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THE RADIO AMATEUR'S JOURNAL

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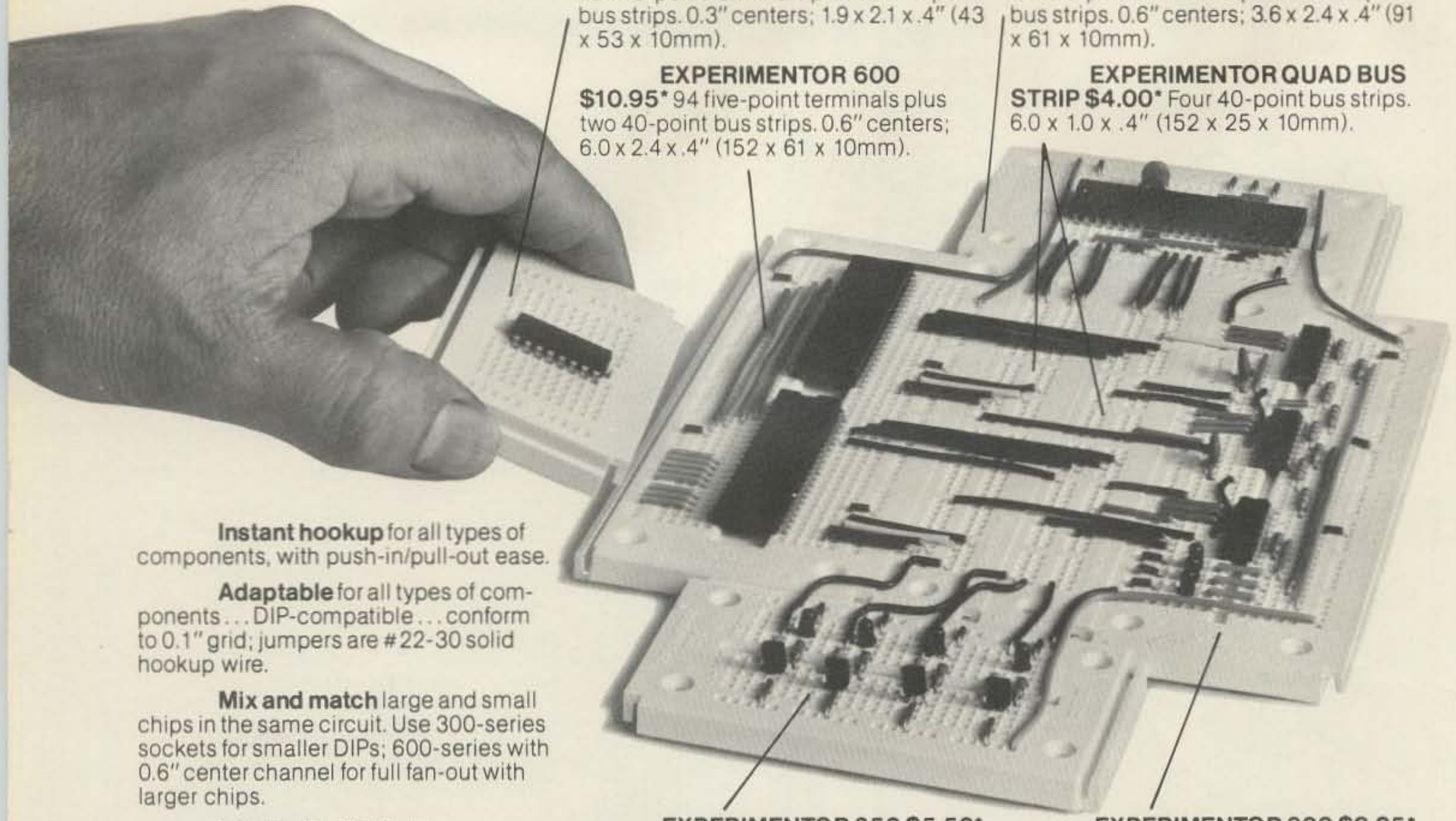

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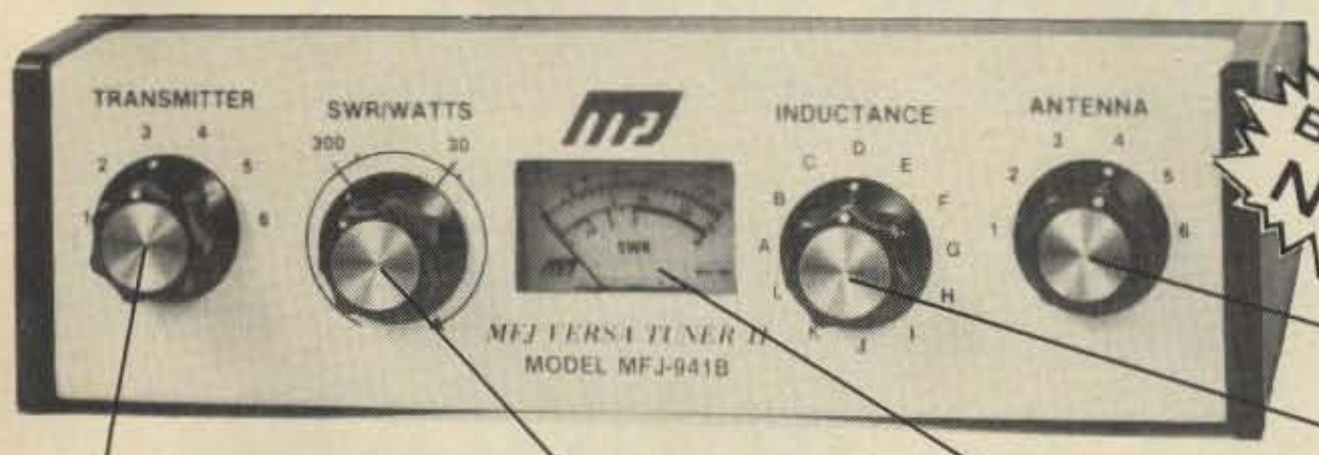

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Efficient airwound inductor gives more watts out and less losses.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B Versa Tuner II with all these features at this price:

A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

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With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.

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Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

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MFJ-901 VERSA TUNER MATCHES ANYTHING. 1.8 THRU 30 MHz. NEW LOWER PRICE

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Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

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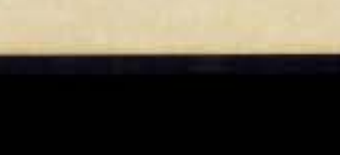

Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

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FEBRUARY, 1979 VOL. 35, NO. 2

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

DXpedition...The Ultimate Fantasy

Clipper ships sailing to foreign shores. Sixteen amateurs primed for adventure, coming together as the first group in 20 years to set foot on the remote French Island, Clipperton. Their goal: 30,000 QSO's in just 7 days.

If you're like most of us, a rare DXpedition is more a dream than a reality, but the Clipperton Linear Amplifier from DenTron brings the thrill of a DXpedition to you.

The Clipperton-L™ was inspired by the famous DXpedition on which 3 MLA-2500's were used. We built the Clipperton with 4 rugged, economical, 572 B's in the final to provide a full 2KW PEP on SSB and 1KW CW on 15 through 160 meters. With features like hi-lo power selector for equal efficiencies at 1 or 2 KW, a power transformer that is vacuum impregnated, wide spaced tuning and loading capacitors, built-in ALC and an improved whisper-quiet cooling system, the excitement of crashing a pile-up can be yours.

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A new touch from Astatic.

Introducing the Astatic T²M amplified microphone with touch pad encoder...created for quality communications.

Now convenient operation and professional performance are at your fingertips. We designed the T²M for repeater control and phone patch applications. And filled it with features and world famous Astatic quality.

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You can always tell who's running a TS-820S. Its superb quality stands out from all the other rigs on the band...and when the QRM gets heavy the TS-820S's adjustable RF speech processor, utilizing a 455-kHz circuit to provide quick-time-constant compression, will get the message through. RF negative feedback is applied from the final to the driver to improve linearity, and third-order products are at least -35 dB. Harmonic spurious emissions are less than -40 dB and other spurs are less than -60 dB.

RF input power is 200 W PEP on SSB, 160 W DC on CW, and 100 W DC on FSK. Receiver sensitivity is better than 0.25 μV for 10 dB S/N.

The TS-820S from Kenwood! See it today at your nearest Authorized Kenwood Dealer.

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TR-7600 (only)

- Memory channel...with simplex or repeater (plus or minus 600 kHz transmitter offset) operation.
- Mode switch for operating simplex or for switching the transmit frequency up or down...or for switching the transmitter to the frequency you have stored in the TR-7600's memory (while the receiver remains on the frequency you have selected with the dual knobs).
- Select any 2-meter frequency.
- Even without the optional RM-76, the TR-7600 gives you full 4-MHz coverage (144.000-147.995 MHz) on 2 meters; 800 channels; dual concentric knobs for fast frequency change (100 kHz and 10-kHz steps); 5-kHz offset switch, and MHz selector switch...for desired band (144, 145, 146, or 147 MHz).
- Digital frequency display (large, bright, orange LEDS).
- UNLOCK indicator...an LED that indicates transceiver protection when the frequency selector switches are improperly positioned or the PLL has malfunctioned.
- 10 watts RF output (switchable to 1 watt low power).

TR-7600 WITH RM-76

- Store frequencies in six memories.
- Scan all memory channels.
- Automatically scan up the band in 5 kHz steps.
- Manually scan up or down in 5-kHz steps.
- Set lower and upper scan frequency limits.
- Reset scan to 144 MHz.
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- Cancel scan (for transmitting).
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- Select repeater mode (simplex plus transmit frequency offset, minus offset, or one memory transmit frequency).
- Select transmit offset (±600 kHz / ±1 MHz).
- Operate on MARS (143.95 MHz simplex only).

- Display indicates frequency (even while scanning) and functions (such as autoscan, lower scan frequency limit, upper scan limit, error, and call channel).

See the exciting new TR-7600 and optional RM-76 now at any Authorized KENWOOD Dealer!

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IC-701, the HF (160-10M) Maximizer

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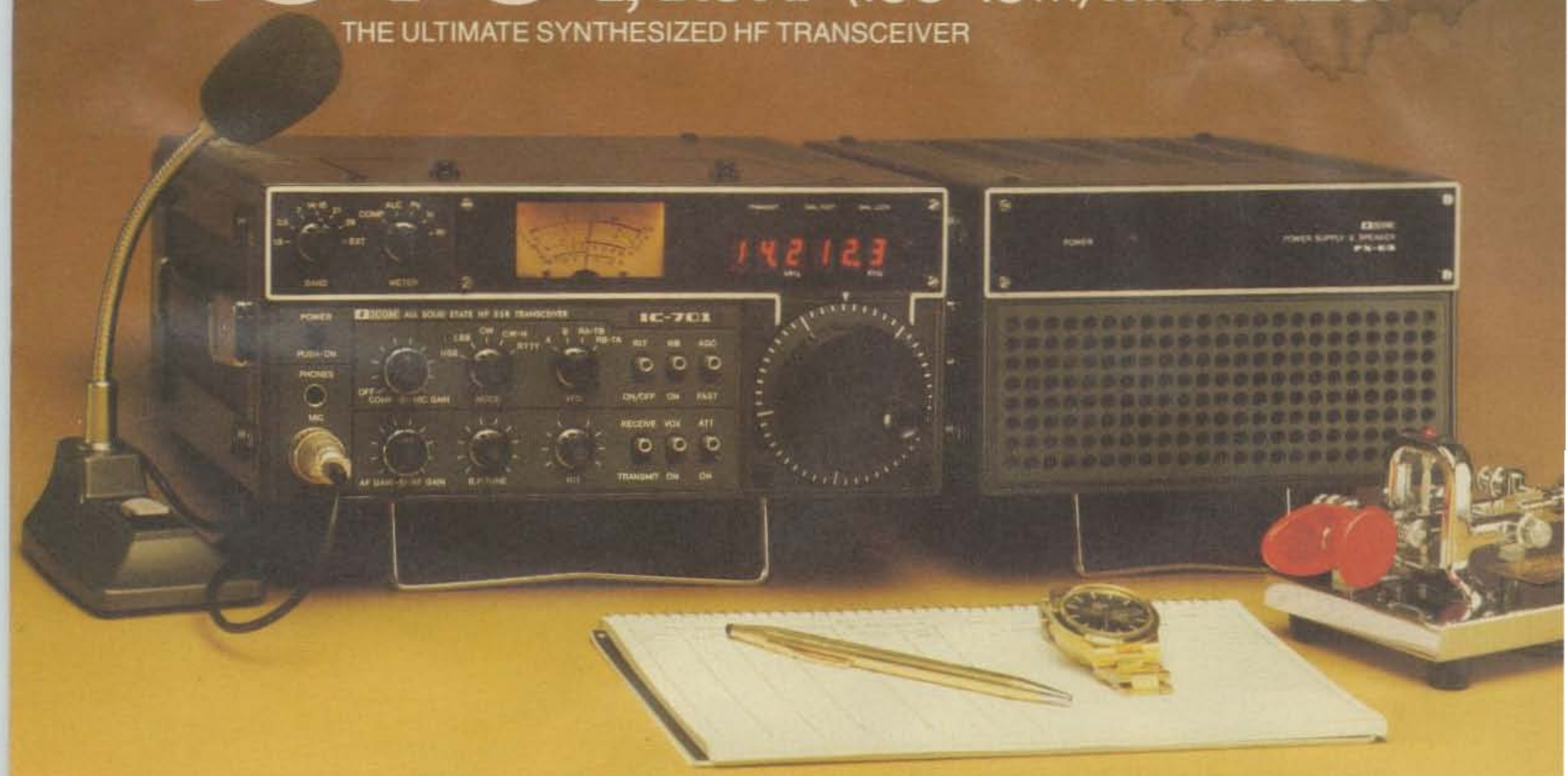

ICOM's superior LSI technology introduces the most advanced transceiver in the HF world, the IC-701! Now ICOM's famous One/Two Team of single knob frequency selection and dual VFO's leaps to the forefront of HF with an extremely compact, all solid state, fully synthesized, 100 W CONTINUOUS OUTPUT Maximizer of all modes and all bands, from 160-10M. The IC-701 is the ICOM breakthrough you've been waiting for: the future in HF.

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- **100 WATTS OUTPUT:** The compact **IC-701** delivers an amazing 100 WATTS OUTPUT, from a completely solid state, no tune final, on all modes and all bands!
- **All HF Bands, 160-10M:** Fullband coverage of each of the six bands, plus some extra coverage for MARS.
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- **RF Speech Processor:** This is an **IC-701** standard feature at no extra cost.
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The new IC-701 is simply the best HF transceiver ever made: that's all. For more information and your own demonstrations, see your ICOM dealer. The ultimate HF Maximizer is yours in your ICOM IC-701.

Sold complete, with base mic and AC power/speaker, as shown.

IC-701 meets FCC Part 97.73.

All ICOM radios significantly exceed FCC specifications limiting spurious emissons.

Specifications: ☐ Frequency Coverage: 1.8 MHz — 2.0 MHz; 3.5 MHz — 4.0 MHz; 7.0 MHz — 7.5 MHz; 14.0 MHz — 15.2 MHz; 21.0 MHz — 21.5 MHz; 28.0 MHz — 30.0 MHz ☐ Frequency Control: LSI based 100 Hz step Digital PLL synthesizer. Independent Transmit-Receive duplex on same band, standard with every radio. ☐ Frequency Readout: 6 digit LED 100 Hz readout ☐ Power Supply Requirements: DC 13.6 V ± 15% Negative ground current drain, 18 A max at 100 W output; AC power supply, speaker console for AC operation ☐ Antenna Impedance: 50 ohms unbalanced, VSWR 2.0:1 ☐ Weight: 7.3 Kg ☐ Size: (transceiver unit only) 111mm (h) × 241mm (w) × 311mm (d) ☐ RF Power Output: CW (A1), RTTY (F1), 100 W; SSB (A3J), 100 W PEP; Continuously adjustable 0-100W ☐ Emission Modes: A1, CW; A3J, SSB; F1, RTTY ☐ Harmonic and Spurious Output: more than 60 dB below peak power (meets FCC 97.73) ☐ Carrier Suppression: more than 40 dB down ☐ Unwanted Sideband: more than 40 dB down at 1000 Hz AF input ☐ Microphone Impedance: 600 ohms ☐ Receiving System: triple conversion, super heterdyne, with continuous bandwidth control (100 Hz — 2.4 KHz) ☐ Receiving Modes: A1, A3J (USB/LSB), F1 ☐ IF Frequencies: 1st & 3rd, 9.0115 MHz; 2nd, 10.7015 MHz; with continuous bandwidth control ☐ Sensitivity: better than 0.25 microvolts for 10 dB S+N/N ☐ Selectivity: SSB, RTTY, ± 1.1 KHz at −6 dB (adjustable to ± 0.5 KHz min), ± 2.0 KHz at −60 dB; CW, ± 250 Hz at −6 dB ± 700 Hz at −60 dB; CN-N, ± 100 Hz at −6 dB, ± 500 Hz at −60 dB (with Audio Filter) ☐ Spurious Response Rejection Ratio: better than 60 dB

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Zero Bias

an editorial

On November 4, 1978, Charles David Tandy died. Mr. Tandy was not an amateur nor do I believe did he aspire to become one. During his 60 years he did create one of the biggest boons to amateur radio, a boon that most of us take for granted. Mr. Tandy created Radio Shack, among his many other financial interests. Radio Shack by itself does not stand out as a purveyer of amateur equipment, transceivers, antennas, and the like, but it does stand out like a beacon to the new generation of amateur.

Those of us who date our amateur beginnings from the early 50's or later can remember with relish the great numbers of parts houses supplying the needs of countless builders and tinkerers. Little by little these numbers withered in sort of a vicious spiral. Whether amateurs reached a stage where they would rather buy equipment than build or they were forced to buy because they couldn't find the parts to build is the helical argument. The end result was that parts in consistant supply and quality were harder and harder to get. Mr. Tandy, through Radio Shack, reversed that trend. Mr. Tandy got us all back to building again.

With over 6,000 Radio Shack stores available to the amateur it is not surprising to find numerous articles in the amateur journals keying their parts lists to Radio Shack catalog numbers. The concept of a "Battery Of The Month Club" whereby a customer at Radio Shack could receive a free battery per month for a year insured parts sales since a battery without anything to run is by itself useless. In recent times, others have seen the potential of parts sales and new names have emerged as sources of components and hardware tailored for the amateur builder and tinkerer.

Mr. Tandy's concept was simple—make the product available and merchandise the heck out of it. People will buy it, use it, and come back for more. The same principle seems to be holding true for the Radio Shack TRS-80 computor, another Tandy inovation. It is another fully supported product line, readily available, and hence the tremendous interest and literature proliferated by the amateur community.

As I said, Mr. Tandy was not an amateur. He never worked DX, never entered a contest, never used a repeater or saw himself on SSTV. He never climbed a tower nor strung a dipole. He *did* bring the smell of solder back to the hamshack and *did* make us use our ingenuity to bring forth new ideas. He taught a whole new generation of people the joy of building. And that's no small thing.

This month we feature two articles of historical note. Out lead article is about an ARC transmitter. Now I don't mean something that was used during WWII and picked up recently at a flea market but a genuine alcohol arc transmitter circa 1919. This predates the spark rigs we've heard about or seen pictures of. The second gem is by Bill Orr, W6SAI. Bill has come up with a 1935-style DX transmitter that may ring a bell with some of our readers. It's always interesting to note our classified ads after one of Bill's articles. There seems to be a rush to round up old parts and equipment to either build one of his projects or to come up with the gear for another vintage year. In fact, John Nagle's recent article (October 1978 *CQ*) on old radio magazines has been very popular, drawing many letters filling in some of the blanks. John plans an update for later on this year.

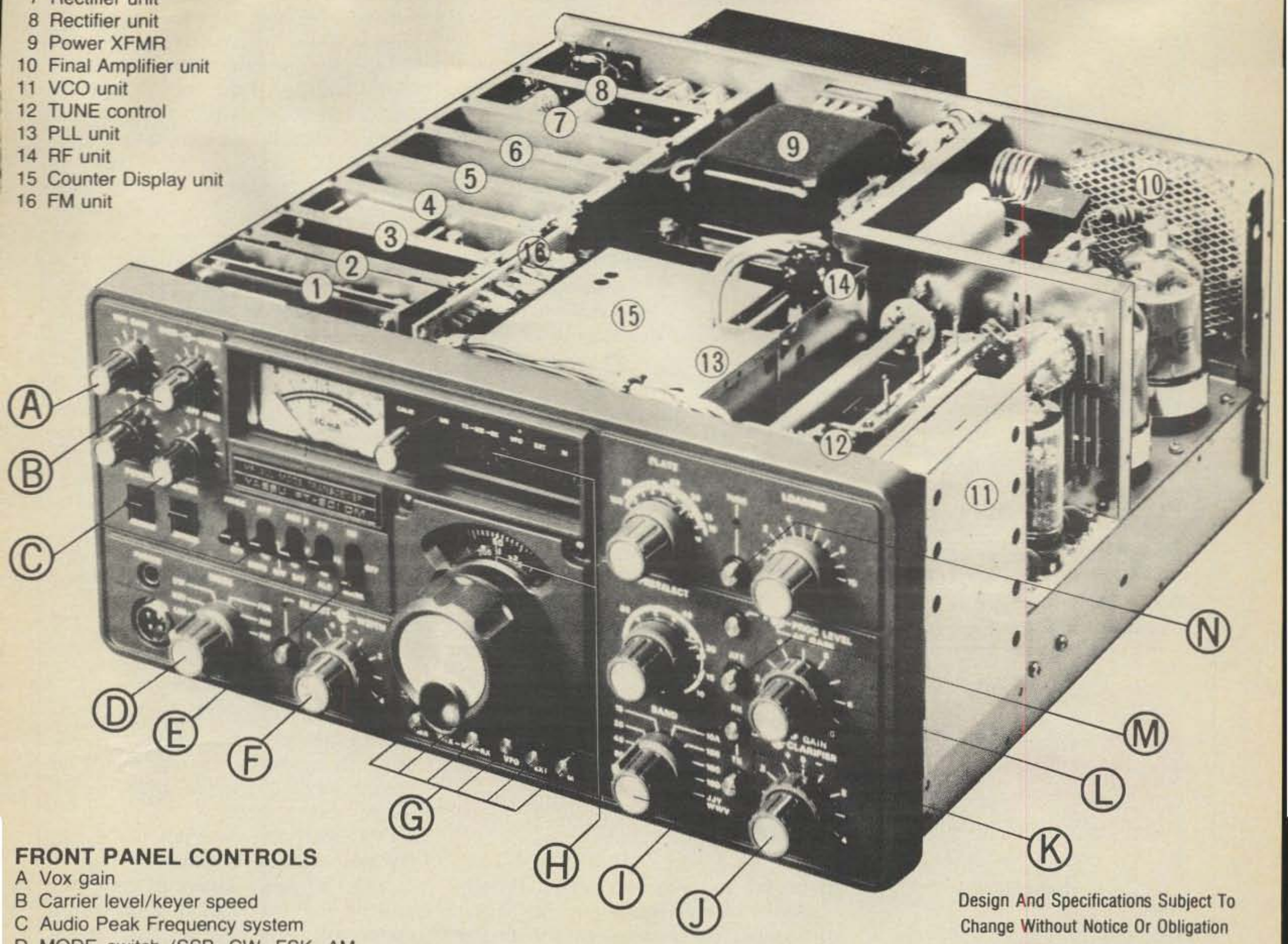
It's a giant leap in thought and technology from our 1919 arc transmitter to today's compact hand-held synthesized transceiver. Sixty years in the scope of history is only the blink of an eye. As a matter of fact just recently I received a phone call from a representative of a radio club that is starting an amateur radio course. He wanted to know where he could get information on simple tube transmitters, basic coil winding data and elementary receivers that young people could build and learn from. Kid s today learn logic circuits and solid-state theory in school, talk with experience about computors and in general awe their elders with the amount of technical knowledge they have attained. Somehow we still have to go back to what seems crude and archaic to explain and demonstrate r.f. in simple terms. The pius side to all of this is the smile and satisfaction that kids of all ages show when these beautifully crude devices they built are able to send and receive messages all over the world.

73, Alan, K2EEK

FT-901DM

BOARDS INSIDE CABINET

1 CARR OSC unit
2 VOX unit
3 AF unit
4 IF unit
5 Filter unit
6 Noise Blanker/RF Processor
7 Rectifier unit
8 Rectifier unit
9 Power XFMR
10 Final Amplifier unit
11 VCO unit
12 TUNE control
13 PLL unit
14 RF unit
15 Counter Display unit
16 FM unit



FRONT PANEL CONTROLS

A Vox gain
B Carrier level/keyer speed
C Audio Peak Frequency system
D MODE switch (SSB, CW, FSK, AM, FM)
E Crystal calibrator/Noise blanker
F Rejection tuning/variable IF passband tuning
G Frequency memory system
H Digital plus analog frequency readout
I Band switch (160-10 meters + WWV/JJY receive)
J Clarifier control
K RX/TX Clarifier selector
L RF Processor level
M RF attenuator
N TUNE control (Places transmitter in "TUNE" condition for ten seconds, then returns to "receive" condition to protect final tubes from excessive key-down time)

Design And Specifications Subject To Change Without Notice Or Obligation

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The smart radio

1C78

CIRCLE 45 ON READER SERVICE CARD

arma amateur radio manufacturer's association

YAESU ELECTRONICS CORP., 15954 Downey Ave., Paramount, CA 90723 (213) 633-4007

YAESU ELECTRONICS CORP., Eastern Service Crt., 9812 Princeton-Glendale Rd., Cincinnati, OH 45215

Announcing

• **Livonia, MI** – The 9th Annual Livonia Amateur Radio Club's Swap n' Shop will be held on Sunday, February 25, 1979, from 8 a.m. to 4 p.m., at the new location of Churchill High School. There will be plenty of tables, door prizes, refreshments and free parking. Talk-in on 146.52 simplex. For further info, send s.a.s.e. to: Neil Coffin, WA8 GWL, c/o Livonia Amateur Radio Club, P.O. Box 2111, Livonia, MI 48151.

• **Mansfield, OH** – The Mansfield Mid* Winter Hamfest/Auction will be held on February 11, 1979, at the Richland County Fairgrounds. There will be prizes, a flea market and auction. Doors open to the public at 8 a.m. Talk-in on 146.34/.94 MHz. Tickets are $1.50 in advance, $2.00 at the door. For additional info or advanced tickets and tables, contact: Harry Frietchen, K8HF, 120 Homewood, Mansfield, OH 44906, or phone (419) 529-2801 or 524-1441.

• **Stuart, FL** – The Martin County Amateur Radio Association will hold its Annual Fifty Cent Hamfest on Saturday, February 17, 1979, from 8 a.m. to 4 p.m., at the Tri-County Rehabilitation Center, 4461 So. Federal Hwy., (U.S.-1), three miles south of Stuart. Admission is only 50 cents of course and swap tables are $3 each. For table reservations or other info, write: MCARA, P.O. Box 1901, Stuart, FL 33494 or contact K4ZK, Hamfest Chairman at (305) 334-7418.

• **Marlboro, MA** – The Algonquin Amateur Radio Club will be holding its Annual Electronic Flea Market on Saturday, February 24, 1979. The event will be held at St. Mary's School Hall on Broad Street. Seller setup from 9 a.m. to 10 a.m. Doors will open at 10 a.m. to 4 p.m. Talk-in on 52 direct. Sellers should contact: Charlie, W1BK, (617) 562-5622.

• The Long Island Chapter of the Quarter Century Wireless Association will be sponsoring the Annual QCWA Membership QSO contest. Several new dimensions will be introduced. 1. For CW QSOs only, the contest runs from 0001 GMT, Saturday, February 10 to 2400 GMT, Sunday, February 11th. 2. For phone QSOs only, the contest runs from 0001 GMT, Saturday, March 10th to 2400 GMT, Sunday, March 11th. Frequencies, confirmation texts, and related contest rules and guide lines are published in the "QCWA News". For additional info, contact: W2FRX, 860 Custer St., Valley Stream, NY 11580.

• **Vienna, VA** – The Vienna Wireless Society will hold its Annual Winterfest on Sunday, February 25, 1979, at the Vienna Community Center. Indoor tables and sales, prizes and food. Admission: $3 including 1 prize ticket, $2 for extra prize ticket. Pre-teens with parents are free. For reservations, write to: Carroll N. Guin, 7533 Oak Glen Court, Falls Church, VA 22042. Information to: Vienna Wireless Society, P.O. Box 418, Vienna, VA 22180.

Our Readers Say

Slow Down!

Editor, CQ:

In the November 1978 issue of **CQ**, my article "The Radio Amateur's Nasty Weather Primer" has a correction on page 28 regarding the speed of sound.

The speed of sound should read 3,960,000 feet per hour instead of 3,960,000 miles per hour.

Depending on temperature, the speed of sound travels at a rate of between 580 and 750 miles per hour.

Vern A. Weiss, WA9VLK

Everybody Is Listening

Editor, CQ:

W1HFA's article "Chasing the Ultimate DX" in the December 1978 issue of **CQ** was very interesting. However, one wonders why we are only listening and not transmitting. We should begin transmitting by beaming messages at the nearest sun-like stars, those that might return an answer within our lifetime.

What if everybody is listening and nobody is transmitting!

John Herro, W8CW
Cincinnati, OH

Clipperton–A Dream Come True

Editor, CQ:

This letter is long overdue and comes as commendation. Commendation for both **CQ** and Charles Signer regarding the two articles published in **CQ** on the Clipperton DXpedition.

I am extremely active in Amateur Radio, but during this very time, I was involved in a move from one residence to another; there was simply no time to work Clipperton, much to my regret.

My beam array was not functional, my gear packed in boxes. Believe it or not, no time existed to even visit a friend with the hopes of working Clipperton. All I could do was listen to the locals rave about the DXpedition.

Then it was published. A very comprehensive report on the whole trip. After reading Signer's first installment, I felt I was actually on the trip with the crew. I waited in eagerness for the next month's publication, so I could be filled in on the trip...and again, there it was.

Mr. Signer is to be highly commended for that fine piece of journalism and **CQ** for publishing the story.

These two issues of **CQ** will be around my shack for a long, long time.

Thanks again for a tremendous story.

R.J. Knox, NØJW
Denver, CO

OMNI—THE *ALL-INCLUSIVE*. Because OMNI has it *all*. Designed to give you every advantage, every capability, whatever your operating specialty. Designed to give you new conveniences and new levels of performance. Designed to give you the world of Amateur Radio with a world of difference—the OMNI world of unique features. An unusual combination not found in any other.

FUNCTIONAL STYLING. The "look" you requested. "Clamshell" aluminum case clad in textured black vinyl. Complementary nonreflective warm dark metal front panel. Extruded satin aluminum trim bezel and tilt bail. Convenient controls. Fully shielded. And everything in a larger, easier-to-use size: 5¾"h × 14¼"w ×14"d.

TOTALLY SOLID-STATE. Sharing the TEN-TEC heritage of solid-state design leadership with its companion transceivers, the highly successful 540/544, OMNI has all the advantages of proven solid-state technology—reliability, long life, cool performance, better stability.

8-BANDS. The world now and in the future. OMNI covers 160, 80, 40, 20, 15, and 10 meters now (crystals included for all present Amateur bands, 1.8-30 MHz). And it has convertible 10 MHz and "AUX" band positions for the future.

BROADBAND DESIGN. Permits changing bands without tune-up, without danger of out-of-resonance damage to the final stage.

ANALOG OR DIGITAL READOUTS. OMNI-A features an analog dial with 1 kHz dial markings. OMNI-D has 0.43" LED readouts with the 5 most significant in red and the 6th in green to show 100 Hz increments.

BUILT-IN VOX AND PTT. Smooth VOX action with 3 easy-to-adjust front panel controls. PTT control is available at both front and rear panel jacks; an external microphone switch may be used.

BUILT-IN SQUELCH. Unusual in an hf rig, but handy for tuning or monitoring for a net or sked.

BUILT-IN 4-POSITION CW/SSB FILTER. 150 Hz bandwidth with 3 selectable skirt contours for optimum CW reception.

8-POLE CRYSTAL FILTER. 2.4 kHz bandwidth, 1.8 shape factor.

SEPARATE MODE SWITCH. Permits using *all* filters in *any* mode.

2-SPEED BREAK-IN. Switch to "fast" or "slow" receiver muting to accomodate any band condition or mobile operating.

2-RANGE OFFSET TUNING. Switch-select the ±5 kHz range for off-frequency DX work or the ±0.5 kHz range for fine tuning.

OPTIMIZED RECEIVER SENSITIVITY. Ranges from 2 uV on 160 m to 0.3 uV on 10 m (10 dB S+N/N) to achieve ideal balance between dynamic range and sensitivity.

GREATER DYNAMIC RANGE. Typically exceeds 90 dB to reduce possible overload from nearby stations. Also includes switchable 18 dB PIN diode attenuator for additional overload prevention.

WWV RECEPTION. On the 10 MHz band switch position.

FRONT PANEL CONTROL OF LINEAR/ANTENNA BAND-SWITCHING. Auxiliary bandswitch terminals on back panel for simultaneous control of external relays or circuits with the OMNI bandswitch.

BUILT-IN PHONE PATCH JACKS. Provide interface to speaker and microphone audio signals for phone patch connection.

BUILT-IN "TIMED" CRYSTAL CALIBRATOR. In the OMNI-A a pulsed 25 kHz calibrator desensitizes the receiver and provides an automatic 5 to 10 second "on" time for easy two-hand dial skirt adjustment.

BUILT-IN ZERO BEAT SWITCH. Permits placing your transmitted signal exactly on the listening frequencies of CW stations.

BUILT-IN SWR BRIDGE. The "S" meter electronically switches to read SWR every time you transmit to provide a continuous antenna check.

FRONT PANEL MICROPHONE AND PHONE JACKS.

ADJUSTABLE AUTOMATIC LEVEL CONTROL. For setting output power level from low power to full output, for retaining low distortion at desired drive power to linear amplifier.

SEPARATE RECEIVING ANTENNA CAPABILITY. Rear panel switch and jack connect receiving section to common antenna or separate receiving antenna. Also acts as receiving antenna by-pass when used with instant break-in linear amplifiers.

BUILT-IN ADJUSTABLE SIDETONE. Variable pitch and volume.

DUAL COMPRESSION-LOADED SPEAKERS. Larger sound output, lower distortion, no external speaker needed.

POWER INPUT. 200 watts when used with 50 ohm load. Proven, conservatively-rated, solid-state final amplifier design with full warranty for first year and pro-rata warranty for 5 additional years.

100% DUTY CYCLE. Ideal for RTTY, SSTV, or sustained hard usage.

PLUG-IN CIRCUIT BOARDS. For fast, easy field service.

POWER. Basic 12 VDC operation for convenient mobile use; external supply required for 117 VAC operation.

OPTIONAL ACCESSORIES. As all-inclusive as OMNI is, there are a few options: Model 645 Keyer, 243 Remote VFO, 248 Noise Blanker, 252M Power Supply.

Model 545 OMNI-A $899 **Model 546 OMNI-D $1069**

Experience the world of difference of OMNI, see your TEN-TEC dealer or write for details.

arma

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SEVIERVILLE, TENNESSEE 37862
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TEN-TEC's NEW OMNI HAS IT ALL

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

You can buy a so-called "maximum legal power" linear for quite a bit less than the price of an ALPHA. What makes the ALPHA worth more . . . or the other model less?

TALK TO AN ALPHA OWNER — Notice how scarce used ALPHA's are? Owners are rarely willing to part with them, and will be delighted to tell you why.

CHECK ETO's TWO-YEAR (limited) WARRANTY — Others give you 90 days. But EIGHT TIMES as much protection is only part of the ALPHA warranty story: there's also a clear message about durability.

NO ALPHA 76/374/77D OWNER HAS EVER BURNED UP A POWER TRANSFORMER, despite our No Time Limit (NTL), full power key down rating. Maybe it's because our '76A transformer is nearly TWICE the size of those in competitive desk-top amplifiers and is cooled by ETO's full-cabinet, ducted-air system to boot.

LOOK INSIDE AN ALPHA — the difference in quality and ruggedness is conspicuous. *Big* coils . . . axial-flow ceramic triodes thoroughly cooled by a centrifugal blower . . . yet ETO's new acoustic-isolation blower system makes the ALPHA 76A series now even quieter than ever before.

EFFICIENCY, versatility, ease of operation, resale value — the story of ALPHA superiority goes on. Before you decide on a new linear, get all the details from your dealer or ETO direct. And ask for our free guide, *"Everything You Always Wanted to Know About (Comparing) Linears . . . But Didn't Know Whom to Ask."* Finally, do talk to an ALPHA owner . . . look for him on top of the nearest pile-up.

ALPHA/VOMAX can boost the "talk power" of any rig up to ten times or more. The new SBP-4 *split band* speech processor uses the only system *more effective than rf clipping* — AND distortion is extremely low so your voice sounds natural. Under tough conditions VOMAX can help as much as most linears. Combine VOMAX *with* a good linear and WOW! It's simple to install and operate with any rig.

Ehrhorn Technological Operations, Inc.
P. O. Box 708 • Cañon City, Colorado 81212 • (303) 275-1613

CIRCLE 12 ON READER SERVICE CARD

A new concept from Atlas

5 band receiver $229.

Some people have called the Atlas RX-110 a stroke of genius. But it didn't take much genius to design it, just a lot of common sense.

Newcomers to amateur radio like to begin by monitoring amateur activity so they want an inexpensive receiver. Many old-timers like to have an extra receiver for their living room or bedroom so they don't have to stay in the shack or car waiting for band openings.

But with the recent popularity of the transceiver concept, the economical receiver simply disappeared. Now Atlas reintroduces a low price receiver: The RX-110 for $229.

DON'T LET THAT LOW PRICE DECEIVE YOU! It's really a high performance amateur band receiver.

It's all solid-state and provides coverage of 80, 40, 20, and 15 meters, and 28 to 29 MHz of the 10 meter band. It's fully self-contained with its own AC supply and built-in speaker, and can operate on 12 to 14 VDC. The RX-110 is really a hot performer, with exceptionally high sensitivity, selectivity, and dynamic range.

But the RX-110 story doesn't end here. There's more!

Transmit module $159.

This is where our new concept makes even more sense (and saves you thousands of "cents"). Since many stages in a receiver are also required in a transmitter (VFO, IF Systems, Crystal Filter, Carrier Oscillator, Band-Pass Filters, and Diode Ring Mixer), we provided a connection on the back of the RX-110 so the TX-110 Transmitter Module can utilize these common stages, eliminating the cost and labor of duplicating these steps. But there is absolutely no compromise on performance with this new concept.

Simply connect the TX-110 Transmit Module to the RX-110 Receiver and you have a complete 5 band CW-SSB transceiver!

Complete 5 band CW-SSB transceiver

- Provides CW and SSB communications on 10, 15, 20, 40, and 80 meters with a choice of two power levels.
- The TX-110-L runs 15 watts input on 20, 40, and 80 meters; 10 watts input on 10 and 15 meters.
- The TX-110-H runs 200 watts input on 20, 40, and 80 meters; 150 watts on 15 and 100 watts on 10 meters.
- Semi-break-in CW with sidetone monitoring is a standard feature.
- PTT (Press-to-Talk) operation on SSB. Lower sideband on 40 and 80 meters. Upper sideband on 10, 15, and 20 meters.
- TX-110-L 15 watt module runs on AC supply in RX-110, so it is completely self-contained, including speaker. Simply connect antenna, and key or mike.
- TX-110-H requires additional AC supply to supply high current for 200 watt amplifier (Model PS-110).
- 200 watt amplifier may be added to TX-110-L at a later date, thus converting it to a TX-110-H.
- The RX-110, TX-110-L, and TX-110-H will all run directly from a 12 to 14 volt DC battery supply for mobile or portable operation. When the two units are mechanically joined (brackets supplied with TX-110), the transceiver slides into a plug-in mobile mount, Model MM-110.

SUGGESTED RESALE PRICES:

RX-110	$229.
TX-110-L	$159.
TX-110-H	$249.
PS-110	$ 89.

ATLAS RADIO

MADE IN U.S.A.

417 Via Del Monte • Oceanside, CA 92054 • (714) 433-1983 • Special Customer Service Direct Line (714) 433-9591

CIRCLE 3 ON READER SERVICE CARD

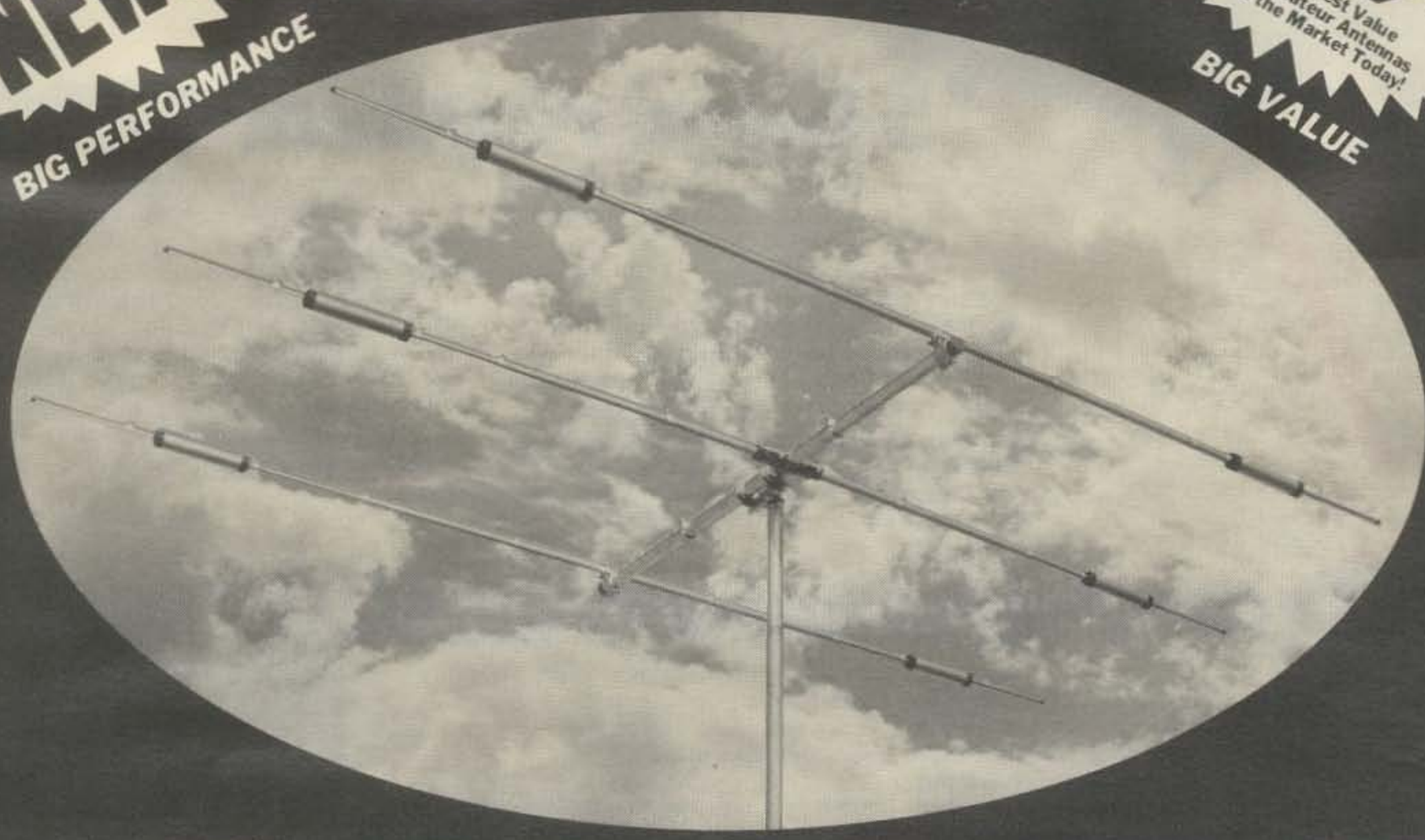
NEW! SYSTEM THREE

WILSON'S NEWEST TRIBANDER FOR 20, 15 and 10 METERS

BIG PERFORMANCE

$179.95 LIST
The Best Value in Amateur Antennas on the Market Today!

BIG VALUE



Capable of handling 2,000 watts, the "SYSTEM THREE" is the newest tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials continues on with the "SYSTEM THREE".

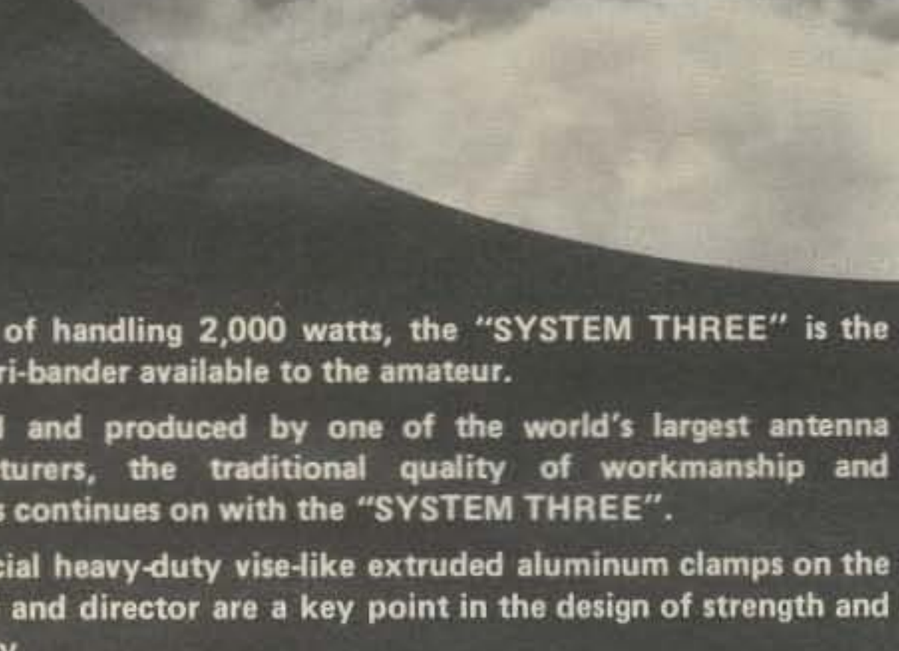
The special heavy-duty vise-like extruded aluminum clamps on the reflector and director are a key point in the design of strength and durability.

Superior clamping power is obtained with the use of a rugged ¼" thick aluminum plate for boom to mast mounting.

The use of large diameter High-Q Traps in the "SYSTEM THREE" makes it a high performing tri-bander with a very economical price.

A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the "SYSTEM THREE" quick and simple.

ACTUAL SWR CURVES



SPECIFICATIONS

Band MHz	14-21-28
Maximum power input	Legal limit
Gain (dbd)	8 db
VSWR at resonance	1.3:1
Impedance	50 ohms
F/B ratio	20 db
Boom (O.D. x length)	2" x 14'4"
No. elements	3
Longest element	27'4"
Turning radius	15'9"
Maximum mast diameter	2" O.D.
Surface area	5.7 sq. ft.
Wind loading at 80 mph	114 lbs.
Assembled weight (approx.)	37 lbs.
Shipping weight (approx.)	42 lbs.
Direct 52 ohm feed or balun maximum wind survival	100 mph

Consumer Products Division

Wilson Electronics Corp.

4288 S. Polaris / P.O. Box 19000 / Las Vegas, NV 89119 / (702) 739-1931 / TELEX 684-522

Prices and specifications subject to change without notice.

CIRCLE 44 ON READER SERVICE CARD

"Your signal has a terrible hum, old man."
"Gee, thanks for the great report!"

Federal Arc Transmitters

BY LOUIS R. MATEO*, WB2MVK

TO OPERATE
1.-Fill the alcohol cup and see that it feeds properly.
2.-Fill the water tank 3/4 full with fresh water.
3.-See that the valves of the water tank are open and that the flow indicator shows a circulation of water when the pump is started.
4.-See that the moving parts are properly lubricated.

Are these the instructions for the operation of some kind of "hot rod"..? ..perhaps for an outboard motor..? ..or maybe for a drilling rig on a Texas tower..?"

