been heard on 14037 at 1640 GMT.

EIØ—EIØDMF, May 18-27, was at the Dundalk May Festival. QSL to EI2I.

FC6—FC6ABP was heard in Europe on 28563 at 1145 GMT.

GW8—GF8QI was worked on 3740 kHz at 1700 GMT by a UK station.

IT57—Special prefix for the 57th International Auto Races in Palermo, Sicily. QSL all IT57 stations to P.O. Box 420, Palermo.

JY5—JY5HC was reported on 14240 at 2210 GMT.

KJ3—KJ3BSA operated July 30-Aug. 11 during the Boy Scout Jamboree. QSL to ARRL.

KJ7—KJ7BSA, July 28-Aug. 9, was also a Scout Jamboree station. QSL to ARRL.

LJ3—LJ3J, 14019 at 1550 GMT.

SK2—SK2XA was a special operation last May by the Kiruna Radio Club.

SL2—SL2AD was heard on 14223 at 2230 GMT.

PT4—PT4AM was reported in Europe on 14150 at 2210 GMT.

UZ3—UZ3RU, 14020 at 2230 GMT.

VA3—VA3JJ was on 14023 at 2120 GMT.

VA5—VA4WCC was operated by VE5KE during the World Curling Championship.

VA8—VA8BW and VA8MN were on the air to commemorate the 25th anniversary of the Yukon Gold Rush.

WF2—WF2, QRV May 19-20 from FOC meeting. QSL to W2HAQ.

The WAZ Program

S.S.B. WAZ

1105.....W4REZ	1115.....JA7HZ
1106.....K6BCE	1116.....K6BTT
1107.....K9VQK	1117.....WØMYN
1108.....12PHN	1118.....JA4FUQ
1109.....W4WSF	1119.....JA8AIP
1110.....WB4SIJ	1120.....WB6PNB
1111.....VE5NW	1121.....W9EXE
1112.....KA2AI	1122.....VK3CR
1113.....WA6INK	1123.....K4CKA
1114.....HS5AFJ	

C.W.—Phone WAZ

3568.....W8QVU	3575.....JR1FVJ
3569.....W5NBI	3576.....OK3JW
3570.....VE3BHZ	3577.....VE3UR
3571.....JA1ILN	3578.....WA9AUM
3572.....JA7KE	3579.....WA5ZWC
3573.....JA1KF	3580.....WA5LES
3574.....JA3AUQ	3581.....WA0TLT

Phone WAZ

485.....VE6AKV

Complete WAZ rules are shown on pages 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

SM7COP puts out a fine signal on 15 meters despite being an apartment dweller. Look at that WAZ certificate on the wall as proof. *(Photo courtesy W0FWN)*

The WPX Program

C.W. WPX

1265—DL2HQ
1266—DJ1YH
1267—I5LAN

S.S.B. WPX

757—VK3CR
758—WB4QFH

Mixed WPX

396—PY1BOL
397—WB2DZZ
398—W9WCE
399—DM3VUH

WPNX

59—WNØGTJ
60—WN5HVY

VPX

57—JA1-1176
58—W0-6437
59—DL-K05/38687

WPX Endorsements

S.S.B.: HP1JC—850, IT9JT—750, W6RKP—750, W8GKM—750, OE1KW—550, JA1BN—400 and K2DNL—400.
C.W.: W8KPL—1050, W9FD—800, UB5-WK—600, F9MS—550, SP1BHX—500, W2SZ—350 and DL2HQ—350.
Mixed: DL3RK—1050, W9WCE—800, YU-2OB—700, JA1BN—600, K2DNL—600, WA5VDM—600, and W5QBM—550.
WPNX: WN4SIJ—200!
80 Meters: WA2EAH and HP1JC
40 Meters: HP1JC
15 Meters: WB4SIJ and W9WCE
Africa: YU2OB
Asia: UA6BV and W9WCE
Europe: DL2HQ and DJ1YH
Oceania: W9WCE
South America: W9FD
VPX: WDX5FEB—400 and JA1-1176—350.

Complete rules for WPX, WPNX and VPX may be found on pg. 67 of the February, 1972 issue. Application blanks and reprints of the rules may be obtained by sending a business size, self-addressed stamped envelope to the Assistant DX Editor, P.O. Box 1271, Covina, CA 91722, or to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

WI9—WI9ANG cards go via WA9DZL.
WM4—WM4SFC is a special call used at the Marshall Space Center, Huntsville.
WS5—QSL WS5MSC to Amateur Radio Club, Space Center, Houston, Texas 77058.
WS9—WS9BGF cards go c/o W9HRF.
XG1—The XG1A operation by XE1J commemorated the founding of the city of Colima, Mexico.
XQ—Chilean stations licensed for more than 10 years may use this special prefix.
ZXØ—ZXØVG, by PY1DVG assisted by WA3-HRV, was QRV from Trinidad Island in June. QSL to PY1DVG.
9H5—This prefix is used by the British military on Malta.

De Extra

As our regular readers are aware, **De Extra** frequently covers controversial and argumentative issues. It's the worlds only "Editorial Page of DX," and we invite interested amateurs the world over to use it as an outlet for their opinions on matters of concern to DX and DXers. **De Extra** is not the exclusive vehicle of the DX Editor, the Assistant DX Editor or any staff member, and this month's opinion is from Father David L. Reddy, CE0AE/6. Father Dave is concerned over the matter of deleted countries:

"Since there isn't any DXCC Committee Member near me, here is my opinion on Swan Island and similar cases. I don't think that a place on the globe that counts as a radio country should ever be deleted from the list, with the exception of those such as Maria Theresa whose simple existence cannot be demonstrated. We should not delete Okinawa, Minerva Reef or Swan Island from the list.

"Regarding the 500 mile requirement, I think it is entirely too arbitrary. Sala y Gomez should be on the country list even though it is only 250-400 miles northeast of Easter Island and also belongs to Chile. As matters now stand an operation from Sala y Gomez would count as Easter Island and I can't think of anything so ridiculous! The people from Easter never get over to Sala y Gomez. It would be much easier to get to Tahiti or Santiago.

"The idea that there are too many places listed as countries is only valid to those who have worked them all. Why take away the enjoyment a ham gets from working a new radio country regardless of where it is? Government administrations form some base for distinction, but not the only base. I realize that some think an award loses it value when it becomes too easy or too many hams have earned it. O.K.—then we should institute some very difficult awards for the people who like to belong to an exclusive club. (*CQ's* Single Band WAZ is a good example, particularly on 40 and 80

meters.) However, we should maintain the basic awards such as the *CQ* C.W. and S.S.B. DX Awards and DXCC, of course, which are relatively easy for all. It meant a heck of a lot more to me to display my 130 cards on the wall at the Scout Camp where I was chaplain than to mention at radio club meetings where my fellow hams would only encourage me to try for more.

"Perhaps the QRP Awards will satisfy the professional ham set, though personally I did not like to work QRP stations from Easter Island. I used to sweat bullets trying to pull them in, and even though it was an achievement for the low power guy on the other end it was so nerve-racking for me that I did not enjoy it. Personally I was more pleased with a 20 over 9 signal from a kw boy."

Amateur Radio in Other Countries

Tanzania and Zanzibar—An Unusual Situation: In the October, 1972 issue of *CQ* an extensive article was presented which analyzed the status of various entities on the DX Country List according to political and economic development, as well as other criteria associated with country classification. This article pointed out that VQ1, Zanzibar, had been combined with Tanganyika to form 5H3, Tanzania, and that consideration should be given to the deletion of Zanzibar from the countries list. In response to that article we received further information from Garth Hamilton, VE7AUE, ex-5H3LV, which casts a little more light on the matter. However, in so doing it has confused us even more by its revelations of complexity and contradiction. Garth recently returned from Tanzania and can speak first hand so we'll let him tell it the way it is and you can judge for yourself:

"I agree that on paper Tanzania and Zanzibar are supposed to be the same country, but in practice it just doesn't work out that way. In international affairs, the agreement specifies that Tanzania represents **both** the mainland and the island (Zanzibar), but there are several noteworthy exceptions. For example, Tanzania recognizes only West Germany while Zanzibar recognizes only East Germany. Tanzania recognizes both Koreas and both Viet Nams, but Zanzibar recognizes only North Korea and North Viet Nam. One recognizes Israel, the other doesn't. The U.S. has an embassy in both Zanzibar and Tanzania.

"Governmentally, the President of Tanzania (mainland) is also President of Zanzibar (island), but in practice the First Vice President of Tanzania is absolute ruler of Zanzibar. The Second Vice President of Tanzania is the Prime Minister of the parliamentary government ruling Tanzania under a one-party system. While the army is supposedly a unifying force, there are actually two supreme commanders, one for Zanzibar and one for Tanzania. Military aircraft from Tanzania must apply for permission to enter the air space of Zanzibar just as anyone else.

From Niamey, Niger, Eva 5U7AV gave a new country to hundreds of amateurs around the world.

"At the people level, if a citizen of Tanzania wishes to visit Zanzibar he must apply for a visa from the Zanzibar government office in Dar-es-Salaam, the Tanzanian capital. A tourist will go through customs and immigration in Dar-es-Salaam, and if he subsequently goes to the island (Zanzibar) he will go through customs and immigration again. Goods traveling between the two countries are subject to duty either way."

In summary, we can only add that we are happy to let the ARRL DXCC Advisory Committee unravel this one. Their decision to maintain both countries on the list seems to be sound from the view that the more countries available to work the more interest there will be in DX.

[*Continued on page 74*]

The CQ DX Award Program

C.W. DX	S.S.B. DX
119—DJ1YH	284—WA5ZWC
120—VE3CVZ	285—WA2EAH
	286—WB9DRE
	287—OE3WWB

Endorsements

S.B.S.: DJ7CX—275, WA2EAH—250 and WB9DRE—150.
Low Band: WA2EAH
28 mHz: WA2EAH

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a business size, self-addressed stamped envelope to the Assistant DX Editor, P.O. Box 1271, Covina, CA 91722, or to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Propagation

BY GEORGE JACOBS,* W3ASK

Contest Special

The 1973 *CQ* World Wide DX Contest will be held on the following dates:

Phone Section: 0000 GMT October 27
2400 GMT October 28
C.W. Section: 0000 GMT November 24
2400 GMT November 25

For the 23rd successive year, this month's *Propagation* column contains a special forecast for use during the Contest sections, both phone and c.w.

Solar Cycle

The present sunspot cycle continues to decline at a steady pace. A smoothed sunspot number of 36 is forecast for October, and 34 for November. This is considerably lower than the corresponding levels of 60 and 59 observed last year. In fast, this is expected to be the lowest level of solar activity during any *CQ* World Wide DX Contest since 1965.

Band-By-Band Conditions

With the considerably lower level of sunspot activity expected during this year's Contest, *fewer* DX openings will occur on 10, 15 and 20 meters as compared to last year. On the other hand, an improvement is likely on 40, 80 and 160 meters.

The following is a band-by-band summary of general DX propagation conditions that can be expected during the 1973 Contest.

10 Meters—As a result of the seasonal increase in daytime maximum useable frequencies, an improvement in DX conditions is forecast for October and November on this band. Fairly good openings should be possible to South America during much of the daylight hours. Other openings may also occur to Africa, the Pacific Islands, Australia and New Zealand, with conditions peaking to the east and south before noon and to the west and south after noon. On days when propagation conditions are above normal, openings may also be possible from the eastern and central sections of the USA to Europe, and from the western section of the country to Asia and the Far East.

15 Meters—A seasonal improvement in DX conditions is also expected on this band during October and November. Good openings are forecast from shortly after sunrise until shortly after sunset, to one area of the world or another. The band should peak to Europe before noon; to Africa at about noontime; South America during the afternoon hours, and to the Pacific, Australia, New Zealand, the Far East and other Asiatic areas during the late afternoon and early evening.

20 Meters—This band is expected to close earlier in the day than it did during the summer months, but between fair and excellent DX conditions are forecast from sunrise through the early evening hours. Openings to many southern and tropical areas may be possible to as late as midnight. Signals should peak shortly after sunearly evening, often with exceptionally strong levels. All-in-all, this is most likely to be the best rise and again during the late afternoon and band for DX during the Contest.

40 Meters—DX openings to Europe and in an easterly direction should begin during the late afternoon hours and improve with darkness. Good openings towards the south should be possible throughout most of the dark hours. Openings in a westerly direction should peak at about sunrise, just before the band closes for DX propagation. Signal levels may be exceptionally strong at times.

80 Meters—Some fairly good DX openings are expected on this band to several areas of the world during the hours of darkness and the sunrise period. Conditions should peak around mid-

*11307 Clara Street, Silver Spring Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For October, 1973

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date *October*				
Above Normal: 6-7, 9, 13, 25, 29	A	A	B	C
Normal: 1-3, 5, 8, 10-12, 14, 17, 21-22, 24, 26-28, 30	B	C	D	E
Below Normal: 4, 15-16, 18, 20, 23, 31	C	D	E	E
Disturbed: 19	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading and noise.

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

D—Poor opening, signals weak 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 particular opening for any day of the month. For example, all openings shown in the Charts with *a propagation index* of (4) will be good on Oct. 27 & 28, the CQ WW DX Phone section.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, or subscribe to MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11768.

night on paths to the east, shortly before sunrise on paths to the north or south, and shortly after sunrise on openings in a westerly direction.

160 Meters—With decreasing solar activity and the longer hours of darkness, DX possibilities are improving on this band. While conditions will not match those on 40 or 80 meters, DX openings should be possible to many areas of the world during the hours of darkness and the sunrise period. Because of power limitations imposed in this band in many areas of the world, signals at best are likely to be noisy, especially on phone. The most likely time for 160 meter DX openings is when the path is in *complete* darkness. Within this period, conditions are often at their best just as the sun begins to rise at the most *easterly* point on the path. The best forecaster for 160 meter DX openings is a set of sunrise and sunset tables. For example, if the sun is expected to rise at 0600 GMT in western Europe, then this is the best time to look for an 160 meter openings between western Europe and the USA, plus and minus 15 minutes, or so. Conditions on 80 meters can often also serve as an indicator for 160 meter openings. The band will often open at times when 80 meters seems to peak on a particular path. With these tips and some patience, it should be possible to work several DX areas of the world on 160 meters during the Contest.