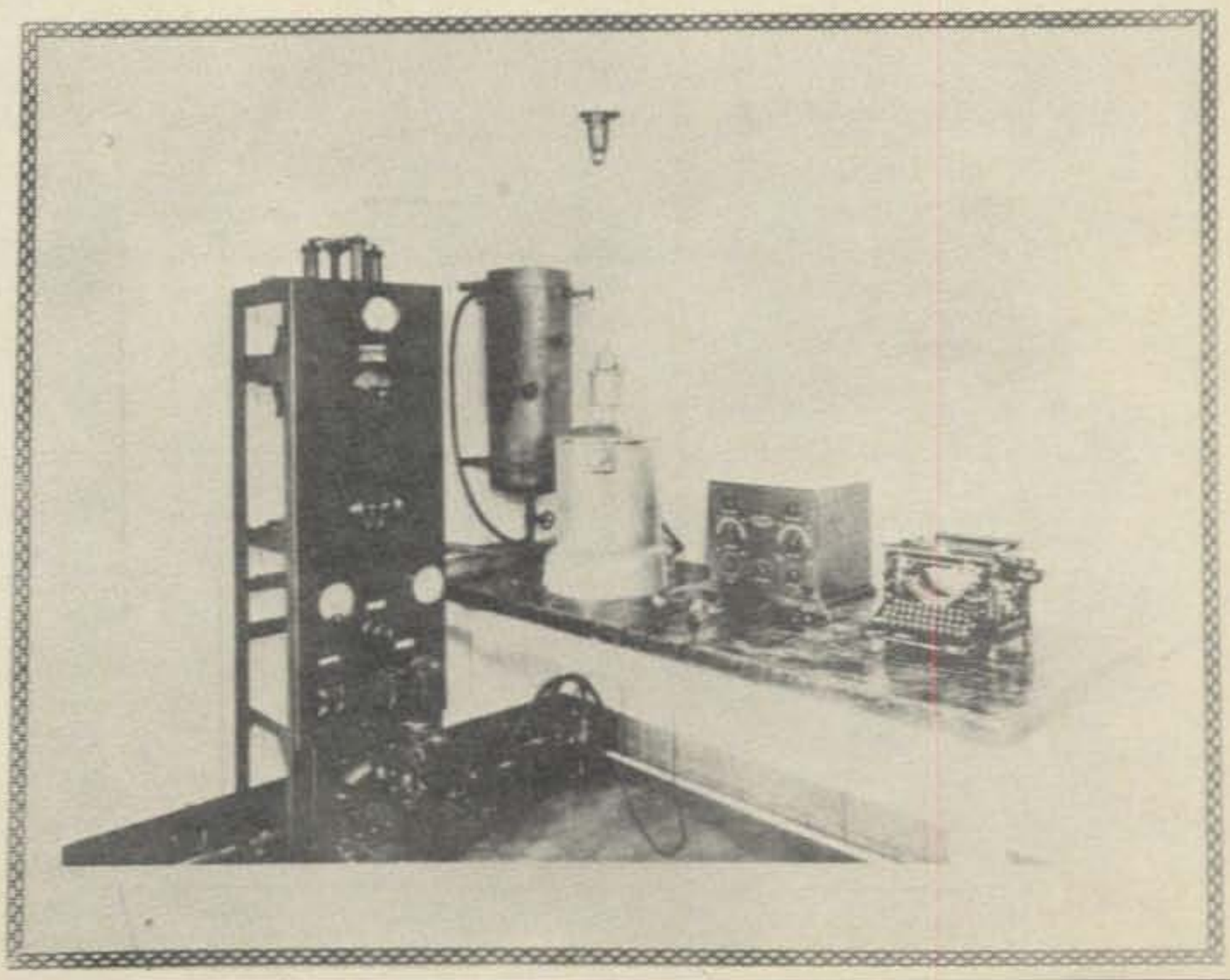
To many the guessing game could be extended "ad infinitum," but to a few "old-timers" of the "brass pounding art," it could bring back some nostalgic reminiscenses, since the above instructions were part of the operating manual of a 2 kW arc radio transmitter built by the Federal Telegraph Co. of Palo Alto, California around 1918 and widely used on board U.S. Navy and merchant ships during that era.

The arc transmitter was invented by the Professor Valdemar Poulsen, a Danish scientist, and was introduced in the U.S. in 1909 where it was adapted and modified. The basic function of the set was to produce undamped r.f. oscillations by means of an electric arc and to be used in wireless communications, on a field dominated by the spark transmitters. Few operational tests demonstrated the superiority of the c.w. mode of the arc as compared to the damped waves produced by the spark sets. The U.S. Navy adopted the arc transmitters in several long range coast stations and ships and the Federal Telegraph Co. was born. The only problem encountered was that the arc did not perform well on lower wavelengths, but that was not very important in those days.

The arc itself was enclosed in a cast iron chamber with an *atmosphere containing hydrogen* (more about that later) and consisted of a pair of electrodes placed between the poles of a powerful electromagnet which produced a strong field, tending to blow the arc out, adding stability to it. The negative electrode was made up of carbon or graphite, while the positive electrode was made up of copper and was water cooled. A water tank of about 15 gallons capacity, a rotary pump driven by an electric motor, valves, hoses, couplings, etc. was included in every set. When the unit was operating a *flow indicator* (a colored marble inside a small chamber) permitted to checking of the flow of cooling water by looking through the glass cover top and watching the "ball bouncing," or by ear (marble rattling).

The transmitter consisted of the following main units:

1. A source of d.c. of suitable voltage and current.
2. The arc converter.
3. The antenna loading coil.
4. The antenna and ground systems.



*1204 Augustina Ave., Far Rockaway NY 11691

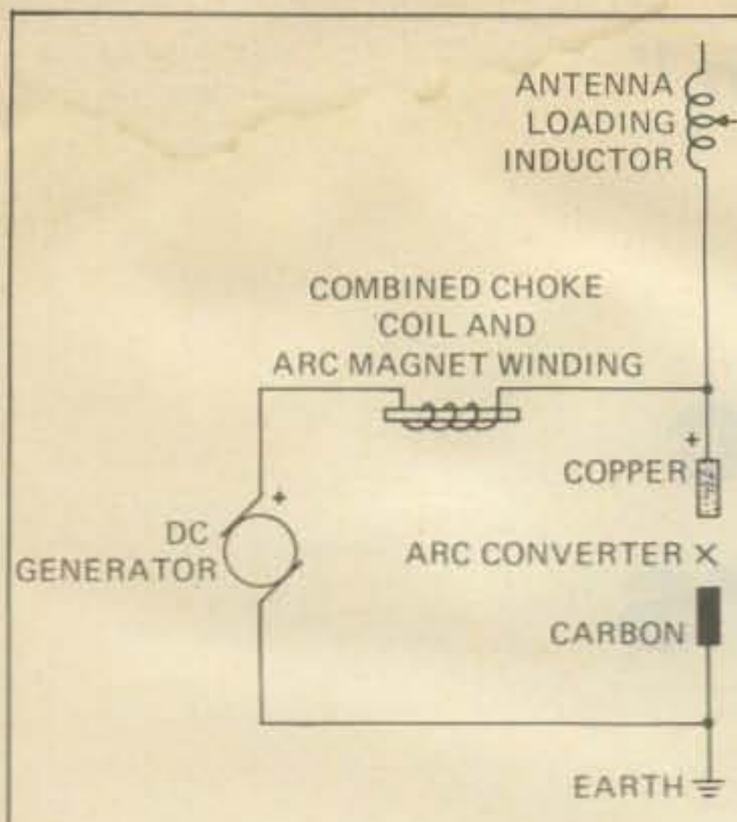


Fig. 1 - Federal arc transmitter (main circuits).

5. The keying device, and
6. Auxiliary and control apparatus.

Fig. 1 shows the basic features of the arc transmitter. The arc converted the direct current supplied by the generator into r.f. energy providing undamped current to the antenna circuit, which consisted of the antenna, the loading coil, the arc electrodes and the ground. The choke prevented the flow of r.f. back to the generator and served to sustain and steady the arc by creating the electromagnetic field. The operating wavelength, (the *work frequency* was not much in use in those days) depending upon the inductance and capacity of the antenna circuit. Since the capacity was furnished by the antenna itself and was fixed, the inductance of the antenna coil was changed by connecting the antenna lead at predetermined resonant points and secured with a wingnut. Simple, but effective.

The wavelengths normally in use on the merchant ships were of 300, 450, 600, 750, 1.000, 1.400, 1.800 and 2.300 meters (1.000, 667, 500, 400, 300, 214 and 167 kHz.)

A rotary converter changed the ship's mains from 120 volts d.c. to 200 or 400 volts d.c. and the arc converter changed it to a high a.c. frequency of about 60,000 cycles per seconds (60 kHz.)

All the parts of the arc converter were stationary, with the exception of the carbon electrode, which was rotated slowly by a shaft connected to the water pump shaft coupling, so it could burn slowly. It was mounted in such a way, that it could be screwed in and out, in order to strike the initial flame and to regulate the arc inside the chamber. In actual operation it was adjusted to secure a maximum output current indication in the antenna ammeter, but some small readjustments were required during long operations. The carbon did not burn away as it did in the old arc lamps. Usually it built up slowly, depending on the chemical composition of the gas in the chamber. And where did the chamber get the hydrogen atmosphere mentioned previously? By the decomposition of the alcohol which was fed in, drop by drop to the chamber and vaporized by the intense heat of the arc. Kerosene was sometimes used. As a matter of fact, it was claimed to be better than alcohol when operating at shorter wavelengths, but a lot of soot accumulated in the chamber. Illumination gas was sometimes used in the coast stations.

Keying

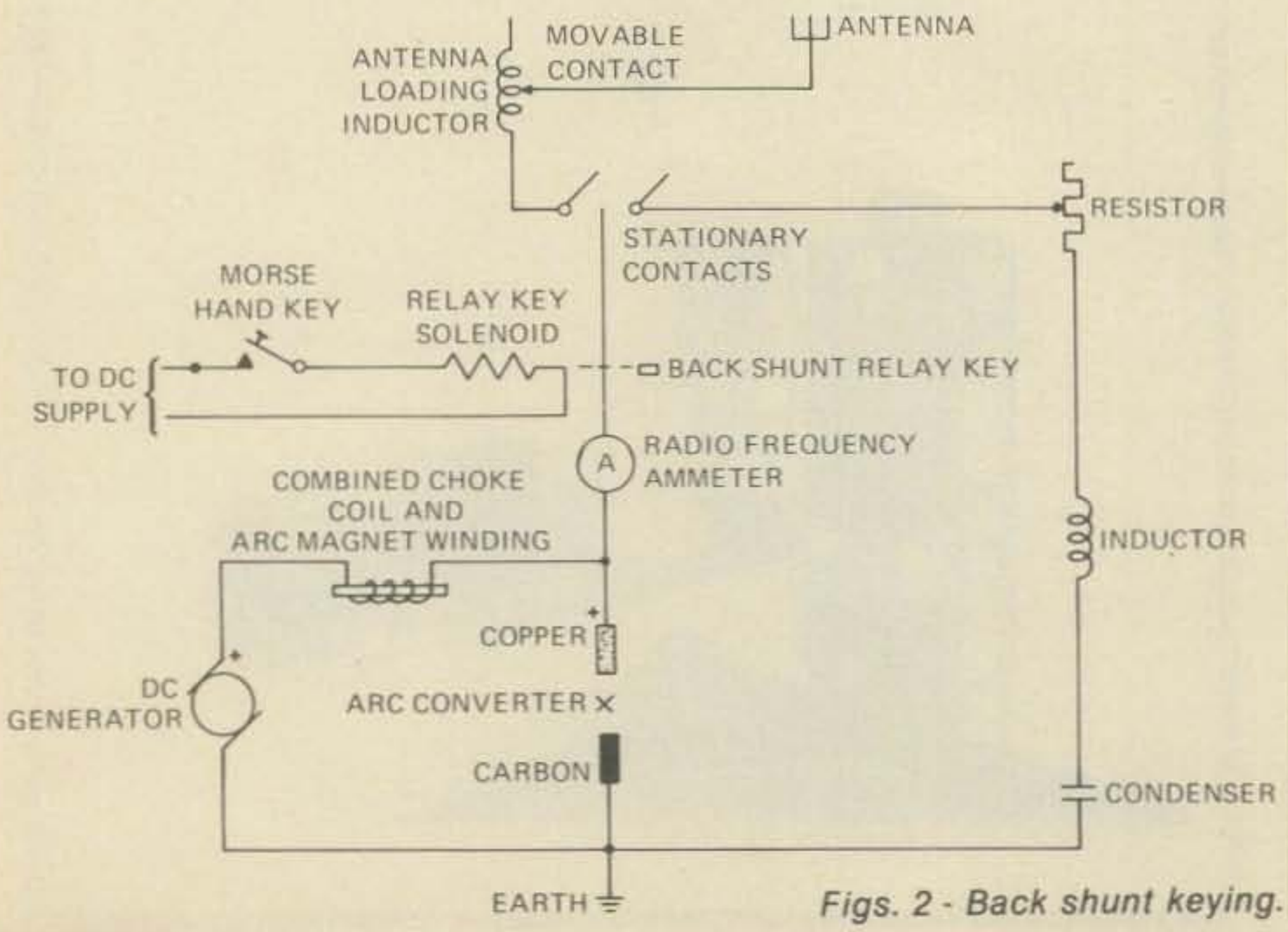
When the arc was in operation a continous flow of c.w. current was indicated in the antenna ammeter and radiated as a continous carrier. Some means had to be employed in order to key the transmitter and send out the "dots" and "dashes" of the Morse Code. The "Brains & Muscles Department" of the Federal Co. solved this problem by three different systems and later by another one which eliminated the first two. They were: 1. *Backshunt system,* 2. *Coupled compensation system,* 3. *Chopper system,* and 4. *Ignition System.*

Both Navy and Merchant ships were equipped with the back shunt method as the principal means of keying and the coupled compensation was supplied as an "extra." In both cases a chopper was provided as part of the installation.

Back shunt

This consisted of the following essential units: back shunt circuit, relay and Morse hand key. See Fig. 2.

When the arc was in operation and the Morse key was closed, the movable armature of the relay made contact with the bottom of the antenna coil and the r.f. flowed into the antenna circuit. When the key was opened the relay armature rested on another contact connected to the shunt circuit and the resistor acted as a dummy load. The relay was adjusted so the movable contact was making connection with one stationary contact before it was disconnected from the other, which permitted the arc to remain in constant operation while it was transferred from the antenna circuit to the shunt circuit, and *vice versa.* Due to the strong interfering signal from the arc to the station receiver, the arc had to be stopped in order to listen to the station in contact with, but it was not much of a problem to well trained wireless operators, who could put the arc back in to operation in a few seconds time. The



Figs. 2 - Back shunt keying.

antenna could be shifted to "send", "receive" or "ground" by means of a three positions knife switch

Coupled compensation

This consisted of a single turn of wire placed at the lower end of the antenna loading coil, which could be closed or opened by means of an auxiliary hand key. See Fig. 3.

With the arc in operation, Morse key closed and auxiliary key opened the r.f. energy was radiated at a certain wavelength; by closing the auxiliary key the energy was then radiated at a shorter wavelength, due to the mutual inductance and transformer action between the antenna coil and the loops. R.f. was thus radiated at two different wavelengths. The only thing the receiving operator had to do, was to tune for the shorter wavelength, which was the one used to transmit with the auxiliary hand key.

Chopper

When transmitting to a station which receiver used a simple detector circuit, it was necessary to modulate the r.f. energy in order to permit the receiving operator to copy the signal at an audible frequency. This "modulation of the carrier" was accomplished by means of a *chopper,* which consisted of a commutator wheel driven by an electric motor. When the wheel was in rotation, it opened and closed the coupled compensation loop at a certain speed, providing a musical note in the receiver. The r.f. was emitted at two wavelengths as before, but alternated between minimum and maximum value. See Fig. 4.

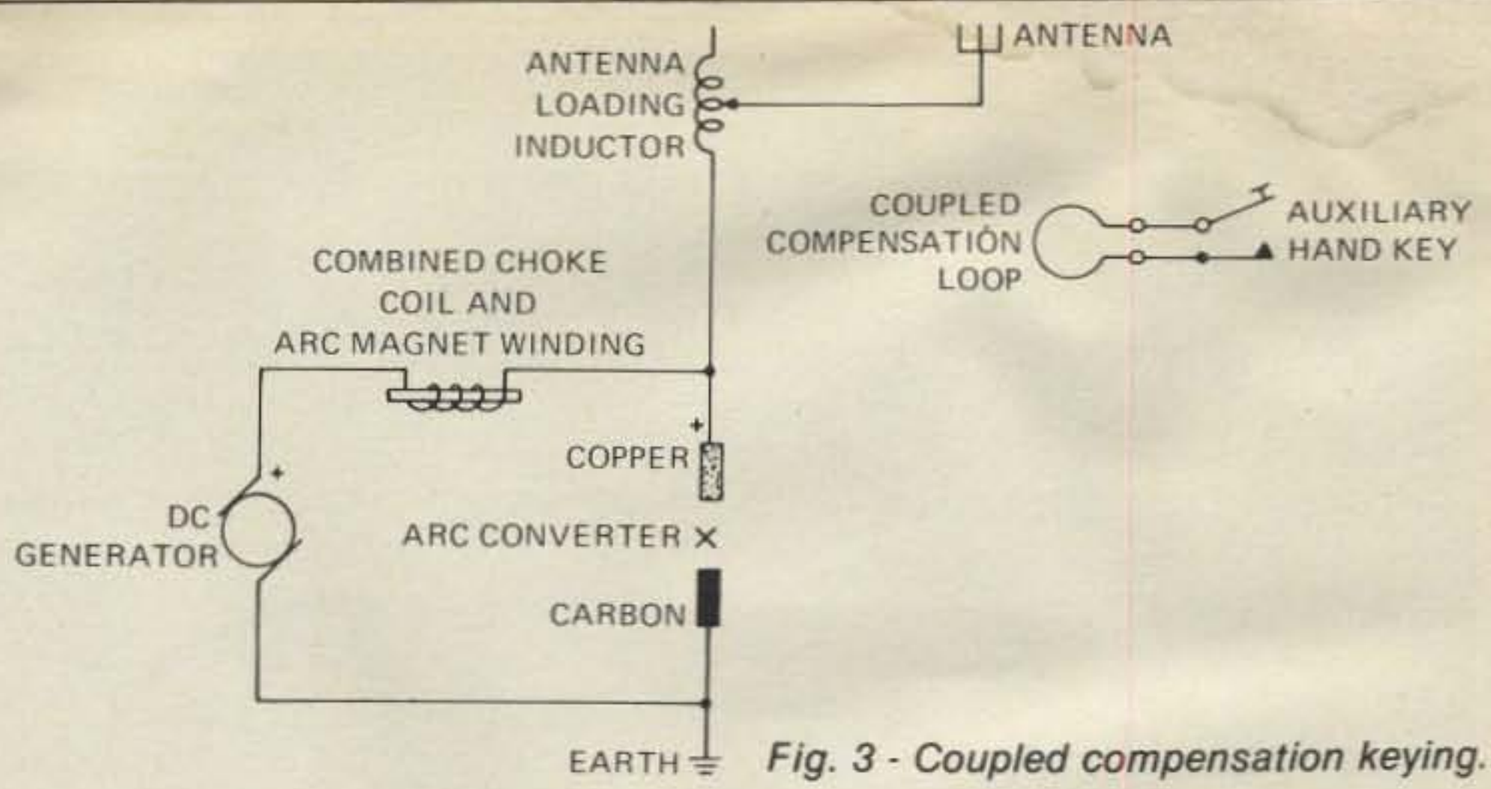


Fig. 3 - Coupled compensation keying.

Ignition

Fig. 5 shows the main circuits used in the ignition method of keying. Besides the usual carbon and copper electrodes, two electrodes were installed inside the chamber, one stationary and other movable, consisting of a copper rod controlled externally by an electromagnet.

When these two electrodes were in contact, the arc was connected to the power absorbing resistor and the arc was extinguished. When the contact was broken the flame which resulted was blown by the magnetic field in to the gap between the main electrodes in the arc converter, causing the arc to re-ignite, passing the r.f. to the antenna circuit. Keying was done by moving the ignition key electrode in and out, following the short and long impulses impressed upon the electromagnet by the hand key. A spring held the electrode close, the arc extinguished and the d.c. power on the power absorbing resistor and the unit

What's The Difference Between Spark and Arc?

The spark transmitters radiated damped waves which have the characteristic of decreasing in amplitude during each successive cycle.

To have an idea of how they sounded and their effect on the frequency spectrum, the only thing that a person has to do, is to listen on a house "all wave" receiver to the interference created by a passing car, whose ignition is poorly tuned up. The note will be rough and coarse and the noise will be heard with different degrees of intensity, on *all* of the receiver's bands.

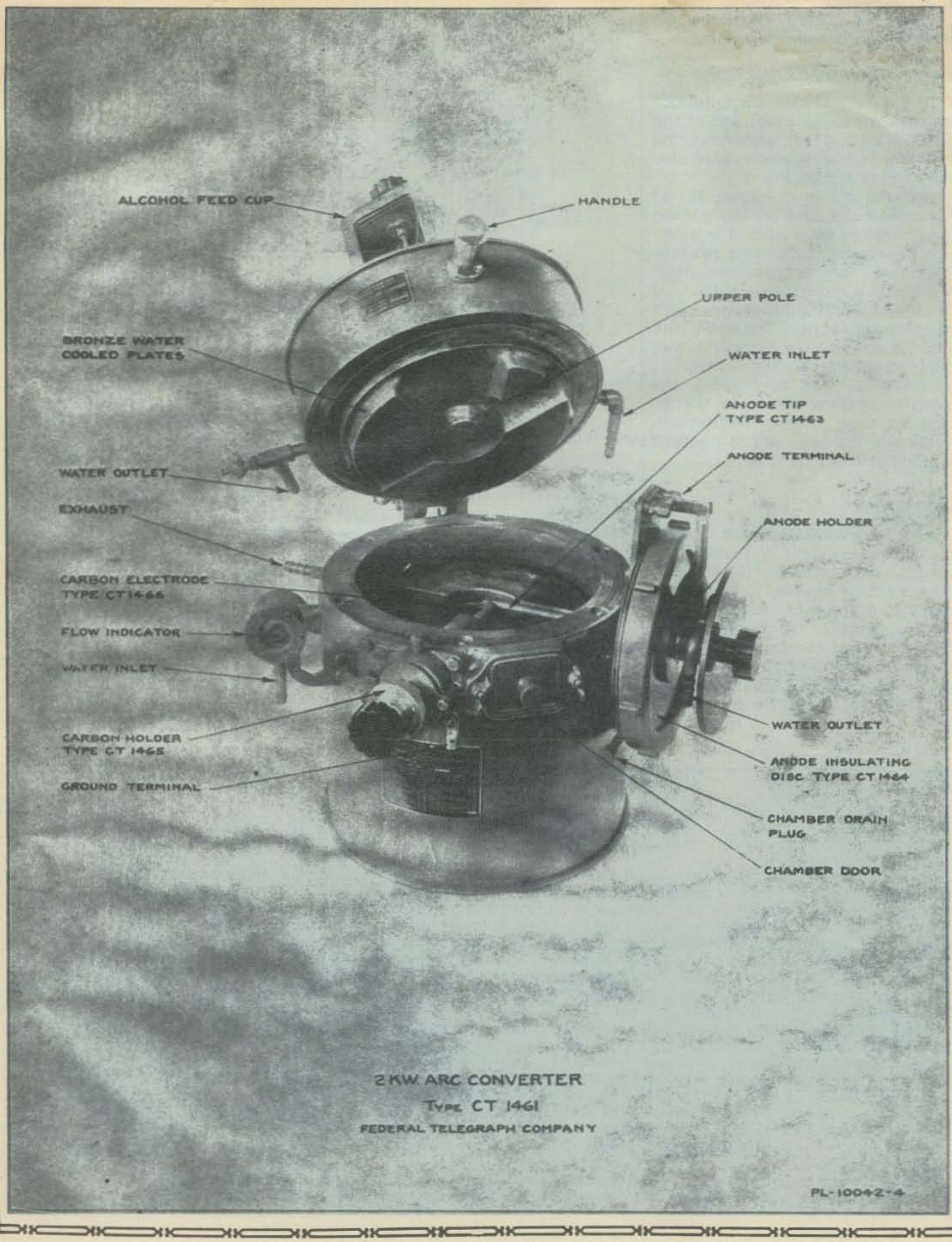
Later improvements purified the note and made it more pleasant and musical. This was accomplished by the use of different spark gap circuitry, by increasing the frequency of oscillation, by tuned circuits and by antenna inductive coupling, to a point that an "almost" c.w. signal was radiated. Still the efficiency was low as compared to the arc sets, whose transmissions were pure c.w. in which a stream of successive identical cycles was radiated. Once the arc has been started, the only sounds percieved were a slight hum, the click of the relay when it was keyed and the electric motor of the water circulating pump. Not so the spark transmitters which spark discharge carried out a "whip-lash" sound as the power was increased. Some manufacturers enclosed their spark gaps in heavy wooden boxes in order to baffle the noise. The coast stations, which used more power, had the spark discharge apparatus installed inside a sound proof room, but, the noise still could be heard within a radius of a mile or so of the station.

The first spark transmitters that Marconi installed on board the ships, consisted mainly of a Ruhmkorf or induction coil, similar to the ones used in the ignition system of the old "T" Ford automobiles. (As a matter of fact, the first amateurs used these "T" Ford coils to achieve the same results). The ignition coils were equipped with a magnetic interruptor that converted the d.c. supplied by a bank of storage batteries to a high frequency a.c. It was increased in the secondary winding of the coil and discharged as the spark between the spark gap rods. One of them was connected to the antenna and the other to ground or the ship's metal hull. A telegraph key in series with one of the battery leads provided the means to turn the transmitter on and off when sending the "dots and dashes" of the Morse Code.

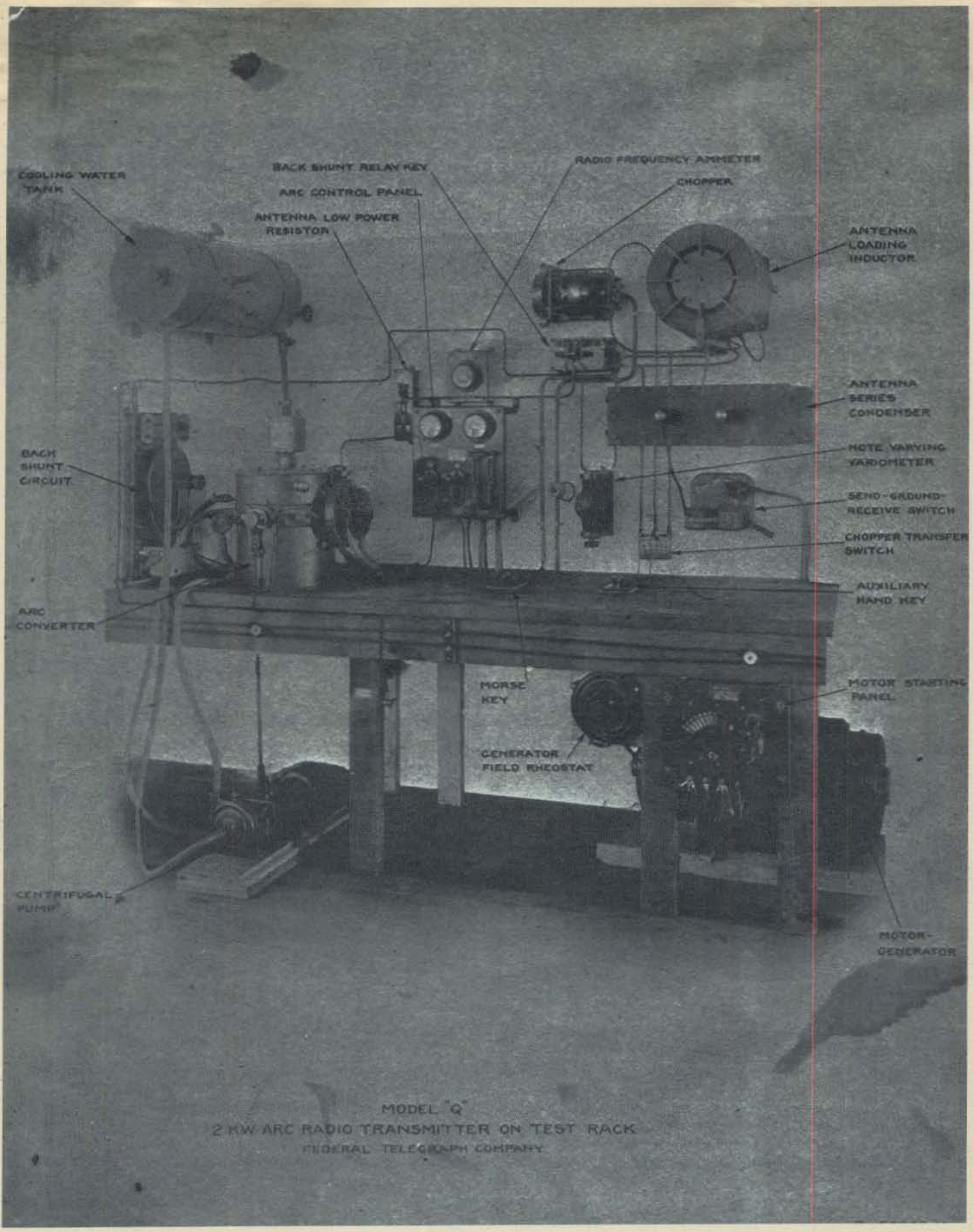
Many experiments were conducted in efforts to voice modulate the spark transmitters, but the results were never entirely satisfactory. The signals that resulted were never clear and the voice, hardly understandable, lacked the proper articulation.

Several factors kept these units in operation for over 30 years. One of them was the semi-monopoly of the British Marconi Co. in the marine communications field, which patents covered this particular type of transmitters at that time. Also, they required a minimum of components, were easy to build, operate and service.

In the U.S. pioneers like Lee De Forest, Fessenden, Stone, Shoemaker and others, built and sold spark transmitters to the merchant vessels communication companies and U.S. Navy. In them they include important improvements of their own to the basic circuit. Nevertheless, all of them used the spark as the source of the radiating electromagnetic power.



The Federal Telegraph Company Type CT 1461 2 kW arc converter, taken from the Federal 2 kW arc manual (1919).



This photo of the Model Q transmitter appeared in the Federal Telegraph Company's 2 kW arc manual (1919).

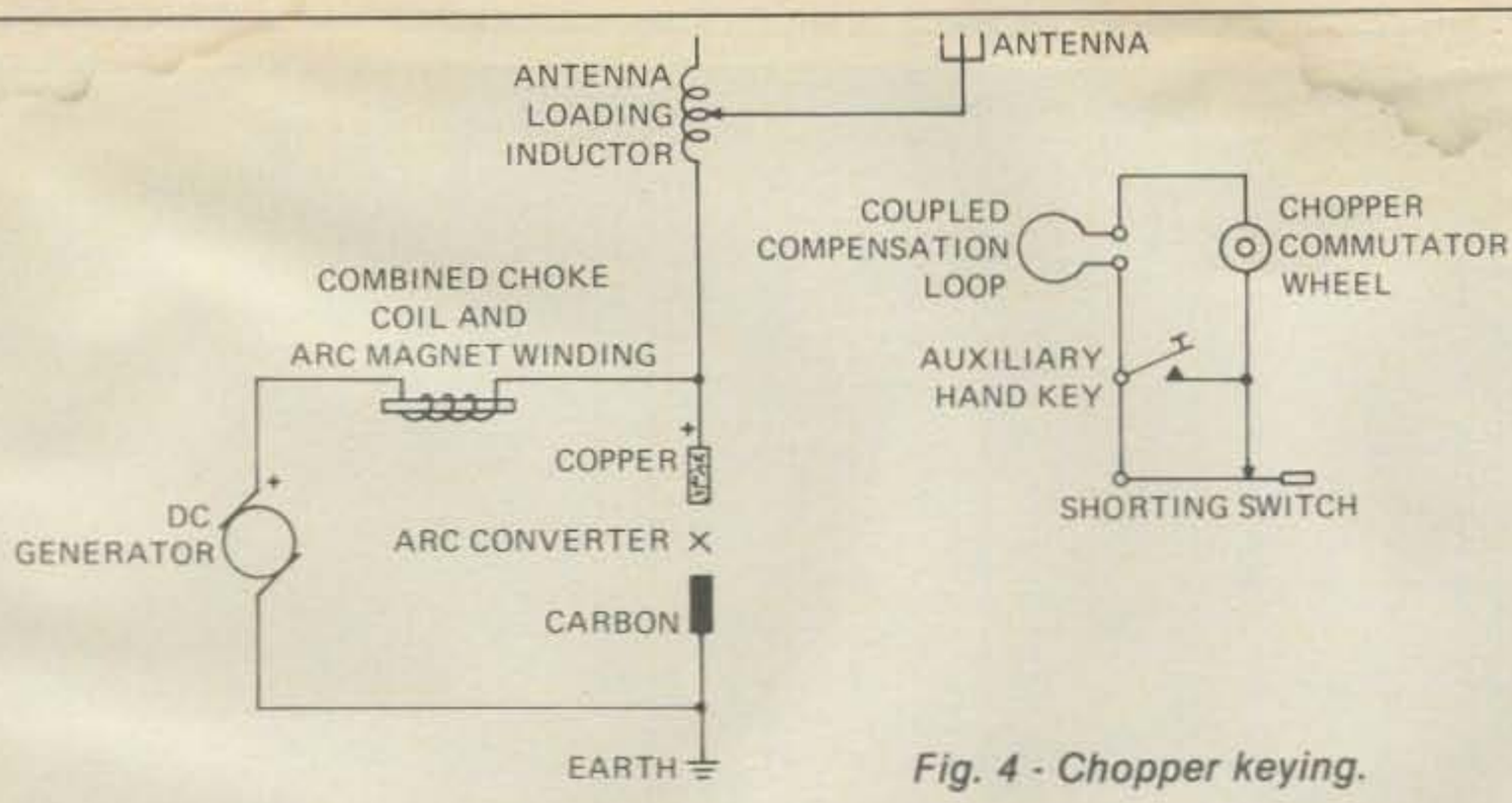
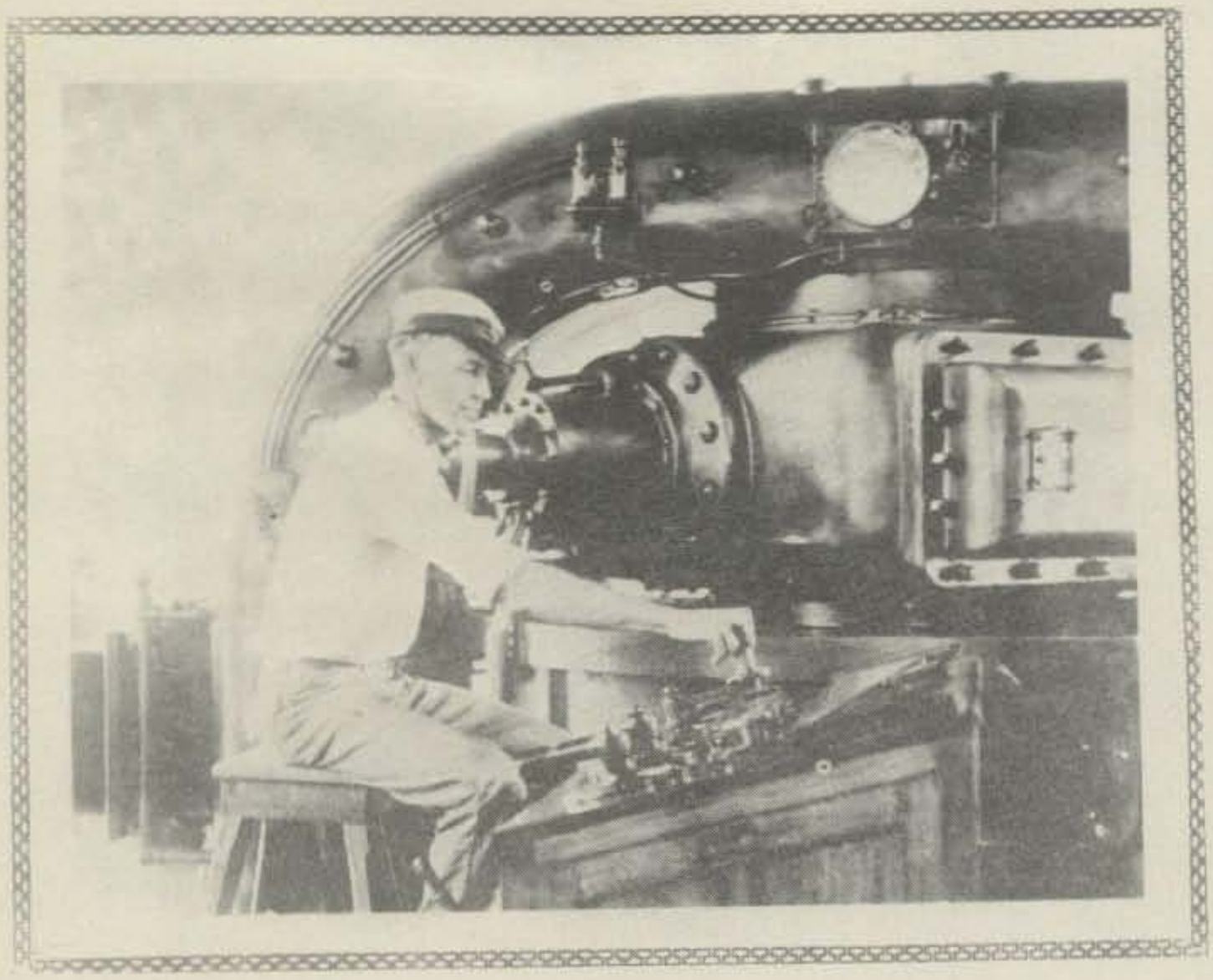


Fig. 4 - Chopper keying.



was off until the hand key was activated. The power absorbing resistor and the unit were off until the hand key was activated. This resistor was variable and was adjusted so the d.c. converter output remained constant whether the arc was operating or not. This provided a stable load similar to that of the antenna circuit when the arc was active.

Most of the receivers used in conjunction with the Federal Arc System employed a "tikker" as a detector. It consisted, basically, of a small metal reed vibrated electromagnetically at an audio frequency. The reed interrupted the incoming train of signals causing them to charge a capacitor which was discharged through the headphones as the reed made contact with this circuit. Another variation consisted of a fine wire held against a segmented rotating metal wheel, which "chopped up" the incoming signals into a "mushy" non-musical sound. (A small replica of the

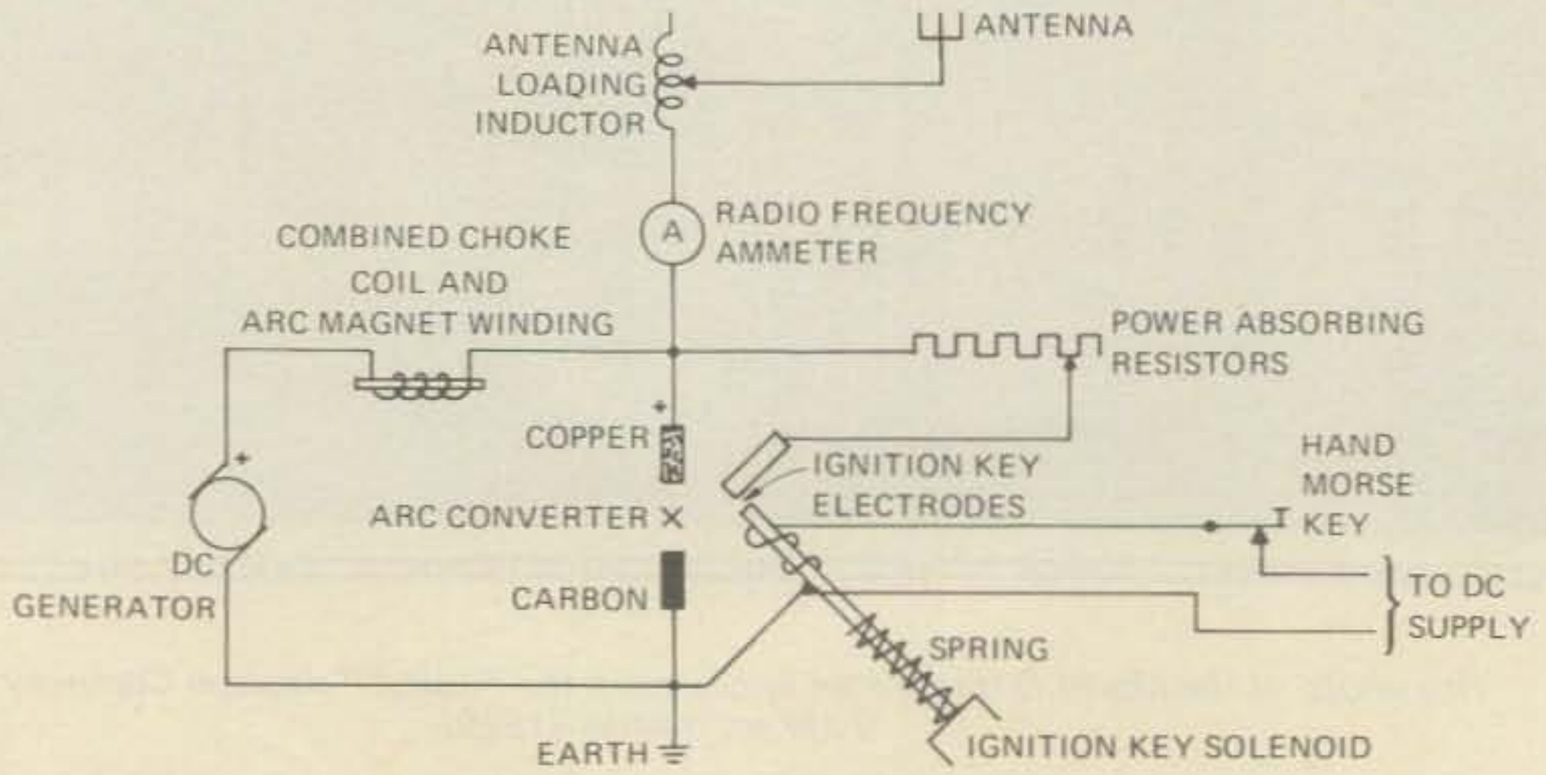


Fig. 5 - Ignition method of keying.

chopper used to modulate the arc.)

By 1920, however, most of the U.S. Navy and many merchant ships were using a three element vacuum tube, which could be used as a detector or as an oscillator to produce the local oscillation required to heterodyne the arc. c.w. signals and reproduced them as a musical note in the headphones.

The arc transmitters were in operation for over two decades, even after commercial tube sets were being installed and had proven their superiority. They gave a "good run for their money" to the more sophisticated competitors until around the middle '30s when International Agreements prohibited their use, as well as the spark equipment. Attempts to voice modulate the arc transmitters were met with a fair amount of success.

Some seagoing radio operators of the "Golden Days" struck the initial flame of the arc with a broomstick, since the chamber when dirty used to blow the lid off the arc converter, spraying black soot all over the radio shack. Another problem was that the alcohol had to be kept under lock and key, or it "evaporated" too fast.

Radio amateurs did not use the arc transmitters, jumping from spark to tube sets; perhaps the installation of these "monsters" required mechanical skills and electrical components beyond their normal reach. Most important yet, they did not perform well on the wavelengths where amateurs could operate at that time, below 200 meters." CQ

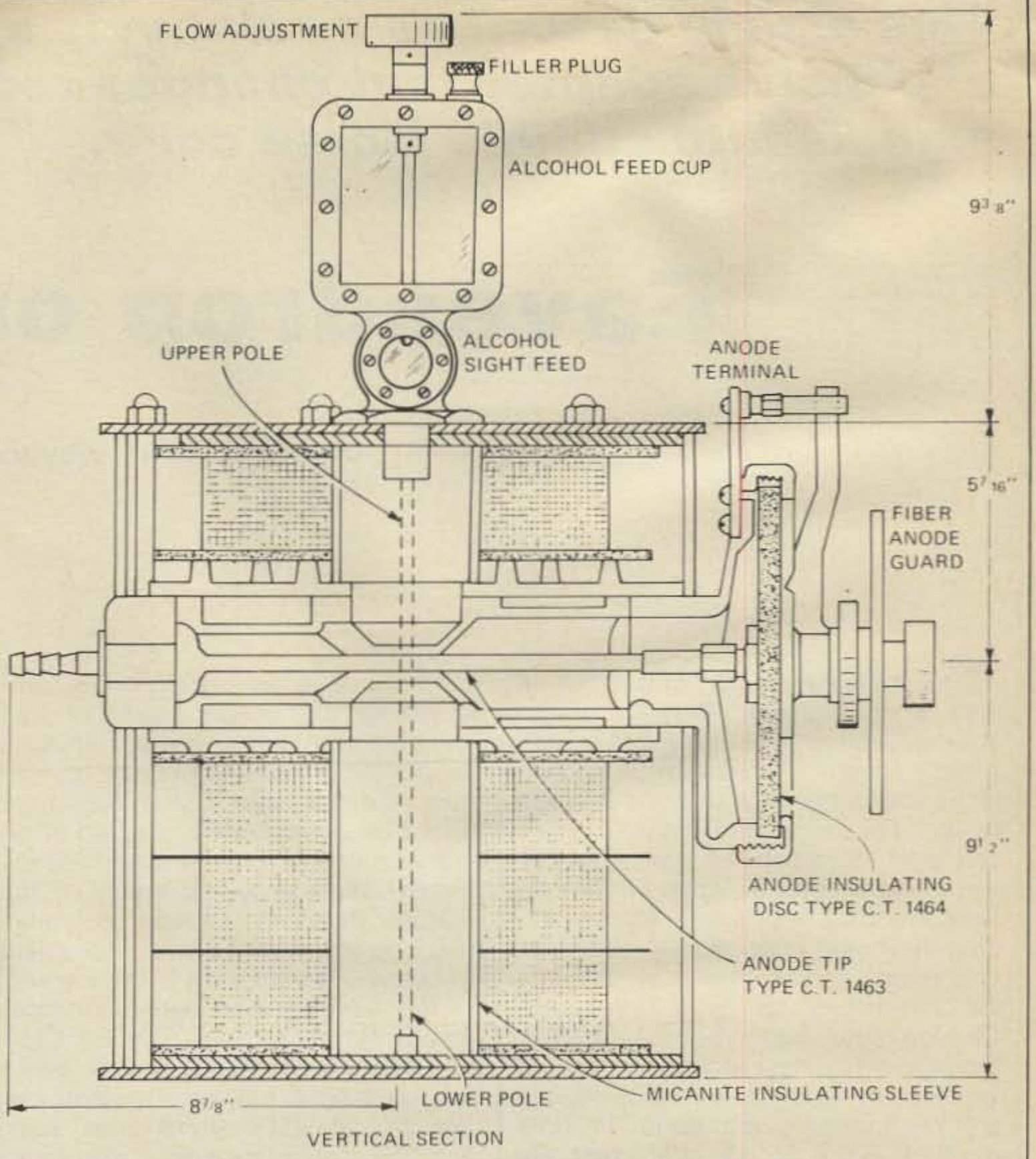


Fig. 6 - Sectional view of a Federal Telegraph Co. 2 kW arc converter.

Watt's Current?

Gary I. Robin, K9HDU, President of the Chicago Area Radioteletype Repeater System wrote *CQ* that on September 30 and October 1, 1978, the Carrs Teletype and Repeater System Club exhibited at the Chicago FM Club's annual Radio Expo.

The purpose of the booth was to provide prospective amateur RTTY operators an opportunity to become familiar with equipment, technology, and local activities.

A seminar was held to relate both the electronics and mechanics of amateur radioteletype. A question and answer period followed the seminar. Attendance at the seminar was in excess of 50, showing the high degree of local interest in this fascinating area of amateur radio.

The Carrs group will soon be operating a teletype only repeater in the Chicago area on 146.10/146.70.