Contest Work Plans

The *DX Propagation Charts* on the following pages show the times that each amteur band from 10 through 160 meters is expected to open for DX from the United States to the major areas of the world. Instructions for the use of these *Charts* are contained elsewhere in this column.

The information contained in the *Charts* can be easily reorganized into more convenient types of operation work plans, or schedules, which can serve as valuable propagation guides during the Contest. Experience gained during previous years has shown that such plans can be extremely useful in piling up points with a minimum of wasted time.

The following is an example of one of the many type of plans that can be devised. It shows, for each three hour period throughout the day, the areas of the world for which, in this example, 20 meter propagation conditions are expected to be optimum.[1] A western USA QTH has been chosen for this example, but similar plans can be devised for eastern and central locations, and for other bands.

[1]Optimum openings are considered to be those rated (3) or better in the *Charts*. However, in some cases a (2) or (1) opening was selected for the plan, when none higer was forecast.

CQ WW DX CONTEST RULES ON PAGE 46

Sample 20 Meter Operating Schedule for Western USA QTH

Time PST	Areas to which openings should be optimum
00-03	No really good openings expected, and this would be a good time to catch some sleep.
03-06	At best, some fair openings to South America and an occasional one to the South Pacific, New Zealand and Australia. If you didn't get some sleep before, get it now!
06-09	Should open in almost all directions: Europe, North Africa, Eastern Mediterranean and Middle East, most of Asia and Far East, Pacific Islands, New Zealand, Australasia, and most of South America. An excellent period to rack up points.
90-12	Same as during previous period, but openings falling off somewhat.
12-15	Western and Southern Europe, most of Africa, most of South America.
15-18	West and Central Africa, Pacific Islands and New Zealand, South America, Far East.
18-21	Another good period to increase scores. Most of Asia including Far East, Pacific Islands, New Zealand and Australasia, South America and Antarctica.
21-00	Fair openings to South Pacific, New Zealand and Australasia, many countries of South America, and Antarctica.

The following is a typical *multi-band* operational work plan devised from the propagation *Charts* for an Eastern USA QTH. The plan shows the times and bands when propagation conditions are expected to be optimum to various areas of the world, for each two hour period throughout the day.

Sample Multi-Band Work Plan Eastern USA QTH

Time EST	Band (Meters)	Areas to which band expected to open
00-02	80	Most of Europe and South America; a few Africans and possibly Antarctica.
02-04	40	Not too much on any band. A good time to eat and catch up on some sleep. Some openings possible to the South Pacific, Australasia, Far East and other Asian areas, but generally not very good. Some fairly good openings to South America.
04-06	40	Still time to catch up on some sleep. Some openings possible to South Pacific, New Zealand and Australasia. Some also to northern and central areas of South America. A few Far Eastern and Asian, and perhaps into Antarctica.

06-08	20	Good openings in almost all directions; Europe, Pacific, New Zealand, Australasia, Asia and Far East. Also to most of South America and parts of Africa.
08-10	15	Fairly good openings to all of Europe and the Middle East, and most of South America. A possible opening to the Pacific, New Zealand, Australasia, and perhaps parts of Asia.
10-12	10	Fairly good openings to most of Africa and South America. Catch them during this period, or you will probably miss them on this band!
12-14	20	Good openings to most of Europe and the Middle East. Fair to Africa, northern and central South America.
14-16	15	Good openings to most of Africa and South America, with some also possible to the Pacific, New Zealand and Australasia. Perhaps to Antarctica also.
16-18	20	Last chance for fairly good openings to Western and Southern Europe, northern Africa and the Middle East, and most other areas of Africa. Good openings to most of South America. Fair openings to the South Pacific, New Zealand and Australasia.
18-20	20	Openings improving to Pacific, New Zealand and Australasia. Also most of Asia and Far East. Good openings to central and southern South America, and possible openings to Antarctica.
20-22	20 & 40	Try 20 for fairly good openings to South Pacific, New Zealand and Australasia. Also deep South America and Antarctica. Also possible to Far East and other Asiatic areas. Check 40 for fairly good openings to most of Europe and the Middle East and the northern countries of South America. Also possible to parts of Africa.
22-00	40	Most of Europe should be possible, as well as Middle East. Also most of South America and a few to Africa.

Radio Storm

The forecasts discussed in this column are based on *normal* propagation conditions expected with a sunspot level in the mid 30's. If conditions during the Contest turn out to be *above normal*, DX openings on 10, 15 and 20 meters are lively to be somewhat better than shown in the *Charts*. On the other hand, if a radio storm should develop, with accompanying *below normal* or *disturbed* h.f. propagation conditions, fewer openings will take place on these bands. During radio storms, propagation conditions on 40, 80 and 160 meters generally become erratic, with poorer openings during certain phases and improved openings during other times.

If a radio storm should develop during the Contest, circuits passing through or near polar regions will probably become weak, fade considerably, or may even black out entirely, depending upon the severity and duration of the storm. During certain storms, while east-west propagation may become poorer, north-south openings may improve.

If a storm should occur, concentrate on working the higher frequency bands and the paths to the northeast, north and northwest during the daylight hours, and the lower bands and paths to the east, south and west during the evening and early morning hours. A "Last Minute Forecast" for the Phone section of the Contest, made at press time, appears at the beginning of this column. A similar forecast for the c.w. section will appear in next month's column.

For a more complete discussion of radio storms, and what can or cannot be done about them on the amateur bands, see "Don't Be Afraid Of The Big Bad Blackout", by John J. Schultz in the November, 1969 issue of *CQ* (page 31.)

Up-Dated Contest Info

In order to meet printing and publication deadlines, the forecasts appearing in this column have to be made more than two months before the Contest dates. For up-dated propagation data, specially tailored for the radio amateur and available at the beginning of the Contest, try MAIL-A-PROP and *CQ's* DIAL-A-PROP service.

A *special* MAIL-A-PROP forecast will be issued for both the Phone and C.W. sections of the Contest. MAIL-A-PROP forecasts, issued in weekly newsletter format, contain a day-to-day description of conditions expected on the various h.f. amateur bands. Written in simple language, they describe conditions as *above normal, normal, below normal* or *disturbed*. Band openings are rated as *excellent, good, fair* or *poor*. There are special sections for DX tips continent-by-continent and band-by-band. MAIL-A-PROP also contains short-skip forecasts, special forecasts of ionospheric conditions casts, special forecasts of ionospheric conditions on the v.h.f. bands, and sunspot data. The forecasts cover a weekly period from Tuesday-to-Tuesday, and are sent airmail to subscribers (regular mail those less than 200 miles from NYC), so that they should arrive a day or two before the forecast period begins.

MAIL-A-PROP is available on a subscription basis from MAIL-A-PROP, P.O. Box 86, North-

port, N.Y. 11768 for $20 annually (*sixty* weekly issues) or $12.50 semi-annually (*thirty* weekly issues). All regular subscribers will receive automatically the special Contest forecasts. To non-subscribers, the special Contest forecasts will be available for $1.00 each, *plus* an s.a.s.e., (airmail if more than 200 miles from NYC.). Requests for the Phone section forecast must reach P.O. Box 86, Northport, N.Y., 11768 by October 15, for the C.w. section by November 12.

A two-to-three minute summary of the special MAIL-A-PROP Contest forecasts will be carried on *CQ's* DIAL-A-PROP service beginning October 23 for the Phone section and November 20 for the C.w. section. DIAL-A-PROP forecasts are available around-the-clock simply by calling Area Code 516-883-6223. They are revised every Tuesday, and are made for a week in advance.

MAIL-A-PROP and DIAL-A-PROP forecasts are tailored for the radio amateur and apply specifically to the amateur bands. Updated propagation data of a more general nature is available from the hourly transmissions of WWV, Fort Collins, Colorado.

Propagation data is transmitted hourly, in voice, following the 14th minute time announcement on 2.5, 5, 10, 15, 20 and 25 mHz.

The transmission consists of a letter:

N (November)
U (Uniform)
W (Whiskey)

Followed by a number between 1 and 9.

The letter designates propagation conditions *expected* during the *present* six hour forecast period, as follows:

N—Normal propagation conditions
U—Conditions unstable or erratic, signals subject to increased fading and noise
W—Radio storm in progress, conditions below normal or disturbed

The number designates propagation conditions *expected* for the *following* six hour forecast period, as follows:

1—Useless; 2—Very Poor; 3—Poor; 4—Poor-to-Fair; 5—Fair; 6—Fair-to-Good; 7—Good; 8—Very Good; 9—Excellent.

For example, the announcement "November-7", repeated once, means that propagation conditions are expected to be *normal* for the present six hour forecast period, and are expected to be *good* during the next six hour period.

Forecasts are made for the six hour periods 00-06 GMT, 06-12 GMT, 12-18 GMT and 18-24 GMT. While they apply mainly to h.f. trans-Atlantic circuits, they often are a fairly good indication of general conditions on a world-wide basis.

V.H.F. Ionospheric Openings

While the *CQ* DX Contest *does not* include the v.h.f. bands, some ionospheric activity may be possible on these bands during October.

Auroral activity is expected to increase during the month, and some auroral-scatter type v.h.f. openings are expected, especially during periods when h.f. propagation is either below normal or disturbed. Check the "Last Minute Forecast" appearing at the beginning of this column for the days that are expected to be in these categories during October.

Orionids, a major meteor shower is expected to last for about two days, peaking during the morning hours of October 21, with an hourly count of at least 25 meteors. This should make possible some fairly good meteor-scatter type openings on the v.h.f. bands.

An occasional 6 meter trans-equatorial (TE) opening may be possible between the southern half of the United States and the central and southern regions of South America. TE openings peak during the evening hours, between 8 and 11 p.m., local time, and the path must cross the magnetic equator at approximately a right angle.

1972 Contest Critique

My colleague and good friend Frank Anzalone, *CQ's* Contest Editor, had this to say about last year's forecast after he reviewed the thousands of logs that had been submitted.

"Conditions for the recent WW Phone Contest (1972) were terrific, just as George Jacobs had predicted. However they were not so good for the C.W. week-end, also just like George had indicated. Personally I didn't think they were quite that bad, so don't know if we should give W3ASK 100% for his 1972 predictions or not."

We'll take credit for hitting one on the nose, and for being partially accurate on the other. This brings the 22 year score for the 44 sections to 34 right on, 7 partially correct and 3 completely wrong.

CQ DX contests generate a very large amount of radio amateur operating activity throughout the world. For this reason, these contests offer an excellent opportunity to check the accuracy, or inaccuracy of the *CQ* propagation forecasts. Reports received during previous contests have contributed considerably in improving these forecasts over the years. Any comments or observations concerning this year's contest forecast would be appreciated, and can be sent directly to W3ASK, the Editor of this column.

C.W. Contest Forecast

This month's forecast is valid for *both* the Phone and C.W. sections of the 1973 Contest. *Be sure to keep the Charts appearing in this month's column for use during next months C.W. section as well.* Next month's column will

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 call areas in he USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 an 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 (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 meters are likely to occur during those times when 80 meter openings are shown with a *propagation index* of (2), or higher.

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) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " 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. Times 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 *standard* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 8 hours in the PST Zone, 7 in the MST Zone, 6 in the CST Zone and 5 in the EST Zone. For example, 14 in Washington, D.C. is 19 GMT and 20 in Los Angeles is 04 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.

contain Short-Skip Charts for November and December, 1973. Short-Skip propagation forecasts for October appeared in last month's column.

Good luck in the Contest!

73, George, W3ASK

October 15—December 15, 1973

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

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

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2) or higher.

[*Continued on page 79*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Oct.	6-7	California QSO Party
Oct.	6-7	Missouri QSO Party
Oct.	6-7	New Mexico QSO Party
Oct.	6-7	VK/ZL/Oceania Phone
Oct.	13-14	VK/ZL/Oceania C.W.
Oct.	13-14	RSGB 21/28 mHz Phone
Oct.	13-15	CARTG RTTY DX Contest
Oct.	17-18	YLRL Anniv. C.W. Party
Oct.	20-21	Boy Scouts Jamboree
Oct.	20-21	WADM C.W. Contest
Oct.	20-21	RSGB 7 mHz C.W. Contest
Oct.	20-22	North Carolina QSO Party
Oct.	**27-28**	**CQ WW DX Phone Contest**
Nov.	1-2	YLRL Anniv. Phone Party
Nov.	3-4	RSGB 7 mHz Phone Contest
Nov.	2-5	IARS CHC/FHC/HTH Party
Nov.	11	Czechoslovakian Contest
Nov.	10-11	ARRL Phone Sweepstakes
Nov.	17-18	ARRL C.W. Sweepstakes
Nov.	**24-25**	**CQ WW DX C.W. Contest**
Dec.	8-9	ARRL 160 C.W. Contest
Dec.	22-23	Hungarian Contest
Jan.	12-13	DL QRP C.W. Contest
Jan.	15-17	OOTC C.W. Party
Jan.	**25-27**	**CQ WW DX 160 C.W. Contest**
Jan.	29-31	OOTC Phone Party

VK/ZL/Oceania DX Contest

Phone: Oct. 6-7 C.W.: Oct. 13-14
Starts: 1000 GMT Saturday
Ends: 1000 GMT Sunday

This one was fully covered in last month's CALENDAR. This year logs go to: Wireless Institute of Australia, Box N1002 G.P.O., Perth, Western Australia 6001, and must be received no later than Jan. 22, 1974.

The California, Missouri and New Mexico QSO Parties were also covered in last month's CALENDAR.

"Jolly Flower" Mini Contest

This is a 6 month long activity that started July 1st and will end December 31st. Unfortunately the announcement was received much too late to make the earlier issues.

The "Jolly Flower" award, an artistic lithograph by a well known Venetian painter, goes to the first 200 scorers.

Send a list of "Jolly" and other Italian YL stations contacted during the above period to: Carla Benatti, I4CYB, P.O. Box 155, 46100 Montava, Italy. (A request of 20 IRCs with your application hardly adds to the popularity of this award. Better check with Carla.)

RSGB 21/28 mHz Phone Contest

Starts: 0700 GMT Saturday, October 13
Ends: 1900 GMT Sunday, October 14

It's the world working the British Isles on 21 and 28 mHz phone, single operator only in this one. (G, GC, GD, GI, GM, GW).

Same station may be worked once on each band, but cross band QSOs are not permitted. Use separate log for each band.

Exchange: The RS report plus a progressive contact number starting with 001.

Scoring: Each complete QSO with a British Isle station counts 5 points. In addition a bonus of 50 points may be claimed for the first contact on each band, with each B.I. prefix. G2, GC3, GD4, GM5, and etc., a maximum of 36 for each band. (No bonus for GB.) There is no multiplier, just total QSO and bonus points.

Awards: Certificates to the leading station in each continent. (You read right, each continent, **not each country.)**

There is also a s.w.l section. Only British Isles statons are to be logged, and scoring is same as above.

Logs should be received no later than Dec. 10th and go to: RSGB HF Contests Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey, England.

C.A.R.T.G. RTTY Contest

Starts: 0200 GMT Saturday, October 13
Ends: 0200 GMT Monday, October 15

This year's contest, the 13th sponsored by the Canadian Amateur Radio Teletype Group, will be known as the "Lucky 13th Sweepstakes."

Contest operation is limited to 30 hours out of the 48 hour contest period. The non-operating periods may be taken any time in the contest, but on and off times must be listed in the score sheet.

Use all bands, 3.5 thru 28 mHz, and the ARRL country list and CPR Zone chart.

Exchange: QSO no., time, zone, country.

Scoring: Two points for QSO's with stations in one's own zone, other contacts according to points listed in CPR zone chart.

Multiplier: Each country worked on each band, including one's own. Same station may

*14 Sherwood Road, Stamford, Conn. 06905.

be contacted on each band for QSO and multiplier credit. (KH6, KL7, VO are countries)

An additional 100 bonus points, to be added to final score, for each VE/VO station worked on all bands.

Final Score: Total QSO points × country multiplier × continents worked plus the bonus points.

Awards: Certificates to top scorers in each country, and each USA and Canadian call district. There are also 19 plaques and medallions in many different categories, including one for s.w.l.'s.

Log sheets and CPR map/exchange table are available from CARTG, s.a.s.e. or IRC's.

Logs must be received no later than Dec. 1st and go to: C.A.R.T.G., VE3RTT, 85 Fifeshire Road, Willowdale, Ontario, Canada M2L 2G9.

YL Anniversary Party

C.W.: Oct. 17-18 Phone Nov. 1-2
Starts: 1800 GMT Wed. (C.W.) Thurs. (Ph.)
Ends: 1800 GMT Thurs. (C.W.) Fri. (Ph.)

This is the 34th annual YLRL contest open to all YLs around the world. OMs not eligible.

All bands may be used but avoid contacts on net frequencies. Phone and c.w. are separate, with separate scoring and awards.

Exchange: QSO no., RS (T), ARRL section or country.

Scoring: One point per QSO between stations within an ARRL section, or between DX stations. Contacts between DX and ARRL sections count 2 points. Work same station only once.

Your multiplier is derived from the number of ARRL sections and countries worked. There is a low power multiplier of 1.25 if input is 150 watts or less on c.w., 350 p.e.p. on s.s.b.

Final score: Total QSO points × ARRL sections and/or countries worked × power multiplier.

Awards: 1st 2nd and 3rd place certificates to winner in each call district and DX country. And two Gold Cups, phone and c.w., to the top YLRL member in the world. There are also 3 special awards for YLRL members. The Corcoran for the highest combined c.w./phone score in an ARRL area, the Hager to the highest combined score from North and Central America, including Caribbean areas, and one for the rest of world.

Compute your score, sign your log and mail no later than November 18th to: Eila D. Russell, WA8EBS, 4348 W. 223rd Street, Fairview Park, Ohio 44126.

Boy Scouts Jamboree

Starts: 12 Midnight Saturday, October 20
Ends: 12 Midnight Sunday. October 21
(Local Time)

This is the Scouts' 16th Jamboree-on-the-Air and has been given extensive coverage in Scout magazines around the world.

The above local times are only suggested. It may be more convenient for some to operate on Friday evening. This is not a contest but a period when Scouts are active.

Participating certificates will be issued to all reporting their activity. Send your report to your National Organizer.

More information may be obtained from the Boy Scouts World Bureau, Att: L. F. Jarrett, P.O. Box 78, 1211 Geneva 4, Switzerland.

WADM C.W. Contest

Starts: 1500 GMT Saturday, October 20
Ends: 1500 GMT Sunday, October 21

This is a c.w. only contest, on all bands 3.5 thru 28 mHz. There are 3 classifications, single operator, multi-operator and s.w.l.

Exchange: RST plus QSO no. starting 001.

Scoring: Three points for each DM/DT QSO. Multiply total by sum of DM districts worked on each band. A district is identified by the last letter in the call, *not* by the number in the prefix. (A thru O, a maximum of 15 on each band possible.)

Awards: Will be in the form of certificates. Contest QSO's may also be applied for the many DM awards. WADM, DMCA, DMDXC and DMKK. More information available from the GDR.

Logs go to: Radio Club of the GDR, Att: DM2ATL, DDR 1055 Berlin, P.O. Box 30, German Democratic Republic.

RSGB 7 mHz Contest

C.W.-Oct. 20-21 Phone-Nov. 3-4
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

This one is also for contacts between the British Isles and overseas stations, however QSO point value is figured differently from the 21/28 mHz contest. Bonus points are the same. Phone and c.w. are separate contests and only single operator entries are acceptable.

Exchange: RS/RST report plus a progressive QSO number starting with 001.

Scoring: Contacts with British Isles stations vary in point value according to the location of the DX station. If in Europe, 5 points; North America, 15 points; Africa, Asia and South America, 25 points; Oceania 50 points.

In addition a bonus of 50 points may be claimed for the first contact with each B.I. country/number prefix, a max. of 36 possible. (No bonus for GB contacts.) Just add QSO and bonus points for final score.

Awards: Certificates to the continental leaders in each contest.

There is a s.w.l. section with scoring same as above. Log only B.I. stations.

The c.w. entries must be received no later

than Dec. 17th and the phone Dec. 31st. They go to: RSGB HF., Contests Committee, c/o J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, Warwickshire, England.

North Carolina QSO Party

Two Periods (GMT)
1800 Sat. Oct. 20 to 0600 Sun. Oct. 21
1300 Sun. Oct. 21 to 0200 Mon. Oct. 22

This year's party is sponsored by the Brightleaf ARC. Each station may be worked once per band and mode. If portable or mobile again with each county change.

Exchange: QSO no., RS(T) and QTH. County for No. Car., state, province or country for others.

Scoring: *For No. Car.* 2 points for out-of-state contacts, 1 point if with other N.C. stations, multiplied by number of states and VE provinces worked. *Others*, 2 points per QSO multiplied by N.C. counties. (max. of 100)

Frequencies: C.W.-3575, 7090, 14070, 21090, 28090. Phone-3810, 3900, 7290, 14290, 21310, 28510. Novice-3710, 7110, 21110, 28110. (Try phone on even hours) VHF-50 and 144 mHz bands. Contacts thru repeaters count for contest score but not for BARC certificate.

Awards: Certificates to top scorers in each state, province and country, and county awards for No. Car. stations. Also appropiate awards for Novices and VHF contestants. Contest QSOs can be credited for BARC club awards.

Mailing deadline Nov. 25th to: Charlie Wells, K4SKI, Rt. 8, Box 414, Greenville, N. Car. 27834

IARS CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, November 2
Ends: 0600 GMT Monday, November 5

This is the Fall edition of the International ARS QSO party. Rules same as last year but it is recommended you write K6BX for official rules and contest forms. (Include s.a.s.e.)

Exchange: QSO no., RS (T), name, CHC/FHC no., state, county or similar subdivision. Non-members send HTH in place of number.

Scoring: For CHCers: 1 point per QSO with other CHCers, 2 points if its a HTHer, and 1 additional point if its a YL, B/P, FHC, Novice, CHC200, Merit or Club station. Double above points if QSO is out of own country.

For HTHers: Contacts with other HTHers 1 point, with CHCers 3 points, otherwise same as above. The same station may be worked on different bands and modes. Scoring for s.w.l. same as for HTH.

Multiplier: Each continent, country, ITU zone and US state (counted only once).

Final Score: Total QSO points from all bands multiplied by the sum of the multiplier. Multi-operator stations divide score by number of operators.

Frequencies: C.W.-3575, 3710, 7160, 14075, 21075, 21090, 21140, 28090. Phone-3770, 3790, 3943, 3960, 7070, 7090, 7210, 7260, 7275, 14320, 14340, 21360, 21440, 28620, 28690. Both for US and DX as allowed.

Awards: Hundreds of certificates and trophies for CHC, FHC, SWL-CHC, HTH, VHF, Novice and B/P. (blind/paralyzed)

Again suggest you send large s.a.s.e. (16¢ or 2 IRC) for awards list and other information including country list, zone map and etc.

Send logs and all requests to: I.A.R.S., K6BX, P.O. Box 385, Bonita, Calif. 92002

Czechoslovakian Contest

Starts: 0000 GMT Sunday, November 11
Ends: 2400 GMT Sunday, November 11

Rules are the same as in previous years, phone and c.w. on all bands, 1.8 thru 28 mHz (OK stations on c.w. only on 160).

This is a world-wide type contest but QSOs with Czech stations have additional value. OK stations are looking for more activity from the USA and Canada.

Categories: Single operator, both single and all band. Multi-operator all band only.

Exchange: RS(T) report plus two figures indicating your ITU zone. (List available from C.R.C., s.a.e. and 2 IRC)

Scoring: One point per QSO, 3 points if its with a Czech station. Multiply total by sum of ITU zones worked on each band.

Awards: Certificates to the top scoring stations in each category in each country.

The "100 OK" and "S6S" awards are available for contest contacts upon written application with your contest log.

Mailing deadline for your log is December 31st to: The Central Radio Club, P.O. Box 69, Praha 1, Czechoslovakia

Editor's Notes

Complete rules and a list of over 25 Trophies and Plaques for this year's contest appear on page **46**.

The basic rules are the same as in previous years. However you can expect a closer and stricter interpertation of Par. III 2a and 2b, and also Par. XII. It is impossible to go into a detailed explanation in the space available, but under 2a Single Transmitter means just that, not a flock of transmitters and operators at other positions Also keeping in mind that there is a limit to the band hopping that is permitted in the same time period.

As for 2b, Multi Transmitter places no limit to the number of transmitters but it does limit the activity to one per band.

The large list of disqualifications in last years contest should give you fair warning that we are not fooling around with Par. XII. We have been more than tolerant in the past.

SAROC

The Fun Convention

hosted by **SOUTHERN NEVADA AMATEUR RADIO CLUB, INC.** at

FLAMINGO HOTEL CONVENTION CENTER, LAS VEGAS, NEV. 89109 — JANUARY 3-6, 1974

ADVANCE REGISTRATION — $10.50 per person includes:

1. Special room rate of $15.00 plus room tax per night single or double occupancy, effective January 3 through 10, 1974 while 500 rooms last at the Flamingo Hotel.
2. Advance Registration drawing ticket for Saturday.
3. Regular Registration drawing ticket for Saturday.
4. Complimentary cocktail at the Flamingo Hotel.
5. Complimentary KENO ticket at the Flamingo Hotel.
6. Admission to technical seminars, meetings and exhibit area, Friday and Saturday.
7. Ticket for admission to cocktail party hosted by SAROC and HAM RADIO MAGAZINE, Friday.
8. Ladies who register will receive admission ticket for their program on Saturday.
9. Ticket for admission to cocktail party hosted by SAROC and SWAN ELECTRONICS, Saturday.
10. Ticket for Flamingo Hotel Buffet Hunt Breakfast with Champagne, Sunday.
11. Tax and Gratuity on all items 1 through 10 except hotel accommodations.

ADVANCE REGISTRATION with midnight show — $17.50 per person:

Includes all items 1 through 11, plus Flamingo Hotel Midnight Show and two drinks, Sandler and Young are scheduled in the Flamingo Hotel Main Show Room.

ADVANCE REGISTRATION with dinner show — $21.50 per person:

Includes all items 1 through 11, plus Flamingo Hotel Dinner Show (Entree: Brisket of Beef) no cocktails, Sandler and Young are scheduled in the main show room.

Advance registration must be received in SAROC, P. O. Box 73, Boulder City, NV 89005 on or before December 15, 1973. Refunds will be made if request in writing received in P. O. Box 73 on or before January 3, 1974.

SEVENTH NATIONAL FM conference Friday and Saturday, FM Hospitality Room 16/76, 28/88 and 34/94 repeaters. WCARS-7255 and WPSS 3952 special events stations to assist mobile operators.

Mail accommodations request to Flamingo Hotel, Las Vegas, Nevada 89109 — Do it now!

Mail Advance Registration fee to, SAROC, P. O. Box 73, Boulder City, NV 89005 — Before December 15

In preparing your score keep in mind that we use the ARRL country list and the WAE list for European contacts. The WAE list may be found on page 66 of the July issue. (DL and DM are now listed as separate countries.)

You are expected to check your log for duplicate contacts and correct multipliers. Recopied logs *must* be in their original form, with dupes included but crossed out and no credit taken. Be sure to indicate the number of QSOs made, less duplicates, and separate your multiplier into zones and countries.

We do insist on a summary sheet showing the scoring, name and address in BLOCK LETTERS and a signed declaration that all rules and regulations have been observed. It is recommended that you use the official *CQ* forms which are available by sending a large s.a.s.e. or IRCs. If you make up your own limit the contacts to 40 to the page, and enter the Zone and Country multiplier *only the first time* it is worked.