Mrs. Edith Parker holding the plaque presented to her by the radio amateurs of Alabama in appreciation for her outstanding work from 1962 to 1978 in the State Department of Motor Vehicles, where she handled the car license tags for the state's amateurs. This presentation was made at the Central Alabama Hamfest in Montgomery. (Photo by K4DOL, Frank Collier)

NO-27-28

This article describes a relatively simple and inexpensive adapter that changes received RTTY signals into audible Morse code.

Eavesdrop on RTTY

BY ARTHUR C. ERDMAN*, W8VWX

You may say, "I thought RTTY is sent at 60 wpm by American radio amateurs. How can I ever receive such a high speed?" What makes audible reception possible is that the *average* typing speed of the typical RTTY operator is much slower than 60 wpm. The adapter described in this article assumes you have a Morse sending keyboard that stores about 64 characters. The adapter is wired to the key switches of your keyboard. Storage is necessary because a RTTY typist may type fast at some times and very slowly at other times. Also, the RTTY characters are equal in time duration while Morse characters are not. You adjust the outputting speed of your keyboard so that the character storage register is never quite full. This speed may be about 40 wpm for an above-average typist, or as low as 15 wpm for a hunt-and-peck typist! If you are receiving a taped message being sent at 60 wpm, then you must be able to receive over 60 wpm!

If you are already into RTTY with a printer or video reader, there is no need to explain to you how to tune in a RTTY signal. After getting good copy, simply set the output speed of your keyboard so that the "buffer full" light never comes on. Adjust the output speed so that the "buffer full" light comes on *occasionally*. You are close to the *minimum* output speed for the *present average* typing speed. If the operator decides to speed up typing, then you will start to lose characters unless you advance the output speed.

The hardest part of using this adapter is tuning by ear only. Included, after the circuit description, is a section on how a sightless person can tune in the RTTY signal. This same description holds for anyone who is tuning by ear with no printer or video reader.

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Circuit Description

This article is written assuming you already have the Morse keyboard that stores characters. Why not build a circuit that pulses the correct key contact of your keyboard in accordance with the RTTY symbol received? You need one chip to convert the serial RTTY to parallel RTTY. (You also need a RTTY demodulator. See reference (1)). This chip is called a UART (Universal Asynchronous Receiver Transmitter). You also need 5 chips to decode the RTTY code. The wires from the decoder output are connected to the proper key of your keyboard. This decoder connection does not interfere with the proper operation of your keyboard. Before attempting to build this adapter, carefully check over the circuit of your keyboard. The keyboard must *not* be of the *scanning* type. You can quickly tell if it is a *scanning* type by observing that neither side of each key switch has a common connection. This adapter works if one side of each key switch is tied in common, preferably to ground. Your keyboard switches should drive logic that is TTL compatible. This means that a binary *low* should be about 0.2 volts or less and a binary *high* should be around +5 volts. If your keyboard has one side of each key switch wired to ground, put a d.c. voltmeter across any key. Read the open-circuit voltage. If it is above about +2.5 volts, your keyboard is TTL compatible. Press that key and the voltage should drop to nearly zero. If your keyboard has a common connection to the positive voltage, then you will need inverters from each output line of the adapter.

Fig. 1 shows the block diagram of the RTTY-to-Morse adapter while fig. 2 shows the completed circuit.

A brief explanation follows:

1. U1D and U1E form a square wave oscillator operating near 727 Hz to drive the UART, U2, for 60 wpm reception.
2. Two chips, U3 and U4, detect the RTTY symbols, LTRS and FIGS, respectively. U5 is connected as a latch, so that it "remembers" whether the characters to be output are upper or lower case of the keyboard. If you are not famailar with an old-fashioned RTTY keyboard, you will be surprised to

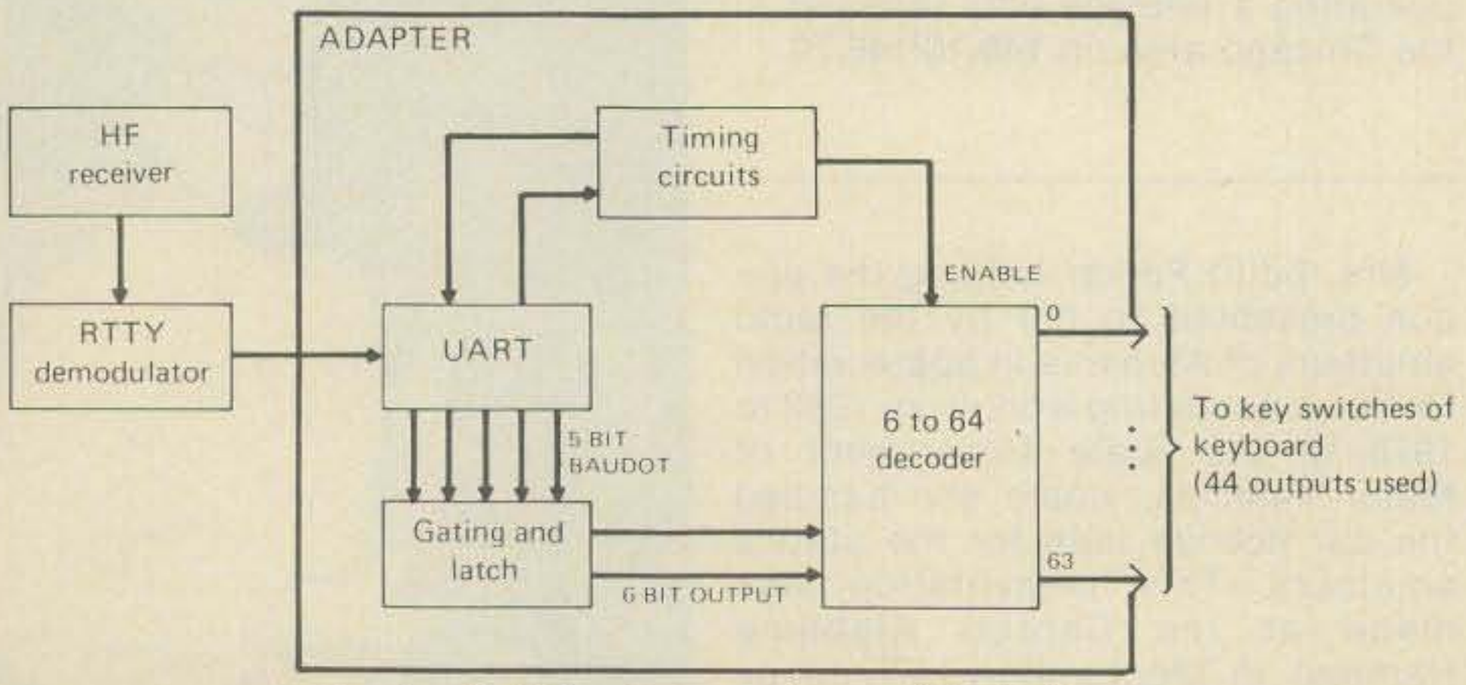


Fig. 1 - RTTY-to-Morse adapter block diagram.

Logic convention: 0 = switch to ground
1 = switch not to ground
Note: Push push button to send symbol

S5	S4	S3	S2	S1	Symbol	Symbol
1	1	1	1	1	= Letters (LTRS)	1 1 0 1 1 = Figures (FIGS)
These symbols follows LTRS						These symbols follow FIGS
0	0	0	0	0	Blank	Blank
0	0	0	0	1	E	3
0	0	0	1	0	Linefeed	Linefeed
0	0	0	1	1	A	- (Dash)
0	0	1	0	0	Space	Space
0	0	1	0	1	S	Bell
0	0	1	1	0	I	8
0	0	1	1	1	U	7
0	1	0	0	0	Carriage Return	Carriage Return
0	1	0	0	1	D	$
0	1	0	1	0	R	4
0	1	0	1	1	J	' (Apostrophe)
0	1	1	0	0	N	,
0	1	1	0	1	F	!
0	1	1	1	0	C	:
0	1	1	1	1	K	(
1	0	0	0	0	T	5
1	0	0	0	1	Z	"
1	0	0	1	0	L	)
1	0	0	1	1	W	2
1	0	1	0	0	H	#
1	0	1	0	1	Y	6
1	0	1	1	0	P	0 (Zero)
1	0	1	1	1	Q	1 (One)
1	1	0	0	0	O	9
1	1	0	0	1	B	?
1	1	0	1	0	G	&
1	1	1	0	0	M	.
1	1	1	0	1	X	/
1	1	1	1	0	V	;

Table II - Baudot Code

demodulator is most easily obtained from the emitter circuit of the transistor that drives the printer magnet (or the relay). Fig. 5 shows a typical circuit.

Tuning by the Sightless

After much trial and error, I found that the easiest form of sightless tuning was listening to the printer magnet in my mechanical RTTY unit. You will find a setting of the receiver (or the setting of the internal frequency control of the PLL demodulator) that will result in a very precise and positive sound from the relay. Other settings result in erratic and mushy sounds from the relay. After you are satisfied that the clicking is as regular as possible to detect by ear, then switch on the Morse output and a very minor receiver adjustment may be necessary to obtain good copy. Substituting a loud, clicky, yet fast, relay for the printer magnet is a simple modification.

Summary

While this adapter seems out of place in this modern era of sophisticated printers and video readers, it has an appeal to the serious Morse operator and also to the sightless. If there is sufficient interest I would be willing to show how the adapter could be connected to a scanning-type keyboard and possibly how to build the unit from scratch. I also have a slightly modified cassette recorder that I use for recording tape-sent RTTY (full 60 wpm) and playing it back at any desired speed.

Reference

(1) Nat Stinnette, W4AYV, *Ham Radio*, Feb. 1975 pg 36.

Here's a nice weekend construction project for you two meter f.m. buffs.

Repackaging The GLB Synthesizer

BY BILL G. MOORE*, K5HTF

It seems only yesterday that I heard my first station using a new device called a GLB synthesizer. At last the two-meter f.m. operator was freed from the limitation of crystal controlled operation. The folks at GLB had certainly done their homework in the phased-locked loop department. Attaching the unit to a crystal controlled two-meter transceiver added great flexibility in operating.

Time passed, and the phase locked loop led the way for hoards of fully synthesized transceivers. A great many of the old reliable GLB units were put aside to make room for the smaller compact rigs in the even smaller cars.

Since the GLB units have not appeared in great numbers in the used equipment areas, we will assume somewhere out there are a lot of fine operating units gathering dust on the shelf in the amateur shack. It is for those owners that this article is written.

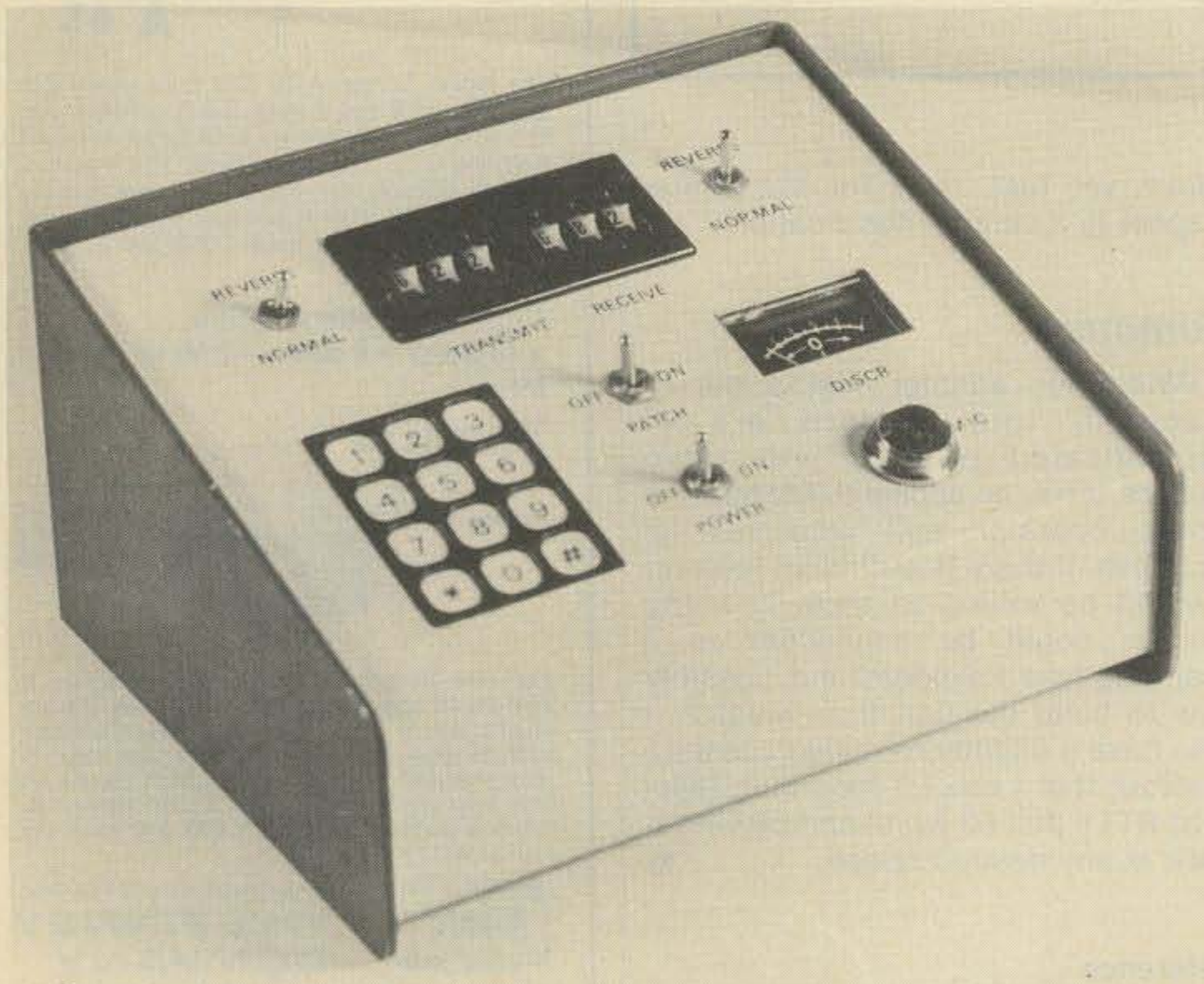
I would not attempt to compete with all the very good information contained in the GLB manual. This article deals primarily with the re-packaging of a good piece of equipment, thereby making a more functional and attractive companion to some of the many crystal controlled rigs available today at bargain prices.

The photographs show the completed unit. Careful planning allows the small case to hold the main GLB board, the v.c.o. board, a thumbwheel switch with three digits on transmit, and three on receive, discriminator meter, *Touchtone** pad, and microphone jack. Toggle switches control the 12 v.d.c. to the unit, and voltage to the *Touchtone* pad. The toggle switches on each side of the thumbwheel switches control the transmit and receive frequencies. In the "Normal" position, the transmitter output is as indicated on the three digits on the left side of the the thumbwheel, and in the reverse position, the transmitter output is as indicated on the three digits on the right. The receive frequency is likewise affected by the position of the toggle switch to the right of the thumbwheel switch.

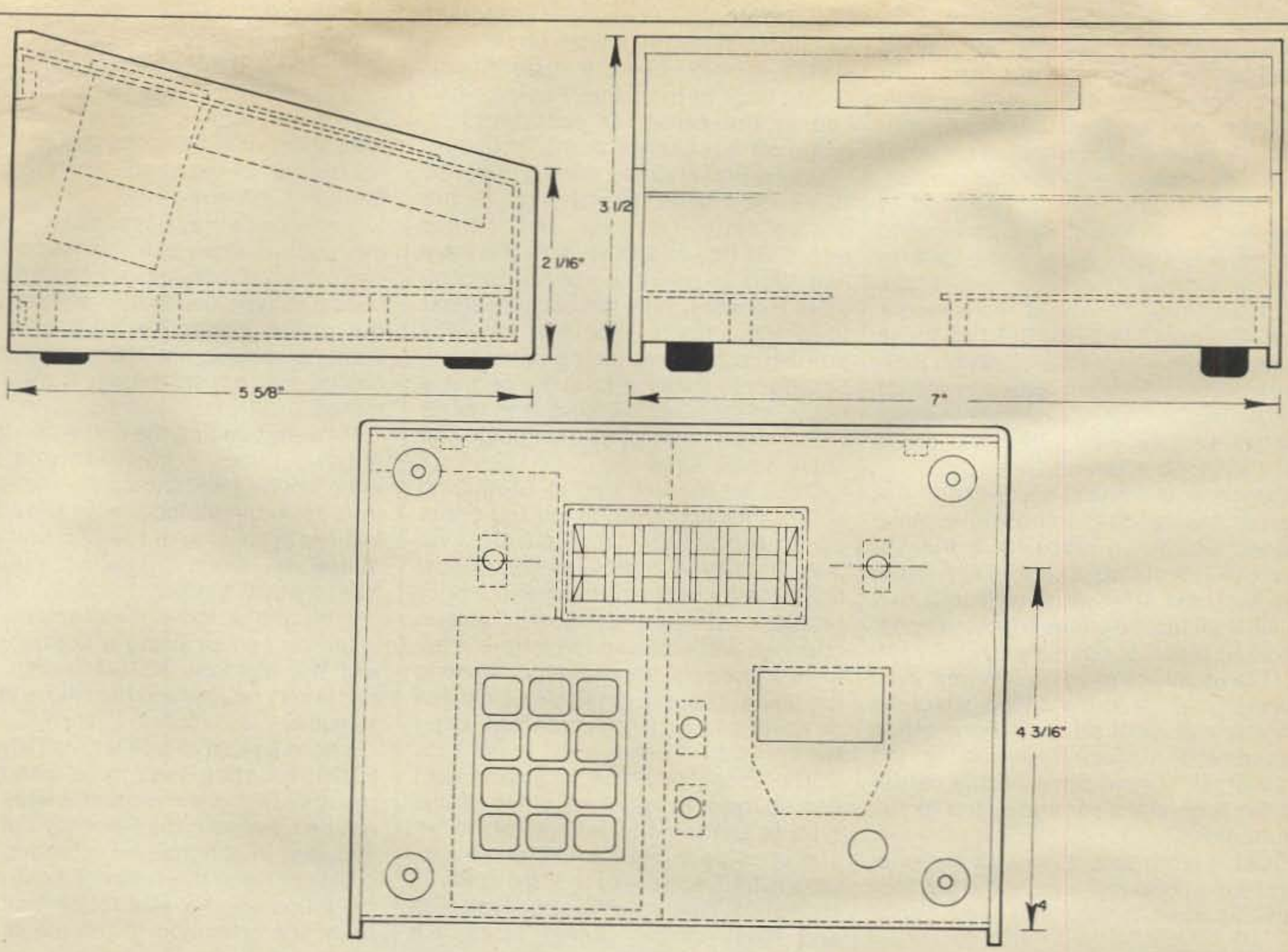
The frequency switching arrangement allows for convenient operating. For example, to operate on a 22/82 repeater, the thumbwheel switches would be set to read 622/682, and the toggle switches on each side would be in the normal position. To QSY from 22/82 to 52 simplex would only require flipping the switch on the left to "Reverse" and the second digit of the right half of the thumbwheel to 5 instead of 8.

The only modification to the GLB unit is the substitution of the thumbwheel switches for the BCD switches included in the kit. Each digit of the thumbwheel switch utilizes a p.c. board with copper lands extending to the rear of the switch. Cutting voids in the copper lands on each section, you will have a convenient place to mount the diodes previously mounted bet-

*5 E. Shore Dr., Russellville AR 72801



This photograph of K5HTF's repackaging of the GLB synthesizer clearly illustrates the front panel parts placement.



A mechanical drawing of the modified enclosure for the GLB synthesizer.

ween the BCD switches and the diode mounting strip in the original unit.

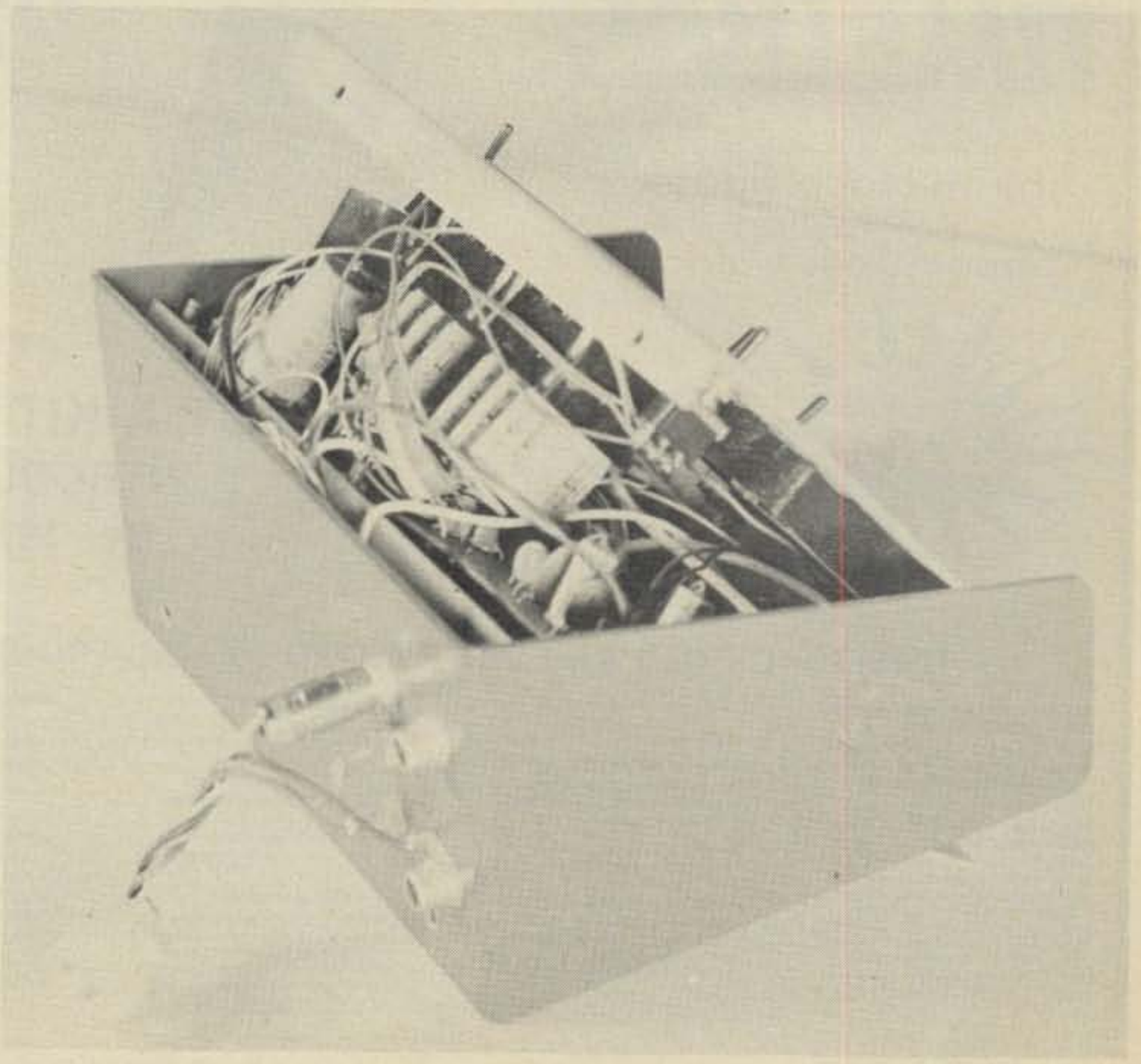
Construction

The cabinet shown in the photographs was obtained from Circuit Specialists, PO Box 347, Scottsdale AZ 85257. The cabinet is in two pieces, the sloping top, front, and bottom are held to the back and sides by four 6/32 machine screws.

The component layout of the unit is purely symmetrical with respect to the centerline. One critical point is the position of the thumbwheel switch assembly. The location shown is necessary for the rear end of the p.c. board which wafers to clear some of the components on the GLB board underneath.

Cutting the rectangular holes for the meter, pad, and thumbwheel switch posed a problem. The metal case was a little thick for the old reliable Adel nibbling tool, and no square punches were available. I used a Dremel Mototool with a carbide cutoff wheel to cut slots just inside the rectangular areas. A short length of hacksaw blade was inserted in the slots and the cuts completed.

A file was used to finish off these



A look inside the unit.

rough cuts so the meter and raised area of the pad were press fitted into the openings. Since the pad and meter have no mounting bezel as the thumbwheel switch does, care must be taken to file the openings exactly to the line.

The pad used in the pototype is made by Bramco and has the *Touchtone* electronics embedded in the back cavity. The meter was obtained from Clegg, and is a replacement part for their FM 27-B. Both of these components have raised areas on their surface and lie flush with the top of the panel. On final assembly these two pieces were secured with a dab of GE RTV Silicone adhesive.

Once all the holes are drilled in the panel and all the components have been fastened in place for a trial fit, remove everything and set them aside for the next step which will turn this plain looking box into a professional looking piece of equipment.

The markings used on this unit were made from "transfer" type which is available at most art supply and office equipment stores. Preferred is the "Chartpak" brand because the carrier sheet is crystal clear and easier to see through.

Use a cloth saturated with alchohol and wipe the panel area and allow to it dry. Sharpen a very soft lead pencil and lightly mark guidelines under each switch position using a small square on the edge of the panel. Mark a small line at the center of each word or group for a reference point.

Count the letters in each group, i.e., REVERSE, and burnish down the center letter E over the center reference line and flush with the base line. Work to the right and left to complete the word. Take the backing sheet from the transfer type and carefully burnish down the completed word. Should you make a mistake or get a letter misaligned, remove the letter with a small piece of masking tape and apply a new letter.

Once all the lettering is completed and burnished down, spray the entire panel with a *very light* coat of clear plastic spray and allow to dry. Follow this with a couple of heavier coats to protect the letters. Some plastic coatings will dissolve the letters if applied to heavily, so you might want to rub down a couple of letters on a piece of scrap and experiment before trying the completed panel.

The most common mistake most people make in applying letters of this type is getting the letters too large. The ones used here are 10 point size, (about 1/8") and are of the UNIVERS 55 type style. This a plain gothic type face and most similar gothic faces will work just fine. Just remember to keep it small.

The dashed lines shown on the top view drawing indicate the position of the two boards from the GLB unit. Note that it will be necessary to notch out the rear of the larger board to clear the rear cabinet screw.

The receive, transmit, and microphone lines exit the rear of the cabinet via phono jacks. Feedthrough, bulkhead type capacitors are used for the power leads. The GLB unit has plenty of output, and the leads may be cabled and run to the car trunk if required.

If I were building the unit again there are two things I would change: The microphone jack should be the same type as on the transciever to allow convenient bypassing of the GLB unit if required as when operating portable from a small battery.

I believe a more reliable tone pad could be had by using a Digitran pad, and the Motorola MC14410 chip. The pad is very reliable and the chip is not r.f. sensitive.

I have used this unit with a Regency HR2-B for quite some time with good results. The discriminator meter cannot be used with the Regency but was included in anticipation of obtaining a different rig in the future. Circuits can be found in the *Handbook* that will allow the operation of the meter with other rigs.

**Touchtone* is a registered trademark.

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Electrical Shock

BY W. EDMUND HOOD*, W2FEZ

Electrical shock has been around as one of the leading bugaboos of amateur radio for as long as the hobby has existed. However, with the advent of solid-state equipment and the corresponding lower voltages, the hazard has all but disappeared from the scene. It will remain to some extent, however, as long as amateur equipment uses tubes or operates at high power. While any old timer has been "belted" more than once, there are many of the beginner-level amateurs who have never gone into the high-voltage cage of their rigs, and prior to amateur radio used only 5-watt, solid-state CB units. It is this group that is least acquainted with the hazard, and therefore more vulnerable.

While we are not trying to scare you out of your new hobby, there is little point in glossing over the fact that, if you work on your own equipment, an electrical hazard does indeed exist and, if it catches you off guard, it can kill you.

Now there are a great many "old wives' tales" floating around concerning electrical shock. Some of them are nothing more than old wives' tales; some have some degree of fact.

The entire human system is controlled and operated by electrochemical impulses passing through the nervous system. Nerves ending in muscular tissue deliver an electrical impulse to make the muscle contract. This is true whether that muscle is your bulging biceps or your heart. One receives a single command pulse and the other receives a steady stream of "clock" pulses. The operation is otherwise similar.

One of the more common conceptions of electrical shock is that voltages below 100 or so are not fatal, 100 to 1000 are quite dangerous, and higher voltages not so much so. This probably stems from the fact that the greatest number of electrical fatalities involve either 110 or 220 volts, these being most universally available to the general public. It is a fact that higher voltages can and, in fact, do kill.

Perhaps the truest of the maxims is the one that says, "It depends on how you get it." As to the voltage theory, voltage has little to do with it. If this were not the case, an awful lot of auto mechanics would be pushing up daisies, since auto ignition systems have a pretty high voltage. The fact is, it is the *current*, not the voltage that does the damage, and the amount of damage it does depends on the path it follows through your body.

Electrical current passing through human tissue does two things of prime concern. First, it burns, second and most important, it causes muscles to contract. Now, the heart is a muscle. If it should receive a foreign electrical impulse during the brief moment after a contraction, when it is trying to relax, its response to subsequent

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clock pulses will be sufficiently disturbed to make it contract very irregularly or give up altogether. If the shock occurs elsewhere during the heartbeat cycle, the same magnitude is less dangerous.

From this we can see that the more dangerous shock an amateur might receive is one that passes through the heart. While a shock passing through the brain is also very dangerous, we are unlikely to find ourselves in a position that would create that current path. For us, the greatest hazard lies in a hand-to-hand or hand-to-foot hookup.

In addition to interfering with heart action, electrical current passing through the arms can contract the arm muscles, locking you on so that you can't let go. In such a case, even if heart action is not interfered with, the steady current passing through the chest can "freeze" the breathing mechanism. When this happens, unless the current is turned off, the victim can die from lack of oxygen.

To make the overall picture even more complicated, we must remember that the entire nervous system operates, in part, via electrical impulses. Depending again on the current path, nerve damage can result. Generally speaking, however, neurological damage is less common than the aforementioned problems.

Finally, when electricity passes through a conductor, it generates heat. This can cause severe burns, particularly at the contact point of the positive electrode. While these burns are generally small in area, they often go pretty deep. Other than being a painful injury, the prime danger there so far as injuries from amatuer radio apparatus is concerned, is the complications from possible infection.

The greatest danger, then, is from a shock that passes through your chest. Medical people estimate that a current of only 60 milliamps or so can do you in. That figure becomes much smaller for people with heart ailments. Depending on its timing, heart action can become very irregular, or stop altogether. Present-day first aid courses include techniques for reviving shock victims, but they aren't much use unless applied within a few minutes of the shock. If you got a belt from your rig that made everything "catch" momentarily in your chest, maybe you ought to go to church next Sunday.

At this point, the reader may begin to wonder just how high a voltage can drive a fatal dose of current. No single figure can be given for this, as no two humans have the same body resistance through similar paths. In the first place, the conductivity of human flesh isn't necessarily constant. In the second place, the contact resistance of the skin varies with time of day and, yes, even with a person's feelings. (Conductivity of the body is one of many activities monitored by a polygraph.) Therefore, unless you measure it, your body resistance is never known for sure at any given time.

As mentioned a little earlier, an adult can be killed by as little as 60 milliamps. This number is much less for a child. The author stopped at this point and checked his hand-to-hand body resistance with an ohmmeter. It varied all over the place, but averaged around 50 to 100k. Wetting the hands cut this figure by nearly a factor of ten. The resistance of a five-year-old child was about half that of an adult. These figures could be way off simply because of the measuring technique. People have been killed by as little as 110 volts going hand to foot. Assuming 60 milliamps to be the fatal current, the path resistance had to be around 1.8k. Do not, therefore, depend on the results of trying to measure your own resistance.

Even if it doesn't kill you, few people would describe a shock as a fun experience. Aside from the actual physical damage done, the sheer trauma doesn't do you any good. It is, in fact, quite similar to the shock condition resulting from any painful injury. Anybody who had had even the most basic first-aid instruction knows that any kind of shock is serious. Depending on how serious it is, it can take over where the electricity left off, finishing the job of eliminating you. Even without serious shock condition afterward, it still hurts, and there is no thrill in seeing that little round hole burned in your hand at the point of contact with the positive electrode.

Any fool knows enough to turn off the switch before working on the rig (I think). However, many of us fools stop worrying when there is only one switch between us and oblivion. Turning off the power is great, but it pays to have more than one opening in the circuit. Otherwise, it is there, waiting for you to make a mistake, and if your work on the equipment often enough, the probability curve of human error says that, sooner or later, it may get you.

Ground-fault interruptors (such as the one in December 1975 issue of *73*) are quite effective when the path is to an accidental ground outside of the equipment. However, unless they are designed specifically to do so, they can be of little use in the case of accidental contact between the high voltage and the chassis. Whatever precautions you use, there is probably no substitute for keeping yourself constantly aware that the danger is there ..... waiting.

a monthly feature by

ADRIAN WEISS, K8EEG

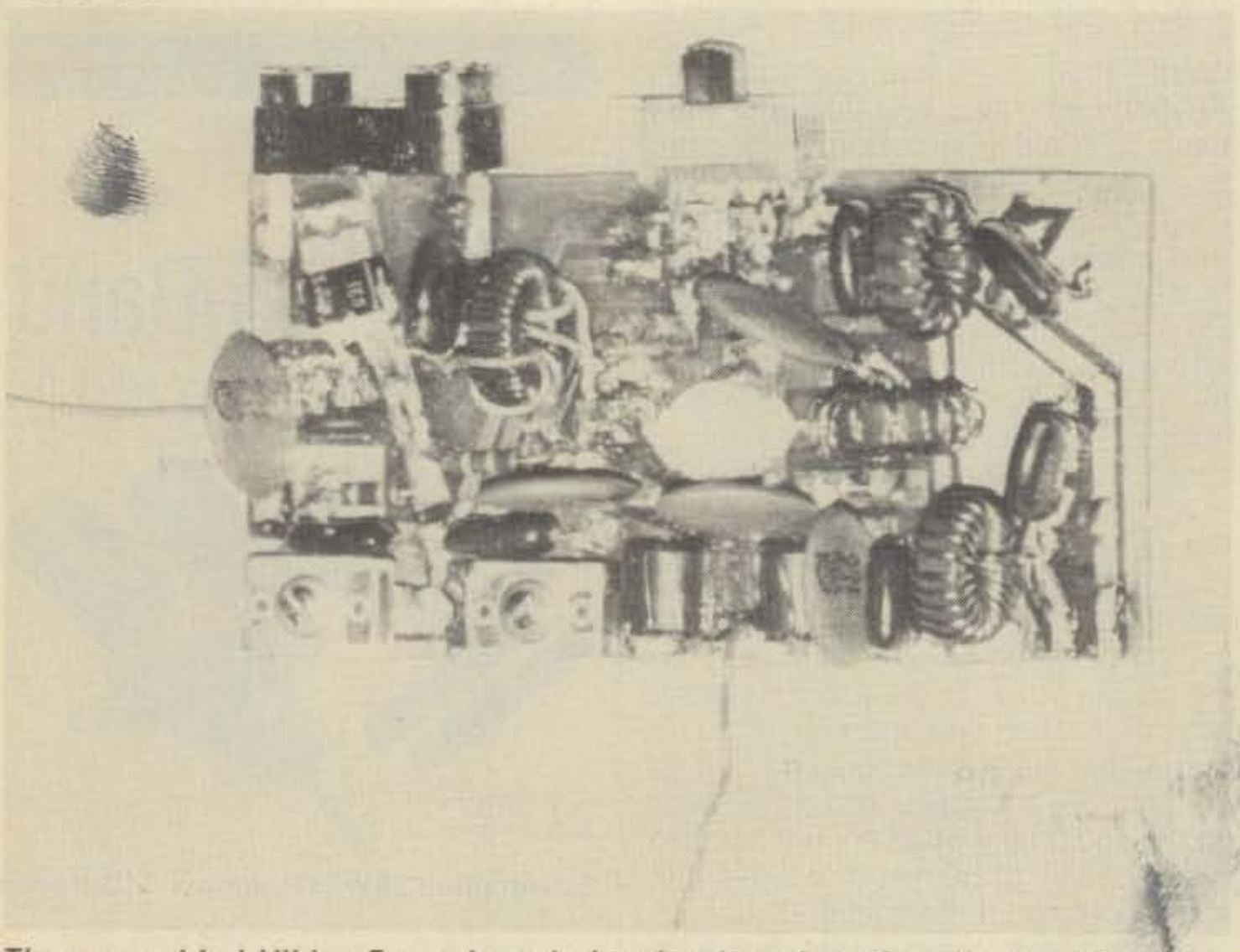
QRP

The art of very low power operating

"The Viking-5: A 5 Watt Solid State Transmitter for 3.5 and 7 MHz"

New converts to the QRPp lifestyle usually follow one of two paths in getting on the air with a QRPp transmitter: 1) they purchase a commercial transceiver such as the Argonaut or HW-8, or a small unit such as the MFJ-40T; or 2), they look through the literature in search of a simple transmitter design which is within their contructional capabilities. Quite a few of us automatically associate QRPp with homebrew because we usually start out with building a simple one or two stage project in order to familiarize ourselves with solid-state circuits as well as learn the technique of fabricating a printed circuit board. Actually making contacts on the air with a finished project of this type provides much more satisfaction than using a "store-bought" rig, since the operator has built the thing from scratch and has had to put time and effort into the whole process, from scrounging through catalogues for parts to final testing and adjustment. The continual movement of amateurs into the QRPp area has resulted in a sustained high level of interest in the new circuits that will be "just right" as first projects. This article describes another such circuit which has all the necessary qualifications and should be rather popular. It is a two-stage crystal-controlled unit which can be constructed either for single-band or two-band operation using alternate circuit boards, and which provides a very hefty five watts output on either 80 or 40 meters, or both bands with bandswitching. In an earlier series of articles, another vaguely similar circuit was discussed which utilized VFO control for about 1 watt output on 40 and 20 meters (*CQ*, Nov.-Dec., 1977). The present circuit is simpler and less difficult as a first project, and results in a truly portable "shirt-pocket" transmitter which will make itself heard with the simple type of antenna that characterizes portable operation.

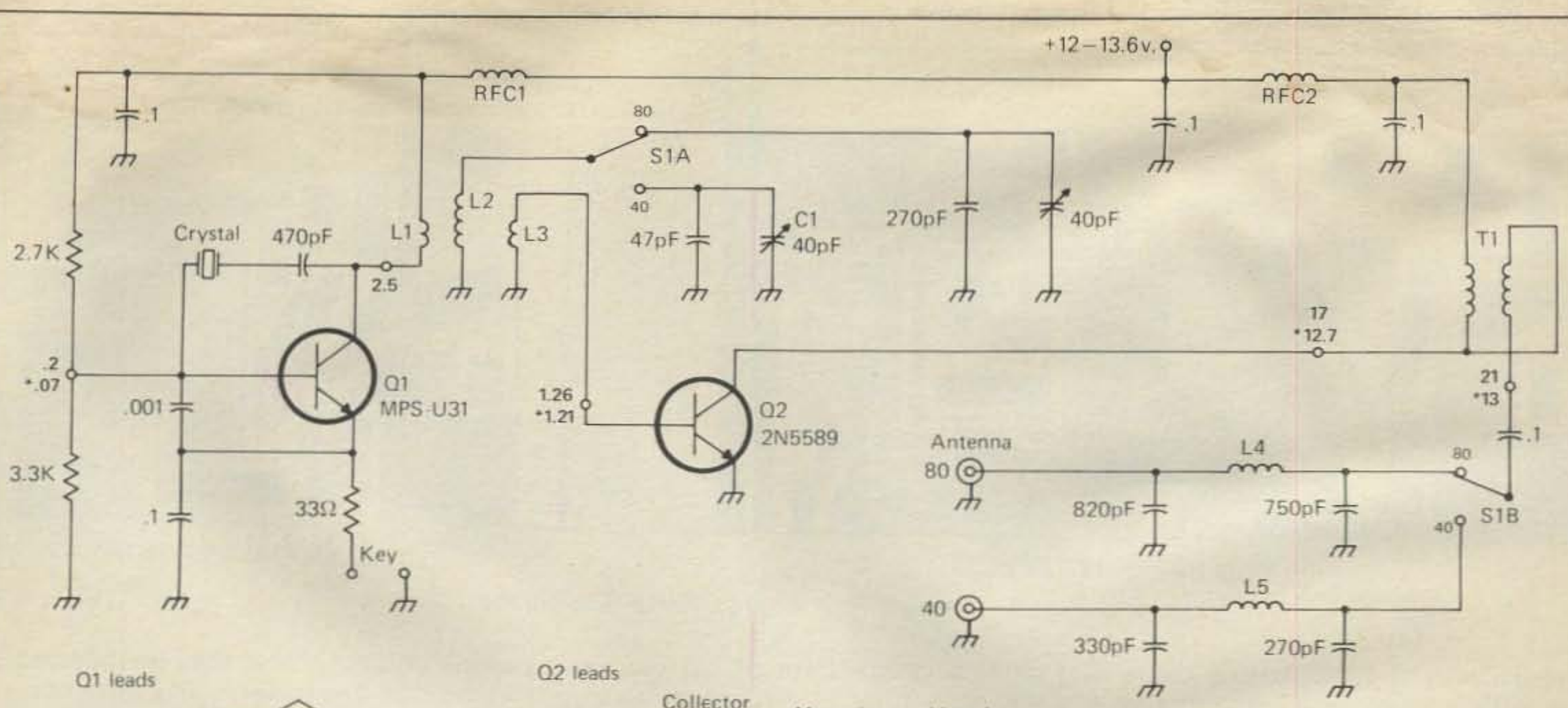
83 Suburban Estates, Vermillion, SD 57069



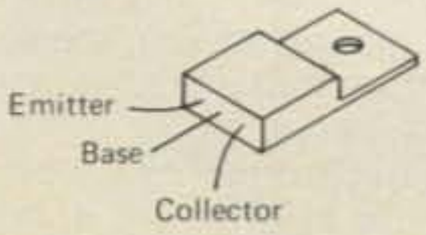
The assembled Viking-5 p.c. board showing location of various parts. Upper left corner shows xtal. socket leads soldered to proper pads, with the heat tab of Q1 bent on two 90 degree angles, with the tip soldered to the pad. To the right of Q1 is the 470pf xtal. coupled capacitor, with $L_{1\text{-}2\text{-}3}$ to the right. A close look at the toroid shows the L3 link connected to the base pad of Q2 and ground. At the bottom left can be seen $C1_{a\text{-}b}$ and $C2_{a\text{-}b}$. To the right of $C2_{a\text{-}b}$ is RFC1, RFC2, 0.1mf bypass for the B+ pad, 820pf 80 meter PI output capacitor, L4, copper foil for 80 meter antenna output, and foil for 40 meter antenna output. Directly above L4 is the 750pf 80 meter input capacitor. The blurred white oval at the center of the board is the 2N5589 with T1 directly to its right. Top right corner shows the 270pf-L5-330pf 40 meter PI network parts. SW1 is at top center.

Viking-5 Circuit

Fig. 1 shows the circuit of the 5 watt two-band transmitter. The circuit for the single-band version is exactly the same, except that the bandswitch SW1 and $C1_{a\text{-}b}$ or $C2_{a\text{-}b}$ and the 80 or 40 meter output PI network, are eliminated for the band that is not used. The circuit is a straight-forward design consisting of a Class-A crystal-oscillator driving a Class C amplifier. The base resistors of of Q1 establish the proper bias level for Class A operation of the stage. A fundamental crystal for either 3.5 Mhz or 7 Mhz is inserted in the a.c. feedback path from collector base, while a .001 ceramic capacitor provides an a.c. feedback path from base to emitter to enhance crystal oscillation as well as stabilize the stage. The emitter resistor controls the gain of the oscillator stage, and with the value shown, the oscillator developes about 400mw into a 50 ohm load. Since the duty cycle of a Class A stage is almost 100%, that is, the transistor is amplifying throughout the whole oscillation cycle, the rather large collector current causes considerable thermal buildup. The MPS-U31 is easily capable of 5 watts dissipation, and runs mildly warm at full power when the heat-tab of the transistor is soldered to the p.c.b. pad



Q1 leads



Q2 leads

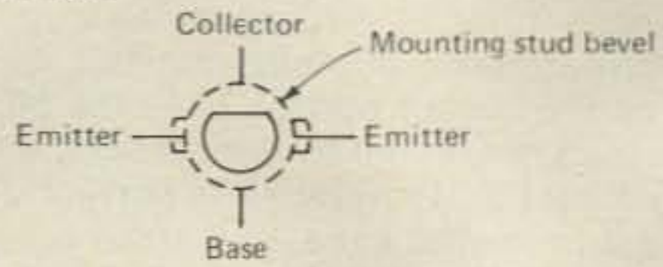


Fig. 1 - The Viking-5 QRPp Transmitter for 3.5-7 MHz. All circles (ie o) in diagram are r.f. measurements in v.r.m.s., $V_{cc} = 13.6$, 80 meters. * indicates 40 meter reading

L_1- 3.5t hook-up wire, 1/3 core circumference, over "hot" end of L_2.

L_2- 35t #24, T-50-2 core

L_3- 2t hook up wire over ground "cold" end of L_2

L_4- 23t #21, T-50-2 core

L_5- 15t #21, T-50-2 core

RFC_1- 8t #24, FB-73-801 ferrite core

RFC_2- 7t #24, FB-73-801 ferrite core

T_1- 16t, 2 wire twisted pairs, T-50-2 core

C_1-C_2- Elmenco 40 pF compression trimmer capacitors (or equiv.)

Xtal.- 80 or 40 meter, fundamental, FT-243 or HC7-U

Capacitors in pF - silver mica, others are disc ceramic

$SW1_{a-b}$- subminiature DPDT slide switch

Parts Source

T_1-L_2-L_4-L_5- T-50-2 toroid cores (55¢ea.)

from: Amidon Assoc.
12033 Otgego St.
N. Hollywood, CA 91607

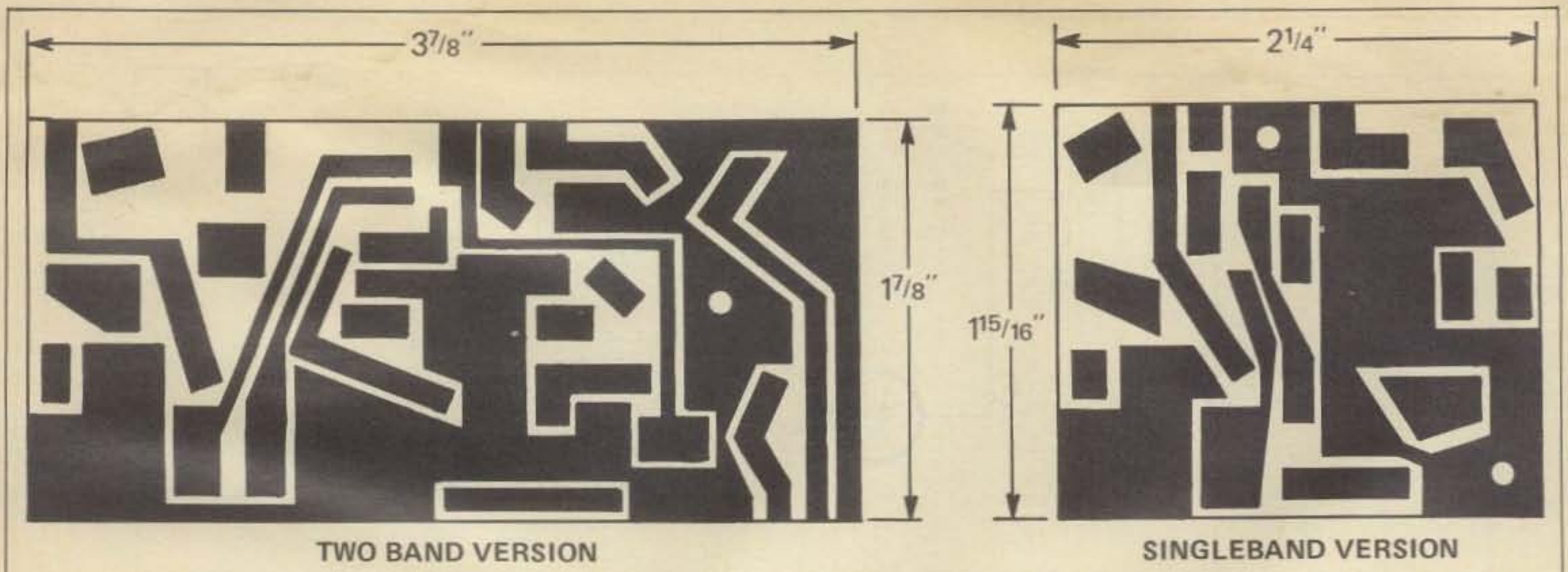
RFC_1-RFC_2- FB-73-801 ferrite jumbo bead ($3.00/dozen)
¼ watt resistors (7¢ ea.)
Q1 - MPS-U31 ($1.10 ea.)
Q2 - 2N5589 ($4.95 ea.)
C_{1b}-C_{2b}- 4-40pF miniature trimmer, Elmenco 404 (1.01 ea.)
Phono jacks (key, B+, Ant) #1247 (45¢ ea.)
Chassis box LMB #101 (4-¼ x 2-¼ x 1-¼) ($1.48)
Key switch - push button momentary s.p. Norm Op #992/8411K11 (90¢ ea.)
DPDT submin. slide switch #1227 (40¢ ea.)
Silver mica caps: 47pF (28¢), 270pF (42¢), 330pF (44¢), 750pF (50¢) 820pF (60¢)

from: Circuit Specialists Co.
P.O. Box 3047
Scottsdale, AZ 85257

to utilize the p.c.b. as a heatsink. Less rugged transistors usually shown in similar oscillator circuits, such as the MPS-6514, 2N706, or 2N2222, will quickly experience thermal breakdown if placed in the circuit. In designing the circuit, the objective was to achieve the full power output capability of the 2N5589, which is rated at 5 watts, and a healthy drive signal in excess of 300mw was necessary. Hence the choice of the MPS-U31 as oscillator transistor.