Clubs are expected to submit a list of participating members and their scores if they want it listed. They will be judged on the submitted claimed score. Do not expect us to dig through the logs and credit you with a score you have not claimed. To make the task easier *CQ* has made up a new form for this purpose, contest managers are strongly advised to avail themselves of this aid.

Be sure to check George Jacob's Propagation Column for his special contest forcast. A special last minute updated forecast will also be available on *CQ*'s DIAL-A-PROP service beginning Friday afternoon preceeding the Contest. Just dial 516-883-6223 anytime of the day or night.

Good luck, see you in the pile-ups.

73 for now, Frank, W1WY

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

CQ'S DIAL-A-PROP

For the latest up to the minute propagation forecasts and special contest predictions call 516-883-6223 any time day or night for a recorded message on conditions.

THE awards PROGRAM

BY ED HOPPER,* W2GT

THE October, "Story of The Month," as told by Floyd is:

Floyd A. Markham, K7WQJ

"Since the doctor has grounded me for awhile, I'll try to put together some information per your request.

"As for my amateur radio activities—I am just having fun and enjoying the friendship and fraternity of ham radio, and doing what I can along the way to be of help to others.

"First of all, I was born near Walla Walla, Washington, October 28, 1912 and grew up in that area. Eventually found my way to Oregon State University, from which I graduated in 1937 with a degree in Science. Went to work for the Department of Agriculture, State of Oregon and in August of 1937, married my Wife, Helen. We have two sons, Terry our oldest is with Arthur Young Associates in the computer field and business consultant. Dan the youngest, is taking graduate work at Portland State University—he served two years in Viet Nam in the Navy. Both sons are married and we are the proud grandparents of three grand-daughters, including twins.

"On Memorial Day 1942, I entered the service —what was then the Army Air Corps. Enlisted as a private and came out as a Captain, four and one half years later. I remained in the U.S.A.F. Reserve and was retired February 1st, 1970 as a Lt. Col.

"After World War II, I returned to work with the Department of Agriculture and have been there ever since. Hope to be retiring in a few years.

"Back in about 1959, my youngest son Don became interested in ham radio and I became active with him, and it was not long before we both had our 'tickets'. It was in 1965 that I accidentally ran across the Net on 75, I became very interested in County Hunting and in January 1966, put a mobile unit in my car and started giving out Counties as well. I was sure hooked now!

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

USA-CA HONOR ROLL

3000	1500	500
K1OME . . . 127	K1OME . . . 227	WB0CGJ . . 950
2500	W1JTD . . . 228	WB6DXU . 951
K1OME . . . 159	WA3GNW 229	W6LRI . . . 952
WA3GNW 160	1000	K1OME . . . 953
2000	K1OME . . . 306	W1JTD . . . 954
K1OME . . . 188	W1JTD . . . 307	SM6CMU . 955
W1JTD . . . 189		WB4RUA . 956
WA3GNW 190		WB4KYA . 957

"I estimate that I have given out at least 175,-000 mobile contacts since 1966. I think that I am most proud of the fact that every person (except the late Clif Corne, K9EAB) who has completed all the counties, has done so with the help of K7WQJ for many of them.

"I am still giving out counties mobile, and having "a ball." I am trying to see how many *last* counties I can give out. Actually I think I get a bigger kick out of giving out counties than I do collecting them. I still want to finish them *all* on 75 s.s.b. before I quit County Hunting, I have about 2900 now. I have worked them *All from my mobile* on 20 s.s.b. and I feel sure this is the first time this has been done.

A few years ago my radio knowledge came in handy when I did all the initial work in setting up a communications system for the Department of Agriculture, State of Oregon, and this is not my regular work, Hi!

Floyd Markham, K7WQJ ready to roll.

Nice Certificate for participating in the 10th Year (1972) 9Y4 QSO PARTY.

"In addition to amateur radio, I am also active in Boys Baseball and am at present serving on the National Board of Directors for Babe Ruth Baseball. I have been active in this baseball program for 20 years.

"A year ago I received another thrill when Chief Mars, USAF, Washington, D.C. presented me with a Certificate of Commendation for my contribution to the USAF Communications System.

"I didn't get to mail this before the doctors got me for a couple of operations, but I'm back on the job again after having been off for six weeks. I still may have to have a spinal fussion—but won't be for awhile—if at all.

"I would like to give special thanks to Don, WA9PRE, who gave me my last county, the first time around. He drove over 600 miles round trip to give me Dolores, Colorado. Also I would like to give credit to Don, WAØJRZ who drove almost as far to give me the last one on 20 meters from my mobile, Emmett, Iowa.

"It would be impossible to list all the fine people who have helped me along the way. In my small way, I hope I will be able to help others as I have been helped".

(Editor's note—This "Story" was submitted some time ago, hope Floyd did NOT have to have spinal fussion, but if so—I am able to say that they do wonderful work along those lines, these days).

Superman Award

Awards Issued

Dick Roth, K1OME, finally found time for all his paper work and sent for: USA-CA-500 & 1000 endorsed Mixed, All 14, All 3.9, and All Mobile. USA-CA-1500 & 2000 endorsed Mixed, All 14, and All Mobile. USA-CA-2500 endorsed Mixed, and All Mobile. USA-CA-3000 Mixed, in fact he needs only 7 Counties to make them All. (You might be interested in knowing that as this is being written, *no award* has been sent to him as he has failed to submit any certification form).

Harold Bubb, W1JTD was issued USA-CA-500, 1000, 1500, and 2000, endorsed All A-1.

Mixed USA-CA-500-Awards were sent to:
Bob Pierce, WBØCGJ.
E. Ingemar Olsson, SM6CMU.
John Boston, WB4RUA.

All S.S.B. USA-CA-500-Awards were won by:
Nick Winter, WB6DXU.
John Griffin, W6LRI.
Bob Kirk, WB4KYA.

Awards

Superman Award: Sponsored by the Chamber of Commerce of Metropolis, Illinois, home town of Superman. Basic Award for one contact with Massac County, Illinois and any other 4 counties (mobile or otherwise) south of route 50 in Southern Illinois. No time limit. Send data and $1.00 to Earl Harrison, K9UTI, Box 567, Metropolis, Illinois 62960. Benefits go to the Chamber of Commerce.

Chesapeake Bay Bridge-Tunnel Award: The Virginia Beach Amateur Radio Club sponsors this Award commemorating the Chesapeake Bay Bridge-Tunnel which was opened on April 15, 1964. The Bridge-Tunnel, constructed at a cost of $200,000,000.00, took 4 years to complete.

The 17.6 mile long bridge-tunnel system is one of the engineering marvels of the world, consisting of two low level trestles and two bridges with two tunnels. One under Thimble Shoals Channel and one beneath the Chesapeake Channel. Bridges span the north channel and Fisherman's Inlet Channel.

The northern terminal of the structure is located at Wise Point on the southwestern tip of Virginia's Eastern Shore. The southern terminal is located in the world's largest resort City, Virginia Beach, Virginia and serves motorists on the older ocean highway route.

Special certificates were awarded on opening day to certain amateurs who either crossed the span or worked club members. The certificate is now awarded to stations which operate within the continental United States who work 25 Virginia stations, 5 of which must be located in Virginia Beach. Foreign stations must work 10 Virginia stations, 3 of which must be in Virginia Beach.

TRW Recognition Award.

Chesapeake Bay Bridge-Tunnel Award

Amateurs must submit log data, including the dates, times (GMT), stations worked, bands and modes. All contacts must be dated after the Bridge-Tunnel opening date of April 15, 1964. The club reserves the right to request the cards be sent in for examination.

The Award is free but the amateur requesting the award is requested to send 16¢ in U.S. stamps or two IRCs, to cover mailing costs from: The Virginia Beach Amateur Radio Club, 1040 Lockwood Court, Virginia Beach, Virginia 23462.

YO Awards Program: The Romanian Radioamateur Federation, P.O. Box 1395, Bucharest 5, Romania have a fine Awards Program. YO Awards (some 22 or so) are issued for different modes or mixed and for different bands as well. Starting with working 30 different YO stations, working 10 YO3 stations, YO stations in the university centers, YO districts, YO DX Club Members, etc. . . . Space does not permit me to list all the rules, but contacts after 23rd August 1949 are valid and GCR rules apply (QSLs not required to be sent), and each Award costs 7 IRCs or $1.00. Send IRC to Romanian Radioamateur Federation, P.O. Box 1395 Bucharest 5, Romania and request a copy of the rules.

The College Bowl Award: Sponsored by the Massachusette Chapter, National Award Hunters Club. Issued for working accredited College and University stations, anywhere in the world. Also available to s.w.l.s. on a heard basis. Issued in 3 classes: Class A—work 50 in at least 20 states, provinces, or countries. Class B—work 25 in at least 10 states, provinces, or countries. Class C—work 10 anywhere in the world.

Fee for basic class is $1.00, Seals for higher class 10¢, except no charge for higher class seals at time of application for basic award. All free to B/P. Award will be endorsed for band and mode. If application is made for additional band or mode, fee is 25¢ as an additional certificate will be issued. Make checks or Money Orders payable to "Mass. Chapter N.A.H.C." IRSs accepted on a ratio of 10 IRCs to a dollar. Apply to: Awards Custodian: George J. Hayes, W1-DOM, 29 Belmont Street, North Quincy, Mass. 02171.

TRW Recognition Award: This certificate will be mailed, free of charge, to those radio amateurs submitting a bona fide list of 5 member stations worked. Application should be made to: TRW Amateur Radio Club, WB6WPO, Box S-1435, One Space Park, Redondo Beach, California 90278.

Admiral Of The Lakes: In case anyone missed my August column, I have placed this Award on the list to forget- even after complaints via registered letters to *WA8HHD*, complaints continue. And, YES, I will be adding more to the list to forget, so send in your complaints.

Notes

Hope all had a wonderful time at MARAC, Ft. Wayne, when I get some data and fotos, I'll pass along to you who could not attend.

Card from Dick, K6ARE who wonders if some California ham could operate from "Ham's Station" on Route 88 in Amador County for the California QSO Party—just think of a QSL from such a QTH!

Again I'd like to remind all readers that my deadline is 90 days—Yes, my only restrictions are *time* and *space*. Do write and tell me, How was your months- 73, Ed., W2GT.

The College Bowl Award.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

ONE of the first pieces of surplus to come to the market from the Viet Nam war is the AN/ARC-96, or at least parts of that system, a high-survivability air-to-ground communications system. Designed to keep operating despite such environmental upsets as helicopter vibration, jungle dampness, heavy weapons recoil, and even nuclear radiation, the ARC-96 is one tough hombre.

The only actual surplus item I have seen from this system is the teleprinter, a neat miniature unit made by National Cash Register. The airborne unit is TT-521/ARC-96, and it uses a 400 c.p.s. drive, while the ground unit, the TT-513/FR, uses a 60 c.p.s. motor. Other data I have however, indicates that either will run on 54-420 c.p.s. power, 117 v.

These units use standard 5-level Baudot code, and are thus directly usable for amateur RTTY. The printing is non-impact, upon heat-sensitive paper.

The equipment was used in 'nam aboard helicopter and prop-driven gunships, for target data, which was better given in writing than by 'phone because of the problem of regrettable errors causing friendly casualties.

The price to Uncle Sam for the printer was $19,000. In surplus, $20 bucks seems reasonable, a real bargain, sort of. Some of the units had keyboards, tape punches, and tape readers, although I have not seen them except at the Armed Forces Communications and Electronic show here in 1968.

NCR was quite helpful with data on these sets, but I suggest that any readers with queries write to me rather than to Paul Perkins or Russ Tuverson. Those gentlemen are busy, and have graciously given me what data they had in order to have me pass it on to you.

Westinghouse, by the way, was the "prime" on the ARC-96, and put the system together.

In the set, the printers were rated as "hardened" against military damage, and had a Mean Time Between Failure rating of 40,900 hours. It is supposed to be able to take a 15 G shock, 100% humidity, + 85 degree C. temperature, etc.

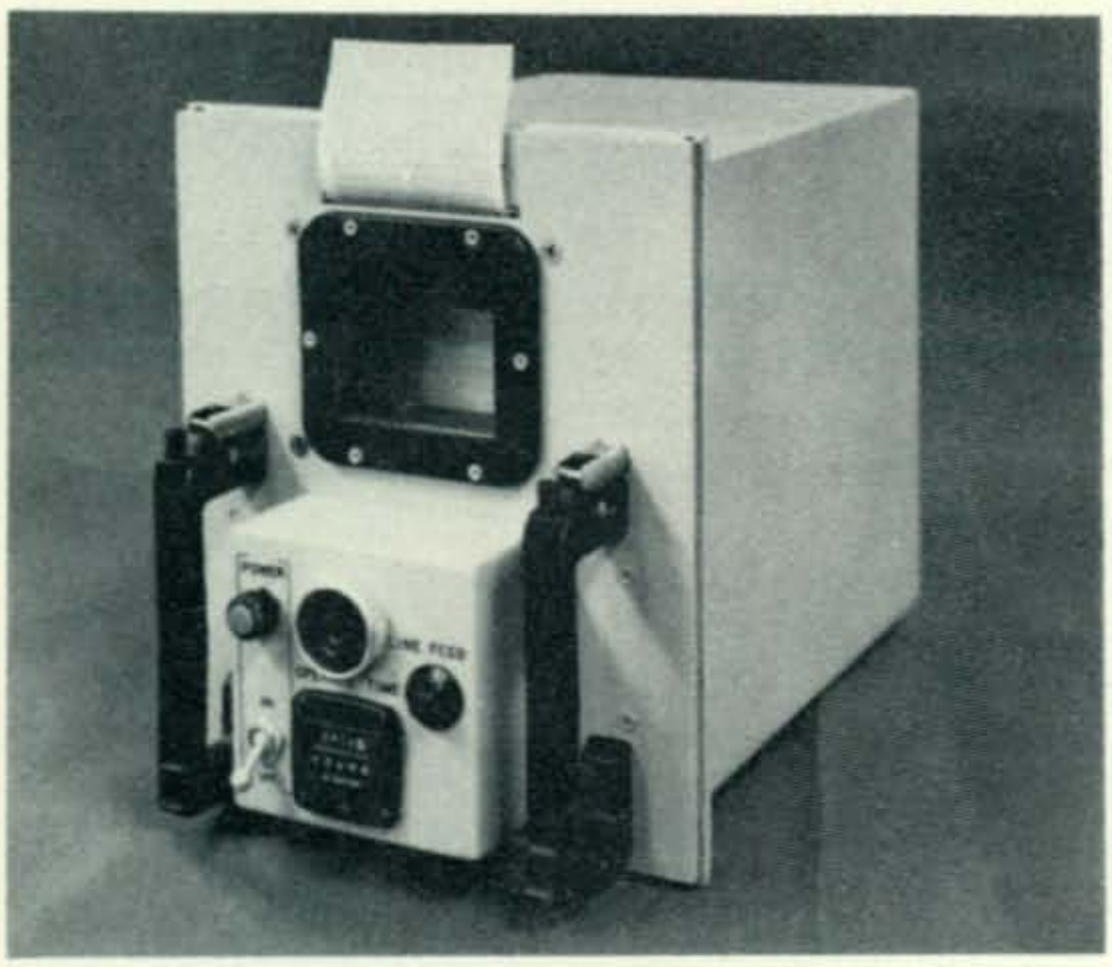
The NCR subsidiary that is now responsible for such items is Electronic Communications Inc., St. Petersburg, Florida.

The process is described by NCR as "Thermochromic," and it is a method of printing by heating elements of a 5 × 5 unit matrix which print by warming the special paper. The characters look a bit like RTTY characters on one of the cathode-ray-tube displays now on the market.

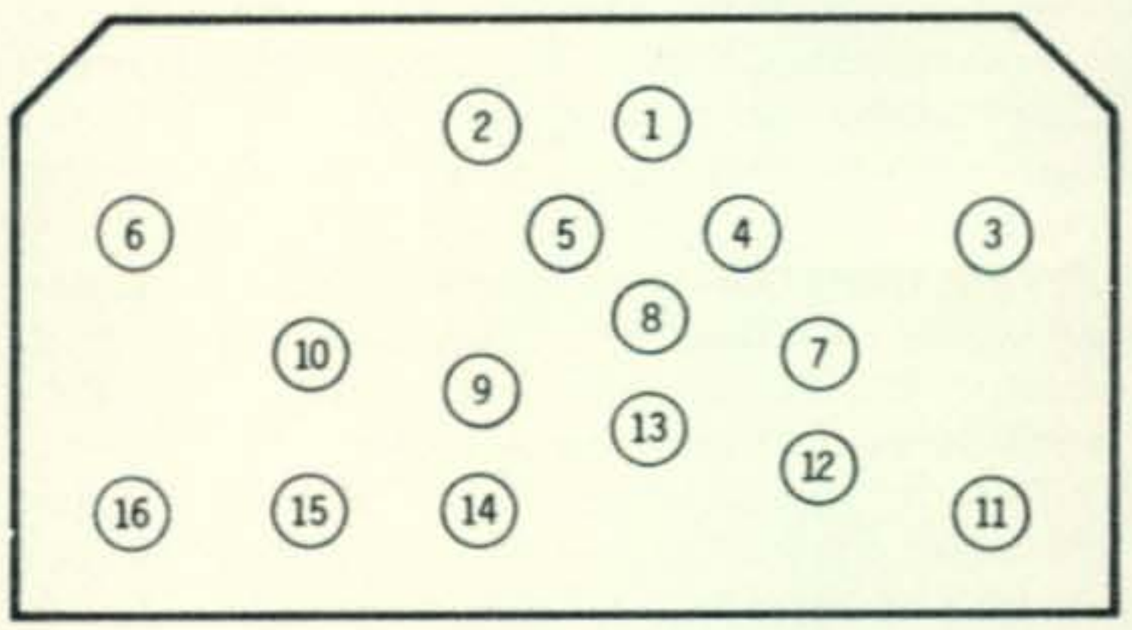
The nominal speed of the unit is 107 w.p.m. (75 Baud) but each line (26 characters) is received character-by-character, stored, converted into the matrix form, then printed, line-by-line. The paper is only three inches wide, thus the narrow format of only 26 letters. Line feed is added automatically, so there is no problem of compatability with standard equipment. The format is standard communications type (CCITT-2) with 0 and so on.

Paper advance (both carriage return and line feed) is also triggered by a space appearing in the last six characters (to avoid excessive word splitting) and by a steady mark signal for five

*1502 Stonewall Rd., Alexandria, Va. 22302



National Cash Register's TT-213/ARC-96 printer, which uses a heat-type of non-impact printing process.



1. No connection
2. Signal ground
3. AC power input
4. Chassis ground
5. No connection
6. Signal input
7. Chassis ground
8. No connection
9. Paper advance
10. No connection
11. Power input, a.c.
12. Chassis ground
13. No connection
14. Paper advance
15. Signal ground
16. Signal input

Fig. 1—Diagram of the hookup connections for the TT-513/ARC-96

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seconds, indicating a pause or end of message.

The printer has an electronic "bell" consisting of a 2500 c.p.s. tone (ground) and 3000 c.p.s. tone (airborne model).

As the description of printing would indicate, the NCR printer has lots of solid state circuitry. Input is Mil Standard 188B, or for the uninitiated, (neutral) space: less than 0.5 v.d.c.; Mark +2 to +7 v.d.c. Fig. 1 shows the hookup connections to the rear-panel plug.

Weight of the unit is 37 pounds, and it occupies only ½ cubic foot.

The AN/ARC-96 was originally designed under a Westinghouse prime contract circa 1969, for an Air Force flying command post which operated on very low frequency transmissions. The project was 487-L, I am told, and was super secret at the time. By now it is all obsolete, but the non-impact matrix printers are being used in the P3C Orion Navy subhunter aircraft, and in the Skylab space station. The Skylab version, to save weight, generates a single line of dots at a time, making up a line of letters in seven passes. There are some mini printers used as commercial data terminals, too.

It would be possible to change the encoding section of the printer to have it print Cyrillic, Chinese, Greek, Arabic, etc., although no one appears to have done that yet. Changing speeds of the unit, say for 60 w.p.m., could be accomplished by altering the resistor/capacitor one-

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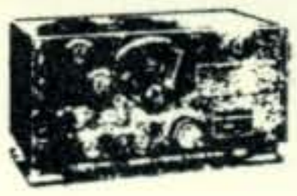

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CV–591A SSB Conv., 455 KHz, OK, w/book	137.50
Nems–Clarke No. 1670 FM rcvr 55–260 MHz w/bk	195.00
OCT–3 TTY FSK deviat. meter/rcvr, new	49.50
WWVB 60 KHz rcvr/comparator OK, w/book	295.00
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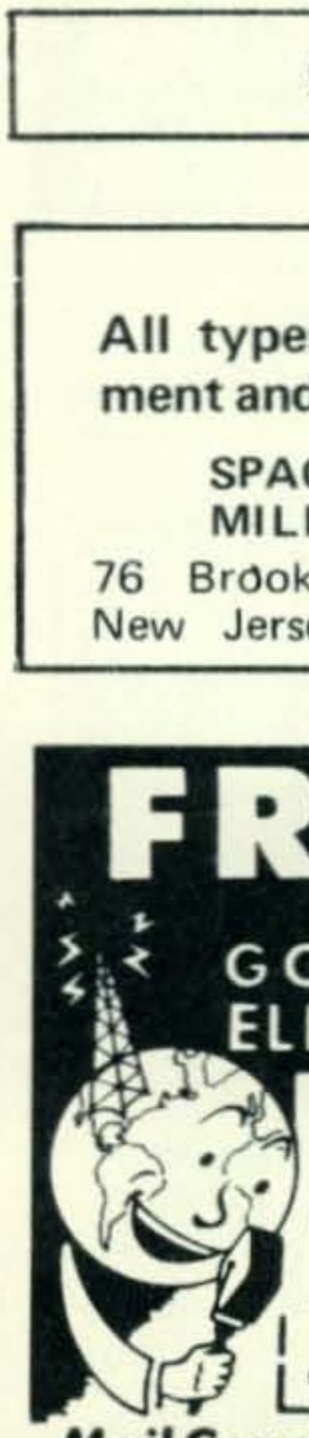

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shot oscillators that "clock" the data into the unit.

Three inch paper for the TT-213 is apparently available only from NCR.

DX [*from page 59*]

QSL Information

A6XB—Via K1DRN (Member **CQ** DX Committee for New England)
A6XF—To G3SUW
CN8BO—c/o W4GKF, 535 Windsor Pkwy. NE, Atlanta, GA 30342
CR7FR—To W7VRO
CR8AG—Via PY7YS
CR8AL—To PY7YS
CT1MK—c/o K6HN
DF8SAR—Via DL8FP
EA6BG—To W1RLV
EP2GW—c/o W2REB
FB8ZB—Via F8US
FC0AHY—To OK1AHV
FC0WV—c/o ON4TJ
FG0AFA/FST—John B. Irwin, 578 Morris Ave., A-6, Elizabeth, N.J. 07208
FP0WY—Via WA0VPK
FM0RX—To DJ9ZB
FL8HM—c/o K4SKI
FY0ADT—Via F8YY
HS3AIG—c/o Jack Corson, FEC-WARIN, APO, San Francisco, CA 96304
JT0AE—To OK3YAO or OK1AIA
JY6FC—c/o K6AQV
K5LTH/Kure—Via WA3HUP
KJ6DI—To K4RHU
MP4BJR—c/o K9KXA
MP4TEE—Via G8FOC
OD5LX—To K4TSJ
OX5AY—c/o K9YPW
PJ8SE—To John B. Irwin, 578 Morris Ave., A-6, Elizabeth, N.J. 07208
PY0ZAA—Via PY1DVG
SV1GA—To K3AFO
SV0WY—c/o WA0PVK
SP0ITU—Via SP5BB
TR8MC—To W2YY
TU2DJ—c/o K4AEB
TU2DV—Via WA6NFC
VK9DH—To W6LYC
VK9FH—c/o W0KHI
VK9MM—Via K4MQG
VP2AAK—To K4RHL
VP2MHB—c/o W4WWG
VP2SN—Via VE3BMV
VP2SQ—To W2MIG
VP8NI—c/o SM3CXS
VS6AW—Via WB6ZUC
VU2ANI—To K6TWT
WF2OC—Via W2HAQ
WS9BGF—c/o W9HRE
XG1J—Via XE1J
XW8EV—To K3NAS
XX7FR—Via W7VRO
YN1MG/HT1MG—To Mike Swinh, K0VVR, 8009 Beverly Drive, Prairie Village, Kansas 66708
ZB2CF—Via WA2MVQ 404 O'Brien Court, Wyckoff, N.J. 07481
ZE6JP—c/o K6AQV
ZF1JN—Via K6JAN
3D2JA—To W2OVC
3X1P—c/o SM0KV
4S7DA—Via W6FJ
5T5LO—To K9KXA
5X4NK—c/o DJ3JV
7Q7DW—Via G3AWY
7X2BK—To W5LUJ
9M8SDA—c/o WB6BGQ
9G1HE—Via VE3FCL
9F3USA—To WA5TKC
9L1VW—c/o K9QZI
CO2FG—P.O. Box 5052, Havana, Cuba
EA6CB—Box 34, Palma de Majorca, Balearic Islands, Spain
ET3USF—Box 304 HHC, APO New York 09843
FC2CG—P.O. Box 76, Bastia, Corsica, France
IT57PUG—Box 420, Palermo, Sicily, Italy
JY5HC—Box 2353, Ammann, Jordan
KC6SK—P.O. Box 55, Yap, Western Caroline Islands 96943
KS6DY—Box 148, Pago Pago, American Samoa
VP2LAW—Box 91, St. Lucia, West Indies
VP2LM—c/o Yacht Club, St. Lucia, West Indies
VS6FB—Box 541, Hong Kong
WN3SKY—Box 86, Greenbelt, Maryland 20770
YB7AAU—Box 47, Balikpapan, East Borneo
ZD7SD—P.O. Box 16, St. Helena, South Atlantic
3D2AA—Box 295, Suva, Fiji
4S7EA—Box 907, Colombo, Ceylon
5U7BA—Box 877, Niamey, Niger Republic
6W8FB—Box 971, Dakar, Senegal
7Q7AE—Box 24, Balantyre, Malawi
9K2AU—Box 77, Kuwait

73, John, K4IIF

Math's Notes [*from page 50*]

2-decade chains with provision for resetting to either 0 or 9. A companion chip, the M004, is a complete decoder for the M003 and provides 10-line decimal outputs. Both chips are TTL compatible and cost $10 for the M003, and $8 for the M004 in 100 quantity.

See you next month.
73, Irv, WA2NDM

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CHECK THESE SPECIFICATIONS

GENERAL

POWER REQUIREMENTS: 12 to 14 VDC
Current Consumption at 13.5 VDC:
Receive: 4 amps squelched, 1.2 amps unsquelched.
Transmit: 6 amps max.

DIMENSIONS: 7⅛" x 3½" x 9¼" deep; 4 lbs. net weight.

RECEIVER

TUNING RANGE: 146.00 to 148.00 MHz, continuously tuneable with reset capability of approx. 1 KHz to any frequency in range.

SENSITIVITY: .35 μv max. for 20 db quieting; .1 μv for reliable squelch action.

SELECTIVITY: 11 KHz at 3 db; Less than 30 KHz at 70 db. Adjacent (30 KHz spaced) channel rejection more than 70 db.

AUDIO OUTPUT: 2.0 watts (min.) at less than 10% THD into internal or external ohm speaker.

TRANSMITTER

TUNING RANGE AND CONTROLS: Same as RECEIVER.

POWER OUTPUT: 25 watts Min. into 50 ohm load. P/A transistor protected for infinite VSWR.

MODULATION: Internally adjustable up to 10 KHz deviation and up to 12 db peak clipping.