The tank circuit for Q1 is parallel tuned to resonance by a combination of fixed silver-mica and compression trimmer at C1/C2. This type of inductor utilizes an inductive link at both collector and output ports in order to achieve impedance transformation, rather than tapping the collector down on the inductance itself. L1 begins at the high-impedance end of L2 and is spread out over about one-half of the toroid core circumference. The L2 impedance at the point where L1 leaves the core is roughly equivalent to the collector load impedance. The L3 link functions in the same way, and matches the collector impedance to the typically low impedance presented by the Q2 base. The oscillator stage is isolated from the amplifier by means of RFC1 and associated bypass capacitors. In selecting the RFC, an inductance value of 5-10 times the collector load impedance is usually appropriate (convert inductance to reactance in ohms to get the proportions). An Amidon "jumbo bead" ferrite core with a permeability (mu) of 2500 is used to achieve the proper inductance value with very few turns of a relatively large diameter wire with very little d.c. resistance. Compression trimmers are included in the circuit to permit precise peaking of the tank circuits which allow about a 75 kHz. bandwidth. It would be difficult to peak the tank circuits using fixed capacitors, if not impossible.

The amplifier stage is a straightfor-



TWO BAND VERSION SINGLEBAND VERSION

Fig. 2 - Viking-5 P.C. Boards/Parts Placement

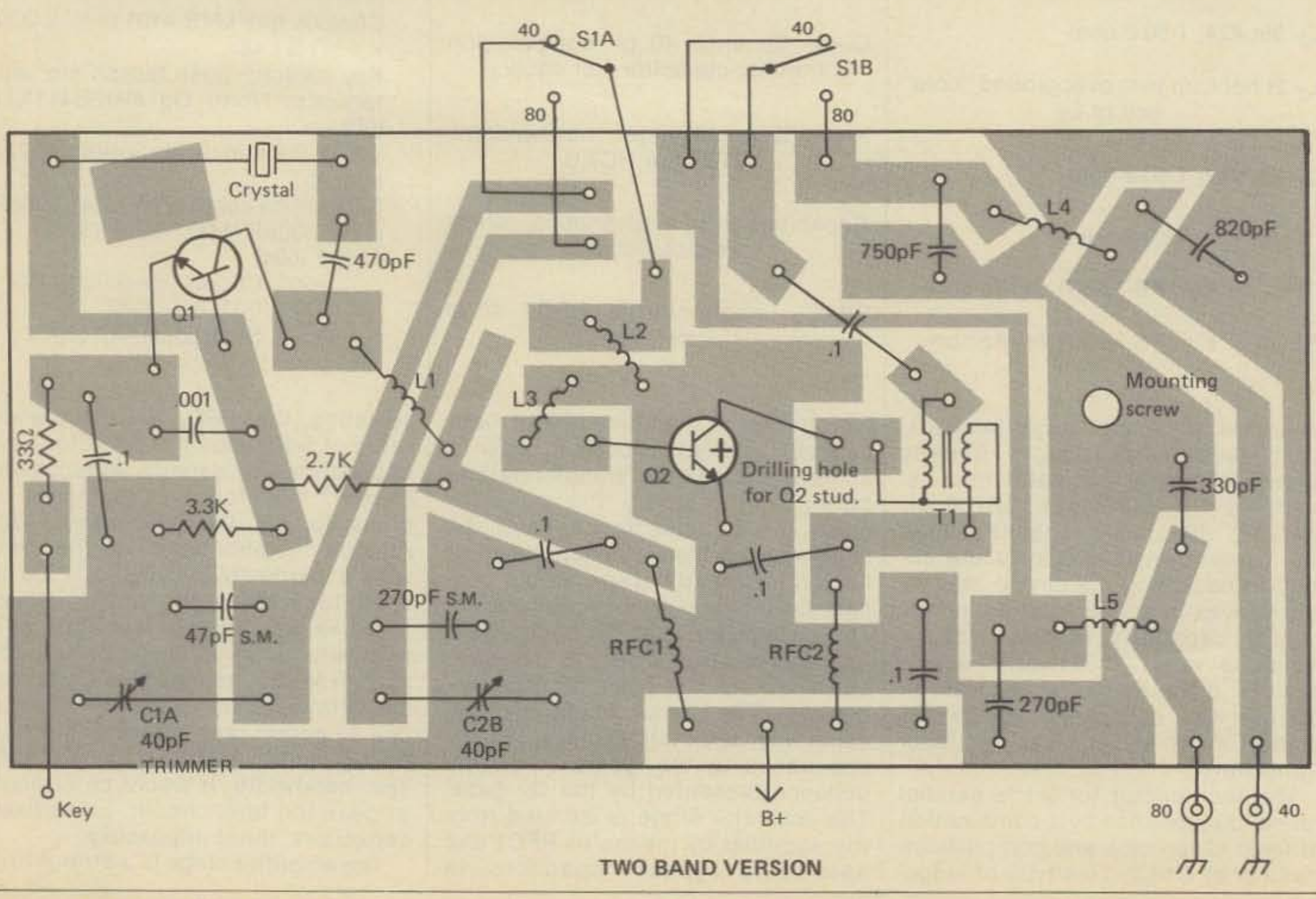
ward Class C type. In this class of operation, a very small amount of d.c. forward bias is developed across the resistance represented by L3, and across the base-emitter junction when a.c. drive is applied from the driver stage. The positive peaks of the driver signal drive the amplifier into the conducting state for only a small portion of the oscillation cycle. The collector load impedance is transformed from about 9 ohms to about 36 ohms through the broadband 1:4 balun transformer T1. Since the transformer will pass all r.f. energy generated in Q2 across a wide portion of the h.f. spectrum, including harmonics, some form of narrow band low-pass filter is necessary to suppress harmonic signals, as well as match the output port of T1 to the 50 ohm load presented by the antenna. A single section PI network is perfectly adequate in this case, since the output from Q2 is fairly clean without filtering and exhibits little harmonic energy. The amplifier stage is isolated from the driver stage and B+ line by means of RFC2, which is similar to RFC1 in its construction and function. Output from the transmitter is a pure sine wave with no harmonics or distortion.

If the builder is so inclined, and 100 ohms potentiometer may be inserted in the KEY line to serve as a drive control, and will permit varying the power output of the transmitter across a considerable range.

Fig. 1 includes r.f. voltage measurements at different points in the circuit to permit testing and check-out should problems arise. These readings are taken through an r.f. probe connected to a VTVM.

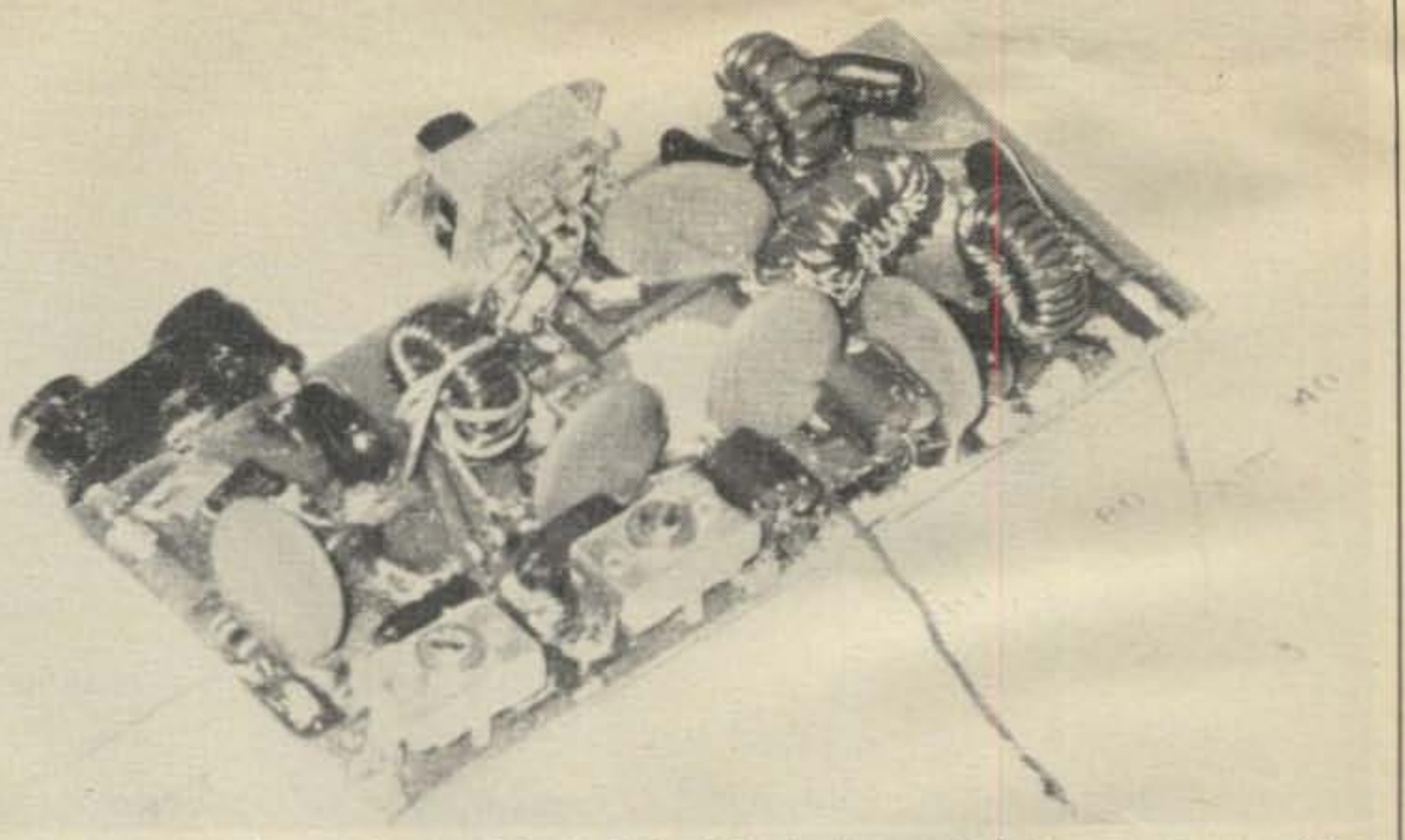
P.C. Board

Fig. 2 shows the alternate p.c. boards for either singleband or duoband operation. The isolated-pad approach is used for two reasons: 1) use

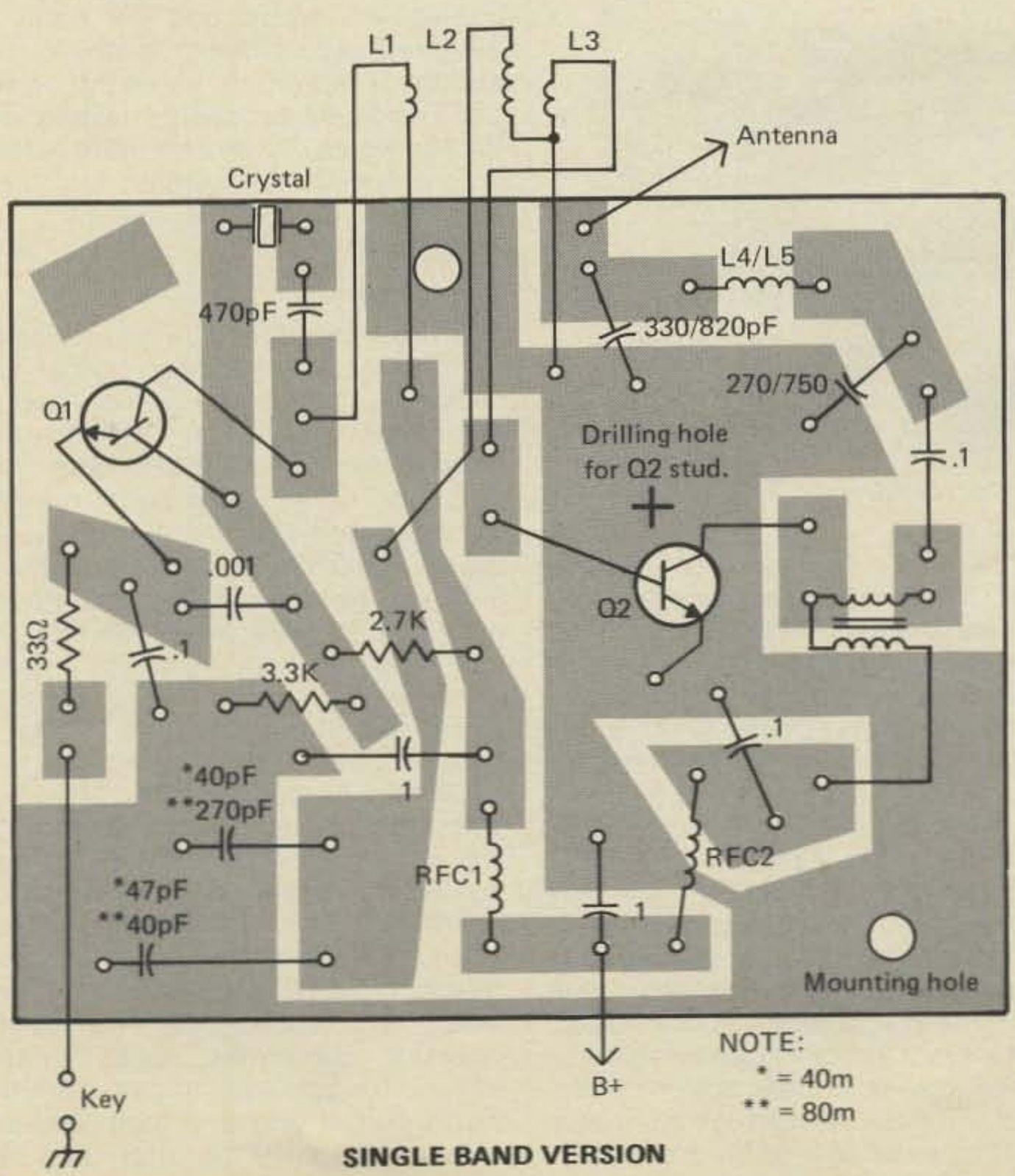


TWO BAND VERSION

of a device such as the 2N5589 requires connecting foils on the same side of the p.c. board as the device is mounted upon; 2) the isolated-pad board is simpler than the usual underside connecting foil type. Fabrication of this type p.c. board was discussed in detail in an earlier paper ("Easy PC Board Fabrication Using Address Labels," *CQ*, March, 1978, p. 32). Briefly, the p.c. board stock (double copper-clad—copper foil on both sides) is cut to template size, and self-adhesive address labels taped to both sides of the board. A copy of the published template is taped to the topside of the board, or glued firmly to the surface. Then a straightedge and sharp-tipped penknife or razor blade is used to cut along the outlines of the pads and ground foil. Once all lines have been inscribed, the label material is removed that covers the copper areas to be etched away. The board is then placed in the etching solution until unwanted copper is etched away, the address label material scraped away, and the remaining adhesive steelwooled off until the clean shiny copper surface remains. Assembly can proceed.



This shot provides a clearer detail of the L1 winding, which leaves the toroid at the top center, and is connected to the B+ foil at the bottom of the toroid. Also, the leads for connecting the terminals of SW1a to the proper pads can be seen through close examination of the switch area. Note that the 40 meter lead runs between the two rows of switch terminals to the far (right) side of the switch. A close look at the lower left corner will show that the mounting tabs of $C1_b$ and $C2_b$ trimmer capacitors are bent 90 degrees to fit flush with the pads, and then soldered in place. At the right end can be seen L4-L5 and their associated capacitors. The key lead leaves the left center edge of the board, while the B+ lead can be seen at the bottom center, with the 80 and then 40 meter antenna leads at the bottom right corner.

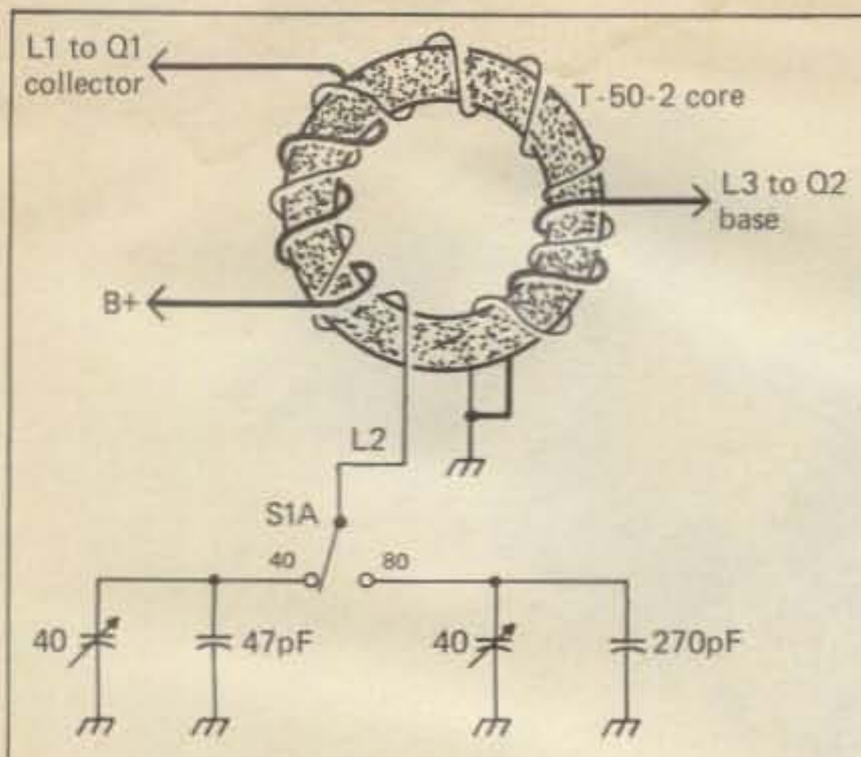


SINGLE BAND VERSION

Assembly

In mounting parts on the pads, leads are cut to the proper length and then bent downward toward the pad, with another bend that makes the lead-end flush with the surface of the pad. Assembly can proceed stage by stage. The leads of $L_{1\text{-}2\text{-}3}$ must be cut and fitted to the proper pads with care. When mounting Q2, both emitter leads should be soldered directly to the groundfoil with the shortest possible leads. This requires bending the tab downward where it leaves the transistor body. Care should be taken when bending the Q1 leads to match up with the proper pad, since these leads easily snap off at the case if too much torque is applied to them. The $SW1_b$ switch leads are soldered directly to the proper pads, and the same is true for the crystal socket leads.

Since Q2 generates a considerable amount of heat at five watts output, it is necessary to provide a heatsink for dissipation of heat. The heatsink is simple and consists of a piece of 1/8 inch aluminum 1.5 x 3 inches. If 1/8 inch aluminum stock is not available, a couple of pieces of thinner stock can be used to achieve this thickness. The heatsink edges are lined up with the front edge and crystal socket end of the board, and a hole for the 2N5589 stud drilled at the proper point on the heatsink. A dab of silicon



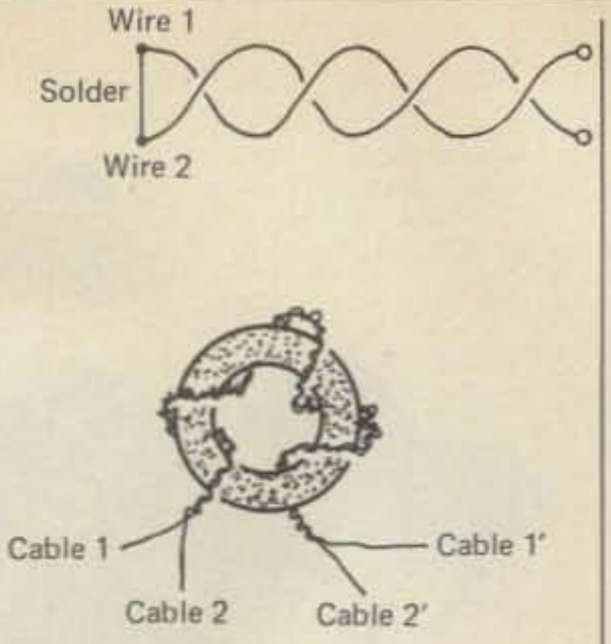


Fig. 3 - Coil Winding Illustration.

T_1: 1) Form 2 wire pairs by twisting 2 wires of equal length until about 9 twists per inch is achieved.

2) Twist the two 2 wire pairs together to 10 turns per inch.

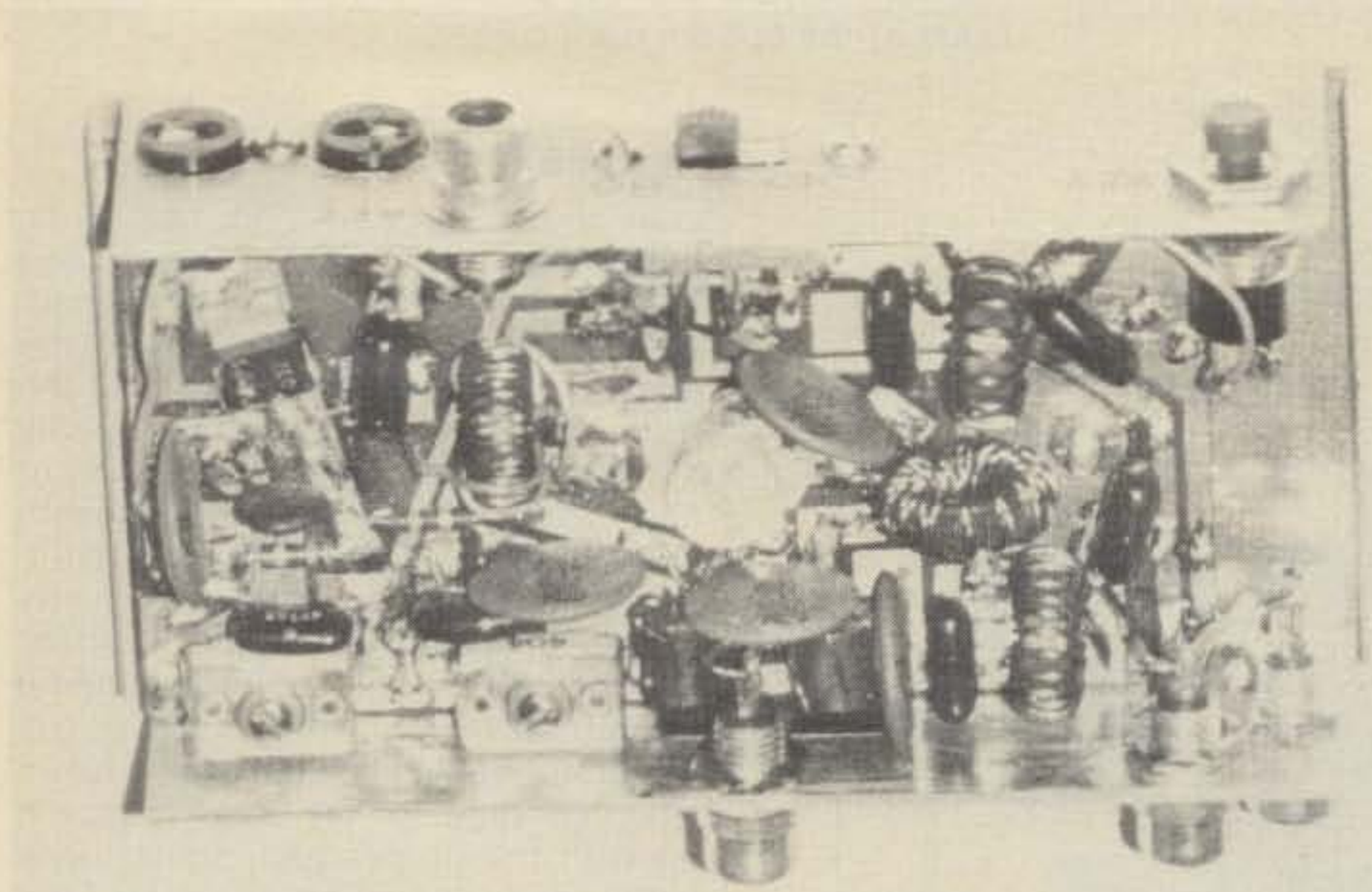
3) Wind the cable of step 2 for 16 turns on the T-50-2 core. Cut excess cable, and solder each cable end separately.

4) Cut excess cable, solder cable 2 to calbe 1. This is the lead which connects to the 2N5589 collector. Cable 1 and cable 2 attach to the B+ pad and 0.1 mf output coupling capacitor.

grease will ensure an efficient thermal path from transistor to heatsink.

Testing/Adjustment

Testing and adjustment of the transmitter should present no difficulties. For adjustment purposes, a 50 ohm dummy load and some method of measuring r.f. voltages and output are helpful. An r.f. probe and VTVM/FETVM, or a wattmeter as described in an earlier paper (*CQ*, May, 1978, p. 43), or a calibrated SWR/OUTPUT meter inserted between the transmitter and 50 ohm dummy load, are all acceptable approaches. An 80 meter crystal is plugged in, and the bandswitch is placed in the 80 meter position. B+ is applied, and if no shorts are apparent, the key is depressed and $C2_b$ is adjusted until the crystal breaks into oscillation and power output is peaked. The signal then should be monitored on the station reciever and the setting of $C2_b$ varied for the best keying characteristics. The receiver is then tuned across the spectrum above and below the signal frequency to verify that no parasitics are being generated which appear as "hash" on the reciever. If power output approximates 4-5 watts and no hash is detected, adjustment is completed and the transmitter can be put on the air. The same procedure is followed for 40 meters. In the two units tested, no problems at all were encountered, and adjustment was a "breeze."



Finished assembly with the p.c. board and connectors mounted in the Calectro 4 1/8" × 2 1/8" x1 1/8" chassis box. A fairly tight fit results so that care must be excercised in drilling mounting holes for the crystal socket and bandswitch. The rear edge of the p.c. board is flush against the rear panel of the box, so the portion of the rear panel contiguous to the B+ foil strip on the p.c. board should be covered with electrical tape to avoid a short circuit at that point. At the lower right corner, a close look will reveal the heat tab of Q1 bent with two 90 degree angles to fit flush against its pad. A phono jack is mounted above and between SW1 and the crystal socket to provide external keyer hookup. At the right upper tip of the front panel can be seen a subminiature spring-activated OFF SPST switch serves as an intergral key, and is connected into the circuit directly. This permits the transmitter to be keyed without an external keyer if so desired. At the upper left corner of the rear panel can be seen the 40 and 80 meter antenna jacks. When operating the rig, the antenna is connected to whichever output jack eliminates the need for an antenna switch. The B+ phono jack is mounted above and between RFC1 and RFC2. To the immediate left of T1 can be seen the nut-screw used to mount the p.c. board to the box. A copper spacer of appropriate length is inserted between p.c. board and box. The 1/8 inch aluminum heat sink is not visible, since it is mounted at the underside of the p.c. board.

Operation

QRPp operation requires attention to details. In selecting crystal frequencies, it might be well to bear in mind that the official QRPp calling frequencies are 3540 kHz. and 7040 kHz., and other QRPp operators can be encountered on these frequencies. (Note: The QRP ARC I has recently attempted to change the calling frequencies to 3060 and 7060 kHz., so these can be kept in mind.) A good antenna is a must for successful QRPp operation, although I have at times used less-than-adequate systems with good results. A random wire at the decent height fed through an antenna coupler often is adequate. Generally, QRPp stations do not call CQ, but rather respond to stronger stations. This general rule of thumb, however, oftentimes results in long "dry spells" as the QRPp operator constantly tunes around looking for someone to call. With five watts output and a decent antenna, calling "CQ QRP" is often very pro-

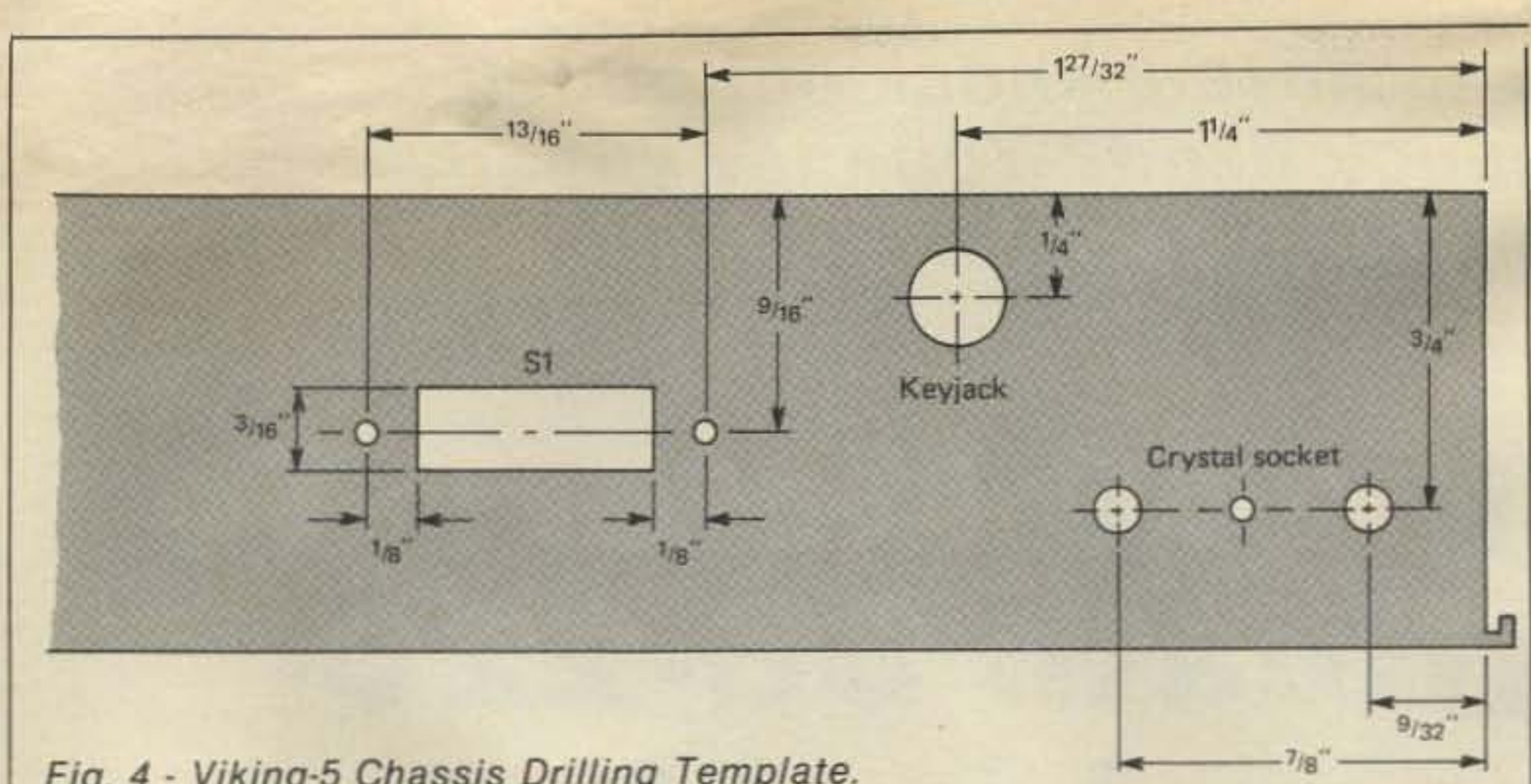
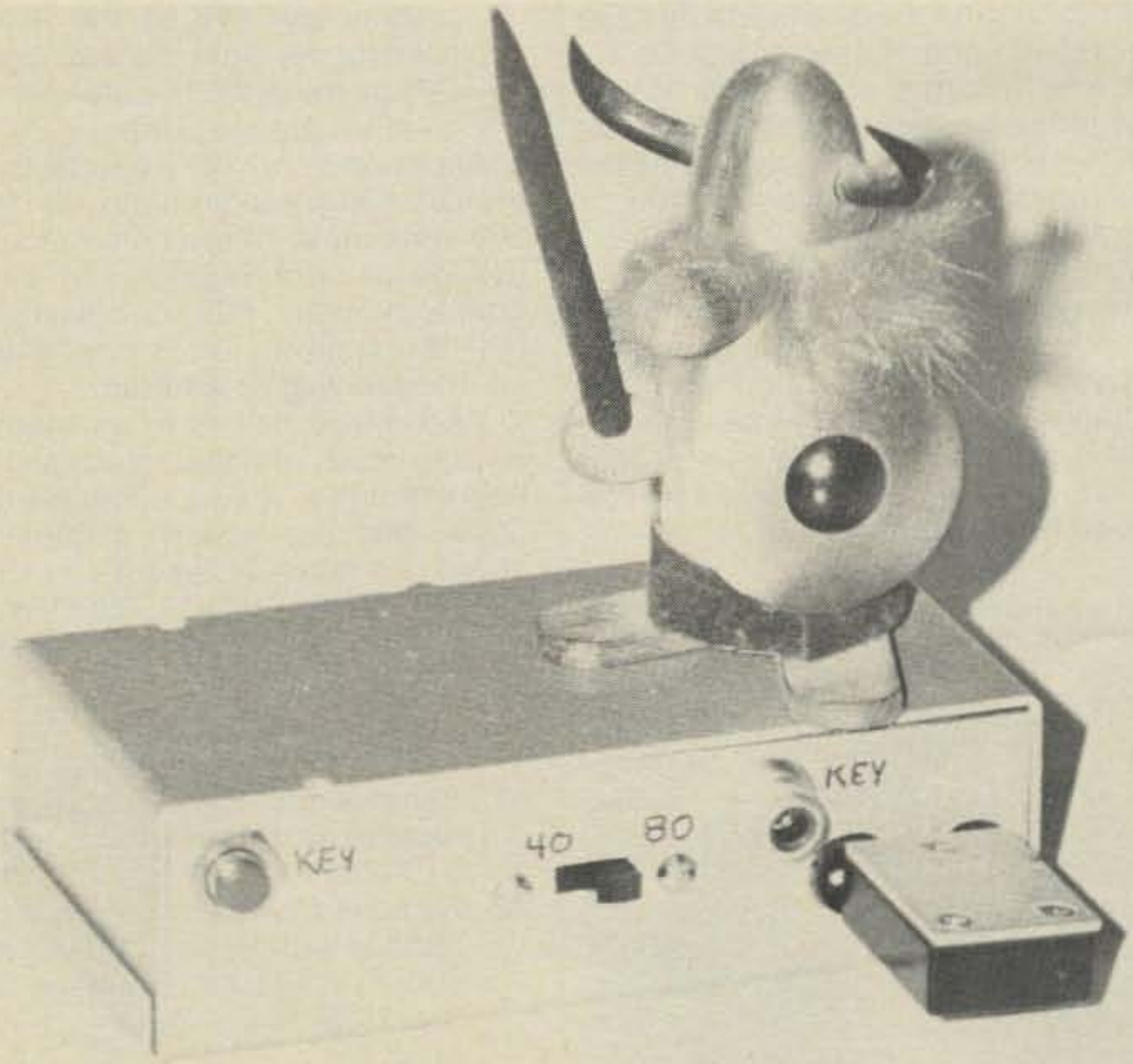


Fig. 4 - Viking-5 Chassis Drilling Template.

ductive, especially on 80 meters. So, don't be bashful. I am positively convinced that many times as I sit monitoring 3540 or 7040 kHz. and hear no one calling, there must be at least fifteen other QRPp operators out there listening to the very same silence! A much more productive approach is to listen and call CQ. If you don't hear anyone calling, go ahead and call on your own. When using QRPp, send at a relatively slow code speed, 10-17 w.p.m. unless the other station requests that you speed up, or your signal report indicates that he copies you solidly. Cleanly formed characters and careful spacing is important with QRPp. Above all, learn to be patient and avoid discouragement. Until you become experienced at low power operation, your call-contact ratio will probably be much lower than with your QRO rig. But as you pick up on better operating techniques, you will be quite surprised and satisfied with the results! Give it a try!

Ade Weiss, K8EEG/W0RSP



The completed Viking-5 QRPp transmitter with its namesake standing guard on top, ready to take on all opponents. The FT-243 crystal plugged into the socket gives a comparative notion of the size of the unit, which fits readily into a shirt pocket. The external key jack is to the left of the crystal, with the bandswitch and push-button microswitch internal keyer at the upper left corner.

How would you like to have a knock-out punch on our lowest frequency band? You may already have the makings in your shack.

Adding 160 Meters To The Heath SB-220 Linear Amplifier

BY ROBERT G. EVANS*, K6QAY

While wanting to put more power than 60 to 70 watts available on 160 meters without a large expenditure, it was decided to attempt to add the low band to my Heath 220.

With no information available I decided to go it on my own. After experiencing many problems such as parasitic oscillations, failure of the final to dip, r.f. getting into the filament supply, burning out of the zener diode and meter lights, I decided to write this article so other interested hams could take advantage of the countless hours of work and avoid the frustration I have been through.

Since the 220 has a pi network input it was decided to drive the 160 signal through the 80 meter input. The pi network will pass frequencies below its resonant frequency. This eliminated the need to change the band switches and the addition of a 160 meter input coil.

It was felt that the drilling of one hole in the panel was justified, as the 160 meter feature can only add to the tradein value should you decide to upgrade at a later date.

You should add the changes to the schematic on page 87 of your manual and possibly add a copy of this article.

If you use your linear on 160 after sundown you must remember to reduce power in order to stay within the limitations for your area. You can reduce the input power by:

1. Reducing the exciter drive and
2. Reducing Mic gain, or as I do by separating the filament supply feeding the PRI of the filament transformer from the wall plug the PRI of the plate transformer from a variac voltage control.

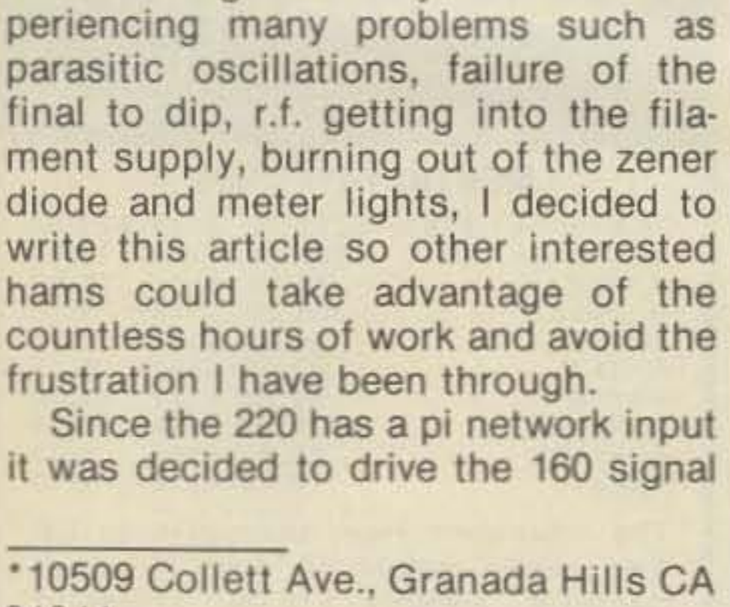
Approximately 60 volts into the primary will place you into the 150 to 200 watt input range. Information on voltage control is included in this article. However, it is not necessary to the 160 m conversion. It may be plugged into the wall or a variac.

I hope you will have as many enjoyable hours with your linear as I have had with mine. If you follow the directions the conversion should take about two hours or less. Thanks must go to K6ZHJ, W6JUT, W6FVW and W6FPV for putting up with me while I was testing this rig.

Instructions

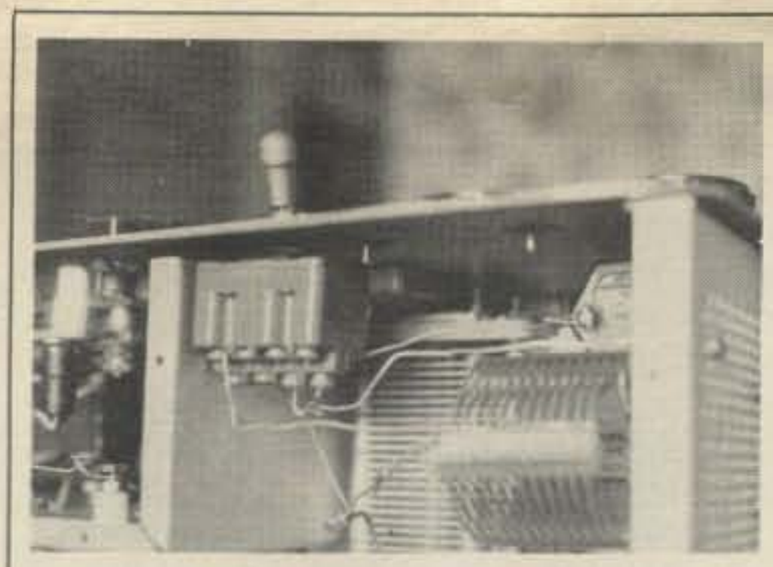
1. Remove r.f. choke part #45-61 replace with a National R175 or equivalent.
2. Remove bifilar choke part #45-78, replace with B&W FC30A or make your own as I did from page 155 of the *1978 Radio Amateurs Handbook.**

*10509 Collett Ave., Granada Hills CA 91344



Left: The panel position of the added toggle switch. Right: Note the addition of the "160" decal.

This choke may be obtained in kit form from Amidon Associates, 12033 Ostego St., N. Hollywood CA 91607. The filament choke kit [30 A., 1.8 MHz (part number FL-KT-33-7)] or the ferrite rod (part number 30-37-7) may be obtained separately.



Installation of the "80/160" toggle switch.

3. Install one each. 15μF 600 volt capacitor across each of C22 and C23 at filament choke.
4. Cut wires from 80 m inductor L7 going to output line and variable capacitor C57.
5. Install 160 m inductor. B&W miniductor #3907-1 2" dia. ten turns per inch, 24 turns needed. Install above C55 and C57 secure to left hand perforated side panel. Slide one piece of 1/8" X 1 7/8 X 3" plexiglass or any other insulating material into the coil. Cement to the coil stiffeners. Fasten coil with two each 1" X 1" X 1/8" homemade angle brackets. Bolt to left hand perforated panel.
6. Install one each .00015μF mica 2,500 volt capacitor with a heavy lead to the RH tie bolt of the 250μF variable C55 at front panel.
7. Install one each .00075μF mica 2,500 volt capacitor with a heavy lead to the LH tie bolt of the 840μF variable C57 at front panel.
8. Install a 4 pole double throw toggle switch on front panel. Drill hole to clear switch 1" down from top of panel and 2" to the left of the plate meter. Alco toggle switch part #406N Newark stock #61F878.
9. Connect the .00015μF to term. #9 and the .00075μF to term. #10 both with heavy wire. Install jumper between term. #5 and #6 run #5 to ground at left hand side of side panel.

   Note: You might think breaking the gound of these capacitors is a mistake but it was done purposely to shorten the leads and prevent a bad reaction problem encountered on the 80 m band.
10. Connect a heavy wire from term. #4 to the input end of the new 160 coil, connect a heavy wire from term. #8 to the output end of the coil.
11. Bend one piece of buss or heavy wire (must be self supporting). Install from output of 80 m coil L7 1" from chassis bottom then to within 2" of the left hand side panel, then bend upward and toward the front panel to fit input end of new coil.
12. Bend 1 piece of heavy wire, install between output of 160 coil to the disconnected output wire and the disconnected 840μF C57 variable capacitor.
13. **Note:** The new toggle switch now introduces the 160 coil and the two capacitors into the circuit in the 160 m toggle up position. It disconnects the two capacitors and shorts out the 160 m coil in the 80 m toggle down position.
14. Install the 160 decal to the right of the toggle up position of front panel. Install the 80 decal to the right of the toggle down position. Install the 160 decal above the existing 80 m decal at the left side of the resonating capacitor dial.
15. 160 m will dip from the low end to the high end of the 160 m band within the 80 m markings on the panel.
16. When you wish the 160 band set the band switch to 80 m position. The toggle to 160, tune as you do

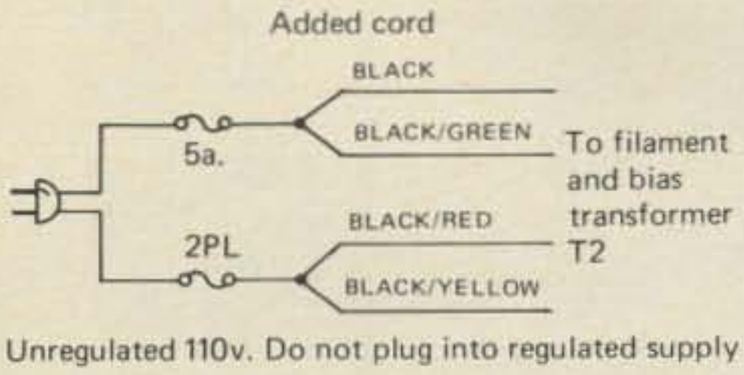
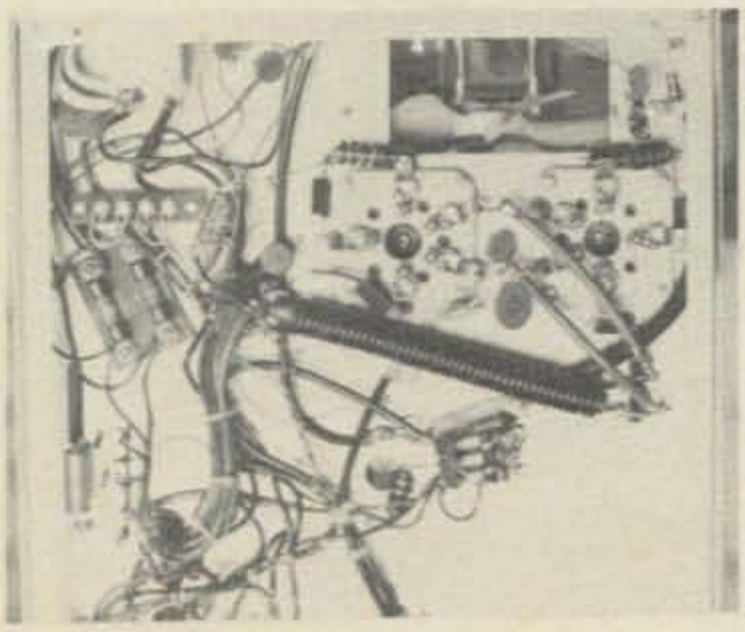


Fig. 1 - Adding a line cord and fusing the filament and bias transformer (T2).