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AMATEUR NET

$299.95

CHECK THESE FEATURES

- 8-10 watts output (minimum).
- Speech clipping.
- Sensitive receiver—.25 μv (max.) for 12 db Sinad
- Selectivity—Adjacent channel (40 KHz) down 50 db.
- Each crystal does triple-duty, providing a transmit and receive frequency (Crystal Saver Frequency Control).
- Monolithic crystal filter.
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FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

160 Meter A.M. [*from page 41*]

The Power Amplifier

The two 2E26's are connected in parallel, as they were in the unmodified strip. The original parasitic suppressors in both the grid and plate circuits are used without modification. A new tank coil, *L*, was installed. This is 50 turns of #22 wire 1" in diameter and about 1½" long, spaced the wire diameter. A .01 mf 3000 volt ceramic capacitor was used for plate blocking. Of course the original plate tank capacitor, about 35 pf, was insufficient, so a double-bearing 235 pf single section air variable was vertically mounted in one of the holes already in the chassis. This is used, full in, as a padder. The 35 pf variable then is used to resonate the PA, naturally with considerable vernier action. The antenna coupling coil, inserted in the bottom of the tank coil, consists of 7 turns of #20 wire ¾" diameter and about ¾" long, spaced the wire diameter. Both screen and plates of the PA tubes are modulated, the screen through a 10K 10 watt resistor. Note that the screen and plate by-pass capacitors are only .002 mf. A higher value would decrease the audio frequency response at the higher frequencies.

The Modulator

Two metal 6L6 tubes, V_4 and V_5, are connected in parallel as a Class A modulator. Metal tubes were used because they fitted mechanically. (To use a glass 6L6G in the V_4 position, the socket would have to be moved away from T2X-2M.) The surplus modulation choke, CH_1, can be anything around 5 h. with a 200 ma current rating. The d.c. resistance should not exceed about 150 ohms. Note that the grid bias for the modulator tubes is obtained from the −15 volt bus that provides bias for the doubler and for the PA. Because the convenient place to mount CH_1 is on the other side of the chassis from the PA, shielded wire should be used for its connection to the PA.

Audio input (*SA*) to the modulator is obtained by capacity coupling from the unmodified speech amplifier V_6. Input (*AF*) to the speech amplifier is via pin 10 on connector P_1. Note that this standard connection is for a carbon microphone with one side grounded. An RC network, on the component board associated with the speech amplifier/clipper, provides the necessary d.c. for the microphone. Figure 4 is the schematic diagram of the early-design speech amplifier/clipper.

Metering

A standard Motorola test set, or equivalent, may be used for metering the transmitter through the 11 pin socket J_1 on the chassis. A portable multimeter may also be used with test prods inserted into J_1. *Caution:* Pins 7 and 8 have +400 volts on them! A milliameter connected to pins 7 and 8 will read about half the actual plate current of the PA because of the original metering resistor R_{307}. The press-to-talk function (from the power supply deck) is brought to pin 9 on J_1 so that the carrier may be turned on by the test set for test purposes. Note that we did not bring the AF input (carbon microphone) connection to J_1. This can be wired to pin 10 if desired. Shielded wire should be used.

Comments

Only the connection to the antenna coupling coil, mounted inside *L*, is brought out to the ANT connector via the original antenna relay K_1. This is so that an external antenna tuner could be used. Actually, we use a shunt-feed to a tower as described in the October 1940 issue of *QST*, page 64.

This project illustrates our contention that many interesting and practical pieces of ham gear can be built from the large amount of commercial two-way radio surplus that is now available to hams, especially the low band mobile sets which can be had for just a few dollars from dealers, or which can be had for the asking from those hams who collected them but now must clean out the basement. A wealth of components and usable chassis can be had from these sets. We hams can *still* build, without spending a fortune, if we use a little of that ingenuity we are supposed to have. ■

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

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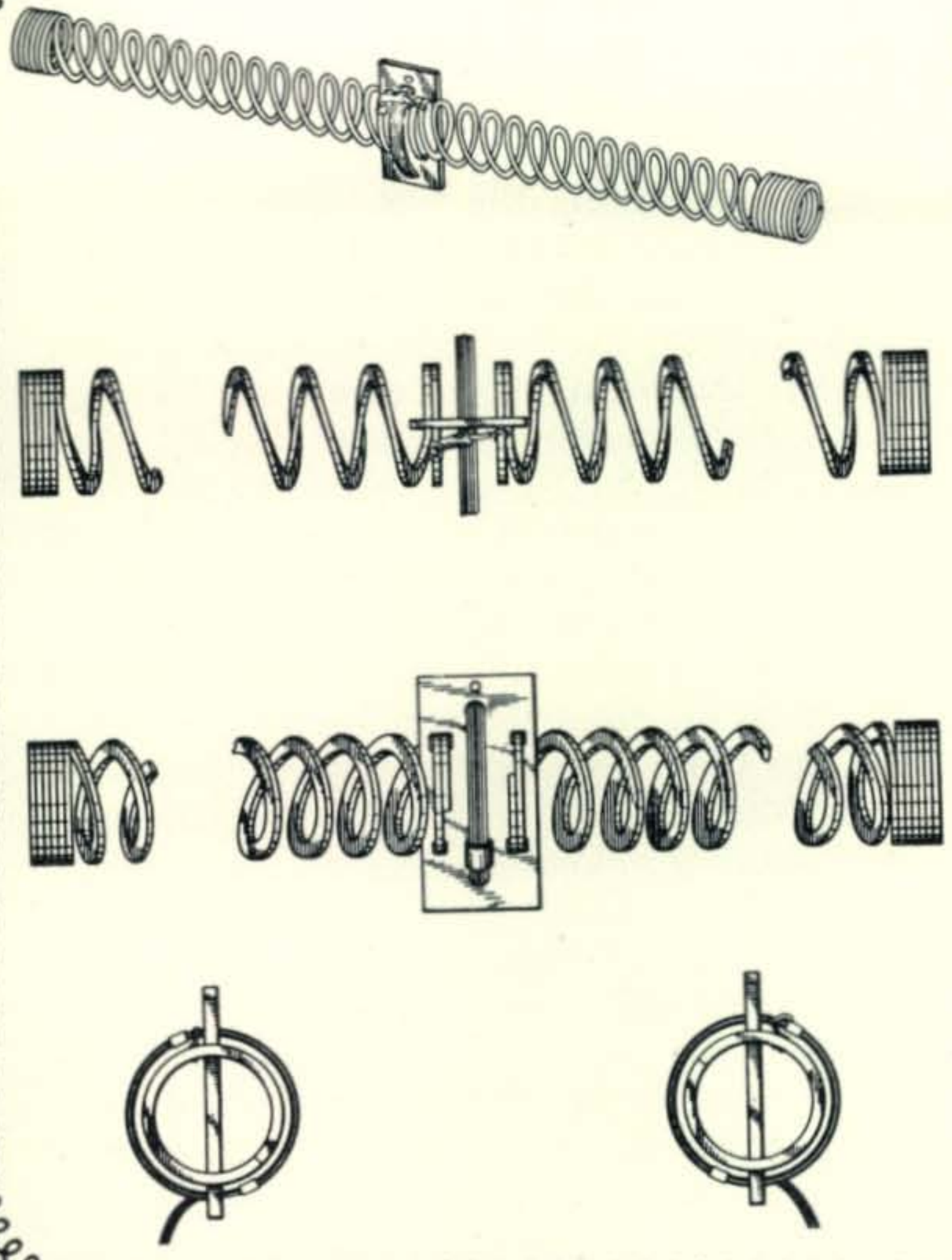

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Letters [*from page 7*]

volts. Obviously, he has never indeed actually tried to read this floating input voltage with a meter as he would have long ago found out that it would read in the area of 1.5 volts DC. Ask anybody who has worked with TTL about this one! In fact, his statement about not being able to trust a meter in digital troubleshooting work is not right. A meter is just as trusty as any logic probe and can detect true, false and open conditions on any input/output. The logic probe is just easier to use.

It should be pointed out somewhere that the diode used to pull down pin 1 of gate U1 should be a germanium type for reliable operation with a variety of IC's (of the 7400 type) to be used. Using a diode for pulldown even if it is germanium is not good TTL practice, but does work. Also, the input circuit might be kind of touchy when using different transistors at Q1 making the selection of the 1 meg series base resistor kind of criticaldepending upon the beta of the particular transistor used.

Cal Sondgeroth, W9ZTK
Mendota, IL

Editor, *CQ:*

Thank you very much for giving me the opportunity to comment on Cal Sondgeroth's letter about my TTL test probe. Point one says that the hypothetical circuit would not function as shown. True. That's why it's called a hypothetical circuit. It was not intended to be an actual working circuit. He is right about the meter reading 1.5 volts on a floating TTL line, but not in every case, and this is where you get caught when using a meter. The probe can also be used to detect pulses which could never be seen on a meter and it can be used as a "baby sitter" which could never be done with a meter.

He points out that using a diode for pull down is not good TTL practice, while admitting that it works. Hams are experimenters, not design engineers; I developed this circuit by experimenting. Usually when a ham is experimenting and finds something that will work, he uses it even if he doesn't know it's bad practice. That's the big difference between Hams and Engineers and the main reason I like *CQ;* it is written by hams, for hams, not by design engineers for hams.

About the diode and transistor combination, what more can I say; it works and it works well, though possibly you'll have to experiment to get a perfect combination, but experimenting is what ham radio is all about.

The VCC polarity is reversed in the diagram. The diagram I sent to *CQ* was correct, so I guess you fellows goofed this one. Possibly the plug on your photo copier is reversed, hi! Possibly Cal could design us a better one that can still be constructed for less than $2.00. It would be interesting.

Pete Walton, VE3FEZ
Ancaster, Ontario

Just as a point of interest, the latest Jensen Tools Catalogue, (No. 572, available from Jensen Tools and Alloys, 4117 N. 44th St., Phoenix, Ariz. 85018), lists on page 91 the Kurz Kasch LP-528 logic analysis probe at the bargain price of $70. For only $100 one can purchase the deluxe LP-520 MSG model which offers a "baby-sitting" function, and betters VE3FEZ's pulse detection capability by 5 nanoseconds. All for only $98 more than Pete's simple probe!

Editor

Scan Conversion [*from page 32*]

done with storage systems. In the broadcast television and other fields much use is made of the selective Write, selective Erase, Zoom, and special effects capabilities of scan converters.

One reason for the writer's enthusiasm for the storage tube approach to scan conversion is that once these tubes become available at a price within the reach of hams, the additional equipment required would not be of an unusual or extremely complex nature. The Hughes MSC-1 is loaded with control logic, provisions for special effects, and a variety of inputs. A ham SSTV-to-fast-scan converter could be much simpler. The elements of the system would be as shown in fig. 2, but a homebrewed black box would take the place of the MSC-1. Techniques for modifying conventional TV sets for monitor use are well documented, so the major effort would be building the necessary power supplies and amplifiers for the video and sweep circuits. The task of converting one frame every 8 seconds to 30 frames per second is enormously simpler than repetitive conversions at higher rates.

A fair question at this point might be, "Why tell *CQ* readers about commercial gear that's priced beyond the ham market?" The answer, as we said earlier, "Amateur SSTV must have a storage and playback system to maximize its usefulness." Whether this capability will be provided by the digital approach or storage tubes will depend upon the costs and quality.

We are grateful to the Hughes Aircraft Company for the loan of the MSC-1 unit to demonstrate the usefulness of a scan converter in amateur SSTV. The company also supplied diagrams and other technical information contained in this article. The personal interest and assistance of Messrs. Robert Currie, Dennis Ortega, James Sandberg, and Dr. Sven Lundqvst is also greatly appreciated. We thank Eastman Kodak for loaning the fast scan monitor, and Mr. Edward Waz, W2BVP of Kodak for his technical assistance.

Fig. 6—Using the MSC-1 scan converter, the photo of YV1AQE is combined with his station identification to produce this composite photo.

There are certain highlights in every Ham's radio experience. In 50 years of hamming we would put seeing the fellow at the other end at the top of our list. Picture transmission gives us communication without the limitations of the spoken word. To make the most of this capability we need continued development of our slow scan system. Scan conversion with fast scan viewing is the next logical step. We are convinced that this is the way to go!

Now that we are about to return the MSC-1 to the Hughes Aircraft Co. we will continue to use the reliable Robot for our slow scan operation (try to get it away from us!). However, we do hope that making one form of scan conversion and its capabilities better known will encourage the continued development of this much needed element of amateur SSTV. ■

SSTV [*from page 45*]

viewing hood. If you want to get several people into the act, though, that isn't the solution. Once the viewing hood is off, steps must be taken to minimize the ambient illumination on the CRT face. At night the room lights can be turned off, or turned down with a dimmer replacement for the wall switch. A table or wall lamp equipped with a low wattage bulb, and mounted to the rear of the monitor front panel will usually provide plenty of light for operating activities without washing out the CRT image. In the daytime, venetian blinds or opaque window shades can be used to darken the room sufficiently. Bob Gervenack, W7FEN, is experimenting with deep red illumination during picture reception periods. His idea is to maintain color contrast and dark adaptaton with a higher illumination level than would be acceptable using white light.

The optimum monitor screen size depends on the viewing distance. For one person, and the screen at a distance of a foot or 18 inches, I prefer a 3" CRT. For group viewing something larger is required. A 5" CRT is about

right for a close-in group of 2 or 3 people. The still larger picture of the Robot and SBE monitors allows the group to expand and back up a bit. For groups of 25 or more, a 12" or 17" CRT would be appropriate. Keep in mind, though, that amateur SSTV pictures appear either small and crisp or large and fuzzy. Small and crisp is subjectively more satisfying.

Lens field-of-view is another important factor. Choice of lens will depend on choice of subject matter, viewing distance, and the raster size on the camera tube. Since raster size is usually not accurately known, the safest thing is to measure your angle of view by pointing the camera at a wall and measuring both the width of the field-of-view and distance from lens to wall. Plot this information "to scale" on graph paper and measure the angle of view (see fig. 2). If you then sketch your shack equipment location and floor plan "to scale" on another piece of graph paper you can see what your camera will cover. If it is not what you want, check to see what a lens of different focal length would buy you. A lens with half the focal length will give twice the angle of view and vice versa. (You may find, as I do, that a fast, *f*/1.4 or *f*/1.5, wide angle lens is the most useful one in a small shack.)