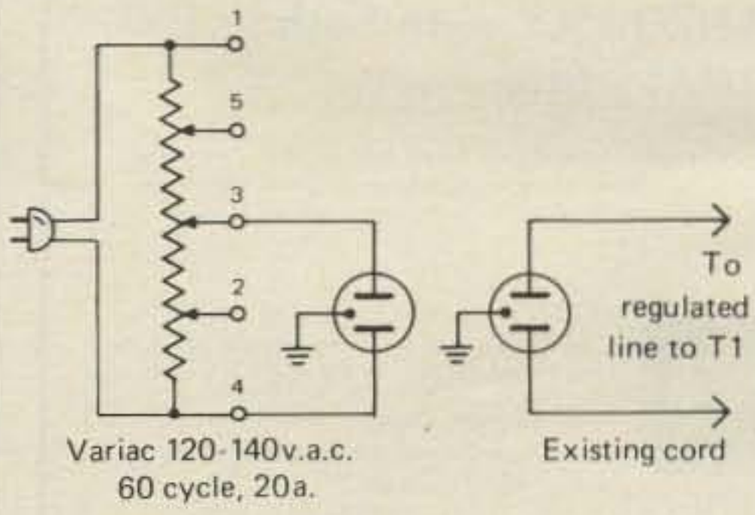
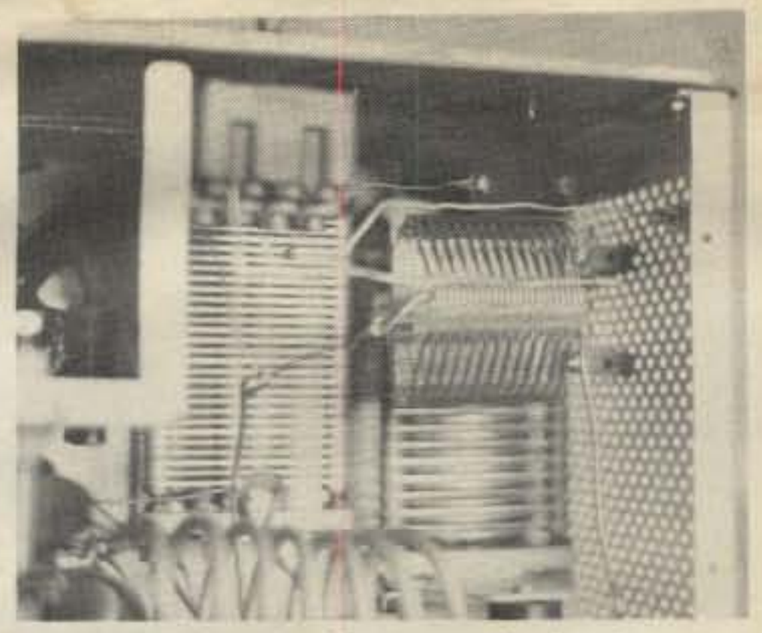


Fig. 2 - Wiring the Variac.



The added 160 meter inductor.

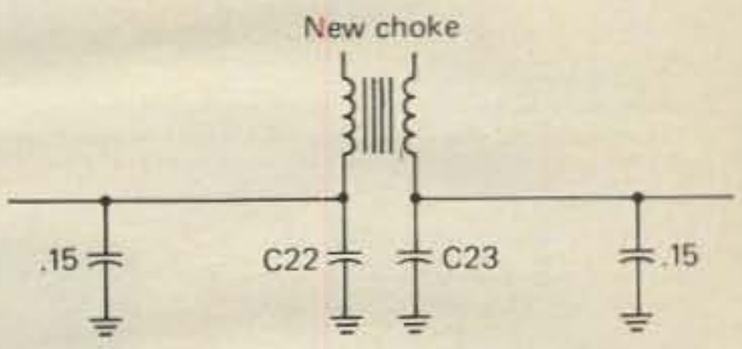


Fig. 3 - Wiring the new choke.

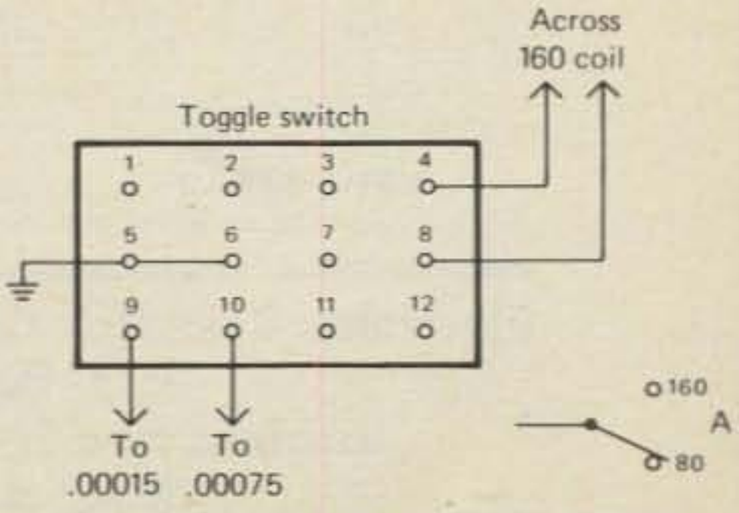


Fig. 4 - Wiring the toggle switch.

the other bands.

17. When you wish to tune any band other than 160, switch the toggle to the down position marked 80 and leave there.
18. This modification will not hamper the operation of any of the other bands.
19. If you use the voltage regulator system, do not allow drive to be applied without the place voltage being on, as damage to the 3-500Z's will result.

That's all there is. Have Fun.

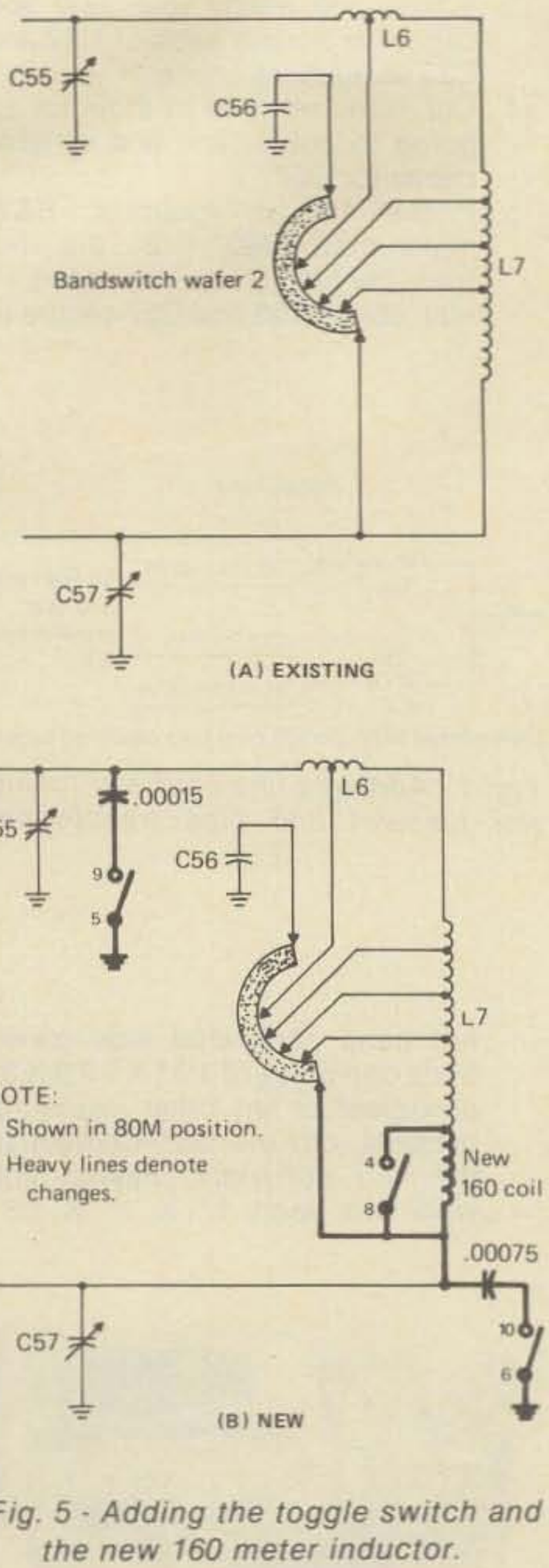


Fig. 5 - Adding the toggle switch and the new 160 meter inductor.

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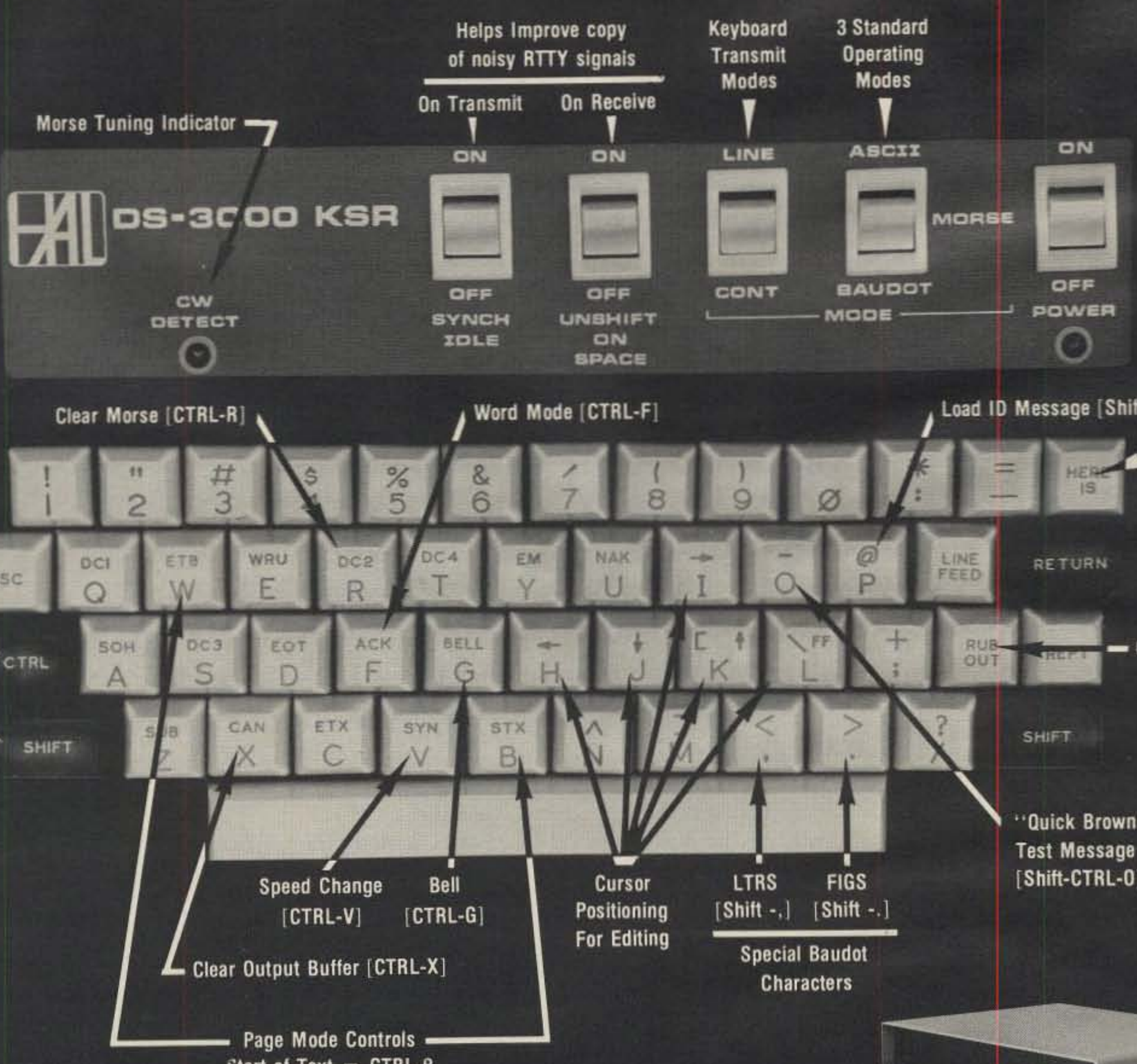

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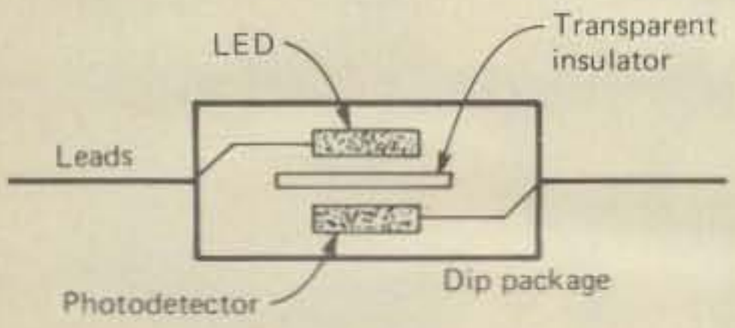
Math's Notes

A look at the technical side of things

Optoelectronic Isolators

One of the more interesting devices available to the electronic experimenter is the optical isolator. This component has the ability to isolate an input and output signal, much the same as a transformer, even though these signals



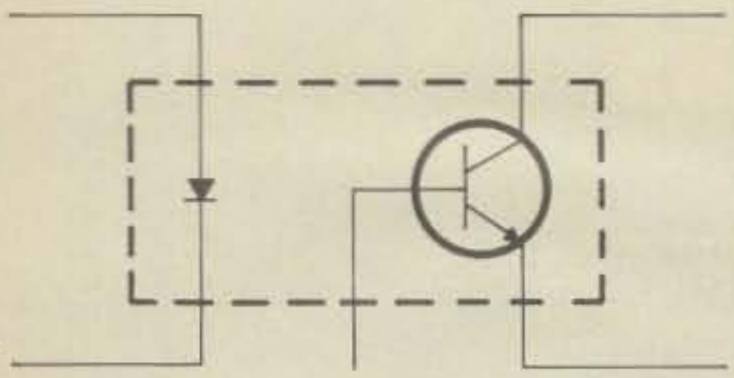


Fig. 1 - Cutaway view of optoisolator (and schematic).

are separated by many hundreds of volts. Unlike the transformer however, there is no two-way feedback. Signals only pass in one direction. Furthermore, the isolator will work with a.c. or d.c. signals.

To see how a typical unit works, let us refer to fig. 1. Here we have a cutaway view of a typical optoelectronic isolator. The input side, you will note, is nothing more than a common LED while the output is a photo detector. Depending on the isolator, this photodetector can be an SCR, phototransistor, or photodiode. Whatever the detector is however, it is separated from the LED by a transparent insulating plate. Information is carried by modulated light passing through this plate between the two elements. There is no other electrical connection.

In fig. 2 we have the schematic of a typical optoisolator hookup which can be built for gaining "hands-on" experience. In this circuit, as the pot is varied, the current on the LED varies causing a similar change to occur in the brightness of the light produced. This varying light changes the degree of conductance of the photodetector, which in turn produces the output signal. The degree of linearity of input vs. output is a function of the photodetector. Photodiodes are usually quite linear, however phototransistors are not. As a result, each has its own place in isolating applications and a search of the appropriate data sheet is a must.

Fig. 2 - "Evaluation" circuit for a common opto-isolator. The devices are made by most common semiconductor manufacturers.

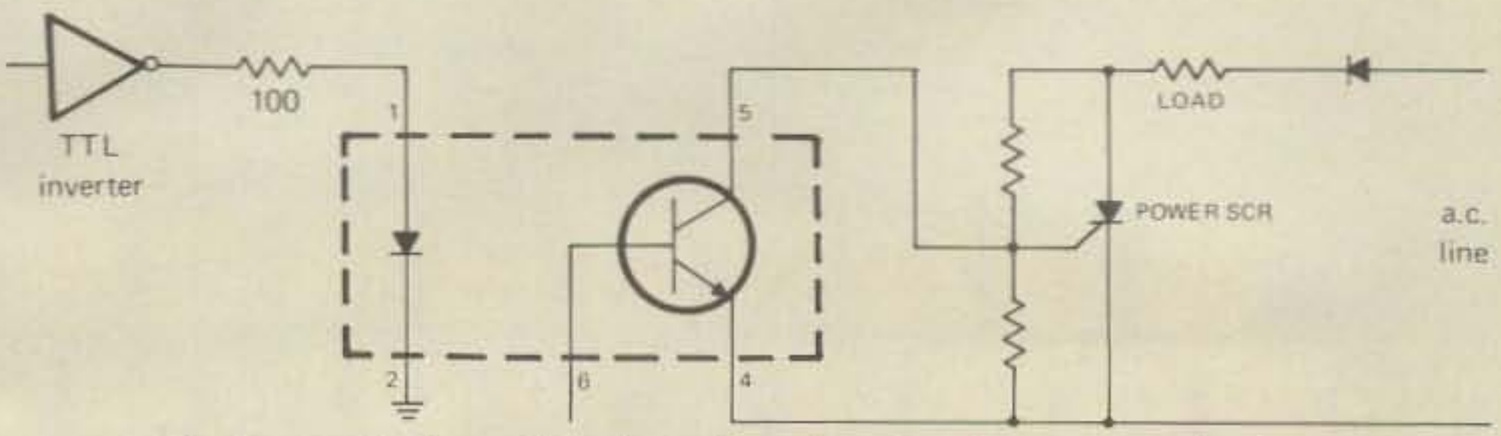


Fig. 3 - Typical a.c. line isolating circuit using an optoisolator.

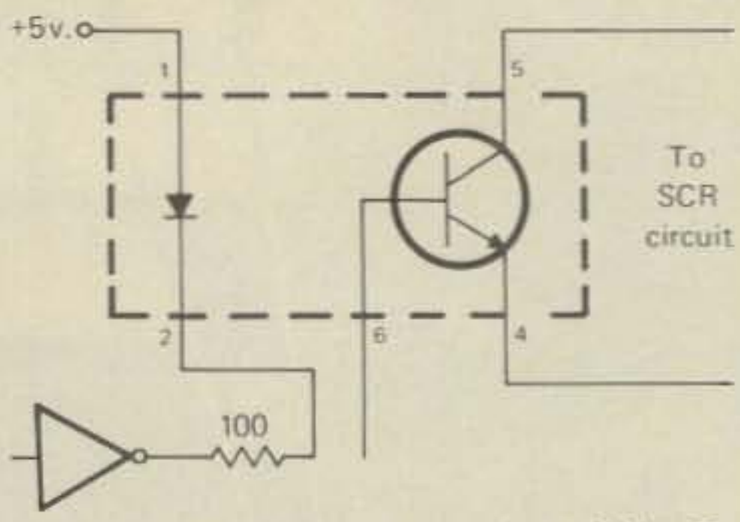


Fig. 4 - Inverted logic version of fig. 3.

In fig. 3, we have one very useful opto-isolator application, that of interfacing the a.c. line with TTL signals. Here a TTL inverter drives an opto-isolator which in turn drives a power SCR. As can been seen, the phototran-

5 Melville Ln., Great Neck, NY 11023

sistor in the isolator is normally conducting when the digital input to the LED is low as the light from the LED turns it on. This prevents the SCR from firing since its gate is low. Now, when a high signal comes along, the LED turns off, the phototransistor also turns off, and the SCR fires. Such a circuit works quite well and fully isolates the 5 volt TTL signals from the a.c. line. If inverted signals are desired, a simple modification as shown in fig. 4, will implement this.

Fig. 5 is a method for transmitting analog signals through an isolator. Here an LED is biased into conductance by the setting of a pot (R_1). This point is chosen so that the output voltage of the driver transistor is in a linear portion of the isolator's LED transfer curve. Now, when a.c. is applied, the LED bias point is "modulated" by the a.c. This results in a duplicate of that signal being produced at the isolator's output where the phototransistor is also biased into a linear region.

When using these devices it is important to realize that the input is really nothing more than a common LED while the output is just a photodiode. All considerations normally allowed for these two devices apply fully. A copy of the data also helps.

Common Optiosolators

Type	MFG	Output Device
4N22-4N24	Texas Instruments	Transistor
4N25-4N38	General Electric, Monsanto, Motorola	Transistor
4N39-4N40	General Electric	SCR
5082-4370	Hewlett Packard	Photodiode

The following is a tabulation of the more popular optoelectronic isolators available. These by no means are the only ones available. A careful look through the semiconductor manufacturers catalogs will turn up a device that should be the ticket to solve your problem.

73, Irwin Math, WA2NDM

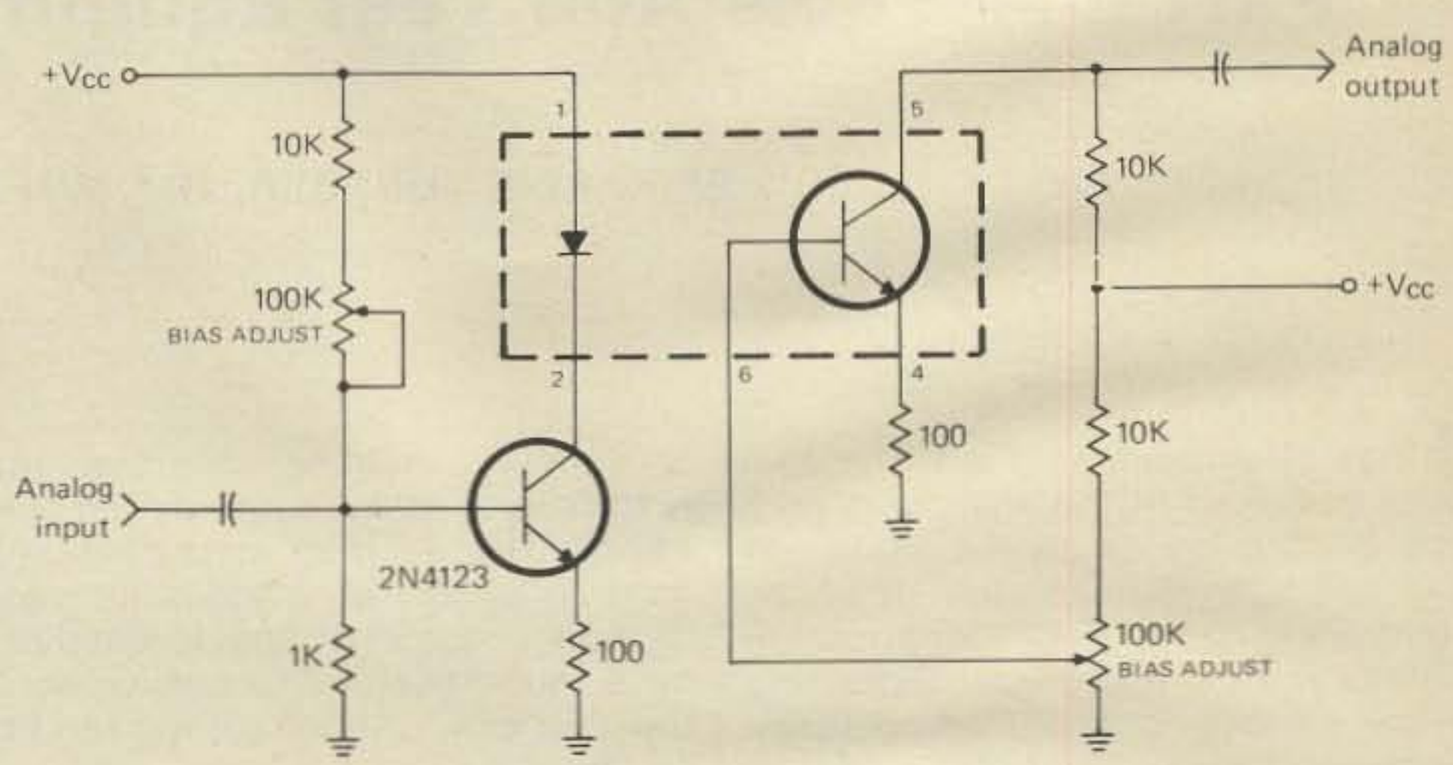


Fig. 5 - Method for transmitting analog information through an optoisolator.

In this part of Karl Thurber's kit-building primer, he discusses the basic necessary hardware for a successful experience.

All About Kits

Part II — Tools And Test Equipment You'll Need

BY KARL T. THURBER, JR.*, W8FX/4

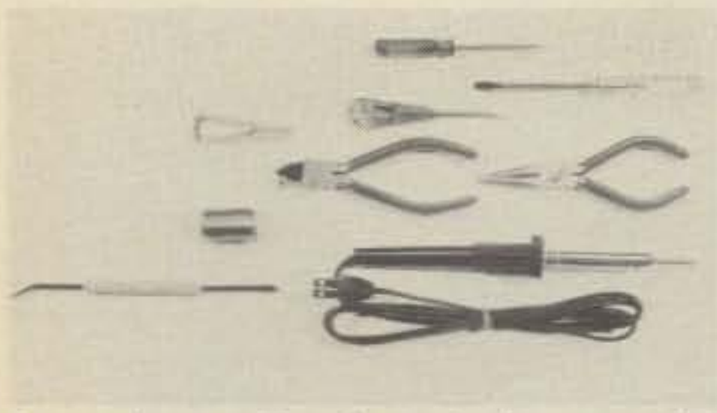
It has often been said that the success or failure of the electronic gear you build depends on the tools you use and how you use them. It's hard to do a good job of construction unless you use the *proper* tools, and know something about *using* them. Fortunately, very few tools are needed for kit-building. Almost none, in fact, although trying to work with a soldering iron and screwdriver is a bit trying.

Different types of tools are required for different jobs, of course. You *can* probably get away with nothing more than a soldering gun and a screwdriver for very simple kits. But, you'll want a wider selection of tools—for convenience, if nothing else. And, specialized tools (such as drills and saws) are required for the home-brew work. Too, there are additional "nice-to-have" tools that greatly simplify building, improve your results, and make construction a lot easier. Rather than trying to split hairs in categorizing tools, let's just introduce some of the tools that I have found useful and convenient in building kits, without getting too fancy about it.

One basic suggestion in selecting your tool is this: *Don't buy junk*. Beware of cheap imported tools of the kind frequently sold in discount houses and chain stores. You'll find that, generally speaking, the higher priced tool is the better one, and will give better service and last longer than the inferior one.

Some of the basic tools you'll want for a kit construction are wire cutters, long-nosed pliers, soldering aids, a couple of screwdrivers, a knife, wire strippers, hex nut driver or starter, and most importantly, a soldering gun or iron.

*631 N. Overbrook Dr., Fort Walton Beach FL 32548



A good set of basic tools is essential to successful kit-building and project work. Without the proper tools, a kit is almost certainly doomed to failure before you start on it. Shown here is Radio Shack's basic 9-piece electronic tool kit which includes all that's needed for simple construction projects.

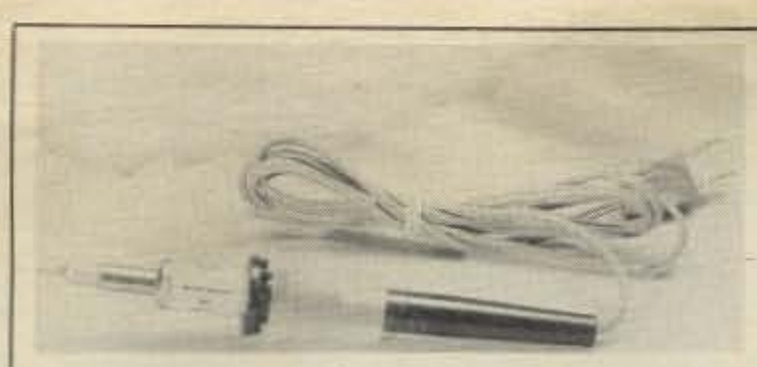
Soldering Equipment

Let's talk first about the soldering tool, as it is the most important item in your toolbox. Without it, it's like trying to build a house without a hammer. The choice between a gun and an iron is not an easy one, so most amateurs end up with at least *one of each* for various kinds of jobs. Looking first at the iron, it's usually low in cost, keeps a fairly uniform temperature, doesn't have to be turned on each time you want to solder a connection. Irons vary in size and heat capacity from about 20 to 600 or 700 watts, but an iron of 25-50 watt capacity is all you'll need for most kit work. A *small* pencil iron is best for printed circuits and for getting into tight places. A heavy 100-watt-plus iron would be good for heavy-duty chassis work and outdoor repairs on your antenna.

On the other hand, you'll find that a gun is more convenient to use. It heats quickly (4 to 5 seconds) when you need to use it, sometimes comes with dual heat-levels, and doesn't need a stand as does an iron. With the gun, you depress the trigger and the soldering tip heats up very rapidly, although it stays hot only as long as you depress the trigger. Some builders complain that the gun is hard to handle and fatiguing to use. They say that they can do a better job with an iron since it's "always ready" to work. The gun is more useful in repair work, however, and when only a few "quickie" connections have to be made. Some advice you might follow in choosing your initial soldering equipment is this: If you are going to do most of your work building kits on a *workbench*, buy an iron. If you are going to do a lot of *repair* work, buy a gun.

A look through some of the distributors' catalogues will show a host of new soldering tools and accessories. One is the rechargeable *cordless* soldering iron, a really nice piece of equipment for your workbench. Some of these boast equivalent heat-powers of 50 watts or more, can make over 100 connections before recharging, and can be recharged in as little as 60 minutes. While they were initially designed primarily to allow you to take your iron anywhere (out of the reach of a.c. power mains), they are rapidly becoming competitive with regular irons and guns. Look into them!

While I can't suggest a specific

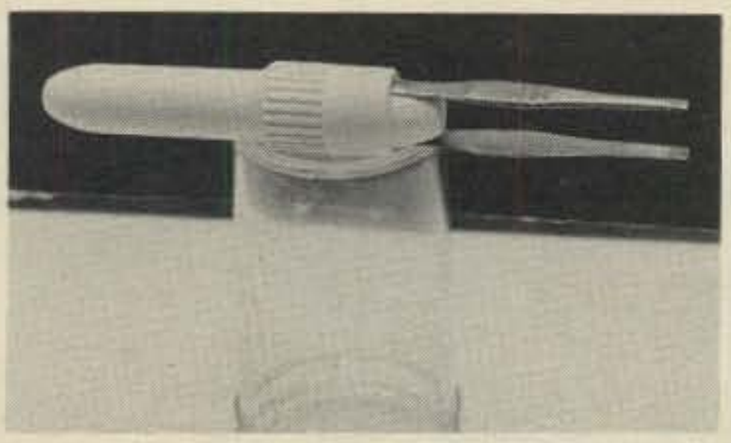


A key tool in any amateur's toolkit: A good soldering iron. Shown here is a versatile unit which features interchangeable tips and heating elements to enable it to tackle a wide range of light to medium duty jobs. (Photo courtesy Radio Shack)

soldering tool any more than I could recomment which brand of car to buy, it's reasonable to invest in a fairly heavy soldering iron (50 watts or more for general work) and a rechargeable *cordless* iron for building and repair jobs. Radio Shack distributes a versatile "custom" iron which has a lamp-type socket at the end of the handle. This allows you to screw in interchangeable 27-watt, 42-watt or 50-watt heating elements and a selection of tips for different jobs. This looks like a good bet for flexibility. Some of the other major soldering equipment manufacturers are Weller, Wen, Wahl, and Ungar. They're all well known for the excellent soldering tools that they make.

Some soldering accessories you'll find useful are an iron holder, sponge tip-cleaner, "heat sink" (to protect delicate components while soldering), a brush and scraper tool, and probes. Some spare tips will be helpful when your old tip becomes pitted.

Also, for correcting mistakes and for repair work on delicate printed circuit boards, you'll want a good illuminated magnifying glass, a low-heat desoldering tool or "desoldering wick," and a soft wire brush. Most of what you need is sold by several electronics outlets in a complete "desoldering kit." It's worthwhile to have the proper desoldering tools, since a construction mistake and messy attempt at repair on a p.c. board can easily ruin it. This can be quite an expensive and frustrating proposition!



An unusual tool is this "lighted tweezer," which can come in handy not only working on circuit boards but in model building as well. The pinpoint illumination highlights hard-to-reach areas and small parts. (Photo courtesy Radio Shack)

Other Tools

Looking at some of the more common hand tools that will be useful to you, they are as follows:

1. Long nosed pliers (sometimes known as "needlenose pliers")
2. Diagonal cutting pliers
3. Adjustable open-end wrench
4. Wire cutter/stripper
5. Assorted insulated screwdrivers—various blade sizes
6. Small Allen-wrench set
7. Phillips-head screwdrivers—various sizes
8. Socket wrench set (nut drivers hex drivers, starters, etc.)—assorted sizes
9. Pocket knife
10. Tweezers
11. "Offset" screwdrivers (the kind having a right-angle twist to get into small spaces otherwise inaccessible
12. Light hammer

Although most kits provide an insulated *alignment tool* if adjustments to r.f. and i.f. coils are required, it's a good idea to have some of your own. There are so many types and sizes that its impractical to describe them all here. But they're inexpensive, so it's wise to buy an assortment for future use. Be sure to use one that fits properly when working with small "powdered-core" transformers and coils. The tool you use must seat correctly, otherwise you may damage or even crack the core, making adjustment impossible. Note that some hex-head alignment tools are shaped so that you can adjust *both* the bottom and top cores of a transformer from the top of its can, reaching the bottom core by passing through the top core until the bottom one is engaged.

Home-brewing

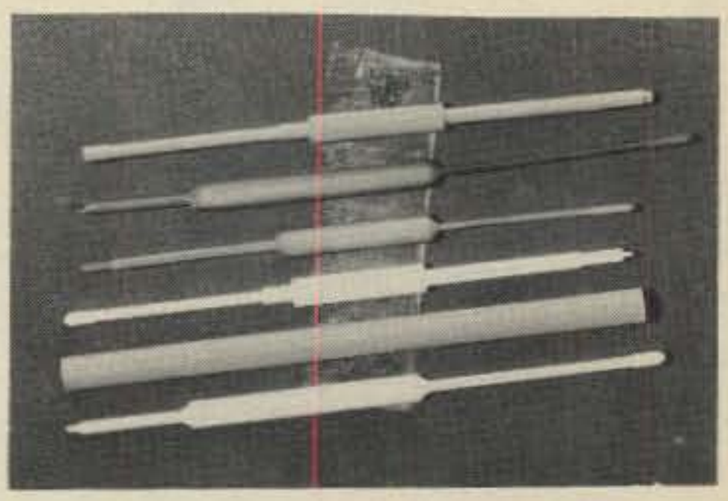
If you plan to do a lot of home-brewing and repair work, you'll need many more tools to do the job right. Some of these would be a 1/4-inch or 3/8-inch electric drill, assorted drill bits, slip joint or "gas" pliers, chassis punches, circle cutter, carpenter's brace, riveting tool, vise, terminal crimping tool, and various files. Tools and their use in home-brewing would be an article unto themselves, so they won't be treated here.

A flip-up magnifier is handy for getting extra "eye-power" for delicate printed circuit board work. The unit pictured is break-resistant and has an adjustable headband. (Photo courtesy Radio Shack)

Tool Care

Whatever tools you buy, take care of them—many will last a lifetime. Here are some suggestions for properly taking care of yours:

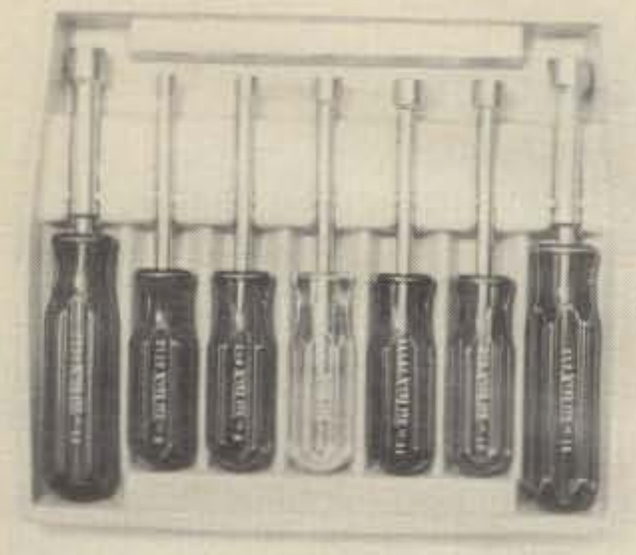
1. Use a *specific* tool for the purpose for which it was designed.
2. Use the proper and right-sized tool for the job.
3. Keep tools in working order with edges sharp. Regrind when necessary.
4. Keep your tools clean!
5. If in storage or in damp areas, keep a light film of oil on them to inhibit rust.
6. Store tools where you can easily find and use them, preferably on a wall or peg-board. Throwing them in a toolbox may damage cutting edges.
7. Keep soldering iron tips clean and tinned.
8. Play it safe when operating electrical tools, particularly saws and drills.



Some kits that require internal alignment are furnished with a basic tool for the purpose. You'll find it convenient and worthwhile, however, to have your own complete set of alignment tools. The assortment shown above is typical of what is required. It includes several hex-heads for iron-core transformers and various insulated screwdrivers. (Radio Shack)

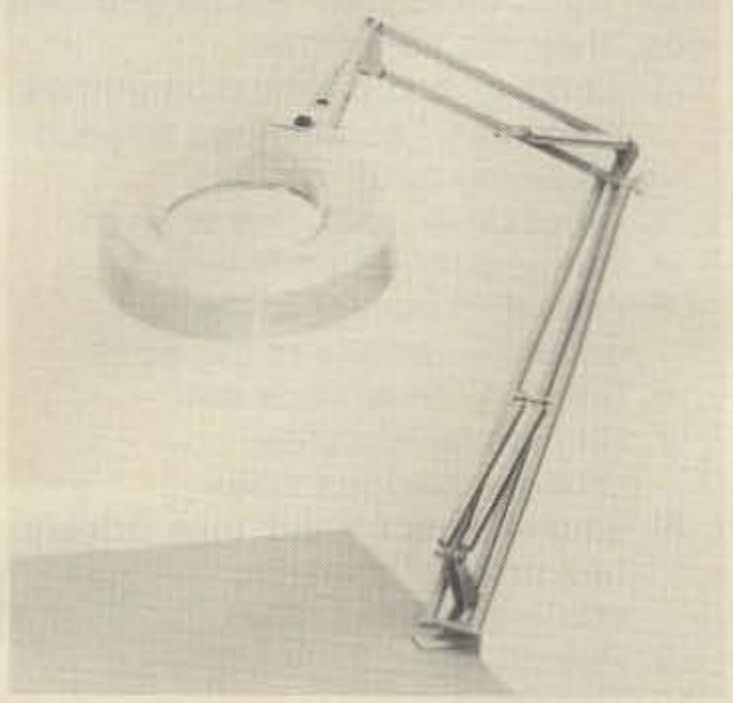
Test Equipment

So far, we've talked a good deal about tools. But what about test equipment? Most kits are specifically designed (or at least advertised) to be built without any test equipment at all. Often, however, you will find that the manufacturer gives a "no-test-equipment" alignment or adjustment procedure but states that specs may *not* be met unless you follow his alternate "with-test-equipment" instructions. So, eventually, if you're going to get satisfaction from the kits you buy, you will need some test gear.

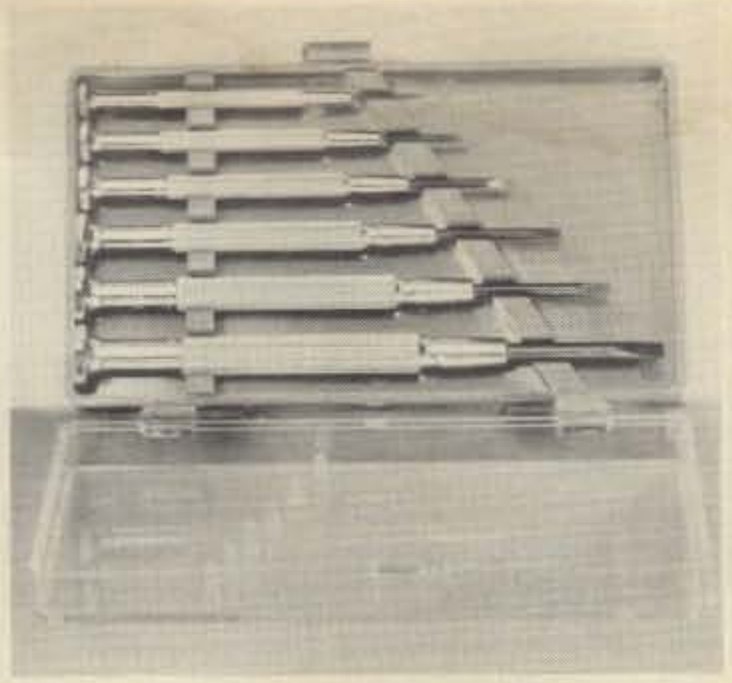


While not in the "must" category, a set of nut drivers makes kit-building a great deal easier. (Photo courtesy Heath Company)

Typical major items needed in and around the amateur shack for adjusting and testing kits are a v.o.m. or v.t.v.m., r.f. and a.f. signal generators, oscilloscope, frequency counter, dummy load/watt-meter, and capacitor checker, to name but a few, You should consider these basic items of test equipment as good projects to build to enable you to make



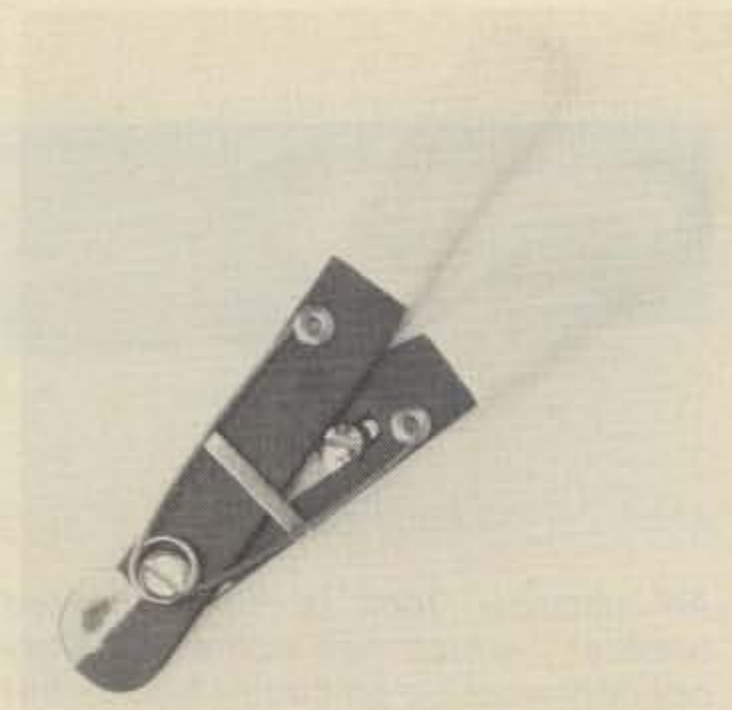
A luxury item is a desk-mounted illuminated magnifier for taking the strain out of close-in work at your bench. This unit uses a 22-watt "Circline" type flourescent tube. (Photo courtesy Heath Company)



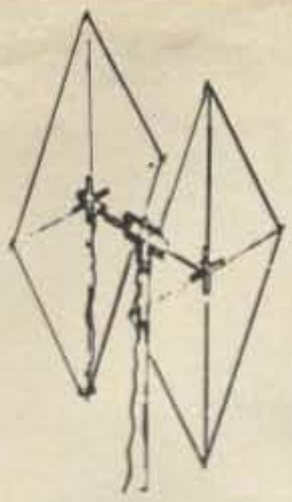
A set of precision "jewelers' screwdrivers" is useful in working with small parts. Other related tools that will come in handy (though not absolutely necessary) are a set of interchangeable nut-drivers, a precision knife set, and an Allen wrench kit. (Photo courtesy Radio Shack)

and adjust subsequent, more complex kits.

Of these, the most essential instrument is the v.o.m. or v.t.v.m. It allows you to make voltage, current, resistance readings. As such, it is invaluable in troubleshooting kits and making repairs. I'd go so far as to say that your very *first* kit should be a v.o.m. A simple, inexpensive Heath or EICO tester can be put together in a few evenings if you own a soldering iron and a few simple hand tools, and doesn't require any special electronic building experience. It will be very useful when building more complicated equipment for your shack. When looking for a meter, look for one with a relatively high circuit resistance. A meter of 15,000 or 20,000 ohms-per-volt or higher is fine—a high resistance meter won't distort readings by overloading the circuit under test.



A good set of wire strippers makes skinning wires and cables a snap. (Photo courtesy Radio Shack)



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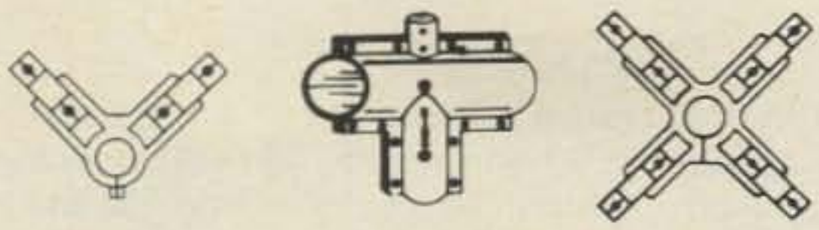

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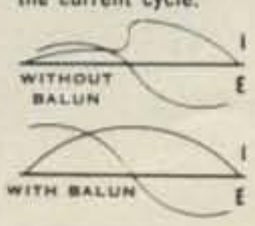

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Build your own transmitter? Impossible. Impractical. Where can you get the parts? There's no trade-in value on a home made rig. What about TVI?

A 1935-Style DX Transmitter for Twenty Dollars-Or Less

BY WILLIAM I. ORR, W6SAI*

There are plenty of reasons why today's radio amateur builds little, if any, of his operating equipment. Perhaps a linear amplifier or a circuit board project.

But the reverse situations was true before World War II. The great majority of amateurs built their transmitter and a lesser number built their station receiver. There was a taint, or perhaps a smell of commercialism, in fact, that hung about the amateur with a completely "store bought" station. It just wasn't done.

There were a few advertisements for commercial transmitters in *QST* magazine of the mid-thirties period. But far more advertisements appeared from stores that had plenty of components for the home constructor. And interesting, inexpensive transmitter circuits were readily available.

In particular, the March and April, 1934 issues of *QST* featured a two-part article by George Grammer, W1DF, which described a two-stage multiband crystal controlled transmitter that had great appeal to the DX-minded amateur with a small purse. In one form or another, this transmitter design was heard on all the DX bands until amateur radio was closed down "for the duration" of World War II.