Beware! All C mount lenses will not work well with a 1" vidicon such as that used in the Robot camera. There are many lenses now on the market designed for the smaller raster of the ⅔" vidicons used in the J & R, and many Japanese cameras. Be particularly wary of lenses having focal lengths of 16mm and 8.5mm coupled with bargain prices. These are "normal" and "wide angle" focal lengths for the ⅔" format. 25mm and 12.5mm are the corresponding values for "normal" and "wide angle" 16mm film, and 1" vidicon format lenses. Lens speed (or *f* number) is another parameter with a direct effect on the visual environment. Light reaching the vidicon drops as the square of the *f* number. An *f*/1.9 lens will therefore require twice the lighting brightness (and twice the wattage) that an *f*/1.4 lens requires, but only half the wattage required with an *f*/3.5 lens. On the other hand, *f*/1.4 lenses are much more expensive than *f*/1.9 lenses.

The Audio Environment

If your activities involve only yourself in the shack, pre-SSTV methods of handling the audio may be quite adequate. You want a good audio-level-to-acoustical-noise ratio while both transmitting and receiving. If you have loud blower noise or external noises, a mike having a cardioid pattern, or a close talking mike with a noise cancelling feature may be the answer on "transmit." Using headphones, keeping the speaker volume high, or placing the speaker close to the operator are approaches to good audio-to-noise ratio on "receive."

With several people involved, another approach is needed. If your shack is very quiet, a single directional mike a few feet in front of the group, or lavalier or lapel mikes may work. Most shacks are not "TV studio" quiet, however, and close-talking mikes are likely to be a necessity. Lightweight headsets with small noise-cancelling mikes, such as used by aircraft pilots are an ideal solution is a noisy environment.

Phone patching, if used to tie a remote person into the group, requires some extra thought. Both on-air received audio and audio generated in the shack should be piped into the phone line for the patched person to hear. His or her incoming audio should be mixed with the shack-generated audio for transmission. A good hybrid patch, or other scheme that separates incoming from outgoing audio is required.

A look at the Control and Physical Comfort interfaces, and some practical hardware next month.

Vy 73, Cop, WØORX

Propagation [*from page 64*]

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	05-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-15 (3) 15-17 (2) 17-19 (1) 23-01 (1)	17-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 19-20 (1)* 20-22 (2)* 22-00 (1)*
Northern & Central Europe & European USSR	08-10 (1)	07-08 (1) 08-11 (2) 11-12 (1)	06-07 (1) 07-12 (2) 12-15 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-01 (1) 20-23 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	07-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-17 (1) 21-00 (1)	19-23 (1) 20-22 (1)*
West & Central Africa	08-10 (1) 10-12 (2) 12-14 (1)	06-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	17-19 (1) 19-21 (2) 21-22 (1) 19-21 (1)*

East Africa	09-13 (1)	08-11 (1) 11-13 (2) 13-14 (1)	07-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	20-00 (1) 21-23 (1)*
South Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1) 22-00 (1)	18-19 (1) 19-21 (2) 21-23 (1) 19-21 (1)*
Central & South Asia	19-21 (1)	08-10 (1) 18-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-21 (2) 21-22 (1)	06-08 (1) 18-20 (1)
Southeast Asia	16-18 (1)	09-12 (1) 14-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-14 (1) 18-19 (1) 19-21 (1) 21-22 (1)	04-07 (1)
Far East	16-19 (1)	08-10 (1) 15-16 (1) 16-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (1) 06-08 (2) 08-09 (1) 02-04 (1)*
South Pacific & New Zealand	11-13 (1) 13-17 (2) 17-19 (1)	09-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-21 (3) 21-23 (2) 23-01 (1)	23-01 (1) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-06 (2)* 06-07 (1)*
Austral-asia	14-16 (1) 16-17 (2) 17-18 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 05-07 (1) 07-08 (2) 08-10 (3) 10-11 (2) 11-14 (1)	02-04 (1) 04-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Northern & Central South America	08-09 (1) 09-11 (2) 11-15 (3) 15-16 (2) 16-18 (1)	06-08 (1) 08-09 (2) 09-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-13 (2) 13-15 (3) 15-18 (4) 18-20 (3) 20-02 (2) 02-06 (1)	18-19 (1) 19-21 (2) 21-02 (3) 02-04 (1) 04-05 (2) 05-06 (1) 19-21 (1)* 21-02 (2)* 02-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	07-08 (1) 08-10 (2) 10-22 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-02 (1)	19-21 (1) 21-01 (2) 01-03 (1) 03-04 (2) 04-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	14-16 (1)	08-10 (1) 13-16 (1) 16-18 (2) 18-19 (1)	15-17 (1) 17-19 (2) 19-22 (3) 22-00 (2) 00-02 (1) 06-08 (1)	23-05 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	08-10 (1)	07-08 (1) 08-11 (2) 11-13 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-14 (2) 14-16 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-00 (1) 19-23 (1)*
Central & Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-09 (2) 09-10 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	21-00 (1)
Eastern Mediter-ranean & Middle East	08-10 (1)	07-08 (1) 08-10 (2) 10-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (1) 21-23 (1)	18-22 (1) 06-08 (1)
West & Central Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-14 (2) 14-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	18-23 (1)
South Africa	08-12 (1)	07-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1) 18-20 (1)*
East Africa	*Nil*	08-10 (1) 10-12 (2) 12-13 (1)	08-13 (1) 13-16 (2) 16-18 (1) 21-23 (1)	18-21 (1) 06-08 (1)
Central & South Asia	17-19 (1)	16-17 (1) 17-19 (2) 19-20 (1) 07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-17 (1) 17-19 (2) 19-20 (1)	04-09 (1) 17-19 (1)
Southeast Asia	14-18 (1)	13-15 (1) 15-18 (2) 18-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-22 (1)	02-03 (1) 03 05 (2) 05-08 (1) 03-05 (1)*
Far East	14-17 (1)	12-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	06-07 (1) 07-12 (2) 12-16 (1) 16-17 (2) 17-20 (3) 20-21 (2) 21-23 (1)	23-02 (1) 02-05 (2) 05-08 (1) 01-03 (1)*
South Pacific & New Zealand	09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	08-12 (1) 12-16 (2) 16-18 (4) 18-19 (2) 19-20 (1)	06-07 (2) 07-09 (3) 09-12 (2) 12-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-00 (2) 00-06 (1)	21-22 (1) 22-05 (3) 05-07 (2) 22-00 (1)* 00-05 (2)* 05-06 (1)*
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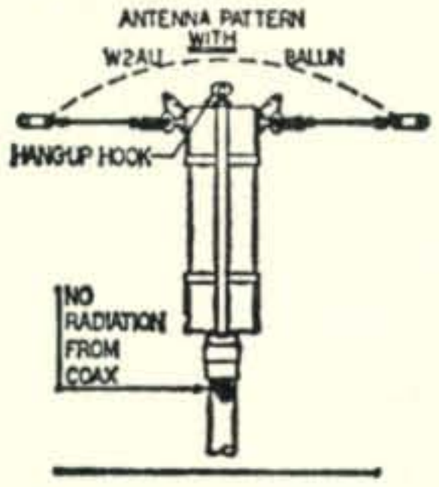

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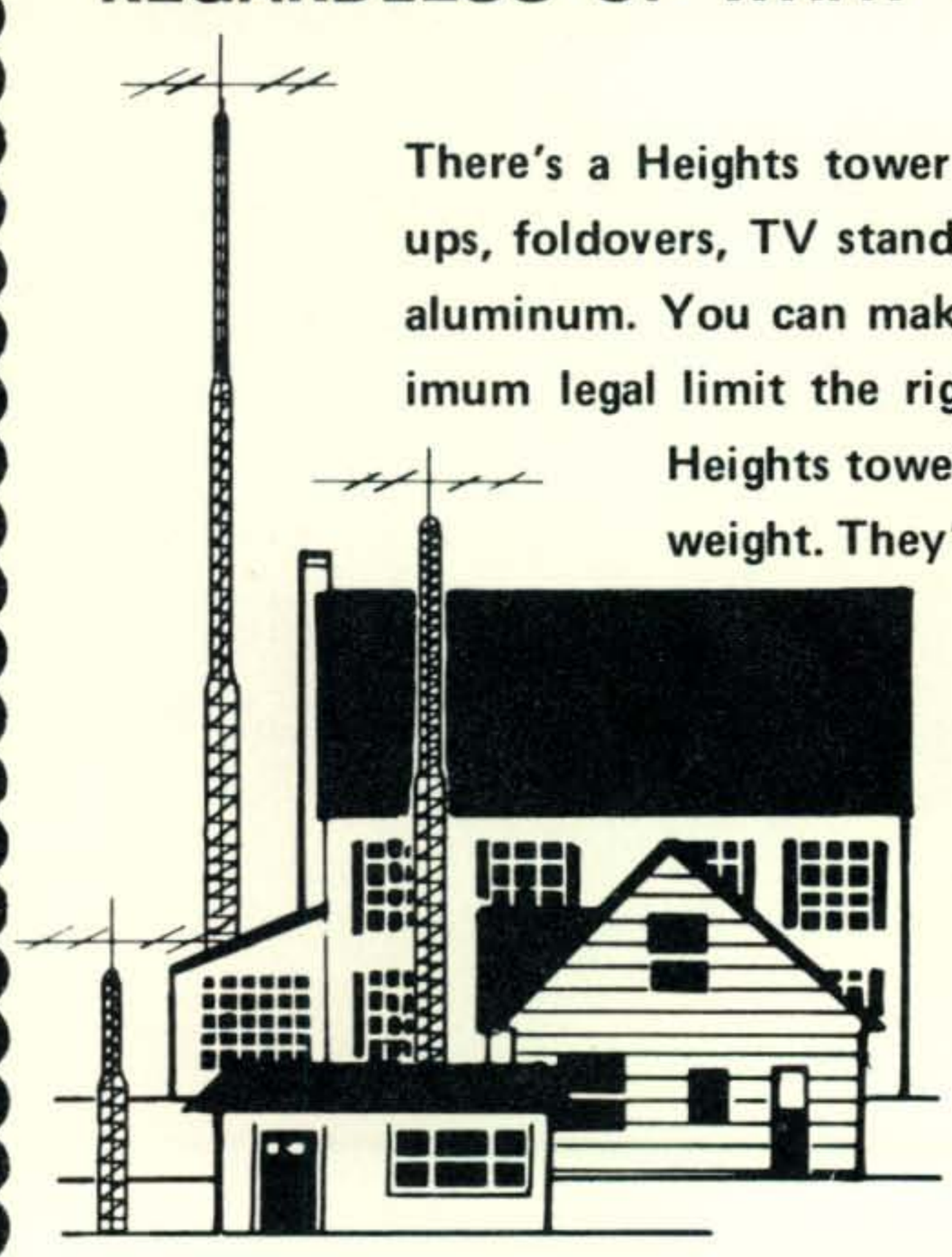

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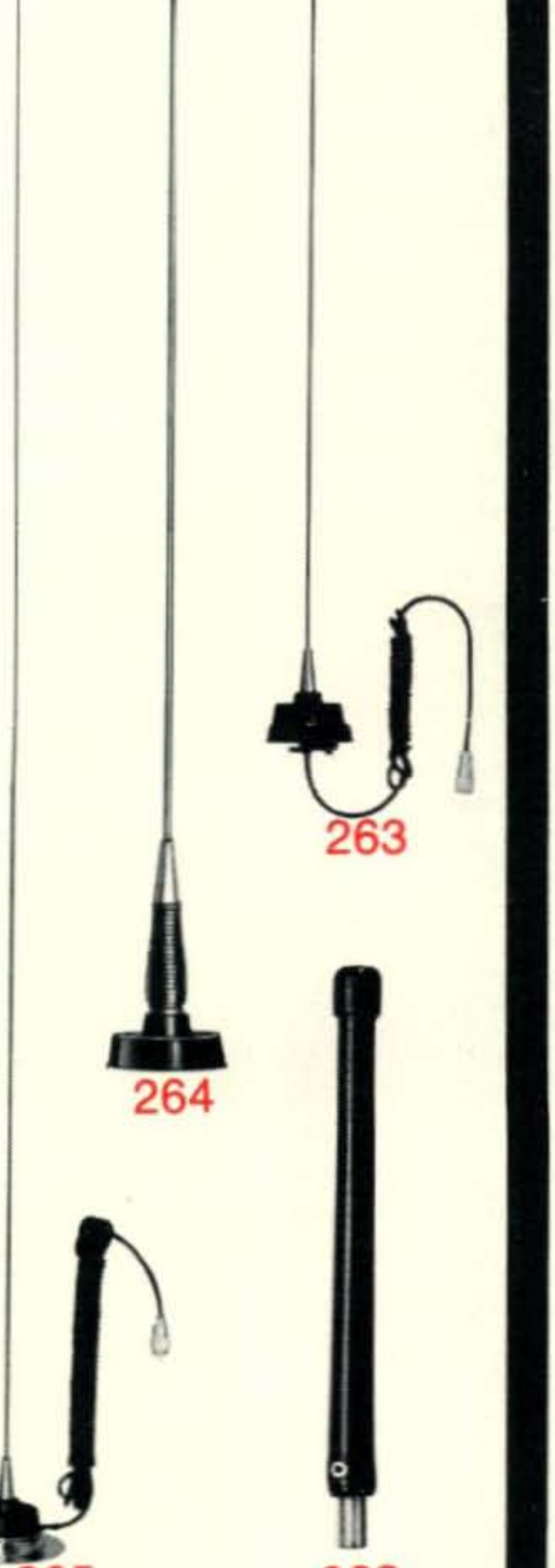