The two tube transmitter arrived on the scene at just the right time. The worst effects of the Great Depression of 1929-1932 were behind; more amateurs had a little money to spend and amateur radio was booming. And more and more amateurs were discovering the art of working DX which heretofore had been really

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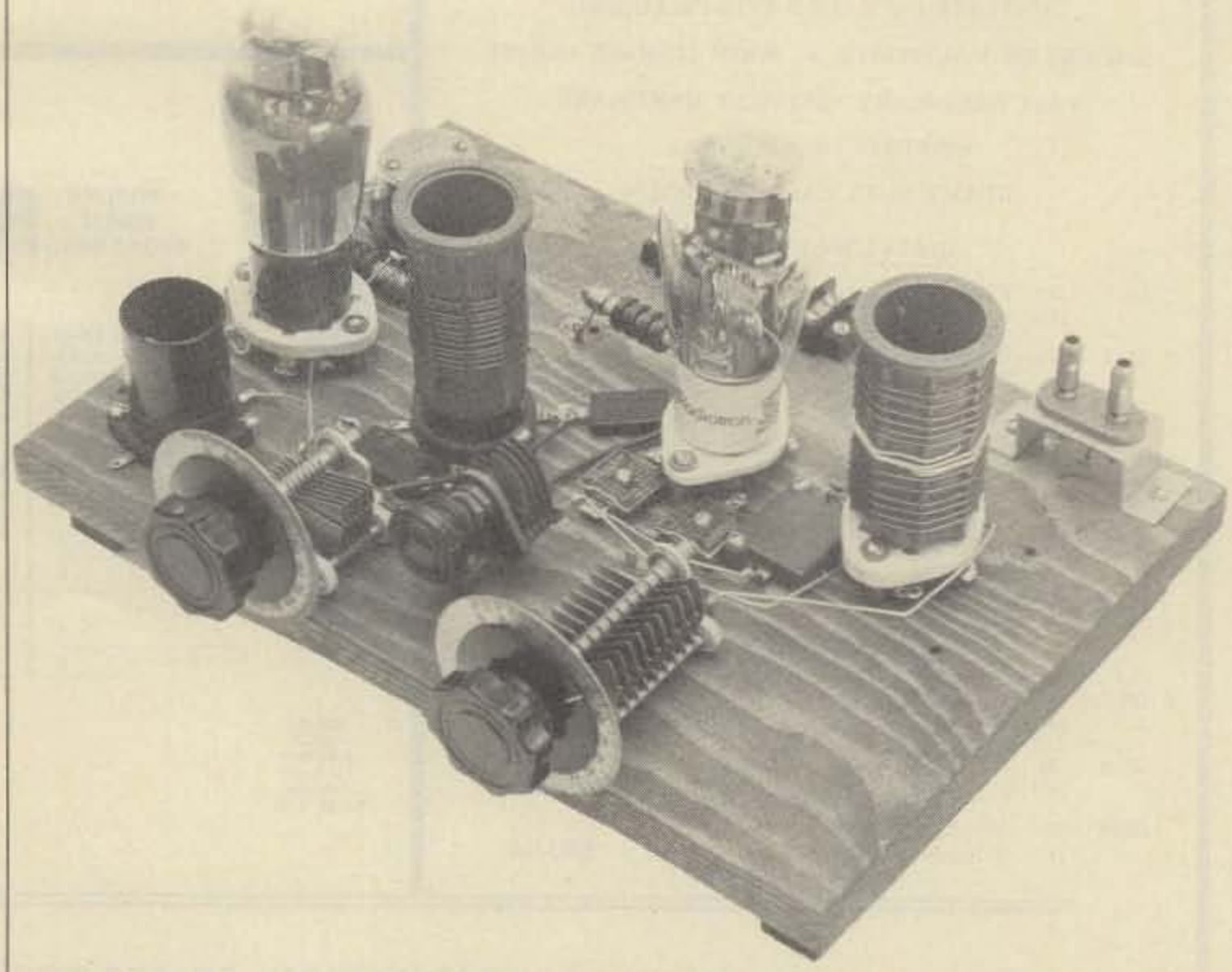


Fig. 1 - Work the world with this 50 watt DX transmitter. The beginning amateur of 1934 built this two tube, crystal controlled transmitter for less than twenty dollars and worked plenty of DX with it. At the left is the 59 pentode crystal oscillator stage. The cathode inductor is to the left of the tuning capacitor and the plate coil is immediately behind it. At the right is the isolantite based 801 amplifier tube. The neutralizing capacitor and tuning capacitor are in front of the tube with the plate coil at the far right. All components are mounted to a small "breadboard". A common negative "bus" runs the length of the set.

reserved for those few amateurs with high power and big antennas. New receiver designs and simple beam antennas, however, (coupled with an increase in the sunspot cycle) were bringing DX to the attention of all the active amateurs.

The Sixth International DX Competition had just been completed and W3ZJ had aroused enthusiasm with his top scoring work of an enviable 32,897 points! And NY1AB in the Canal Zone had run up 25,648 points for the highest score outside of the United States! And the famous DX operator KH6IJ got his start in this contest as K6CGK with a solid 730 points! (You've come a long way, Nose!)

Some of the fun those dear, dead days are recreated with this version of the two-stage DX transmitter that was so popular in the dawn of modern intense DX work. This article shows such a transmitter that today's amateur can easily duplicate—and put on the air— provided he can find the components!

Here's an up-to-date 50 watt, DX-style transmitter, designed for the crowded amateur bands of 1934. Especially designed for the economy-minded amateur, it uses only two tubes and can be built for twenty dollars—less if you have a good junk box.

The transmitter is built on a small breadboard, as all modern 1934-style transmitters are, and features the new electron-coupled tri-tet crystal oscillator, recently popularized in *QST* magazine. A single amplifier, (or doubler) stage follows the oscillator. A complete schematic of the transmitter is given in fig. 2.

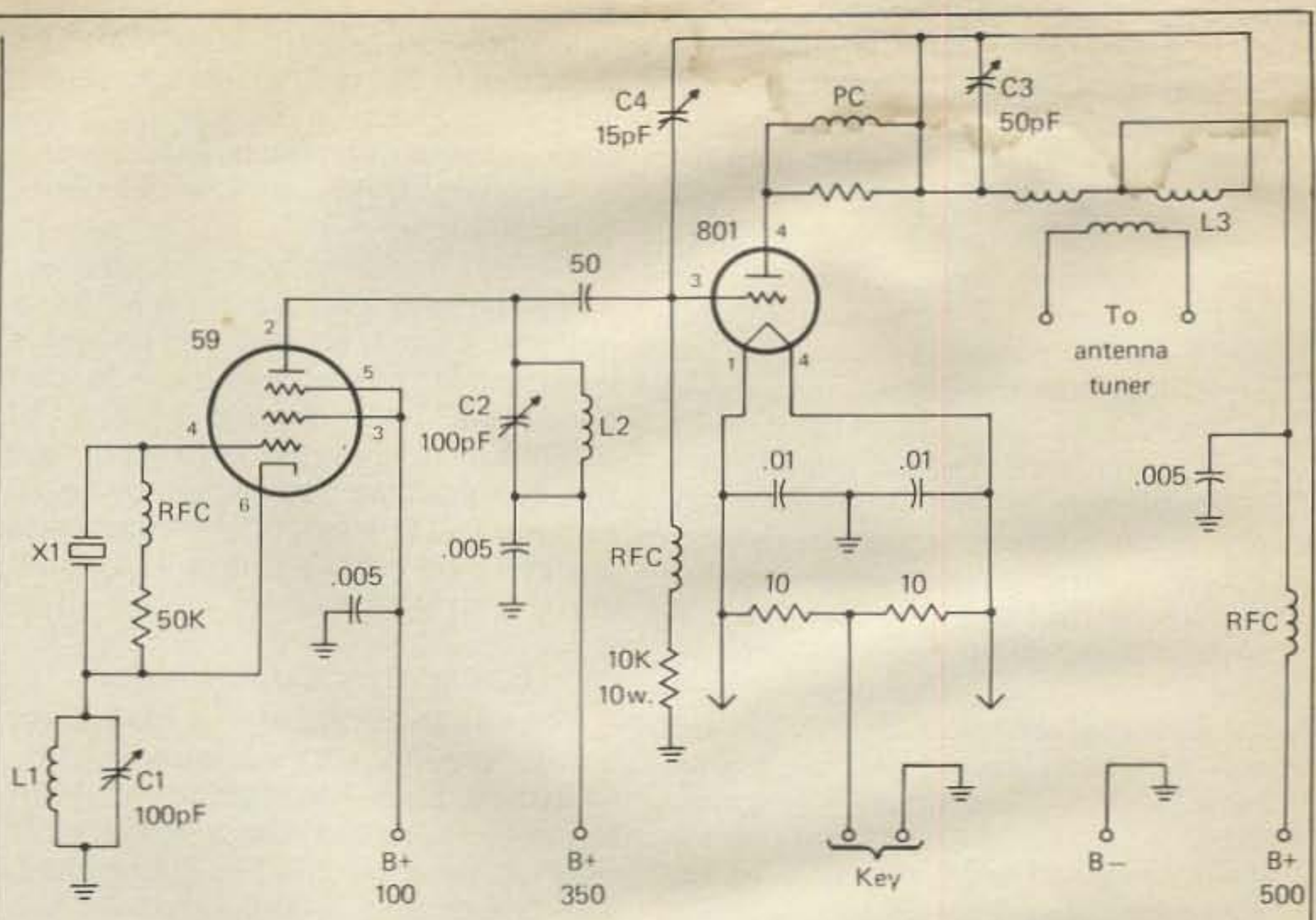


Fig. 2 - Transmitter schematic
C1 - 100 pF mica compression capacitor located inside of L1
C2 - 100 pF
C3 - 50 pF
C4 - 15 pF double spaced
L1 - For 14 MHz. operation: Resonates to 9 MHz. with C1 at about half-capacitance (6 microhenries). 12 turns #20 enamel wire on 4-prong tube base (1-1/8" diameter)
L2 - For 14 MHz. operation .8 turns #16 enamel wire space wound on 1-5/8" diameter coil form.
L3 - For 14 MHz. operation. 12 turns #16 enamel wire spaced out to full length of 1-5/8" diameter coil form. A small space is left at the center of the coil for the link winding which is 4 turns #16 double cotton covered wire (try and find that!) You can use hookup wire for the link winding.
RFC - National R-100 or equivalent (2.5 uH)
Note: *A surplus VT-25 tube can replace the 801. Grid-dip all coils to operating frequency when in place before power is applied to the transmitter.*

Theory of the Tri-tet Oscillator

The tri-tet crystal oscillator was an outgrowth of the electron coupled oscillator developed by J.B. Dow for use in high frequency Naval transmitters. The Navy requirements was for a high power, frequency-agile oscillator of good stability. Lamb converted the design to crystal-control for amateur use. The new circuit (fig. 3) provided output on the crystal fundamental frequency and harmonics, permitting stable operation on 20 meters with either a 40 or 80 meter crystal, something heretofore unobtainable without a multiplicity of stages.

Lamb explained operation of the tri-tet oscillator as a combination of a low-mu triode and a high-mu pentode or tetrode in one tube. The triode served as an oscillator with the anode at r.f. ground potential and the cathode circuit "hot" to r.f. This was coupled to the tetrode which served as either an amplifier or a doubler. Both the triode and the tetrode were combined in one tube, the screen of the tetrode serving as the anode of the triode. Either an inexpensive 24A or a slightly more expensive 59 tube could be used in the new circuit. A power output of nearly 3 watts could be obtained on 20 meters, more than enough to drive a husky amplifier stage.

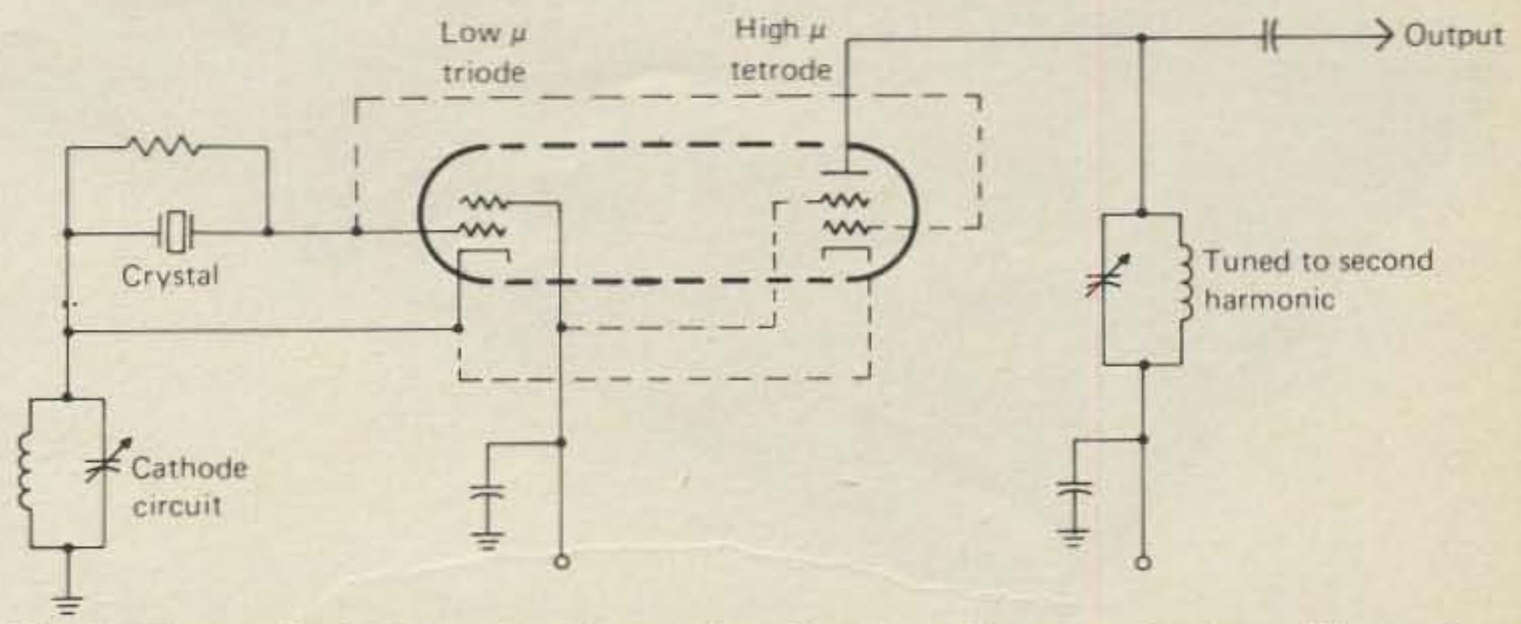


Fig. 3 - The orginal tri-tet circuit was described as a low-mu triode oscillator electronically combined with a high-mu pentode amplifier or doubler. The screen of the amplifier also served as the plate of the oscillator. Both triode and pentode were combined in one tube. Either a 24A or a 59 could be used in the circuit. Cathode circuit was tuned to a frequency about 1.5 times higher than that of the crystal for best results.

The Transmitter Design

The schematic of the 50 watt transmitter is shown in fig. 2. A popular receiving-type audio pentode, the 59, is used as the tri-tet oscillator. It will provide output on two amateur bands from one crystal. For 20 meter operation, a 40 meter crystal is used, and 20 meter output is taken from the plate circuit of the 59, which is tuned to the second harmonic of the crystal.

The oscillator stage is capacitively coupled to a triode amplifier stage which can use either the old, reliable 210 tube, or the recently announced big brother to the 210— the new RCA carbon plate 801 transmitting triode. The 801 has the same general electrical characteristics as the 210 but has a carbon anode and a ceramic base. These improvements provide a lower loss and a greater safety factor, both of which are important at the high frequency represented by the 20 meter band.

Many amateurs have found that the 210 just won't operate efficiently at a frequency as high as 14 megacycles (MHz. to all modern amateurs). Usually, an overworked 210 will fail at 2 meters because of excessive losses in the "mud" base. Wise amateurs crosscut the base between the grid and plate pins with a hacksaw to reduce base loss, but this is not necessary with the 801 tube.

The triode amplifier is plate neutralized to prevent feedback (and this modern re-creation incorporates a parasitic choke, a device unknown back in those dear, dead days). Keying is accomplished in the amplifier cathode circuit.

The 801 performs as a very efficient amplifier and can also serve as a power doubler if an 80 meter crystal is used for 20 meter operation. In this case, the plate circuit of the 59 oscillator is tuned to 40 meters and the 801 doubles the frequency to 20 meters. The 801 amplifier efficiency is about 70 percent, but drops to about 35 percent as a doubler.

Transmitter Construction

The whole transmitter is built upon half a "breadboard" measuring 10 by 14 inches. Since breadboards are hard to come by these days, a piece of 5/8-inch thick plywood is substituted. The breadboard is supported on two thin wood cleats glued to the underside of the plywood sheet. Components are screwed to the wood. Ceramic sockets are used for the tubes, naturally, as well as for the amplifier coil. A common ground wire is run along the breadboard from the crystal socket to the bypass capacitor on the amplifier tank coil. All ground connections are made to this bus. Power is brought in through a terminal strip on the rear of the board (fig. 4) and r.f. power output is taken from the transmitter via a center-link winding on the amplifier coil and terminals mounted at the edge of the breadboard. All wiring is point-to-point and direct.

The coils are wound on 1-¼ inch diameter coil forms, a 4-prong form being used for the oscillator coil and a 5-prong form for the amplifier coil. Data for the coils is given in the schematic drawing. Since every live-wire amateur is adept at winding plug-in coils, no detailed information will be given on this process.

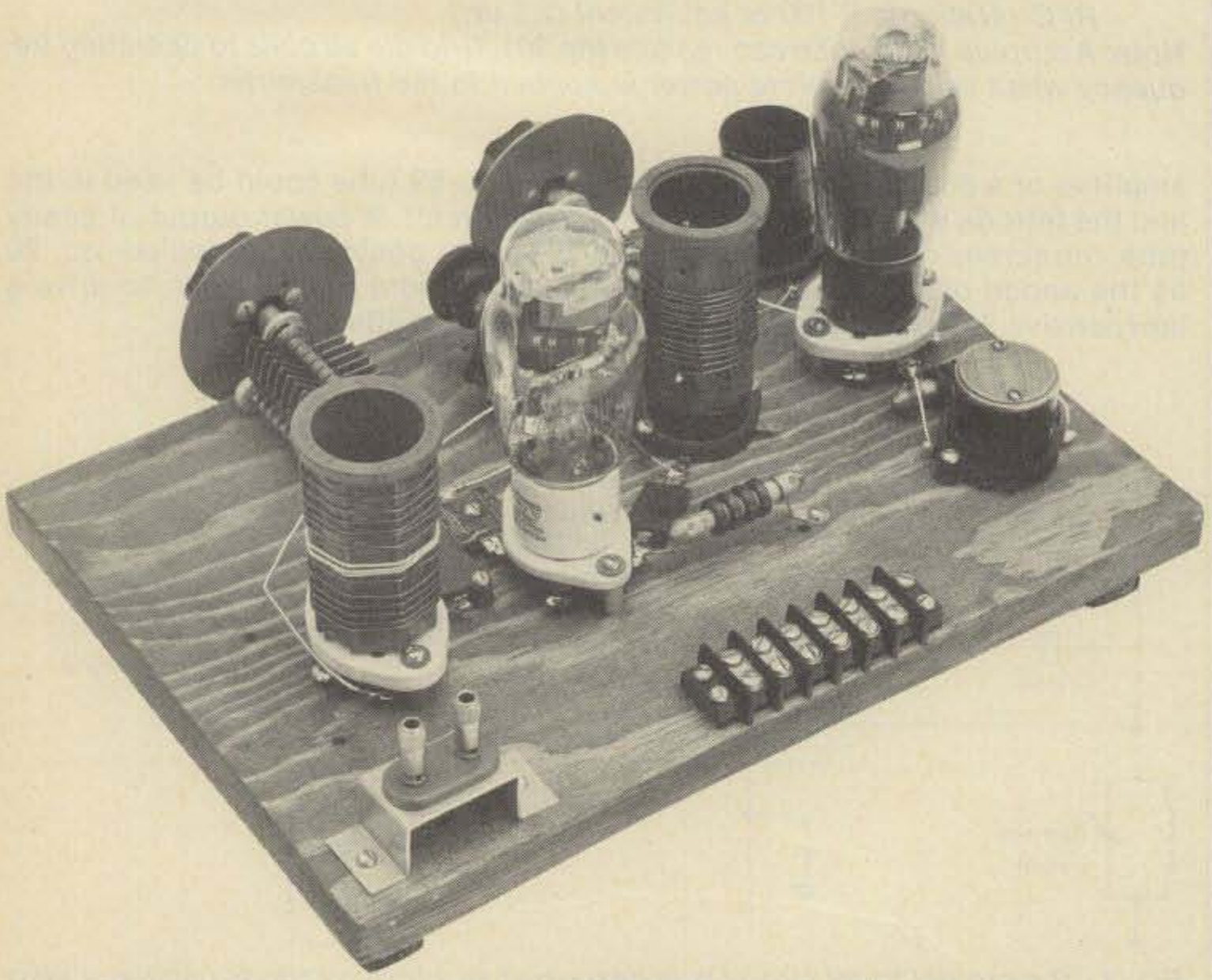


Fig. 4 - Rear view of the "breadboard" transmitter. The antenna terminals are at the rear corner of the board, with the terminal strip for power and key connections at the center. The early 810 tube had a massive carbon anode which was soon replaced by a cheaper metal anode in the 801A. Original carbon anode tube is a rare collector's item today.

Testing the Transmitter

If operation on two bands is intended, it will be necessary to purchase a crystal having a frequency such that its second harmonic (twice the fundamental frequency) will fall inside the higher frequency limit of the two bands. Thus, if operation is intended between 14,000 and 14,100 kilocycles (kHz.), the crystal frequency should be between 7,000 and 7,050 kilocycles.

When the transmitter output is at the same frequency as the fundamental frequency of the crystal, the 59 operates as a normal screen-grid oscillator. In this case, no coil is required at L_1, and it is necessary to short-circuit the tuning capacitor, C_1. A simple method of doing this is to bend one corner of the outside rotary plate of the capacitor so that when it is set at full capacitance the bent-over plate will touch a stator plate. When the transmitter output is twice the crystal frequency, the circuit is converted into a tri-tet oscillator by tuning the cathode circuit to produce oscillation at the fundamental frequency and adjusting capacitor C_2 to resonance at the harmonic frequency.

Once the circuit has been inspected for wiring goofs, the transmitter is ready to put on the air. Plate and filament voltages as indicated in the schematic are applied to the oscillator stage only. A 0-100 mA meter connected temporarily in the B-plus lead is used as a tuning indicator. The correct coils are plugged in, and (for second harmonic operation) capacitor C_1 is set at about ¾ full scale and C_2 about ¼ full scale.

It is convenient to listen to the second harmonic frequency on a nearby receiver. Capacitor C_2 is tuned for minimum plate current (about 15 to 20 mA). A neon lamp is held near coil L_2 and both capacitors are adjusted for maximum glow, which should coincide very closely with the plate current dip. Tuning of C_1 will be quite broad.

Once the oscillator is working it is time to turn your attention to the power amplifier stage. No plate voltage is applied to the amplifier at this time. The 801 is plugged in the

socket and filament voltage is applied to it. Maximum grid drive to the 801 is achieved by holding a neon lamp near the grid terminal and returning capacitor C_2 for greatest glow.

The appropriate plate coil is plugged in the amplifier socket and with the neutralizing capacitor, C_4, set at zero, the plate tuning capacitor, C_3, is tuned until the neon bulb (held against the plate lead of the 801) indicates maximum brilliance. The plate circuit is now in resonance. Now increase the setting of the neutralizing capacitor very slowly until it is impossible to get any signs of r.f. in the plate circuit of the 801, even when the terminal of the neon bulb is placed on the plate terminal of the tube. The 801 is now neutralized.

After neutralization, plate voltage is applied to the 801 with a 0-100 mA meter connected in the positive plate supply lead. Tune the plate circuit capacitor to resonance, indicated by a dip in plate current (about 15 to 20 mA), assuming a plate supply of 500 volts. When this has been done, the amplifier is ready to connect to the antenna.

This transmitter is designed to be used with any of the small, inexpensive antenna couplers on the market. Connection between the transmitter and the coupler may be made with a short length of RG-58/U coaxial line. (At this stage of the game we bid "farewell" to the coupling and antenna systems of the "thirties"—they just are not adequate for today's operation).

The 801 can be loaded so that the plate current at resonance is as high as 70 milliamperes. Grid current will be about 10 mills. Power output is approximately 20 watts.

The amplifier tuning capacitor should always be readjusted for resonance. An SWR meter placed in the line to the antenna tuner will prove to be of great help in tuning the amplifier.

Using the DX Transmitter

The lucky amateur who has found the components and has built this little transmitter will have a powerful urge to get it on the air. It will work, and you can really work plenty of DX with it. A handful of crystals for quick and easy QSY is suggested. Amplifier keying is "hard" and a key-click filter may be necessary if there are nearby amateurs on the same band of operation. TVI? Well, the little "rig" is wide-open and no TVI precautions have been taken. In a strong TV signal area it was noted that the transmitter placed a light interference pattern on channels 2 and 4 on the home TV set during operation on 20 meters, even though a low-pass filter was incorporated in the coaxial line to the antenna tuner. The TV receiver next door was not affected.

Results? Over ten contacts in two days, with six of them scattered over three continents. A European contact fairly made the plate of the 801 blush with pride. Clearly, the little transmitter could hold its own in today's world of kilowatts and beam antennas.

L'envoi

Today, the little transmitter sits proudly on a shelf in the family room, a conversation piece whenever radio amateurs gather for tell tales and good times. On special occasions it is put on the air and always draws an interested comment when the fellow at the other end of the QSO finds out he's working a home-made, breadboard rig of the "thirties". For, in truth, if you don't tell 'em, they won't know from the good signal the little rig puts out!

Acknowledgement: Much of the background material for this article was taken from 1933-1934 issues of *QST* magazine. Tuning information is from the article by George Grammer in April, 1934 *QST*.

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

QSL - Part II of III

This month's column continues the three-part QSL article which began in last month's column. You will find that each part contains information which can be used without referring to either of the accompanying parts of the overall article. However, you are advised to read the entire article to dervie maximum benefit.

Report forms and how to use them.

Location. Some QSL cards are printed with all of the information on one side and the other side just provides space for writing in the name and mailing address of the amateur contacted. In some cases, the address side of the card includes space to write a few personal remarks to the other operator. This card style is usually cheaper but most amateurs prefer to use cards which have the report form printed on the reverse side beside the addressing space. One reason for this preference is that it is difficult to write on the glossy surface that most of us prefer for the front side of our cards. Even if you use a writing instrument (such as a felt-tip pen) that easily marks glossy surface cards, the report information added to the face of the card can detract from its appearance. Obviously, cards can be easy to use and have good eye appeal whether the report form is printed on the front or back side. If you select a card design with the report form on the front side, it is wise to also specify matte (dull) stock finish on both sides of the card, since it is easy to write on a matte finish with most common writing instruments (ballpoint pen, pencil, felt tip pen, typewriter, etc.). Cards with a glossy front side have a matte finish on their reverse side, since that is the way this stock is normally purchased by printers.

2814 Empire Ave., Burbank CA 91520

Here is Jan Clute, WD0HWU, of Marion, Iowa. Jan runs a Century 21 Transceiver into a 135-foot longwire thru a Ten-Tec tuner. He has contacted amateurs in 44 states and 24 countries during more than 400 contacts since April 1978. Most of his operation is on 15 but he has lately been using 10 meters more often. Jan previously held WV6PFM and KN1RKG Novice callsigns about 17 years ago but did not continue in amateur radio at that time. Jan is a Speech Clinician in the Iowa Public Schools and his wife is a Spanish Professor at an Iowa private college. Jan already holds the RCC (Rag Chewers' Club) and TAD (Ten American Districts) awards and should quailfy for several others very soon.

Writing Instruments. Use a good writing instrument when filling in QSL cards. In most cases, it is convenient to also use this same good writing instrument to make entries in your station log. Pencil reports are sometimes difficult to read and they often fade with time. Retractable ballpoint pens have a little give to them every time they are applied to a surface on which one is going to write. This little bit of bounce can slow down your writing and it often results in trail lines, between letters and numbers when one does not left the ballpoint pen straight up after writing something. The non-retractable ballpoint pens are more suitable then either pencils or retractable ballpoint pens in these applications. The felt-tip pens are even better than non-retractable ballpoint pens and the fine-line felt-tip pens are the best writing instruments I have found so far. Like most good typists, I have gone through a phase in which I typed my QSL card reports and station log. However, I quit typing them because it is easier to fill them in by hand. There is also the consideration that QSL cards tend to be curled when they are typed. Last but not least, I do not want the typewriter and its stand in my way when I don't need them.

Filling in report forms

Fig. 1 shows a typical good preprinted report form. In the following paragraphs, I will detail exactly what should be filled in at each point in the sample report form. One blank report form and a completed one are included in the figure to provide better understanding of the subsequent descriptions. It does not matter if the report form is printed horizontally or vertically, but make sure it is complete. Each report form entry appearing on the blank sample is covered in sequence (from top to bottom) in the subsequent paragraphs.

To Station/Station Worked...The single most common error I see is that amateurs make the card out to themselves instead of writing in the callsign of the other station contacted. The space for a callsign to be written on the report form is where you fill in the callsign of the station you worked on the air. In the example, I (W6DDB) contacted my wife (W6JEP), so her callsign is written on the report form of my QSL because it is being sent form W6DDB to W6JEP. A similar but less common error is that of filling in two callsigns in the report form. This kind of error occurs when an amateur operates from a club station or another amateur's station and makes the mistake of mentioning his own callsign. Basically, a QSL made out to two stations has very limited usefulness to either of them. Make the card out to the callsign used on the air for station identification.

Ur/Emission. This space is used to indicate the type of emission used at the other station during the contact. It is okay to use designations (A1, A2,

etc.), abbreviations (USB, FM, RTTY, etc.), or words (code, etc.) to indicate the type of emission. Frankly, most amateurs use whatever is most suitable for the emission involved. As examples, it is easier to write FM, RTTY, or SSB than frequency modulation, radioteletype, or single sideband, respectively. Correctly indicate the emission mode received from the other station during the contact. As an example, if you were operating code on the 15 meter Novice band and a foreign amateur answered your general call to all stations (CQ) on voice, you list USB or SSB (voice) on the card because you are giving a report on the signal transmitted by the other station. Remember that if you worked another station using unmodulated carrier on-off radiotelegraphy, the emission can simple be indicated as code or AI on the report form. However, do not list the received signal as CW because CW (A0) is continuous wave; it is not code.

Sigs/Report. When giving another station a signal report, make it an honest one. You are not doing the operator a favor if you send a flattering but untrue signal report. The signal report must be honest and correct to be useful. Since this is a Novice column, I will just cover signal reports for code contacts. However, the discussion will generally apply to signal reports for any mode of emission. We use an RST (Readability, Strength, Tone) signal reporting system with code contacts. It is a pretty good system but it is often misused by amateurs. Each part of the report is completely independent from the other two portions. The exact meanings are as follows:

R (Readability)
1 Unreadable
2 Partly readable
3 Readable with great difficulty
4 Readable with very little difficulty
5 Perfectly readable

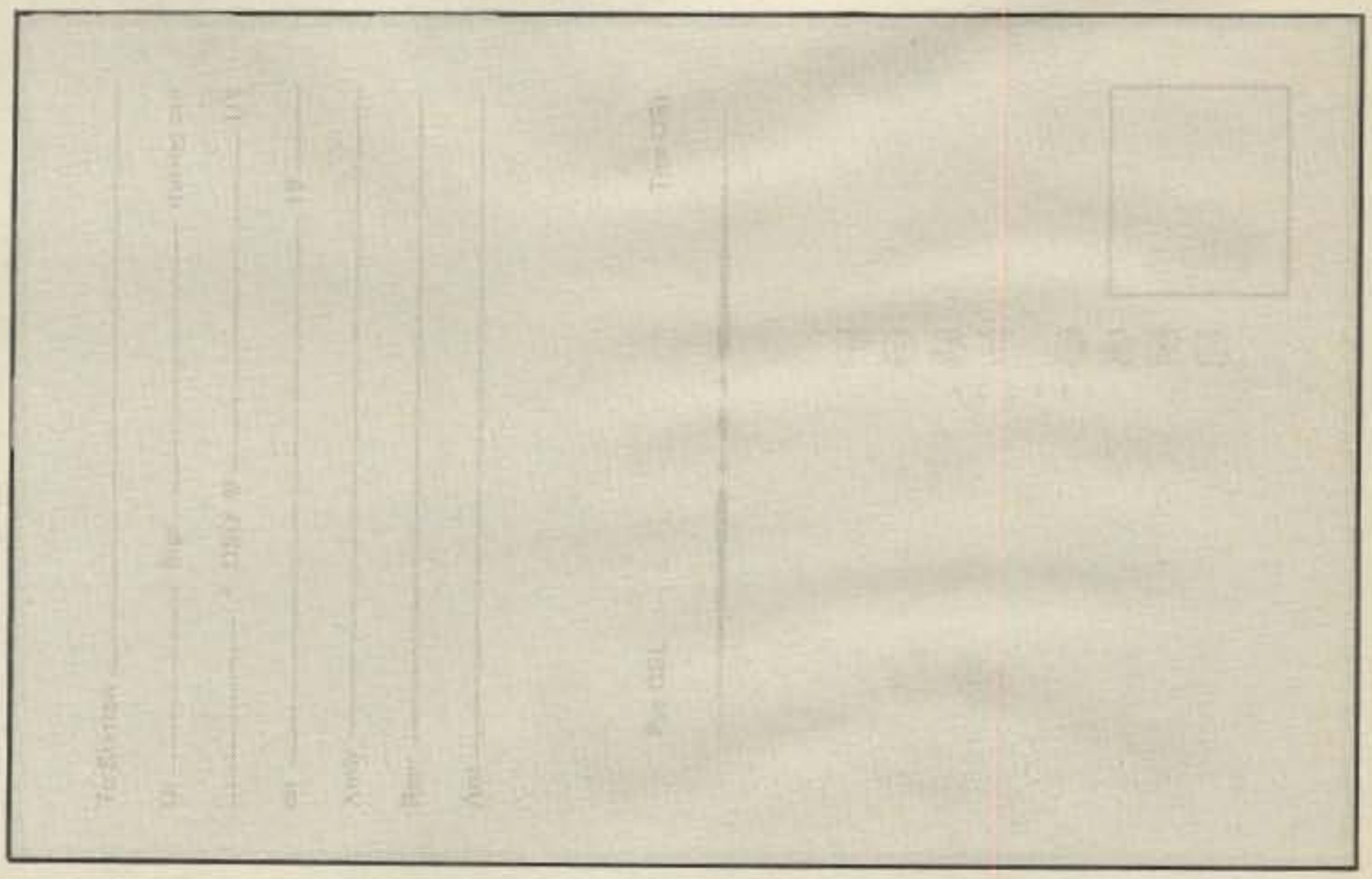
S (Strength)
1 Barely perceptible weak signals
2 Very weak signals
3 Weak signals
4 Fairly weak signals
5 Fairly good signals
6 Good signals
7 Moderately strong signals
8 Strong signals
9 Extremely strong signals

T (Tone)
1 Very rough and broad (60 hertz)
2 Very rough, harsh, and broad A.C.
3 Rectified but unfiltered rough A.C.
4 Rough, but with some filtering
5 Strong ripple due to poor filtering
6 Filtering evident but has ripple modulation
7 Fairly pure with some trace of ripple
8 Almost pure with some trace of ripple
9 Pure tone with no ripple or modulation of any kind

Suffixes
C Chirp on signal
K Key clicks on signal
X Signal sounds crystal controlled (stable)

Unfortunately, amateurs commonly link readability and strength together when giving RST signal reports; however, each part of a signal report is completely separate from the rest of the report. As an example, a very weak (S-2) signal can be perfectly readable (R-5) if it is not buried in noise (atmospherics) or bothered by interference from other stations. On the other hand, a signal can be extremely strong (S-9) but be very difficult to read (R-3) due to QRM (man-made interference), QRN (natural interference, or atmospheric noise), backwave radiation (carrier not completely cut off between dits and dahs of code symbols), poor shaping of dits and dahs, chirp (frequency instability), or other similar reasons. Each part of the three numeral RST report should be stated completely independent of the other two parts.

A typical RST report for an average good signal would be 579; this report would advise the other operator that his signal is perfectly readable (R-5), moderately strong (S-7), and has a pure (no power supply ripple modulation) tone (T-9). If a signal is noted to have frequency instability (chirp), the



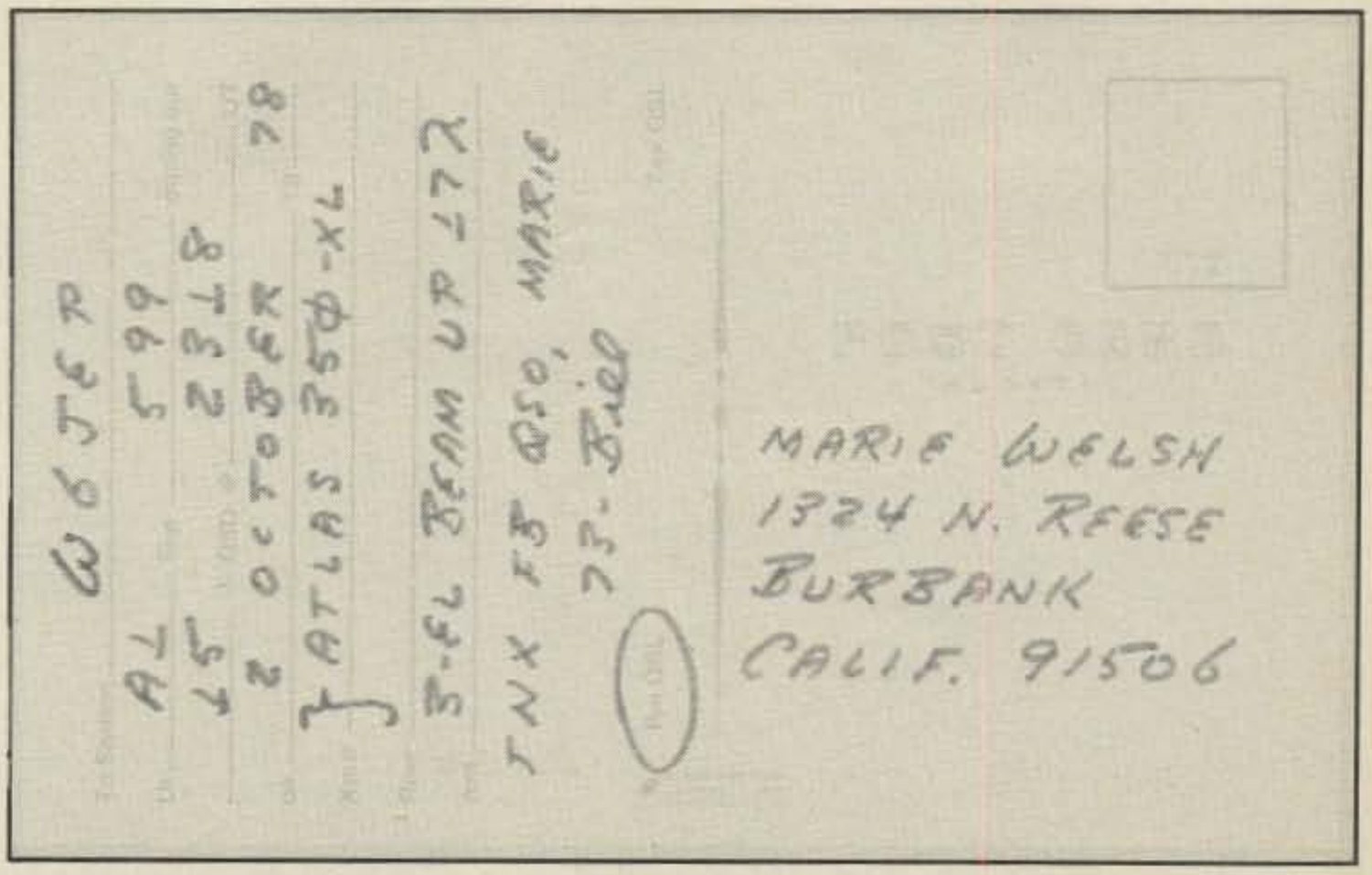


Fig. 1 - QSL Card report form and address area.

letter C is added to the report; this would revise the previous report to be RST 579C. Similarly, if a signal is noted to include severe key clicks, the letter K is added to the normal 3-numeral report, producing an RST report such as 579K. The suffix letter X is sometimes added to the normal 3-numeral report to indicate that the frequency stability of the received signal is so good that the other station is assumed to be using a crystal (xtal) controlled oscillator in his transmitter. The X suffix has very little real significance with modern highly stable amateur radio equipment, since it could be added to almost all reports.

There are several other signal report systems and some of them apply to telegraphy, but they are not commonly used by amateurs.

The overall rating number system for telegraphy is as follows:

Rating Scale	Meaning
1	Unreadable
2	Poor
3	Fair
4	Good
5	Excellent

The SINPO signal reporting code is as follows:

Rating Scale	Frequency of Fading	Excellence of Modulation	Magnitude of Modulation
1	Very Fast	Very Poor	Continuous Over-modulation
2	Fast	Poor	Poor/Nil
3	Moderate	Fair	Fair
4	Slow	Good	Good
5	Nil	Excellent	Maximum
	F	**E**	**M**

Signal Degraded by

Rating Scale	Signal Strength	Man-Made Interference (QRM)	Atmospheric Noise (QRN)	Propagation Disturbance	Overall Readability (QRK)
1	Barely Audible	Extreme	Extreme	Extreme	Unusable
2	Poor	Severe	Severe	Severe	Poor
3	Fair	Moderate	Moderate	Moderate	Fair
4	Good	Slight	Slight	Slight	Good
5	Excellent	Nil	Nil	Nil	Excellent
	S	**I**	**N**	**P**	**O**

The SINPFEMO signal reporting code system is basically a further refinement of the SINPO system but it includes three additional categories of signal report data. A simplified explanation of the SINPFEMO categories is as follows:

S Strength
I Interference (QRM) Degradation
N Noise (QRN) Degradation
P Propagation Disturbance Degradation
F Frequency of Fading
E Excellence of Modulation
M Magnitude of Modulation
O Overall Signal Rating

The SINPO categories of the SINPFEMO system are exactly as previously listed. The meanings of the additional three categories are as follows:

Amateurs just use the RST signal reporting system for radiotelegraphy (code). The other signal report information is provided for the use of amateurs who also do some shortwave listening and send signal reports to the non-amateur stations they hear. Another reason these other signal reporting systems have been mentioned in this article is because they occasionally appear on cards shortwave listeners send to amateurs. It is particularly helpful to at least know the SINPO system.

λ/Band/Frequency. The meter (λ) blank is used to indicate the generally accepted designation for the amateur band on which the other station's signals were heard. Simply write in the appropriate band designation, such as 80, 40, 15 or 10 to indicate which Novice band was involved. It is also a common practice to have kHz. (kilohertz) or MHz. (megahertz) printed in this portion of the report form. If your card lists kHz., list the frequency (in kilohertz) where you heard the other station, such as 3723, 7137, 21,117, or 28,167 kHz. Similarly, if you use MHz. on your card's report form, list the same information as 3.723, 7.137, 21.117, or 28.167 MHz. respectively.

UT/Time. The time indicated on the report form is the time the contact started and new amateurs must force themselves to immediately write down the time as they start a contact. I often receive cards showing a beginning time that is 5 to 10 minutes wrong. In addition to showing the correct time when the contact started, the kind of time must also be indicated. If you use local time, indicate which local time you use by adding the appropriate designation (such as EST or EDST for Eastern Standard Time or Eastern Daylight Savings Time, respectively) to your QSL report and station log.

Most active amateurs prefer to use Coordinated Universal Time (UTC/UT) to track all of their operating activities and UT is shown on the sample report form. UT is essentially what was previously known as Greenwich Mean Time (GMT), Greewich Civil Time (GCT), and Zulu time. No matter what it is called, the use of a common international time minimizes the possibilities of amateurs in differnet countries being confused by time and date differences when participating in contests, keeping schedules, and during all other operating activities. It may at first seem more complicated to use UT on your cards and station log but you will quickly learn that you have made a worthwhile change. It is better and simpler to the Universal Time to track all your amateur operating activities. Remember that the sun rises in the East, which means that Europeans are getting up and going to work about the time we are going to bed in America. Also, remember that it is the morning of the following day in Europe when it is evening or night time here. When we are on standard time in America, UT is 5, 6, 7 and 8 hours ahead of our Eastern, Central, Mountain, and Pacific time zones, respectively. When we are on daylight savings time, these same time zones are 4, 5, 6 and 7 hours behind UT, respectively.

Four-Digit Time. It is also simpler to use the 4-digit, 24-hour time system in your amateur radio operating activities. You will quickly learn it meets your operating requirements better than the 12-hour time system with its A. M. and P. M. designations. When using 4-digit, 24-hour time, the first minute after midnight is 0001 and the 59th minute after midnight is 0059. As is also true in the more common 12-hour time system, the time switches to the next hour one minute after 0059 and becomes 0100. In other words, the first two numbers show the hours (00 to 23) and the second pair of

numbers show the minutes (00 to 59). Neither A.M. (ante meridiem) nor P.M. (post meridiem) designations are used with 4-digit, 24-hour time; similarly, no colon is used between the hour digits and the minute digits. There is also no reason to add the word hours after this type of time. If you want to indicate a contact was started 44 minutes into the 22nd hour of the day, just show the time as 2244 UT; do not list it as 22:44 or 22:44 PM or 2244 hours. If you try using 4-digit, 24-hour time for a few weeks, you will learn to like it as the natural objection to anything new wears away. Contests, schedules, and most other information related to amateur radio international operating activities is shown in Universal Time and this simplified system is greatly appreciated by most amateurs.

Local Time. If you still show your local time on your cards and station log, clearly indicate which local time is being used by adding an appropriate designation such as EST/EDST, CST/CDST, MST/MDST, or PST/PDST. If you are using 12-hour time designations, do not neglect to indicate A.M. or P.M. in the report. To make a direct comparison to the time indicated in the preceding paragraph, a time of 2244 PST would be expresed as 10:44 PM PST.

On/Date. The day, month, and year of the contact are entered on this part of the QSL report form. Remember to use the next day's date as soon as the time being used passes 2359 (11:59 PM). It is common to receive a card showing the wrong date of a contact. Inexperienced operators often forget to use the next day's date when they use Universal Time. As an example, if you make a contact during the late evening hours of the 2nd day of the month per your local time, it is the 3rd day of the month per Universal time and that is the date that belongs on your report. When using UT/UTC, remember to shift to the next day's date for all contacts after 0000 UT.

Date Sequence. One of the many odd things new amateurs encounter is that the day and month seem to be listed in reverse order in the report section of cards received from most foreign (DX) amateurs. Instead of listing October 2nd, 1979 or 10-2-79 as the contact date (for example), it is listed as either 2 October '79, 2-10-79, or 2-X-79. In other words, they list the day of the month first and follow it with the month and the year. As indicated in the preceding example, a Roman numeral is sometimes used to distinguish the month. In case you are not familiar with Roman numerals, the Arabic numerals 1 through 12 (representing the months January through December, respectively) are often placed by Roman numerals I, II, III, IV, V, VI, VII, VIII, IX, X, XI, and XII, respectively. An easily available source of information on the entire scope of Roman numerals is the dictionary. However, the preceding twelve Roman numerals suffice in this instance. If you think about the two systems for a while, you may decide that their system (day first, month second) makes sense. The year is the part of the date which remains unchanged for the longest time and it makes sense that the year is listed last in both systems. The month also remains constant for a relatively long time and DX operators list it next to last in their system. The day of the month changes daily and it is logical to list it first, as DX operators show it on their cards. After all, if you gave a brief reply to someone who asked for today's date, you would almost certainly state just the day of the month, such as the 14th or 22nd (for example); very few people would respond by stating both the month and the day of the month. You will avoid confusion if you list the day, month and year in that sequence when sending cards to foreign amateurs. Many active American amateurs (including myself) list dates in the day-month-year sequence no matter where we are sending a card. When the day of the month is any number (13-31) above 12, there is no doubt about whether a received card is indicating the day or month first, since the numbers 13 through 31 do not apply to a month of the year. However, when the day of the month is 1 through 12, a received card indicating 1-12-78 could be indicating the contact was made on either the first day of December or the 12th day of January. Until this area of confusion is eliminated by adopting a single date system for universal use, confusion can be minimized by emphasizing the month in each indicated date. I usually spell out the name of the month whenever it could be confused with the day of the month (days 1 through 12). The DX practice of showing the month in Roman numerals is also effective and it is widely used. If you use the American date system showing the month first, followed by the day of the month, you can reduce confusion by either spelling out or abbreviating the month instead of just representing it with a number.

No matter which time and date system you use, be sure to position a large calendar and an easily read accurate clock where you can see both of them while you are seated in your normal operating position. A lighted clock with large numerals is easier to use than a wristwatch when you get busy operating. I use a wall mounted 24-hour, 4 digit clock that is set to Universal Time and is lighted for easy reading at all times. If possible, locate your calendar and clock where you do not even have to shift your position to read them. Many amateurs mark their station logs to indicate when a card is received and/or sent to confirm specific contacts. When I receive cards showing incorrect times and/or dates, I sometimes wonder if those amateurs have a calendar or clock handy where they operate. It is a nuisance when one has to hunt through a station log to locate a specific contact which is incorrectly reported on the received card.

Xmtr/Rcvr/Equipment. The transmitter (xmtr) and receiver (rcvr) are listed on the next two lines shown on the sample report form in figure one. If you are using a transceiver in lieu of a separate transmitter and receiver set up, just use a bracket to show that the transmitter and receiver are included in your transceiver, as shown in fig. 1. Station equipment (including the antenna) are usually listed on the QSL report form to let the other operator know what was used during the contact. If you are using a well known piece of equipment, there is no need to identify it in detail on the report form. Simple notations such as Argonaut 509, Atlas 350 XL, Drake TR-4CW, Kenwood TS-520, and Century 21 are sufficient; in fact, many cards simply list TS-520S, TR-4CW, and similar items since they are distinctive enough and they can suffice to identify the station equipment.