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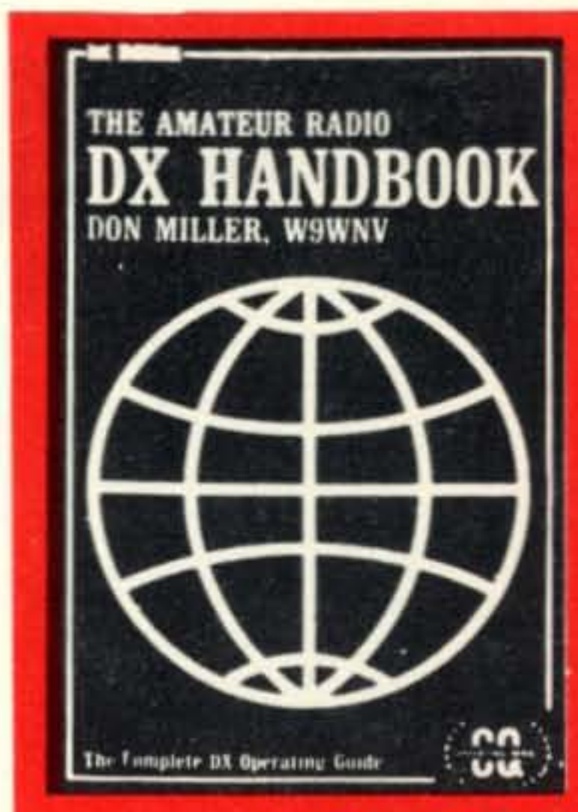

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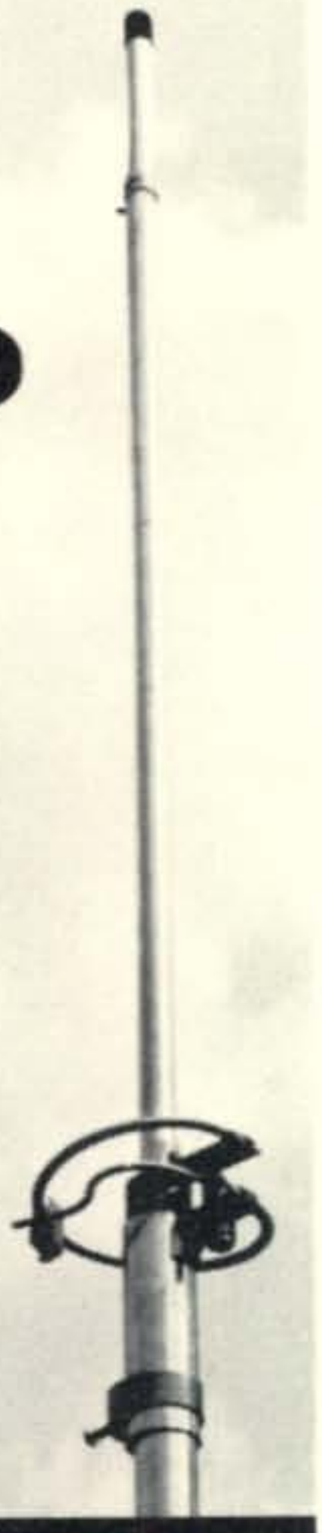

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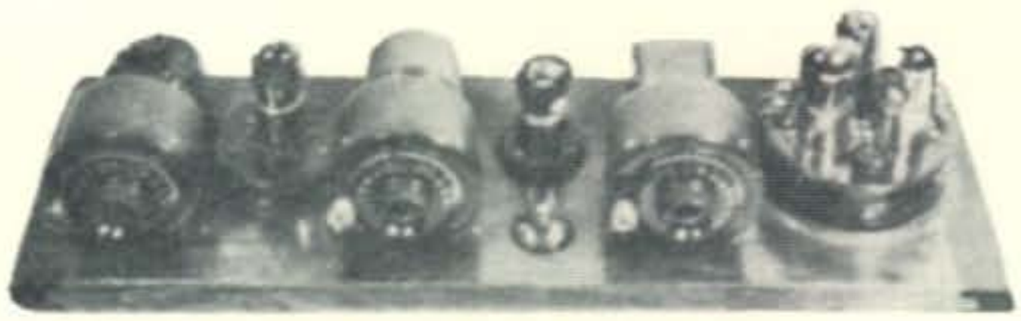

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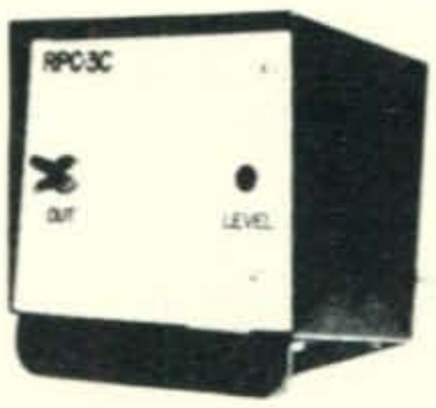

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TOUCH-TONE PADS: Twelve button unlighted $12. Twelve button lighted, $16. Full leads/guaranteed/prepaid, insured, S. Roberts, WA5GNT, 1130 Fuller Dr., Apt. 223, Dallas, TX 75218.

BC-610-1, BC-614, T.V.'s and coils, spare tubes. Make offer F.O.B. Cupertino, CA W6OTW, 10385 Mann Dr., Monta Vista, CA 95014.

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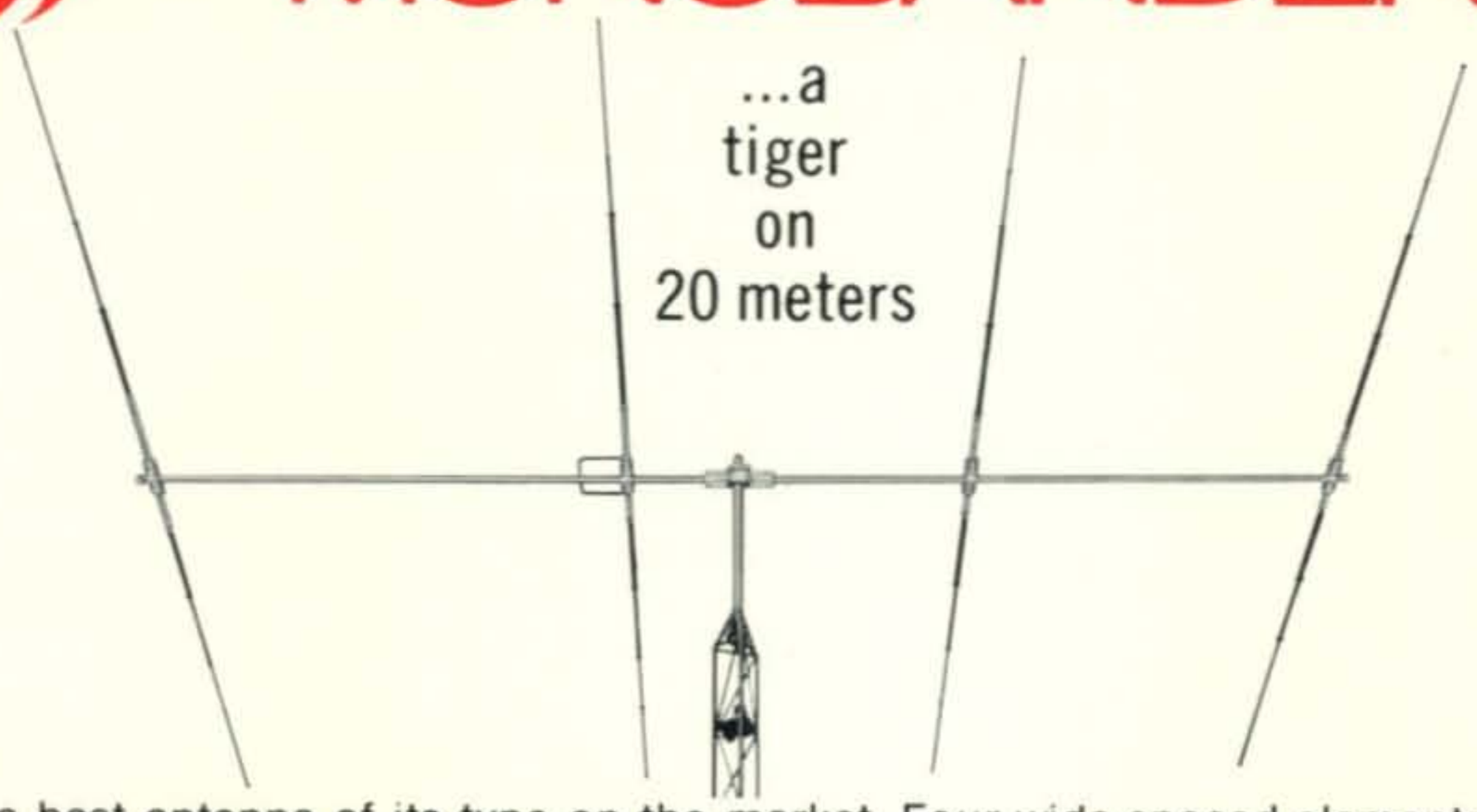
HY-GAIN 204BA MONOBANDER



The best antenna of its type on the market. Four wide spaced elements (the longest 36'6") on a 26' boom along with Hy-Gain's exclusive Beta Match produce a high performance DX beam for phone or CW across the entire 20 meter band.

- 10 db forward gain
- 28 db F/B ratio
- Less than 1.05:1 SWR at resonance
- Feeds with 52 ohm coax
- Maximum power input 1 kw AM; 4 kw PEP
- Wind load 99.8 lbs. at 80 MPH
- Surface area 3.9 sq. ft.

The 204BA Monobander is ruggedly built to insure mechanical as well as electrical reliability, yet light enough to mount on a lightweight tower. (Recommended rotator: Hy-Gain's new Roto-Brake 400.) Construction features include taper swaged slotted tubing with full circumference clamps; tiltable cast aluminum boom-to-mast clamp; heavy gauge machine formed element-to-boom brackets; boom 2" OD; mast diameters from 1½" to 2½"; wind survival up to 100 MPH. Shipping weight 51 pounds.

See the best distributor under the sun...the one who handles the Hy-Gain 204BA Monobander.

Model 204BA (4-element, 20 meters).....**$159.95**
Model 203BA (3-element, 20 meters).....**$149.95**
Model 153BA (3-element, 15 meters).....**$ 79.95**
Model 103BA (3-element, 10 meters).....**$ 64.95**

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Improves transfer of energy to the antenna; eliminates stray RF; improves pattern and F/B ratio. **$14.95**

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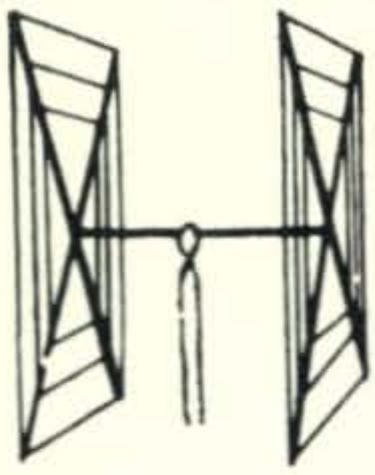
WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15 meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices - rely on the results of open, competitive contests. Ask yourself: Why do Gotham antennas win?

QUADS Worked 42 countries in two weeks with my Gotham Quad and only 75 watts . . .



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished): 52 ohm coaxial cable

Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
15-20 CUBICAL QUAD	38.00
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

BEAMS The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!

Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$25	4 EL 10	24
3 EL 20	31*	7 EL 10	38*
4 EL 20	38*	4 EL 6	24
2 EL 15	21	8 EL 6	34*
3 EL 15	25	12 EL 2	31*
4 EL 15	31*	*20' Boom	
5 EL 15	34*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H, and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$18.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$20.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$22.95

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GENERAL ELECTRIC
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- **132-150 and 150-174 MHz/Size: 9.5" x 5.3" x 1.7"**
- **1 watt output, .5 micro-volt sensitivity.**

High performance, completely self-contained two-way FM radio. Compact, lightweight, easily operated and hand-carried. Housed in high-impact, 2-section case. All external hardware polished stainless steel. Top section has transmitter and receiver modules, built-in mike and speaker, antenna, carrying handle, all switches and controls. Bottom section has battery power supply. Power connections to top section made by plug and jack connection.

$138. Includes rechargeable nickel cadmium battery pack and charger.

Crystals and tuning, add $50.

Proper chargers available separately, each $15.

Lots of 5 less 10% — $124.20
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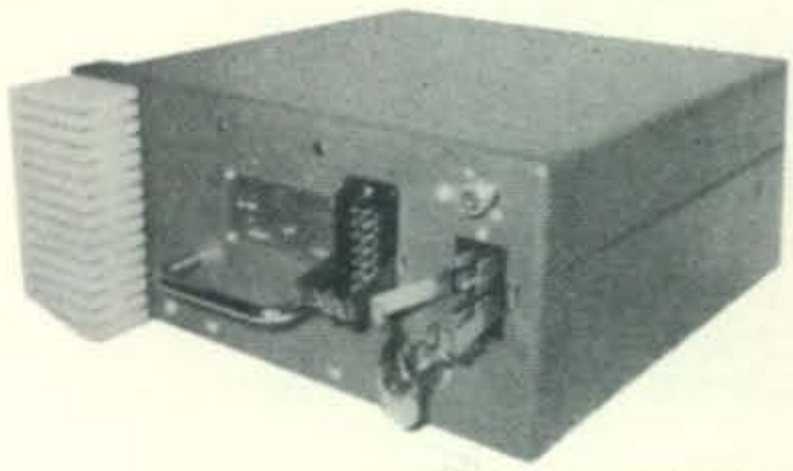
GENERAL ELECTRIC PROGRESS LINE
14" or 17" case, complete accessories, fully narrow band.



MT/33

MT/33, 12 volt, 30 watts, transistor power supply.....$158
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Total only $599.00

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Tomorrow's Transceiver Today: 20 tubes plus 50 silicon semiconductors, passive crystal filter (6 pole), velvet smooth tuning, superb noise blanker, standard electrical parts. This is truly the best buy in the amateur field today. See your local dealer for brochure & demonstration.

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