Amateurs sometimes have the information about their equipment and/or antenna included in the report form when it is printed. The advantages are a neater appearance to the completed (filled in) report form, more room available on the report form for other entries, and no need to expend time and effort writing equipment and/or antenna information on each card. Unfortunately, these three advantages are offset by the disadvantage that such printed information usually becomes incorrect rather quickly since most active amateurs frequently change equipment and antennas. Such changes are normally more frequent with new amateurs than those with established operating preferences.

Remarks. This space in the report form is usually captioned remarks or comments. As in the case in the fig. 1 sample, an unmarked space can be left in the report form to add your per-

sonal message to the other amateur.

I particularly appreciate special interest notes added to the comment portion of the report form. I pay more attention to the comments on each received card than to any other part of the report. If your on-the-air conversation revealed that you share a common interest with the other operator, it should be easy to think of an appropriate remark that will please the other operator when he reads your card. It is particularly important to add a comment to let the other operator know if he/she was your first contact with a YL, 2-letter suffix, club, state, county, or country. Personal notes can bring back memories of pleasant contacts which might otherwise be too quickly forgotton. If nothing else is written in this space, most operators at least write 73 and sign their nickname.

Tnx/Pse QSL. Report forms normally include some way to tell the other operator his card has been received (thanks) or is wanted (please). Use some pre-printed arrangement which precludes the need to write anything in the report about needing or receiving a QSL from the other operator. It is easy to just circle PSE QSL or TNX QSL on a printed report form and this type of indication stands out well in the report.

Summary. This concludes the second part of this three-part article on QSL cards. In the first part, we covered what QSL cards are, plus how we use, store, and display them. QSL design considerations were also detailed in the first part. The second part of this article was devoted entirely to QSL card report forms and how they should be filled in. The third (and last) part of this article covers how QSL cards are exhanged, including detailed plain language descriptions of how QSL bureaus function.

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to CQ. A brief description of operating activities and some personal background information are needed with your picture.

Some of the stations I've recently worked on and the novice bands are: WB1FXJ Ken @ Leominster, Mass., WD2ADC Brian @ Merrick, N.Y., WB3KYP Irv @ Wilmington, Delaware, WD4NYH Helen @ Norfolk, Va., WD5EAE Steve @ Monroe, La., WD6FYG Mike @ Sherman Oaks, Ca., KA7AUG Dick @ Prescott, Arizona, WD8QWW Jim @ Iron Mountain, Mich., WD9EOT Mae @ Hammond, Ind., KA0BZK Rick @ Edina, Minn.

73, Bill, W6DDB

A Message From The Publisher

This is about money. Your money. The money you spend on ham equipment; the money you can "save" by buying right. Please make no judgements on the subject until you've read the whole story.

The December issue of *Ham Radio Horizons* features an article by K4SDS on how to save money when you purchase ham gear. It recommends a bidding system in which you send out a form letter to a whole bunch of retailers, requesting a firm low bid on a particular item or group of items. When all the bids are in, you simply take advantage of the lowest deal.

This idea isn't a new one. It's been going on for years. And you know something? It stinks. Why? Because in the long run it means that you'll be spending far more for your equipment. Think I'm crazy? Please read on.

When I first started working for *CQ* back in 1955, there was a boom just beginning for the ham radio industry. Single sideband was brand new. Tens of thousands of amateurs were stepping up from a.m. to s.s.b. There were many fine manufacturers of beautiful radios in the market. Remember names like Hallicrafters, National, E.F. Johnson, Barker & Williamson? How about Multi-Eimac, Morrow, Pierson-Holt, Central Electronics, Collins or Eldico? Or P & H, Gonset, Harvey-Wells and Lakeshore Industries? All fine companies. And with the exception of Collins, not one remains as a factor in the ham market. In fact, most of these companies aren't even around anymore.

During those same years, if you wanted to try out a new radio or compare competitive antennas, all you had to do was drive down to your local ham supply store. There was one in just about every major city in the U.S., and several in the larger cities. I remember names like the Tydings Company in Pittsburgh, Steinberg's in Cincinnati, and Walter Ashe in St. Louis. There was Fort Orange Radio in Albany, World Radio in Council Bluffs, Almo in Philadelphia, and Newark Electric in Chicago. How about Ken-els in Fort Dodge, Iowa and Custom Electronics in Dayton? I could list more than a hundred good dealers, most of whom are no longer in the ham radio business.

What happened to them? Simple. A few wheeler-dealers, operating with little or no overhead, began advertising equipment at just a few dollars above their cost. The "smart" hams bought "right." They saved some money. Not a lot of money, but enough that most of the old-time dealers got fed up with the market and dropped out of the industry. And with those dealers, went the manufacturers listed earlier. Because without a nationwide network of stocking dealers, most of the manufacturers just couldn't sell enough product to survive. It was Armageddon in the amateur radio marketplace.

But after every holocaust, a new generation evolves. And over the years, new companies have come into the picture. You all know the names. Kenwood and Yaesu, Drake and ICOM. DenTron, Ehrhorn, Wilson and Swan. Atlas, Alda, the list has become almost as healthy as it was back in those good old days. And with this new emerging marketplace, beefed up by new blood in our hobby that's come up from the CB ranks, a whole new flock of stocking dealers has come into being. I won't bore you by listing any more names. All you have to do is scan the various ham magazines.

And now, K4SDS tells us to send out bids to squeeze every last dollar we can from the dealers in the business. Good Lord, didn't we learn anything from the last go-round? Do we want to drive out the few healthy marketers that we're fortunate enough to have in our industry?

Before you answer that a buck saved is still a buck saved, consider these facts: the costs that a legitimate dealer must expend to service his amateur customers. I've spoken to numerous dealers across the country and have a pretty clear picture of the retailer's problems.

Let's picture an imaginary dealer, with a small store, who sells 100 ham radios in a typical month at an average retail suggested list price of $1,000 each. But we know that over the years hams have come to expect at least a 10% discount, so we'll assume that the dealer will sell his radios for $90,000. Those radio cost him $75,000. He needs at least three full time employees to keep his store open six days a week, ten hours a day. The salaries and fringe benefits to those employees cost him $5,000 a month. He spends $2,500 on advertising, $350 on rent, $500 freight for merchandise in, and $200 for light and heat (or air conditioning, if he's in the South). His insurance costs another $150. A WATS line (most decent dealers today must have an incoming WATS line to survive) runs $1,500. Office supplies average another $100.

There you have it. The basic costs of doing business are more than $10,000 for what appears to be a $5,000 gross profit. But out of that, the dealer has to pay taxes, and he has to lose a certain portion from theft and pilferage. What's left isn't much, considering the investment of time and money that the dealer has made to service his ham customers.

In his article, K4SDS suggests that you visit the local dealer to check out the merchandise before deciding what to buy. Then, after you've got all your bids in, you should give the local dealer a last shot at competing with the lowest bid. My God, what's he thinking of? He wants you to pick the man's brains, take his valuable time teaching you all about the radios, and then take your business to someone else who has no overhead, no time invested in your sale, and probably little equipment in stock. Sure, the wheeler-dealer can give you a better price. But at what cost to you in the long run?

If we let the wheeler-dealers drive out the legitimate retailers, we'll have Armageddon all over again. And as we lose the good dealers, we'll eventually lose the manufacturers, or at best, force them to raise their prices to survive. So we save a few bucks now, and pay dearly down the road. Sorry, fellows. It just doesn't make sense.

If you want the availability of the best product, and the opportunity to check it out before you buy, then you simply must support the legitimate equipment retailer. If you expect decent warranty service at the lowest price, you must support your legitimate retailer. If you want to destroy the market, then support the wheeler-dealers. But remember, you'll have only yourself to blame when the prices go up.

— Richard A. Cowan, WA2LRO

a regular feature by

THEODORE J. COHEN N4XX

dateline... Washington, D.C.

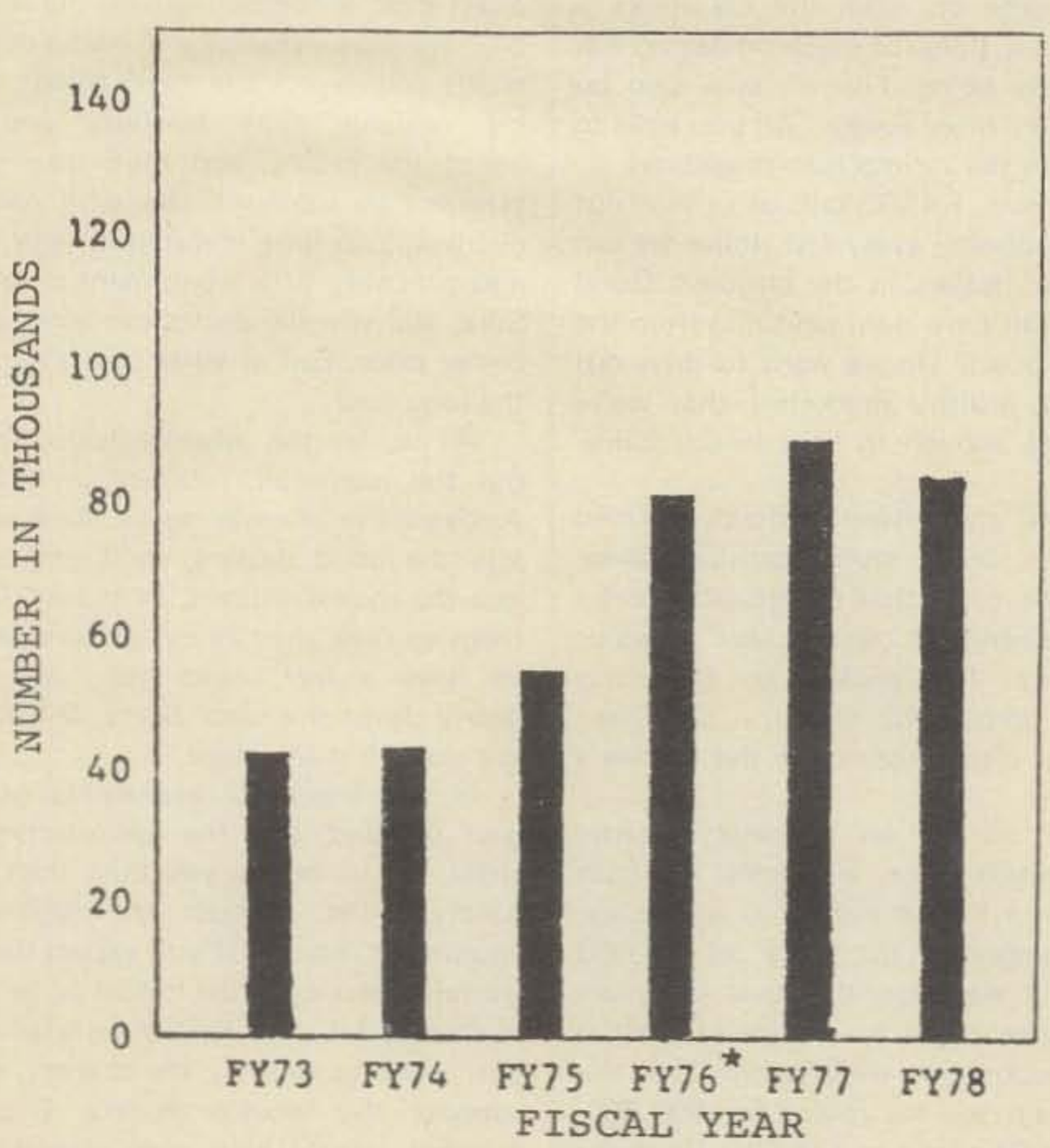
The ins and outs of the Washington scene

RFI complaints for FY-78 exceed 80,000

Mr. Jeffrey Young, Chief, Investigations Branch, FCC, reported that for fiscal year ending 30 September 1978, r.f.i. complaints to the Commission totaled 84,404. Of course, amateur operations accounted for 1023 complaints, while 18,729 were alleged to result from CB operations.

As seen in the accompanying graph, r.f.i. complaints for FY-78 were down slightly from the number received in FY-77, suggesting that the r.f.i. problem may be moderating. Young attributed the decline in r.f.i. complaints to the following:

INTERFERENCE COMPLAINTS RECEIVED



*(Transition quarter data excluded)

-The use of linear amplifiers in the CB service is abating.

-CB time-of-use, on the average, is declining for any given station; this reflects a decline in enthusiasm by 'hamming.'

-New CB equipment has better harmonic-emmission standards.

-Over 125,000 copies of the FCC's Interference Handbook have been distributed by the Government to the public; thus, the consumer is better educated in the matter of r.f.i., and the manner in which r.f.i. problems can be corrected.

-Because of the material in the FCC's Interference Handbook, and because of an education program on the part of the EIA, TV and radio servicemen are better able to cope with interference problems than they were in years past.

Young also noted that the Commission had also changed the manner in which complaints must be made to the Commission. While complaints at one time could be made by telephone, all complaints made today must be made in writing. Thus, the Commission is less "accessible" today than in years past for the purpose of receiving RFI complaints.

Whether the decline of RFI complaints in FY-78 will continue in FY-79 is open to question. Regardless, that it declined in FY-78 indicates that the matter is finally receiving the attention of the consumer, the Commission, and manufacturers of electronic home-entertainment equipment.

Editors of CB and Amateur Magazines threaten to list Manufacturers whose products are susceptible to radio frequency interference (RFI)

In his editorial for October 1978 Mr. Wayne Green, W2NSD/1, Editor/Publisher of **73** magazine, proposed to list the names of manufacturers who continue to produce electronic home-entertainment products which are overly susceptible to RFI. A similar announcement was made by Mr. Leo Sands, Editor of **CB Magazine**, in an editorial published in 1978. Presumably, both editors would first contact manufacturers of equipment which has been found to be susceptible to strong r.f. fields, and would seek assurance that the design of the equipment in question would be changed so as to make the device less susceptible to RFI. If this assurance was not forthcoming the name of the manufacturer, and the device which is susceptible, would be published.

In the case of **73** magazine, Mr. Green indicated that he would rely on TVI committees to supply preliminary information on "consumer electronic equipment which was inadequately designed, and as a result, was overly susceptible to interference from nearby transmitters."

While we have every interest in seeing the designs of consumer products upgraded to reduce their susceptiblility to r.f. fields from nearby transmitters, the approach voiced by **73** and **CB Magazine** is fraught with difficulties. According to Ms. Sally Browne, Director of Consumer Affairs, Electronic Industries Association (EIA), "The proposed actions by **73** and **CB Magazine** could possibly open legal questions pertaining to the type of measurements made, the testing procedures employed, and the standards used to judge a device's performance."

Since there are no recognized standards for field-strength levels in which consumer devices must operate free from RFI, and since no standardized methods have been developed for testing electronic home-entertainment equipment in r.f. fields, the assertion by an individual for an organization that a particular device is susceptible to r.f. fields from a nearby transmitter is open to serious question. Further, should such assertions be published, it is your Washington correspondent's opinion that manufacturers could challenge the statements published about their products as being libelous.

It is interesting to note that the RFI Task Group of the American Radio Relay League (ARRL) approached several consumer organizations in the early 1970's with a proposal that they test for RFI when they examine the performance of a product. All of the organizations appproached indicated that without recognized and accepted RFI test and evaluation methods, it was highly likely that an adverse review of a product's susceptibility to the r.f. field from a nearby transmitter would almost certainly result in a lawsuit. As such, no consumer organization would agree to perform the types of tests which are needed to verify whether a device is immune to strong r.f. fields.

While it would be desirable to publish the names of manufacturers who continue to produce products which are susceptible to RFI, and thus to coerce these manufacturers into correcting the design deficiencies which exist in their products, this does not appear to be a prudent course of action. A more viable approach would be to use the RFI Assistance List available from the ARRL, the EIA, or the FCC, and to "delist" those manufacturers who refuse to cooperate in resolving RFI problems which are experienced with their products.

FCC issues NOI in the matter of RFI

By the time this is published, the

FCC should have issued a Notice of Inquiry (NOI) in the matter of radio-frequency interference. The NOI, which was scheduled for release on or about November 14, 1978, will address five RFI-related issues:

Consumer issues
Equipment manufacturing issues
Economic issues
Government issues
Engineering issues

Amateurs, it is hoped, will provide a significant amount of information on a problem that has plaqued them for decades.

More type acceptance for amateur equipment possible

There is growing concern within the FCC about the illegal use of 10 GHz. equipment for jamming police radar units. The equipment used for jamming is being operated in the amateur 10 GHz. band, and its use constitutes a violation of the Communications Act of 1934 to jam intentionally the signals of another station.

To eliminate the misuse of amateur 10 GHz. equipment, it is possible that the FCC will shortly require type acceptance of this equipment. The feeling within the Commission is that because of its limited staff, pursuing the manufacturers of the 10 GHz equipment, it is possible that the FCC will shortly require type acceptance of this equipment. The feeling within the Commission is that because of its limited staff, pursuing the manufacturers of the 10 GHz equipment is the easiest way in which to attack the problem.

Participation of private sector representatives on U.S. delegations limited

Recent guidelines set forth by the Department of State severely limits the participation of private sector representatives on U.S. delegations to conferences such as the 1979 World Administrative Radio Conference (WARC). In the first, detailed written procedures to be released on the subject, the Department of State indicated that private-sector representatives may not negotiate for the United States, or decide U.S. policy. Their role is to provide the responsible U.S. Govern - ment officials with on-the-spot views and other information based on their private perspectives.

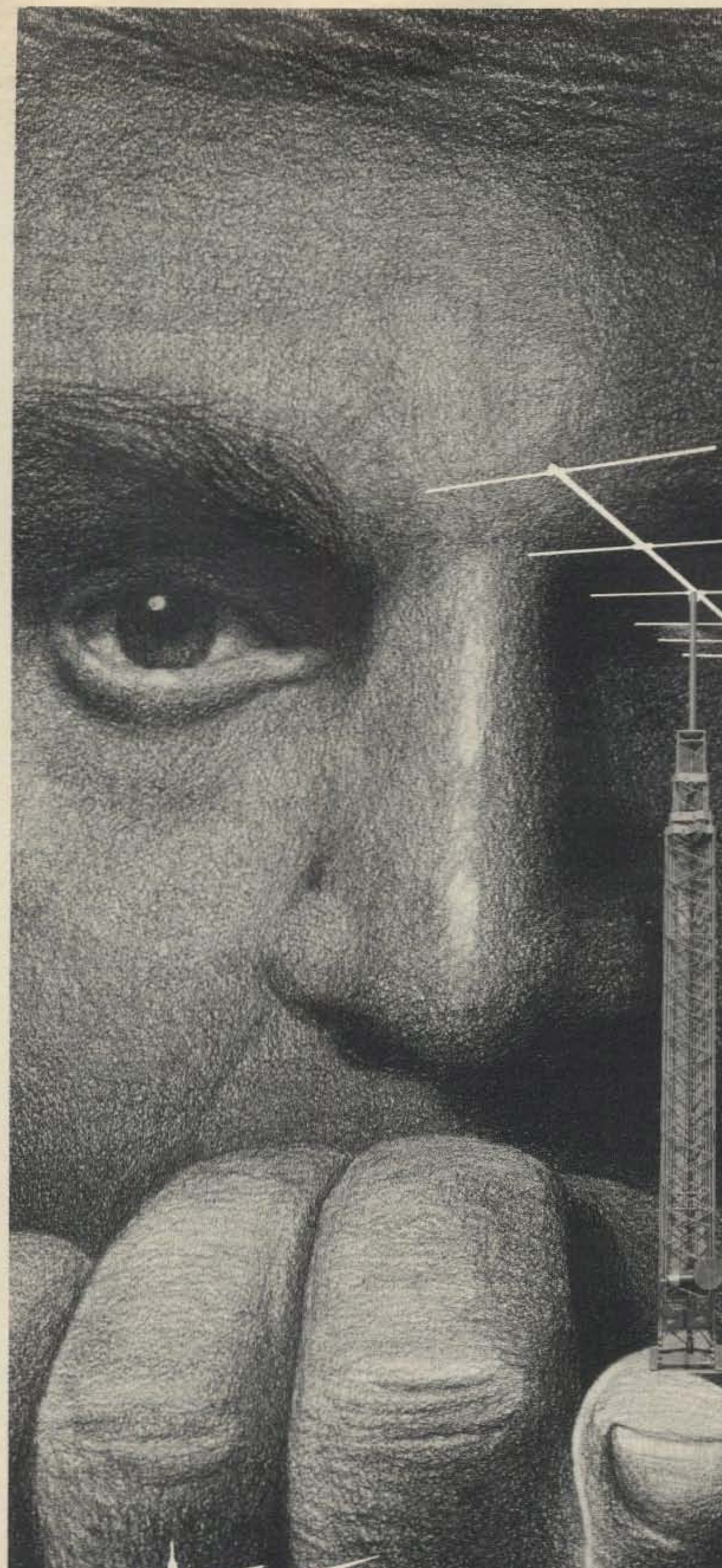
The guidelines further indicate that no Government official shall permit private-sector representatives to speak for the U.S. Government at any meeting with foreign government officials. However, the head of a delegation may authorize a private-sector representative to explain a technical or factual point, if, in the judgement of the head of the delegation, this will advance U.S. objectives, and the private-sector representative is best able to speak on the subject under discussion.

These guidelines will obviously affect many private-sector representatives to the WARC, including those from the ARRL, upon whom the Amateur service will depend for support at the WARC.

CBA/ALERT completes move to Washington

In the October, 1978 issue of CBA World, Mr. Ron Hyden, Executive Vice President of CBA/ALERT, announced that the Washington headquarters for this organization was officially opened. As noted in a previous column, this organization is the largest CB organization in the U.S.

The new CBA/ALERT office is located in suburban Washington near Dulles Airport. Accordingly, its staff is well positioned to become a highly vocal spokesgroup in the Federal City, and to influence federal legislation pertaining to CB which may be under consideration by the FCC or the Congress.



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Confessions Of An XYL

BY GAIL STECKLER*, XYL OF K2OT

At this moment my husband, K20T, is standing on a six-foot ladder supported against the beam of an antenna mounted on our roof. When I look up and see him silhouetted against the clear blue sky of a lazy Sunday afternoon he appears to be completely relaxed. He is performing a labor of love. What might be an awkward grasp and balance act at a dizzying height he takes in stride. From his perch atop the ladder Hank is straightening the elements of our TV antenna which he says bent from the weight of the two-meter Ringo antenna lashed to the mast.

My husband is an amateur. But, he is more than just an amateur radio operator—he is an amateur radio lover. His interests lie in perfecting and adapting his setups. Many long and frustrating hours are spent squirreled away in his shack tinkering with this and tweeking that. At times he crawls into bed unable to sleep because the problem he is working on keeps pulsing through his mind. As I begin to doze off I sometimes hear him going back downstairs to his mechanical mistress. Obviously all the frustration he encounters does not detract from his reward when the perfect signal is achieved.

I do not want to become an amateur. I am not even very fond of eyeball sessions. But I am glad that Hank has this interest. It is an entrance into a world of acceptance and fellowship by people with a common interest. I used to passively "allow" the radio interest, if it didn't disturb my social plans. Now I respect the importance of the radio as an aspect of my husband's life which happens to be apart from me. After a busy day in a large impersonal office, he can put on his old jeans and disappear into his shack where he can work by himself and for himself. His satisfaction is taken from work which he initiates and completes. When he emerges from his world of radio there is an inner peace and an acceptance of his self which translates into a better balanced relationship for us. Having given something to himself, he is then ready to give to me.

Before I understood my husband I was jealous of the time and money spent on the radio. Now that I have a healthy respect for his individuality, I am the one who encourages his interests. Earlier this year I noticed leaflets in the house which illustrated various handy-talkies. In years past on birthdays and anniversaries I would give him a shirt or a tie as a present—things which he didn't want. This year I surprised him when I asked if he would like a handy-talkie.

The other day he told me he had spoken to a fellow amateur on the way home from work. The amateur had mentioned that he was taking his XYL to dinner for her birthday. My husband then suggested his favorite place, a very nice moderately expensive restaurant. The other man's reaction was that the price was too high. To the delight of the XYL, my husband replied "You'd be able to spend it fast enough if it were for ham gear!"

When you give something the other person wants you receive as well. The best part is that the giving can be as simple as allowing the amateur to have time and space alone in his shack without guilt. In return, a smart amateur will make an effort to encourage the interests of his wife and to give her the same respect by allowing her some time and space alone. In our case, it sometimes means that Hank will put up a load of wash or do the dinner dishes just so I can have the time to organize my thoughts or persue one of my interests.

It is rare when the mail does not contain a catalog for parts or equipment. Each issue of every radio magazine is eagerly awaited and more than one editor can attest to a phone call regarding tardy issues. In a similar vein, the United Parcel Service men know that if I am out when they attempt to deliver even as small an order as a wire or a connector, Hank will personally call for it at the depot later in the evening. I think once, when there was a heavy snow, he let the men re-deliver it the following day.

Our home has been adapted to accommodate Hank's radios. The most major requirement we had was to find a house that was situated on a hill. Since there are hills and then there are hills, I made sure we got a gently sloped area rather than a mini-mountain.

Hank's radio friends hoisted the main antenna several weeks after we moved in. The extra downstairs bedroom orginally envisioned as a home office, now houses the radio and amplifier in addition to an office desk, two bookcases, two paper filing cabinets crammed with specification sheets on new radios and testing equipment, and a loveseat my mother gave us from her den. It is decorated with QSL cards flanking an ARRL map in glorious color. The rest of the room is bare save for the two tables containing radio equipment. The former is a multi-shelved unit which was especially designed to hold radios and was ordered from a magazine ad. The latter is a formica kitchen table rescued from a dear friend who would only have sold it at a garage sale. In its new life, it is a laboratory work bench for testing, examining and repairing. The shack is generally kept very neat and I am not overly welcome since I leave things where they fall.

Our backyard is dotted with trees which hold out their limbs to gracefully support several homemade antennas. In summer the wires and insulators are hidden by leaves; but in winter their presence is very visible. I am sure that more then one sparrow has been grateful for the lofty resting place. When guests peer out the window with a puzzled look on their faces I am rather proud to tell them that it took Hank months of testing and research to achieve the working results of that clever antenna. It is true that it does nothing to enhance nature's beauty—but look what it does for us.

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NC-303 Receiver	199
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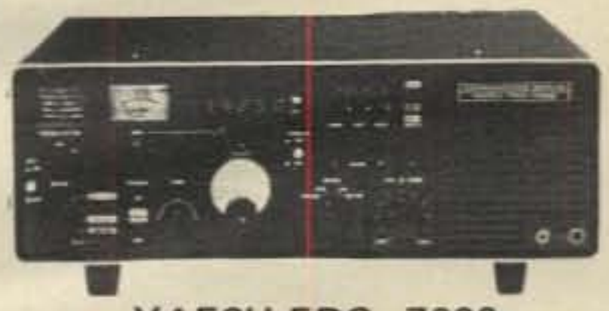

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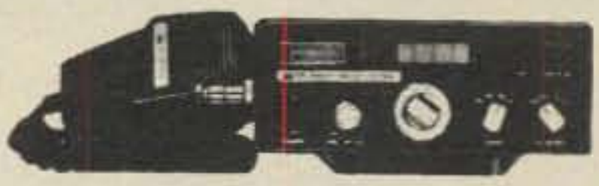

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Communicasting

The following two news releases were sent to CQ recently by Ed Piller, W2KPQ, President of Communicasting Association of America, Inc. Although the official closing date for comments to the F.C.C. has past, the Commission very often accepts late reactions to proposals. —K2EEK

Amateur Radio Operators Propose New Community Telecommunications Service

Just as early experimental work performed by amateur radio operators evolved into the braodcasting industry so too many a new service evolve called "communicasting". Based on experience from amateur radio repeater operation, a petition was filed in January 1977 by WA2RPC of the Center for Advanced Study in Education of the Graduate School of CUNY with W2KPQ for a new "Community Educations Radio Fixed Service" (RM-2846). This service would employ the communicasting concept.

Communicasting utilizes a low power community repeater station which can transmit audio and video signals a distance of thirty miles or more from a high antenna. Signals can input the repeater from many parts of the community and the output can be transmitted on an unused UHF TV channel for anyone to receive. The petitioners and others filing comments had additionally requested that these low power facilities be exempted from conforming to rigid broadcast standards in order to minimize costs.

In a recent "Memorandum Opinion and Order" on RM-2846 the F.C.C. praised the communicasting conept and made it part of a broad" Inquiry into the Future Role of Low-Power Television Broadcasting and Television Trnaslators in the National Telecommunications System" (Notice of Inquiry in BC Docket No. 78-253). The F.C.C. stated that, "The petition and comments by others suggest an imaginative and potentially beneficial public service television concept and that this type of communications activity is one which deserves considerable attention in the overall inquiry".

The F.C.C. requested comments in BC Docket No. 78-253 from all interested parties. These comments are due (original and six copies) at the F.C.C., Washington 20554 D.C. by December 11, 1978. Late comments are also often considered.

Communicasting Concept To Be Included In New FCC Inquiry

The FCC recently released a "Notice of Inquiry" concerning the future role of low power television broadcasting and television translators in the national telecommunications system. Simultaneously, it declared moot RM-2846 which was a petition cosponsored by the Center for Advanced Study in Education of the Graduate School and University Center of CUNY and the Communicasting Association of America. While commenting very favorably on the communicasting concept, the FCC stated that matters presented in this petition will be addressed in the Commission's inquiry in BC Docket No. 78-253. An original and six copies of comments are due by December 11, 1978. Late comments are also important and are often considered.

Communicasting employs the use of a low power community repeater station which can transmit audio and video signals a distance of thirty miles or more from a high antenna. Signals can input the repeater from many parts of the community and the output can be transmitted on an unused UHF TV channel for anyone to receive it. The petitioners and others filing comments had additionally requested that these low power facilities be exempted from conforming to rigid broadcast standards in order to minimize costs.

The television community repeater concept was developed by radio amateurs who are now experimenting with the systems in the 420 and 540 MHz band in various parts of the country.

It was the intent of the original RM-2846 petition to open up frequencies in the UFH TV broadcast band to output to the community for educational and scientific communications. Other uses will also be considered in this inquiry.

All parties interested in filing comments are urged to obtain copies of "Notice of Inquiry" for BC Docket No. 78-253 (released Aug. 24, 1978) and "Memorandum Opinion and Order" for RM-2846 (released Aug. 22, 1978) from the FCC at Washington, D.C. 20554.

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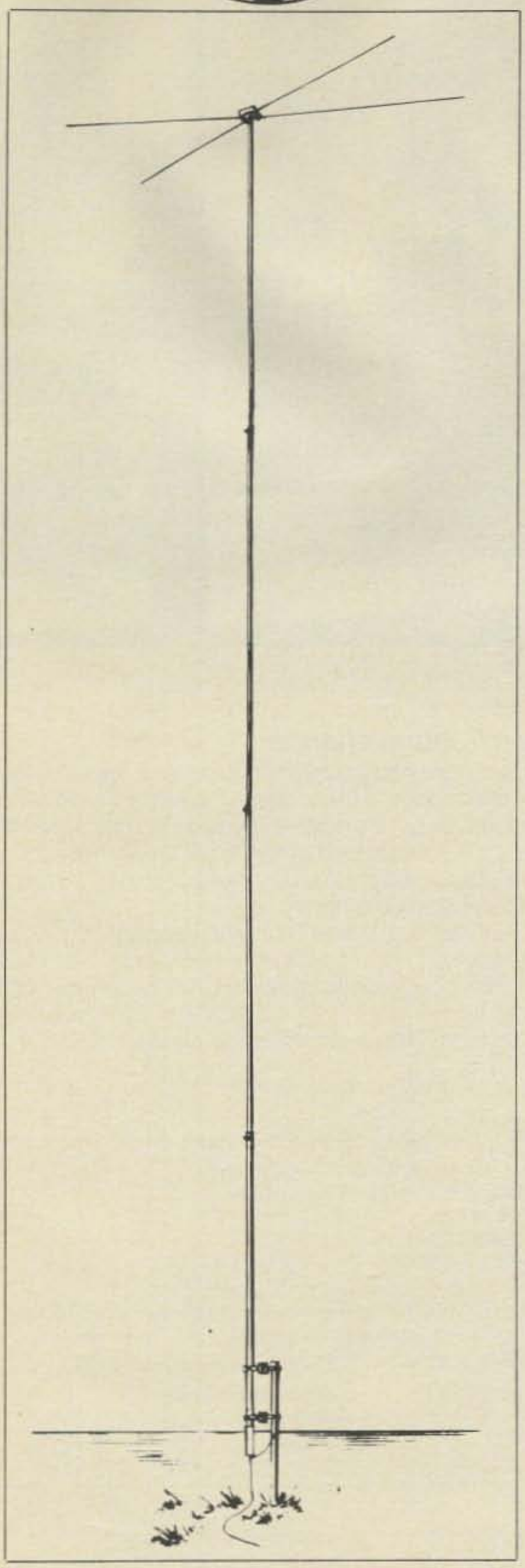

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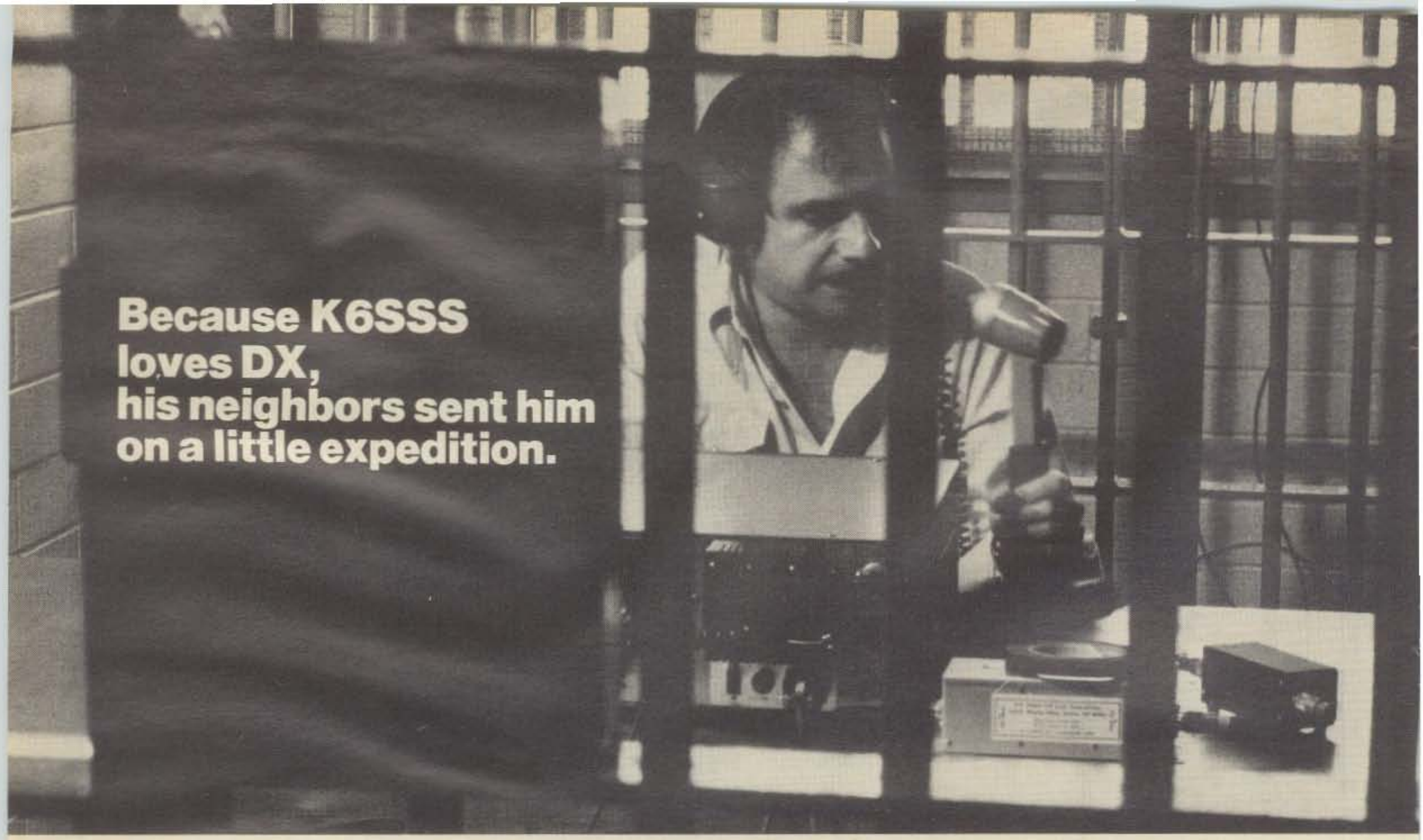

One neighbor sued him for interfering with Lawrence Welk. Another filed a complaint about that "monstrosity" in his backyard – a tribander at 40 feet.

7,781 tangled with the law

The K6SSS case is an example of what can happen to you these days. No matter where you live. It is hypothetical. But real lawsuits are being fought right now by people like K50VC, W2LTP, WB7NOM, W8NRM and W6UFJ/N6QQ to name a few. Last year nearly 8,000 unsuspecting hams and CB'ers ran afoul of the law. Sure, they're taking their fight to court – but they're losing! Never mind that they've got building permits for their towers. Or that the FCC says their rigs are "clean." Judges are ruling against them. The alarming part is that every suit lost makes it that much easier to nail the next guy. Prosecuting attorneys love to cite recent adverse decisions during a trial.

Legal ammunition available

The tragedy is that suits are being lost that could have been won. But TVI/RFI and tower cases fall into a little-known area of the law. Unless your lawyer is a specialist, he could spend hundreds of hours researching court decisions. And still not be sure he's put together the strongest defense possible. It's expensive (expect to spend an average $4,000 to $8,000 if you're sued). And risky. Which is why we formed the non-profit Personal Communications Foundation.* To provide your lawyer with legal ammunition.

Who we are

We're a handful of ham lawyers, professors and judges (all volunteers) who wanted to help before it's too late. We're putting together the first research library of personal communications and zoning law. And having briefs written by the best legal brains. It's all available to your lawyer. For 10¢ a page. We can't guarantee you'll win. We can't try the case for you. But if you or your lawyer contacts us, we'll sure make sure you get a fighting chance.

Give us a fighting chance

To be even more successful in future battles, we're building an arsenal of weapons to use in court. For example, we're commissioning a study by real estate experts on the effect of a backyard tower on neighborhood property values. The pricetag is a stiff $11,000. But without the study, more cases will be lost. And more dangerous precedents will be set.

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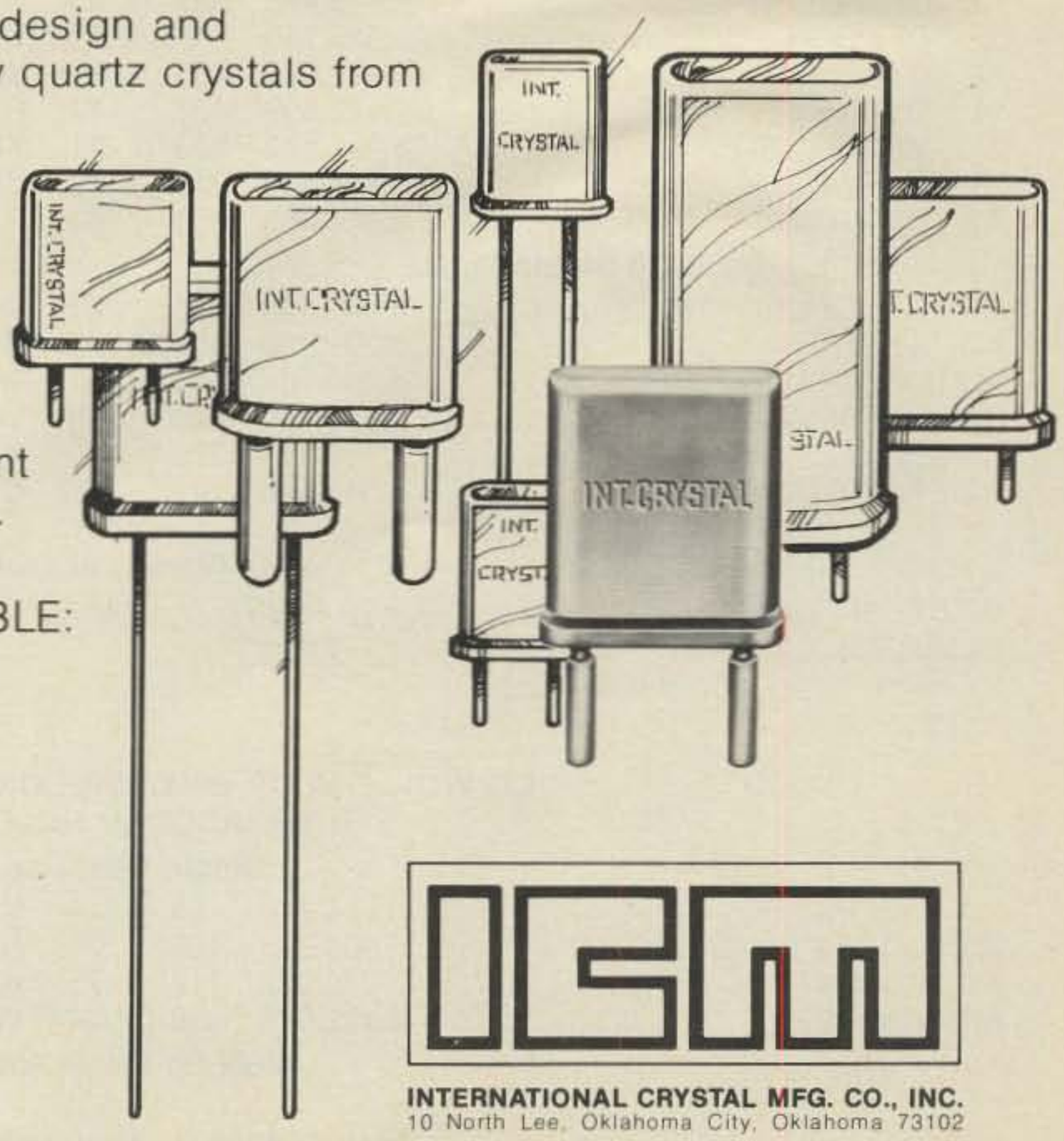

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CIRCLE 30 ON READER SERVICE CARD

CQ World-Wide WPX/SSB Contest All-Time Records

By BERNIE WELCH, W8IMZ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be up-dated and published annually. The method of computing final scores changed several times since 1957. Data following the calls below are: year of operation, total score and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	XJ3FFA ('76)	31,416	77
3.5	YY4YC ('76)	739,468	223
7.0	CT4AT ('77)	1,212,070	305
14	PJ9JR ('71)	2,385,192	348
21	CG3BMV ('78)	2,445,366	402
28	CW3BR ('78)	3,203,514	361
AB	UA9ACN ('78)	3,319,488	459

Multi-Operator Single Xmtr

	KP4RF ('78)	6,113,910	485

Multi-Operator Multi-Xmtr

	UK9AAN ('78)	10,702,776	532

AFRICA

1.8	No Entrant		
3.5	No Entrant		
7.0	ZD8CS ('72)	40,230	45
14	CQ6LF ('73)	1,138,047	309
21	XX6OZ ('75)	1,247,145	305
28	5Z4LS ('70)	1,059,723	267
AB	9L1CA ('78)	2,678,728	344

ASIA

1.8	No Entrant		
3.5	4X4DK ('71)	478,950	155
7.0	JA2BAY ('78)	238,700	154
14	UK9ABA ('71)	1,740,020	361
21	JA6LLO ('78)	1,344,902	338
28	4X4IL ('78)	993,616	281
AB	UA9ACN ('78)	3,319,488	459

EUROPE

1.8	DL8PC ('75)	6,468	33
3.5	DM2DUK ('76)	526,750	245
7.0	CT4AT ('77)	1,212,070	305
14	ON4UN ('78)	2,122,999	433
21	YU3ZV ('78)	1,717,443	273
28	DK5WL ('78)	774,430	215
AB	OI1VR ('78)	2,214,459	351

Multi-Op Single Xmtr

AF	CT3/OH2BC ('78)	4,377,450	385
AS	4J9B ('77)	5,201,056	434
EU	UK6APA ('78)	4,700,904	456
NA	KP4RF ('78)	6,113,910	485
O	5W1AZ ('76)	3,114,315	295
SA	PJ9JR ('74)	4,543,618	347

NORTH AMERICA

1.8	XJ3FFA ('76)	31,416	77
3.5	W1CF ('77)	460,908	186
7.0	W4BRB/C6A ('76)	911,302	213
14	KZ5FR ('78)	2,039,456	391
21	CG3BMV ('78)	2,445,366	402
28	VP5WW ('78)	2,043,486	321
AB	K2SS ('78)	2,527,044	388

OCEANIA

1.8	No Entrant		
3.5	VK3XB ('75)	540	10
7.0	ZL4BO ('73)	187,884	102
14	DU1FH ('71)	1,264,640	260
21	ZL2ACP ('78)	956,208	264
28	YB0ACT ('78)	1,784,079	297
AB	VK9GN ('70)	2,057,160	316

SOUTH AMERICA

1.8	No Entrant		
3.5	YY4YC ('76)	739,468	223
7.0	YV5CVE ('76)	671,160	255
14	PJ9JR ('71)	2,385,192	348
21	YV5CVE ('78)	1,947,996	306
28	CW3BR ('78)	3,203,514	361
AB	PJ9JR ('70)	2,972,826	317

Multi-Op Multi-Xmtr

AF	9E3USA ('69)	2,398,192	296
AS	UK9AAN ('78)	10,702,776	532
EU	OG1AA ('78)	6,629,483	497
NA	VC7WJ ('78)	9,389,696	436
O	KG6FAE ('78)	1,483,398	193
SA	CE6CA ('69)	3,341,180	340

CLUB RECORD

WESTERN WASHINGTON DX CLUB ('78) 13,256 472

WPX (Prefix) RECORD

UK9AAN ('78) 532

QRPp RECORD

4T8V ('78) 397,800

CQ WORLD-WIDE WPX/SSB CONTEST ALL-TIME U.S.A. RECORD HOLDERS

Single Operator

1.8	W8LRL ('78)	4,914	63
3.5	W1CF ('77)	460,908	186
7.0	K6JAN ('75)	270,972	117
AB	K2SS ('78)	2,527,044	388
14	K4VX ('75)	943,824	336
21	N6CW ('78)	2,104,914	322
28	K5JA ('78)	1,007,774	302
QRPp	W8ILC ('78)	353,466	269

Multi-Op Single Xmtr

	K4VX ('78)	4,150,443	519

Multi-Op Multi-Xmtr

	WB6GFJ/6 ('72)	1,745,272	269

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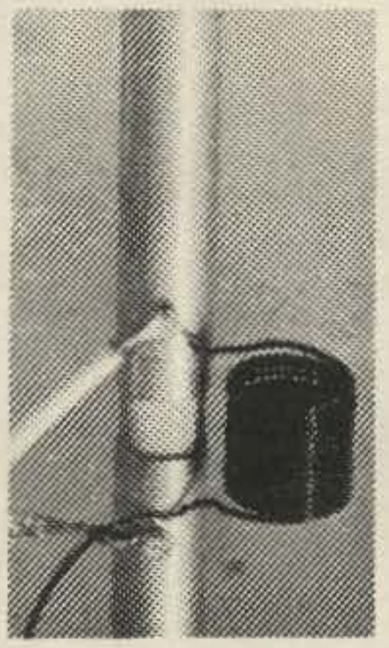
Model HF3V - - Automatic bandswitching 80-20 meters.

May also be used on 10 meters with low VSWR. Same rugged construction as models HF5V-II and HF4V-II. Will not operate on 15 meters without a tuner, but specifications are otherwise identical to those of model HF5V-II except as noted below. Comes complete with mounting post, base shunt inductor for d.c. grounding, RG-11/U matching section, and connectors for PL-259 and any length of 50-53 ohm cable.

Shipping weight: 10 lbs./4.5 kg.

Height: 25 ft./7.5 meters

$72.00



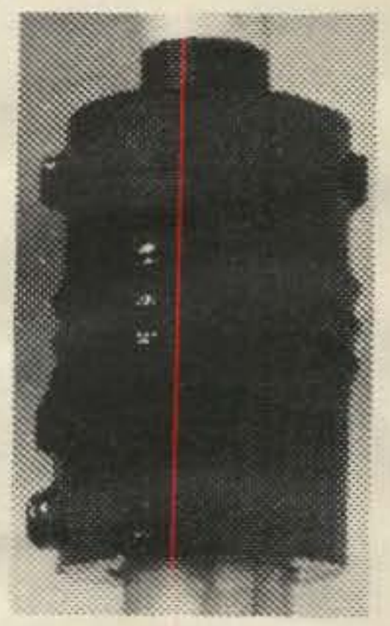
Model HF4V-II - - Automatic bandswitching 40-10 meters.

Entire radiator length is active on 40, 20 and 10 meters (full size quarter-wave resonance on 15 meters). Same construction and 40-10 meter specifications as model HF5V-II except as noted below. Comes complete with mounting post, base shunt inductor for d.c. grounding, RG-11/U matching section, and connectors for PL-259 and any length of 50-53 ohm cable.

Shipping weight: 9 lbs./4 kg.

Height: 25 ft./7.5 meters.

$72.00



$94.00

Low-profile antennas for mobile home parks and other restricted height areas! Same quality construction and 80/40 meter resonator circuits as used in the larger HF models; traps for 10 and 15 meter operation, but entire radiator length is active on all other bands. Both models complete with mounting post, base shunt inductor for d.c. grounding, and socket for PL-259 coax plug. May be ground or roof/tower mounted.

ELECTRICAL AND MECHANICAL SPECIFICATIONS:

Model HF5V-S - - Automatic bandswitching 80-10 meters.

Shipping weight: 9 lbs./4 kg.

Height: 16 ft./4.8 meters

Power Rating: legal limit SSB/C.W. 20, 15 and 10 meters; 1200 W PEP/500 W C.W. 40 meters; 500 W PEP/250 W C.W. 75/80 meters.

Feedpoint impedance: nominal 50 ohm all bands.

VSWR at resonance: 1.5:1 or less all bands.

Bandwidth for VSWR of 2:1 or less:
10 meters - - 1500 Khz; 15 and 20 meters - - entire band; 40 meters - - 150 Khz; 75/80 meters - - 30-50 Khz.

Wind survival rating (unguyed): 80 m.p.h./128 km.p.h.

Model HF4V-S - - Automatic bandswitching 40-10 meters.

Shipping weight: 8 lbs/3.6 kg.

Height: 14 ft./4.2 meters

Except for operation on 75/80 meters, all other specifications are identical to those given above for the HF5V-S.

$68.00

BUTTERNUT ELECTRONICS CO.
ANTENNAS

HF5V-S HF3V

CIRCLE 14 ON READER SERVICE CARD

HF4V-II HF4V-S

This month by

ROD LINKOUS, W7OM

DX

News of communications around the world

Have you ever wondered why DXers continue to reply to QSL cards received, even when they already have over 500 cards from your country or state? What is the motivation? I asked a DX friend that question. His reply was simple, yet very revealing.

The Golden Rule of QSLing

He answered "I remember how important those first DX cards were to me, now I am returning the *pleasure*." It seems to be a common bond among most DX QSLers to do unto others as you would have them do unto you.

With well over 5,000 Japanese JA cards, I can still remember the pleasure of receiving those very important five JA cards for 5BDXCC. In return, maybe some of those hundred odd cards I send to JARL each month will be a new Japanese DXer's first USA, first USA on a new band or simply a new state or country contact.

Like most DXers, I do not send my card out unless I want a card in return. Likewise, when I receive a big batch of QSLs from the bureau, I treat them the same way. The DXer who sent the card really wants mine. What a compliment! Granted, there are those who QSL everyone, but higher postage rates are thining their ranks fast.

So my DX buddy was really on target. It is the Golden Rule of QSLing that keeps the bureaus full and the cards coming back from the not-so-rare new ones.

I am reminded of a short note from one of Oceana's most active DX contesters. He wrote "The contest was great sport. Yet, I sometimes dread the big pile of QSLs coming as a result. The high cost of QSLing is becoming even higher. Then I remember how important the first DX cards I received were. It is at that point that I realize the QSL cards signify the real importance of the QSO. The cards say Thank You."

We are indeed fortunate in DXing for the DX QSL bureaus. They reduce QSLing costs to where almost all can afford to QSL. But we are really lucky for those DXers, who continue to reply to our requests for a QSL to confirm a new one. To those DXers and the DX QSL managers, we give a big Thanks!

The Big Challenge

As previously announced, the big challenge in DXing is here—five band WAZ. It may be a while before a top DXer can claim the prize—the first 5BWAZ. But the band activity in pursuit of the 5BWAZ Honor Roll began early in 1969 when 5BDXCC came into being.

Like 5BDXCC, the 5BWAZ challenge is one of skill and dedication. It is a significant achievement to work 100 countries on five different bands. But that means 100 out of a possible 319. Location is often a key to success, (some say) because a specific QTH may be in the midst of the multiple nations and thus many countries are short haul and very active.

However, there is a significant difference with WAZ on five bands. It means you need *all* of the forty zones on each band. No one has a real distinct advantage of location. The advantage lies in the station and its operator. So, if you wonder why there is all that new interest in zones 3, 4 or 5, it's because of the Big Challenge-5BWAZ. Any bets on who makes the 5BWAZ Honor Roll first?

This should get the big guns off of 160 meters and back on 75 and 80.

Desecheo

Desecheo is a small 360 acre island located in the Mona Passage

The CQ DX Awards Program

S.S.B.

612	K9QVB	618	K1RAW
613	W2CC	619	DK3YY
614	XE1RX	620	DL7JK
615	K9MD	621	VK4VC
616	WB4FOT	622	WD5CBA
617	OZ4RP		

C.W.

325	WD8AHS	327	DL7JK
326	DL3IA	328	9H1ED

S.S.B. Endorsements

310	WA2RAU/319	275	N2SS/284
310	W2TP/318	250	W2CC/266
310	I0AMU/316	250	VK4VC/265
310	W9JT/315	200	WB0RTZ/221
310	DJ9ZB/310	150	W9RY/190
310	ZS1LW/310	150	OZ4RP/155
310	W0SD/303	150	K0GT/150
300	WB6DXU/302	150	WB6NJW/150
300	W9SS/300	28 MHz	K1RAW
275	K8PYD/294		

C.W. Endorsements

275	N6CW/292	150	WD8AHS/150

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

5632 47th Ave., SW, Seattle, WA 98136

Terry Newton, K7CHT on a recent trip to Europe visited two of the world's most famous DXers. Both have given many a new country. Standing on the balcony in front of the famous Vatican quad is Father Ed Amram, HV3SJ. Seated is Mario Graziami, M1B in San Marino.

about 13 miles off the western tip of Puerto Rico. It is in the Caribbean Sea, in the passage between the Dominican Republic and Puerto Rico. The island is uninhabited, except for a few wild goats, a small colony of monkeys, and a lot of birds and land crabs.

The island was discovered by Christopher Columbus in 1493. The administration has changed hands a number of times since then and is currently administered as a National Wildlife Refuge under the auspices of the U.S. Department of Interior.

Trespassers are subject to deportation to the Dominican Republic, unless they can prove U.S. citizenship. In that case, they are subject to trial in the federal courts in San Juan, Puerto Rico. It has been rumored that punishment for unauthorized entry to the island has been severe.

In April, 1976, Dave, KP4AM, requested country status for Desecheo from the ARRL. Unaware of that request, Bill, KP4DSD, made a similar request about a year later. In the meantime, Dave and Bill have joined forces in a single effort to organize a DXpedition to Desecheo.

Before Dave and Bill could activate Desecheo, Bob Dennison W0DX and John Ackley KV4KV put the island on the air. They were unable to spend 24 hours each day on the island (sun up to sun down only). Dave and Bill plan to activate the island around the clock giving more amateurs a chance at the latest new country. With luck this item will be out of date at press time by a DXpedition.

DX Extras

DE H44DN BT All amateurs located on the island of Guadacanal, are in Honiara, the capital (Solomon Islands.) The following are active:

H44BT Barry Fiffany
H44DX Wes Elton
H44CF John Fitch
H44DN Dave Newman

I now have a two element quad at 41 feet. AR

DE KL7AF BT The Alaska DX Association has 50 charter members. Their first officers are:

President	Ron Wenstrom	AL7J
Vice President	Tony Smaker	KL7AF
Secretary/ Treasurer	Dave Cloyd	KL7IYH
Activities Manager	Bill Ward	KL7JFJ

The new Alaska DX club cards are starting to show. They intend to give us a lot of Alaskan DX activity in the DX contests. AR

DE W4DZZ BT I wrote to your DX column for possible QSL information on two stations I worked in 1962 and 1964. You supplied one. A CT4 read of

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with **CQ** master prefix list. Scores are based on the current prefix total regardless of an operator's all time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed in "inactive" until next up-date.

Mixed

1745 W4WV	1350 DJ7CX	1095 K6ZDL	923 K5DB	803 N6JM
1683 K6JG	1350 K2VV	1094 WA0KDI	918 YU1ODS	793 W6ANB
1651 F9RM	1302 PA0SNG	1063 W8CNL	906 W3YHR	791 IT9AGA
1606 YU2DX	1258 K5UR	1062 DL1MD	902 K6DT	782 K8LJG
1512 VE3GCO	1254 W9FD	1055 I6SF	872 DL1CF	782 K2ZRO
1476 ON4QX	1250 WB4KZG	1028 W6ISQ	859 W4BYU	782 YU4EBL
1475 W2NUT	1229 AA4A	1025 N4NO	855 WA2AUB	755 YU2CBK
1451 W3PVZ	1208 N6CW	1020 I0JX	849 G3DO	750 K8UDJ
1433 W9DWO	1200 N6AV	1016 SM7TV	848 I3ANE	749 WA5LOB
1428 W7LLC	1181 W8ROC	1015 W0SFU	831 JA1AG	749 CT1LN
1428 N4MM	1153 N2AC	1008 WA1JMP	827 JH1VRQ	735 PY4AP
1428 W2NC	1139 N6JV	1000 SM6DHU	814 PY4OD	733 K0BLT
1425 YU1BCD	1123 I2PHN	960 K4KQB	811 W9WHM	713 WA6EPQ
1384 W4BQY	1120 YU2OB	950 W4IC	811 YU3EY	706 PA0VB
1368 W8LY	1107 W0AUB	949 WA6TAX	811 W6NJU	705 UA3FT
1358 W4CRW	1100 YU1AG	938 W0SD	807 W9ZTD	610 WB8ZRV
				605 I4BFY
				600 WB9CGL

S.S.B.

1555 W4UG	1107 ZL3NS	923 CT1PK	783 K8SQE	653 I4LCK
1547 F9RM	1100 K2VV	909 PY3BXW	765 G3DO	626 WA2AUB
1505 I0AMU	1086 HP1JC	900 WB4KZG	765 W2NC	623 ZP5RS
1415 K6JG	1059 WB4SIJ	896 DJ7CX	747 WA5LOB	613 CR7IK
1374 I0ZV	10344 K5UR	889 OE2EGL	720 W6YMV	
1295 I8KDB	1033 DL9OH	884 W0YDB	719 YU1ODS	
1250 N4MM	1031 DK2BI	881 W3YHR	717 W4BQY	
1231 K2POA	1017 F2MO	863 N4UU	708 WB6DXU	
1200 I8YRK	975 WA6TAX	822 W6RKP	702 I0MBX	
1158 I4ZSQ	967 I2PHN	818 W3DJZ	702 CX2CN	
1142 W9DWO	950 N2SS	817 OK1MP	686 JH1VRQ	
1137 YU1BCD	948 DL1MD	801 YU1AG	680 N2AC	
1124 PA0SNG	941 WB2NYM	800 W4IC	666 PA2TMS	

C.W.

1406 W8KPL	1101 N6JV	964 K5UR	790 SM5BNX	660 DL1MD
1350 W8LY	1044 W4BQY	950 K2VV	768 W4BYU	649 KH6HC
1297 ON4QX	1044 G2GM	913 N4NO	754 W4IC	649 K2ZRO
1296 K6JG	1031 DJ7CX	905 N4MM	716 YU1ODS	647 W9OYZ
1279 DL1QT	1030 W3ARK	902 YU1AG	703 I5IZ	629 K1LWI
1255 W2NC	1012 VO1AW	829 I6SF	700 WB4KZG	623 JE1JKL
1220 K6XP	1006 WA2HZR	825 IT9AGA	698 OK2BLG	600 OK2QX
1165 YU1BCD	1006 N2AC	824 W6ISQ	694 PY4OD	600 VE4OX
1158 W9FD	976 WA0KDI	812 K7ABV	693 OK2DB	
1126 W2HO	973 K6ZDL	809 VK3AHQ	676 SM0GMG	
1104 N4UU	972 W2AIW	800 VO1KE	668 LZ1XL	

The activities in Haiti have increased recently due in a large part to the Radio Club of Haiti. (L-R) Daniel Mario Craam, HH2MC is the club president. Claude LeBreton, HH2CL, serves as the treasurer for the club. The cause of some very large twenty meter phone pileups is one of the Radio Club of Haiti's, advisors Marylise Craan, HH2YL. Terry Dilahuntz, HH2TD is also a club advisor. They not only have provided many a new country but they have also assisted DX-peditions with obtaining operations in one of the Caribbean's most colorful countries. (The photos are courtesy of Daniel's QSL manager, Morris Johnson, WA4AKU.)

A recent receipient of a CQ DX award is Luigi Ladi, I3LLD. The call at the operating table indentifies the operating position where Luigi has worked and confirmed 295 countries.

my plight in the column and knew of CR7CD. It seems he had moved to Portugal and he even sent me his address. I wrote a letter with great anticipation to the missing CR7. In about two weeks I received the nicest letter and a QSL confirming our 1964 contact. Tony said all logs with the exception of two were lost in the "quick" move from CR7 land and my contact happened to be in the saved logs. As you know, CR7 QSOs are pretty rare at this time, so I was grateful for this one.

Tony has gotten back on the air and after several letter exchanges; we have become radio friends. AR

Tricks of the DX Trade

Rolff, PY1RO, sends along some very valuable tips on International Reply Coupons (IRC). IRCs have only limited value; for example in Brazil, *no* post office will accept the following IRCs:

IRCs without a printed price,
IRCs without a postmark,
IRCs with cancellation on the right hand side,
IRCs with holes produced by staples,
IRCs with folds,
IRCs of the older form,
IRCs postmarked over four years ago,
IRCs with stamps for added value.

I know this sounds ridiculous, and it is, to some extent, but that is the way it is. The number of IRCs received last fall in at least one of these categories is tremendous.

Also, many countries have had large increases in inflation and in Brazil postal rates go up sharply (about 50%) the first of every year. Those sending SASEs should make sure they send stamps at the current rates. Those that send an SAE plus an

IRC should never expect an air mail reply. Two IRCs are required for most countries for return by air. *(ed. When sending that SAE, use a plain envelope, not the air mail type just in case you didn't send enough postage. It is always better to get the card late than not at all because your air mail envelope had only surface postage and therefore ended up in the dead letter file.)*

CQ DX Awards Program

In the November column we listed the CQ DX Awards checkpoints. Since then we have had some additions:
Stan Parsons, VE1RY
Eastern Canada

Howard Martin, VE7AFY
Western Canada

Jack Gutzeit, W2LZX
Long Island DX Association
We also had a big goof. Max Gilliland, W0KU, the Mile-Hi DX Association checkpoint listing was the victim of a two finger typist. Sorry Max!

DX Splatter

Five members of the Clipperton DX-pedition operated FG0/FS on St Barthelemy during the *CQ* Worldwide DX Contest. Inquiries have been sent to the DXCC on new country status—(WCDXB). LU3ZY on South Sandwich is real! The station is on Tule. They have a rhombic.—(LU1DZ). KA1NC on Minami Torishima is active along with KA1BQ.—(VERONA). Congo Republic is now active. Look for TN8AG.—(VE3HGN). Larry and Sandy are the operators of VE1MTA on Sable Island. They will operate as work schedules allow.—(Long Skip). The 3Y0BZ license for the operation from Peter I Island is valid for the

Aldo Baroni, I2SYG, proved you can work a hundred countries with dipoles and the DXer's greatest ally-Patience. The impressive wall paper attests to his DX-ing skill.

The proud holder of the CQ 2XSSB award is Laci Szalo, HA0HW. Licensed since 1972, he has 192 countries. He is currently chasing DX with QPP power.

Tony Vigorita, WB3HAZ is hasty to acknowledge the help he has got from the old timers in working over 150 countries since becoming a novice in April 1977. It took only a year to get his DXCC. He especially is grateful to the fast help of the QSL managers like W3HNK and WA3HUP. Tony is taking a breather here with Pat, WB3FIZ.

Alber Seis, DK2BL is one of the big signals from Leiblfing, West Germany. With mono band beams Albert has successfully obtained the impressive awards including 5BDXCC.

The WPX Program

Mixed

680	YU2AAU	684	LZ2SC
681	GU4CHY	685	YB0ABV
682	I5ZUF	686	N5TV
683	WB8ZRV	687	K2UFM

S.S.B.

1085	WA2YUH	1091	EA8LK
1086	K9RU	1091	WA4OIB
1087	WB6NJW	1092	N5TV
1088	WD8CRY	1093	K9MD
1089	W5OHF	1094	I0JX
1090	VE2DYL	1095	K2UFM

C.W.

1733	DK6BU	1737	F9XL
1734	GU4CHY	1738	F6KDT
1735	OK3FON	1739	DK3NP
1736	SP3BLP	1740	I0JX

WPNX

125	WD0AYT	127	WB3HGE
126	WD9FPQ	128	WB1FPF

Endorsements

Mixed: 400 YU2AAU. 450 W6OJW. 500 W6YMH, HA0HW, LZ2SC, YB0ABV. 550 I5ZUF. 600 WB8ZRV, K2UFM. 750 I8RFD, YU2CBK. 850 WA2AUB. 900 W0SD. 1000 K5DB.

SSB: 300 K9RU, W5OHF, WB6NJW. 350 WB8CRY, VE2DYL, EA8LK, JH3XCU, I6PQO. 400 I3GRX. 450 K9MD, K2UFM. 500 I0JX. 1250 K2POA.

CW: 300 GU4CHY, SP3BLP, F6KDT, DK6NP, WA4OIB. 350 I5YGB, SM6AYM. 400 DK6BU, JA3ARM. 450 DK7XX, W3OGY. 500 DK7XX, VE7CNE, F9XL, I0JX. 550 VE3HLC. 600 I1TLA, W1DMD, HP1AC. 650. DL7MQ, JA2IU, WA4QMQ. 750 KH6HC. 950 N2SS. 1000 DL7CS. 1100 N6JV.

10 meters: WA2AUB, N6JV, DL7CS, I0JX, K2UFM, WA2AUB.
15 meters: YU1NFR, I0JX.
20 meters: YU1NFR, I0JX, N4YB.
40 meters: W4BQY, DL7CS, I0JX.
80 meters: KL7AF, YU1NFR, EP2TY, DL7CS, I0JX, N2SS.
Africa: I0JX.
Asia: YU1NFR, JH3XCU, DL7CS, I0JX, N2SS, YU2CBK.
Europe: WB3CQN, YU1NFR, I0JX.
No. Amer: OK1AEH, OK1IQ, WA4OIB, DL7CS, I0JX, YU2CBK.
Oceania: DL7CS, I0JX, N2SS.
So. America: DL7CS, I0JX.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to "CQ WPX Awards", 5014, Mindora Dr., Torrance, Calif. 90505, U.S.A.

period January - December 1979—(G Watt). By now Horace Gray, 9M8HG, should be back on the air after surgery—(WCDXB). Glen, KA1IW, is on from Iwo Jima/Ogasawara. Should be active for several months.—(Long Skip). VK2AGT is on Lord Howe. (Long Skip) A DX newsheet is published by Grupo Argentino DeCW, $6 U.S. For further info write Alberto Silva, LU1DZ.—(GACW). Tom, ZD8TM, has closed down and now is active as ZD7WT. He likes CW. (VERONA). The Chatham Island crew operating as ZL3HI/C consisted of Carol, ZL1AJL; Jan, WA1YQW; Marion, ZL1BKL; Chuck, ZL1ADI; Jim, ZL4NF; and Ron ZL1AMO. Marion and Carol were with the recent Kermadec DXpedition.—(N2CW). A DXpedition known as "Beata Operation" by the Dominican Ham Radio Group will activate Beata Island as HI1. Beata Island is a restricted area, under the administration of the Dominican Marine Corps. A special diploma is available for working nine HI zones. So working Beata Island is a key.—(HI8MFP). Carlos, PY1DHG, is very active on ten and has a supply of QSLs for those who need one.—(PY1DHG). I am no longer the QSL manager for FP8DX, FP8ML, and FP8HL. All QSLs should now be forwarded to the CBA or via the REF.—(K9OTB). Stephen Lowe, EP2SL, has been QRV from Tehran since September 1978. He is active on all bands 10 - 160 SSB. The EP QSL bureau is closed. Use QSL managers or direct.—(G3XCS). The Virginia Century Club membership is growing; just passed 40 members. If you are in the Virginia Beach area contact WA4OUF for details.—(VCCB). ZF2AI is W0CW of the Kansas City DX Club.

Very social gang when not DX contesting.—(K0CS). Bruno, FB8XS on Kerguelen is being relieved by F6FLZ who expects to be assigned the next sequential call sign.—(LIDXAB). S9DX in Sao Thome is D4CBS. Angelo will be on for a few months and will handle his own QSLs.—(LIDXAB). The OLD OLD Timers Club elected DXer W6MLZ as president. Congratulations! (HR Reports) The KH6XX gang on during the SSB segment of the CQ worldwide was the Western Washington DX crew.

The WWDXC also was behind the gang signing FG0EID/FS7.—(Totem

The WAZ Program

Single Band WAZ

15 Meter Phone

9...I0AMU
10...I1YG

20 Meter Phone

173...WB5LBJ/DU
174...K8NW
175...W7JUO

20 Meter C.W.

58...K4IQN
59...W0WP

All Band WAZ S.S.B.

1528	K0GT	1534	DL7UX
1529	I2MQP	1535	DL2AD
1530	WB5LBJ/DU	1536	DJ2OW
1531	DK5QK	1537	OZ4RP
1532	WB0MSZ	1538	W3NZ
1533	VS6FB	1539	WA5YMW

C.W. Phone

4368	K9FD	4376	W0IZ
4369	W0VX	4377	K0LUZ
4370	K1HBX	4378	DJ4AX
4371	K6UD	4379	WD8EOJ
4372	DK5VO	4380	DL1TL
4373	DJ6BN	4381	KL7HCC
4374	SM7UV	4382	JA1MDK
4375	PA0GIN		

The complete rules for WAZ are found in the May, 1976 issue of CQ. Application blanks and reprints of the rules may be obtained by sending a self-addressed stamped envelope to the WAZ Manager, Leo Haijsman, 1044 Southeast 43 Street, Cape Coral, Florida, 33904. Applicants forwarding QSL cards direct to the the WAZ Manager should include sufficient postage for the safe return of the QSL cards.

G'Ampolo, I2FGP shown at home with his two harmonics, Roby 11 and Sabry 7. G'Ampolo has operated at 601FG on SSB and his next operation from there will be a CW operation. QSLs for the 601FG operation go to: G.P. Forti, I2FGP via G. de Ruggiero, 33 20141 Milano, Italy. (Photo courtesy Jack, W2LZX)

A SWLer of note is Brian Russell, BRS-33915. Due to ill health, Geoff Watt had to restrict the distribution of his famous newsheet. Brian came to our rescue and now forwards Geoff's newsletter to those who desire to keep up with DX from the European post. Brian's address is given in the QSL information for your query.

DX by satellite is getting more popular and now includes some of the better known rare DX. Shown at the mike is Felix, FK8AC. He is very active on Oscar and the HF bands (photos by K6JG).

Taboloid). 4U1UN chief op. HB9RS/W2 is distressed at the malicious stateside QRM that occurs during his overseas session on 14,240 KHz. at 2100 UTC. As a result, operations have been curtailed. Pass the word that 4U1UN is supported by the members of the UN ARC, *not* by a UN budget. The 4U1UN crew did a great job during the SSB CQ worldwide giving many a new country.—(LIDXAB). The North Florida DX Assn. is both an active and very above board DX club going through some recent charter changes. (ed. noted from NFDXA News) Dr. George Collins VE3FXT is on his way back to Africa; looks like some more good ones.—(Long Skip.) ZS1TD is the operator of ZS2MI on Marion Island. He is not interested in DXing.—(ZS5PG). With the recent decline in the U.S. dollar, many stateside QSL managers are wondering why the JA DX gang are not sending 200 yen (approximately $1.10 U.S.) instead of the very expensive JA IRCs.—(annonymous). (ed..Most large U.S. banks will gladly exchange the Japanese yen.) The W7PHO cor-

ner, 14,225 mhz. sports the rare ones—YI1BGD, ST0RK and many others. Most hope to escape the pileups and get a little control from the Iron Fist. Yet the list question stirs. The way Bill runs the show with the assistance of many others it isn't a list show. Funny the only ones complaining really are the DXers who are trying for their multiple contact with the rare stations while keeping the new comers from working a really rare country.

This corner of the column is a new idea using a version of Rod Newkirks, W9BRD, style. With your inputs it will grow.

OOPS I Goofed

In the July column, a photo of OK1MP had the wrong caption. Milos is one of Czechoslovakia's most active DXers and a member of CQ's DX Honor Roll. Milos Prostecky, OK1MP, is also on the WPX Honor Roll, the recipient of the WPX Award of Excellence, USA-CA-500, 5BDXCC,DX-CC on RTTY and about 200 other certificates.

Most of the caption errors come when two captions get reversed. But this time we really erred by including the wrong caption when it went to press.

The amateurs of Xolmsk City were host of Ivan Primak, UA0FAW, from Kunashir Island (Kurile Island). The group represents some of the most active DXer in Asiatic Russia (l to r) Rudolf Kozyrer, UA0FAC; Victor Melnikoo, UV0EX; Ivan, UA0FAW; Ivan Bulan, UA0FBF; Val Baranovieb, UA0FBZ; and Valentin Kozinyi, UA0FCR. (The photo courtesy of Victor via W7PHO) (Translation by K7CW)

So Long - Welcome Back

With the November DX column in *QST,* Bill Lowry, W1VV, put away the pen due to pressures of his regular job. Bill will be missed. He did make a major point in his farewell column that I would like to share for those who might have missed it.

"Based on the correspondence received, I believe many readers are apparently unaware of the fact that the DX editorship historically has *not* been a fulltime position... the editor typically has a regular occupation elsewhere, and all the correspondence, writing and work associated with the column are done during his spare time. As a result, the news and QSL information aspects of the column depends heavily on contributions from readers. Thus, I am extremely grateful to all who have helped me this year by supplying information and sending me friendly letters of encouragement and support." (QST)

Bill said it well. Our thanks to Bill for the job well done! Welcome back to the DX pileups, and a big thanks to our contributors as well.

73, Rod, W7OM

The DXer at the mike is Tom Stiehl, PA2TMS. While giving many a PAZ contact, Tom has worked over 200 countries from Texel Island.

QSL Information

This month's contributions are from the *The QSLer:*

AP5HQ—to N0RR
CE0AE—to WA3HUP
CN8AK—to WA3HUP
CN8CW—to WA3HUP
CT1BY—to WA3HUP
EL1I—to VE1RU
EP2SL—to G3XCS
EP2ZZ—to WA4FVT
F5LO—to K9KXA
FG7TD—to W5RU
FG0DDB/FS7—to W3HNK
FG0EID—to K7GEX
FG0EID/FS7—to K7GEX
FG0GEX—to K7GEX
FK8BG—to W7OK
FK8CR—to W7LLC
FO8DP—to N7RO
FO0PJM—to WA6PYN
GD3RFD—to W5MYA
H44AK—to W7OK
H44CD—to W4BAA
H44KM—to WA6AHF
HH2DX—to W4ORT
HI8XBH—to W0GX
HK7UL—to N7RO
HK0COP—to W9UCW
HP1KC—to W0GX
HP1XYA—to W3HNK
HV3SJ—to W6KNH
HZ1BS—to DJ9ZB
J3AAD—to W5MYA
J3AAE—to W5MYA
J3AJ—to W7LLC
J28AZ—to I8JN
JY1—to WA3HUP
KA1BQ—to I8CZW
KA1IW—to K8DYK
KA1NC—to K4JEX
KG6RE—to K7ZA
KG6RI—to K7NF
KG6SW/KC6—to W7OM
KL7NA—to W3HNK
KP4AST—to W3HNK
KP4KK—to WA3HUP
LU3ZY—toLU2CN
LZ2JF—to WA4WTG
M1B—to WA3HUP
OA4JN—to K1ALP
OY5J—to WA3HUP
P29DP—to W7OK
P29NKV—to WA7ILC
PJ8UQ—to W3HNK
PJ8YL—to W3HNK
TA2SC—to WA3HUP
TF2KJ—to K8LJG
TF0DF—to K4SAK
TU2EP—to K1ALP
TU2GA—to K9KXA
TU2GK—to K9KXA
VP1RY—to W4SME
VP2AR—to K8LJG
VPAYL—to K8LJG
VP2KA—to W7OK
VP2KN—to W7OK
VP2LEX—to K7GEX
VP2LY—to VE3EWY
VP2SF—to W7OK
VR1AF—to W7OK
VR3AH—to WB4PRU
VR3AR—to W7OK
VR4AK—to W7OK
VU2KV—to W6KNH
W1GNC/PJ2—to AB1U
W1GNC/VP9—to W1GNC
W0DX/D—to W1GNC
WA4UAZ/HC1—to WA4QMQ
WA7SIN/4X—to W3HNK
WB5LBJ/DU6—to K7LAY
WB8VLG/DU2—to W3HNK
YB9ADE—to WA7ILC
ZB2DV—to G4EMR
ZE6JJ—to K6ZDL
ZF2AR—to W4KA
ZF2BC—to WD4AXM
ZF2BP—W4YKH
ZF2BY—to K4VYN
ZK1CY—to W6KNH
ZL3HI/C—to N2CW
ZL3HI/C—to ZL1ADI
ZM7AH—to WB7UJR
ZM7MM—to WA6PYN
ZP5CF—to W3HNK
ZP5YW—to WA3HUP
ZS1XR—to N7RO
ZS4PB—to N7RO
3A2CP—to WA3HUP
3D6CP—to N7RO
4N2EC—to YU1JAS
4X4FQ—tp K2BYB
4X4NJ—to WA4WTG
4X4UF—to WA4WTG
4X4VB—to WA4WTG
4Z4DX—to WA4WTG
4Z4BG—to WB4FSV
4Z4EV—to WB4FSV
4Z4JW—to K2BYB
5W1AB—to W4KA
5W1AU—to W6KNH
5W1BH—to WA6PYN
5Z4RH—to WA4WTG
7X2BK—to WA3HUP
8P6AH—to WA4WTG
8P6BN—to WA4WTG
8P6CP—to WA4WTG
8P6IB—to WA4WTG
8P6JP—to K7GEX
8P0A—to WA4WTG
9HIED—to WA1YYX
9J2JN—to WB2IZN
9J2SJ—to N8JW
9J2TJ—to N8JW
9K2FX—to W4KA
9Y4VV—to K9KXA

BRS-33915; Brian Russell, 163 Halton Road, Runcorn. WA7 5RJ, Cheshire, England

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The "Story of The Month" for February, as told by Hank is:

Henry A. Freiberger, W5VD (ex-W5ULN) All Counties #49, 12-15-70

"I was first licensed in December 1951 as WN5ULN/W5ULN, Novice/Technician class and operated 80 meter c.w. until I could get the 13 wpm. This came early in 1952 and at least I could fulfill my dream—get on 40 meter c.w. The rig was a 10 watt 6L6 oscillator built on a wooden frame with sucker sticks for coil forms. When I worked KG6 with this rig, it was forever to be remembered.

Special Honor Roll
All Counties

#196 Wesley G. Carr, WB4TNY 10-10-78
#197 Michael E. Gilmore, K7CLO 10-10-78
#198 George A. Leidheiser, WA0BPE 10-21-78
#199 William A. Grew, W9GBI 10-28-78
#200 Robert S. Hanson, W0KMH 11-3-78
#201 Glenn F. Coleman, K4IUO 11-6-78
#202 Harve J. Epton, VE1DI 11-6-78

"I stayed on c.w. until I passed the Extra Class and Second Telegraph tests in early 1954 and then went to phone, c.w. has taken a back seat to date.

"I was introduced to *real* County Hunting by Dave, W4SKI/W5PWG in late 1967 when I innocently asked if I could help relay to a mobile. Dave instantly rewarded me by giving me Net Control of the 20 meter Independent County Hunter's Net! I had been working the net occassionally and picking up a few counties for about 3 months, but not fanatically, as yet. I had ordered the USA-CA Record Books when they first came out, when Wayne Green was still with *CQ* and I was somewhat familiar with the program.

"I started operating mobile on 20 meters after Dave's insistence (he needed some nearby Counties) but first I had to convert my HW-12 to a HW-22 during the Christmas holidays.

"Over a period of time I gave out a lot of counties in my travels. I went on

*P.O. Box 73, Rochell Park, NJ 07662

Hank Freiberger, W5VD.

a South Texas expedition with Uncle Ben, W5HDK and Leo, WA5AEB in mid-1969, after the Mountain Home convention. We sure gave out a bunch! We almost caused an International incident when we signed out for a while and went into XE land for a cool one. The net thought that we had been kidnapped, I think. I wonder if it was our welfare or the next counties that concerned them?

"A year later, Ray, K5RPC and I went on an expedition to cover most of South Louisiana, South Mississippi, North Louisiana and some of East Texas. These were really fun trips to make. I am pleased to find that I have given out all Louisiana Parishes, about 70% of Mississippi Counties, and about 60% of Texas Counties. Many Counties have been given out in several other states as well. Giving is indeed as much fun as receiving!

Hank, W5VD with Rupert, his Vicious Dog.

"I suppose the fabulous WA0DCQ/WA0JKT trip through the midwest in June 1968, really got me interested in mobiling as well as adding so many to my score.

"I really think that my biggest County Hunting thrills were the circumstances surrounding my last two Counties. The next-to-last was KH6HDO who came on the net to ask for me while I was driving down a freeway in San Antonio. I worked him with a 4-2 report, which left me with 1

USA-CA Honor Roll

3000		2000		1000	
WB4TNY	216	W4KFA	325	WB4TNY	498
W1UYL	217	WB4TNY	326	WA0BPE	499
WA0BPE	218	K9DAF	327	W0KMH	500
W9GBI	219	WA0BPE	328	500	
W0KMH	220	W0KMH	329	JR1NRP	1278
K4IUO	221	K4IUO	330	WB4TNY	1279
VE1DI	222	1500		WD8NZE	1280
2500		WB4TNY	382	PA2TMS	1281
WB4TNY	275	K9DAF	383	K2VGV	1282
VE3IR	276	WA0BPE	384	OK2BLG	1283
W7KWI	277	W0KMH	385	WA0BPE	1284
K9DAF	278	K4IUO	386	7X4MD	1285
WA0BPE	279			HB9LP	1286
W0KMH	280			DK3SN	1287
K4IUO	281			AA9S	1288
				W0KMH	1289
				WB4KSQ	1290

to go! I had previously written to him for a possible contact with Kauai, and he graciously came on the net this fortunate time to give me and many others, the rare County. Thanks again, Stan!

"The *"Biggie"* - No. 3079 came about three weeks later when I heard that an Alaskan Net was in session on the band and a Second District (Northwestern Judicial District) station was on frequency. I got off the highway in Miller County, Arkansas and drove out into and Alfalfa field away from power lines and automobile noises. With the diligent help of my good friend John, W4HA, we waited for the net to finish and I got KL7HBC for the last one! Tom QSLed immediately, thanks Tom! In no time at all, Ed, W2GT, had me my last sticker and I became All Counties #49, endorsed All 2XSSB, All 14 MHz. These last two were really no more important than number 1 or number 986, but they sure seem more exciting. Having been at both ends of

last County, I can vouch for this excitement, however!

"I still like to give out Counties as time and conditions permit, but I don't think I'll try to work 'em again. 5BDXCC and 5BWAS seem to keep me busy but I can work states on the County Hunters Net.

"On a more personal note, I have been in radio since getting a commercial ticket in 1942 and working one-way Police Radio Station KPBR on 1714 kHz. A.m. during college at Texas A & M. Several broadcast stations and an Airline ground station construction project in Brazil were next.

"After delayed graduation from college, I worked for power companies as an Electrical Engineer before entering the Two-Way FM Radio sales business where I am still employed.

"My younger son is WB5BBW and the XYL is W5SGE. The older son is in TV Broadcast Remote Pickup business and has no ham ticket. Since he has provided me with a granddaughter, I intend to forgive him, however!

"It is impossible to thank all the good friends who made this facet of the hobby so enjoyable. I'll just say thanks to you, Ed, for co-ordinating the overall program and everyone else from whom I have received the necessary contacts. Thanks *CQ* for your sponsorship, first of all! 73, Hank".

Awards Issued

WOW, the Special Honor Roll started to run wild this month with 7 new ones.

Wes Carr, WB4TNY waited until he had them all and then (after 7 years, 3 months and 2 days) applied for them 500 through all endorsed all A-3.

Mike Gilmore, K7CLO got them all, endorsed Mixed.

George Leidheiser, WA0BPE also waited until he got them all, before sending his application to me.

Bill Grew, W9GBI was issued USA-CA-3000 and All Counties, endorsed all SSB, All Mobiles.

Bob Hanson, W0KMH also waited until he collected them all before applying for USA-CA-500 through All Counties.

Glenn Coleman, K4IUO (ex K8VZW) claimed USA-CA1500, 2000 and 2500 endorsed All SSB, All Mobiles and USA-CA-3000 and All Counties endorsed All SSB.

Harvey Epton, VE1DI added USA-CA-3000 and All Counties, endorsed All SSB, to his fine collection.

Jim Carroll, W1UYL claimed USA-CA-3000 to add to his collection.

Bob Rennie, VE3IR acquired USA-CA-2500.

Russ Fish, W7KWI picked up USA-CA-2500-All SSB.

Bob Thorne, K9DAF obtained USA-CA-1500, 2000, and 2500.

Dick Peterson, W4KFA qualified for USA-CA-2000, All SSB.

USA-CA-500 Certificates, endorsed All CW, went to:

Shigehiro Mochizuki, JR1NRP.
Jerry Van Dyke, WD8NZE.

USA-CA-500 Certificates, endorsed All SSB were sent to:

Thomas Stiehl, PA2TMS (#2 Award to The Netherlands).

The Offshore Radio Cruising Ass'n Award.

Dr. Driss Bendani, 7X4MD (#1 Award to Algeria).

USA-CA-500 Certificates, endorsed Mixed have gone to:

Joseph Schwartz, K2VGV.
Karel Karmasen, OK2BLG.
Edwin Page, HB9LP.
Ladislav Holanda, DK3SN.
David Ramsey, AA9S.
David Klaiber, WB4KSQ.

Awards

Mexico DX Award: This Award is issued by the Mexico DX Club, to licensed radio amateurs and SWLs for confirmation of QSOs with Mexican DX Club Members, located in Mexico. XE applicants need 10 QSOs with 10 different Mexican DX Club members. Zones 1 to 13 (North, Central, South American and Caribbean) need 5 QSOs with 5 different Mexican Club Members. All other applicants need 3 QSOs with 3 different Mexican Club members. Applications with details of the required QSOs and QSL cards must be sent to Mexico DX Club, P.O. Box 21-167, Mexico 21, D.F., Mexico. Only contacts after January 1, 1973 are valid. For safe return of your QSL cards and the Award, please include 10 IRCs (or 2 U.S. dollars).

FO8 Award: This Award is issued by the Radio Club of Tahiti for working 6 different FO8 stations. Send complete log information (no QSL cards, please) and 12 IRCs to: Radio Club de Tahiti, P.O. Box 426, Papeete, Tahiti, French Polynesia. (Thanks to Jean Parker, FO8DF and Ross Forbes, WB6GFJ/FO0 for data).

Offshore Radio Cruising Association Award: This association, based in Seattle, Washington, was founded to promote amateur activity on the part of boaters and to increase non-boating amateurs' awareness of marine mobile activities. ORCA, the acronym of the Association's title, is the scientific name of the killer whale, which is native to Puget Sound.

ORCA Operates two nets on 10 meters. The primary net is a slow-speed code net at 1900 hours Pacific Time Tuesdays on 28,125 MHz. The phone net is a very informal rag-chew affair that meets on most Thursdays at 1900 hours Pacific Time on 28.555 MHz, but ORCA's may be found at other times on this frequency. The basic *ORCA Award* requires 10 points, one contact must be with a marine mobile ORCA station or Master Mariner.

The **Navigator Award:** requires 25 points, including 3 contacts with marine mobile ORCA's or Master Mariners.

The **Master Mariner Award** requires 50 points, including five contacts with marine mobile ORCAs or Master Mariners, or 10 contacts with marine mobile ORCAs.

Point value of contacts is: ORCA or honarary = 1 point.
Charter = 1 point.
First state or country = 1 point.
Navigator = 1 point.
Master Mariner = 1 point.

The basic and senior awards are $1.00 each - for more information and to apply, the certificate manager is WB7BZR, P.O. Box 1078, Seattle, Washington 98111.

Minnesota - St. Louis County Award: Work three (3) stations in St, Louis County, Minnesota. No date, frequency, or mode limitations. Available to SWLs on a heard basis. Send $1.00 and two 15¢ stamps and log information (no QSLs please) to: Wilderness Ham Operators, Certificate Manager, Ron Heruth, WA0WNV, Wyandotte Road, Hoyt Lakes, Minnesota 55750.

Minnesota - St. Louis County Award.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The present sunspot cycle seems to be picking up speed. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 123 for October, 1978. Daily values ranged from a low of 55 on October 5th to a high of 170 on the 14th. The mean level of solar activity observed during October results in a *smoothed sunspot number* of 75 centered on April, 1978. This is an increase of 7 numbers over the level of the previous month. It is very likely that the present cycle will climb past the 115 mark this month. In fact, the Swiss Observatory is predicting a smoothed sunspot number of 132. It seems almost certain, therefore, that the intensity of the present cycle has already exceeded the peak of the previous cycle, which reached a level of 111 during November, 1968.

DX propagation conditions will be excellent on *three* bands during the *daylight* hours of February. *Fifteen* meters is likely to be the best band, with *10* and *20* meters not far behind. Worldwide DX should be possible on all three bands during most of the daylight hours.

During the period from *sundown* to *Midnight* as many as *five* bands may be available for DX. *Fifteen* meters is expected to hold up well past sundown for DX openings towards Central and South America, the Pacific area, and the Far East and Asia. *Twenty* meters should remain open to most areas of the world, but with signals strongest from southerly and western directions. Good DX towards the east and the south should be possible on both *40* and *80* meters, with some openings also possible on *160* meters.

From *Midnight* to *sunrise* DX conditions should be best on *40* and *80* meters, with good openings possible to almost all areas of the world. Fairly good openings to many areas of the world should also be possible on *20* meters during this period, particularly when conditions are HIGH NORMAL or better. Some DX openings should also be possible on *160* meters.

11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for Feb., 1979

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 7, 22	A	A	B	C
High Normal: 5-6, 20-21, 23	A	B	C	C-D
Low Normal: 1, 3, 8-10, 17, 19, 24-25, 27	B	C	D	D-E
Below Normal: 2, 4, 13-14, 16 18, 26, 28	C	C-D	D-E	E
Disturbed: 12, 15	C-E	D-E	E	E

Where expected signal quality is:

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

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

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

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

Beginning late in February and continuing through March and early April, expect considerable improvement in DX conditions between the northern and southern hemispheres. This will result from the affects of the spring equinox period, as the sun crosses the equator in its apparent travel towards northern skies. Improved conditions should be noticeable on all bands from *6* through *160* meters, on circuits mainly between the United States and South America, Africa, Australasia, parts of Asia and Antarctica.

This month's Propagation Charts contain band opening predictions for major DX paths for the period February 15 through April 15, 1979. A short-skip propagation forecast for February appeared in last month's column.

V.h.f. Ionospheric Openings

The big news this month should be the continued DX openings on the *6* meter band. Solar activity is now high enough to expect fairly regular transcontinental and DX openings, particularly when conditions are HIGH NORMAL or better. Signals arriving from directions between northeast and southeast should peak by midmorning. Noontime should be the best period to check for openings from the Caribbean area and from Central and South America. During the afternoon hours the skip will swing around to the sector between southwest and northwest. Exceptionally strong signals can be expected at times. These openings will be due to regular F-layer propagation now possible because of increased solar activity.

Another form of *6* meter propagation, trans-equatorial scatter (TE), usually improves during the spring months. Some TE openings may be possible during February between South America and the southern tier states. The best time to check for these openings is between 7 and 10 p.m. local time.

No significant meteor showers are expected during February, and very little sporadic-E propagation is likely to occur. Best chances for unusual short-skip openings on the v.h.f. bands should result from auroral activity expected during periods of radio storminess. Auroral-type openings on *6* and *2*meters usually range in distance from a few hundred miles up to approximately 1300 miles. They are often characterized by flutter fading and signal distortion. Check the "Last Minute Forecast" at the beginning of this column for those days during February that are expected to be DISTURBED or BELOW NORMAL. These are the days on which unusual ionospheric short-skip openings on the v.h.f. bands are most likely to occur.

73, George, W3ASK

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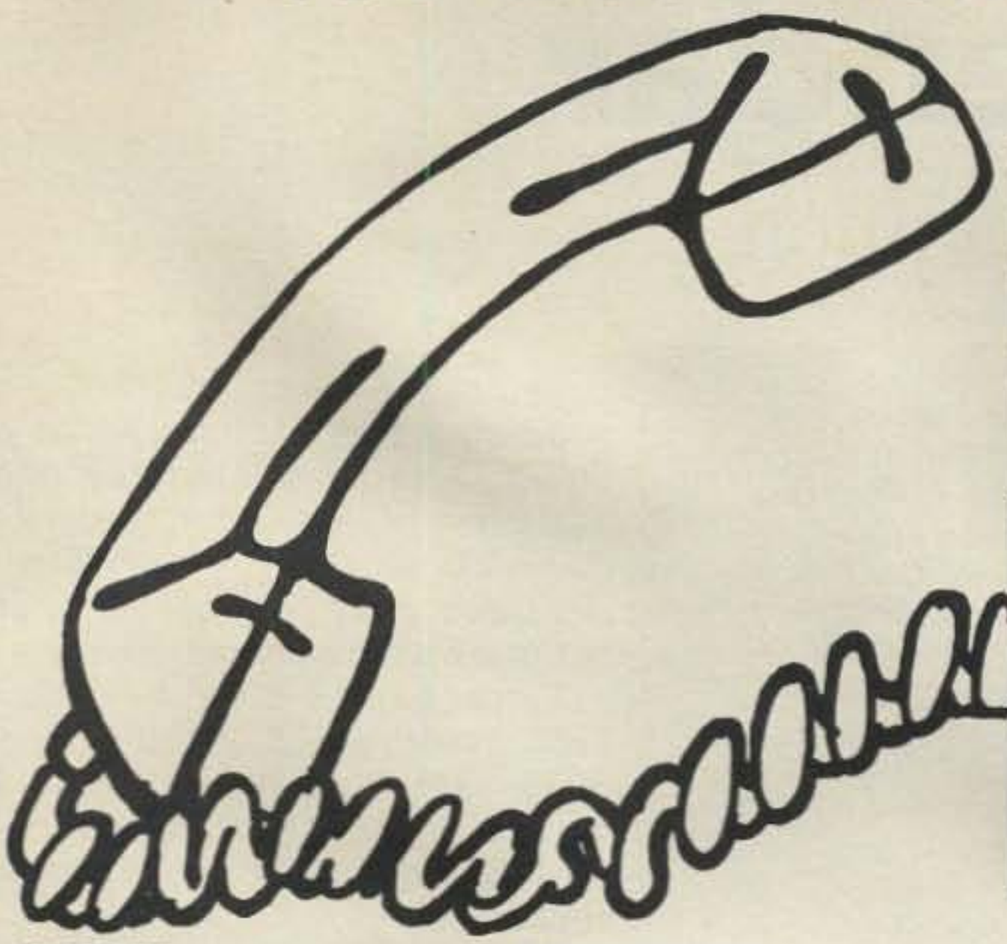

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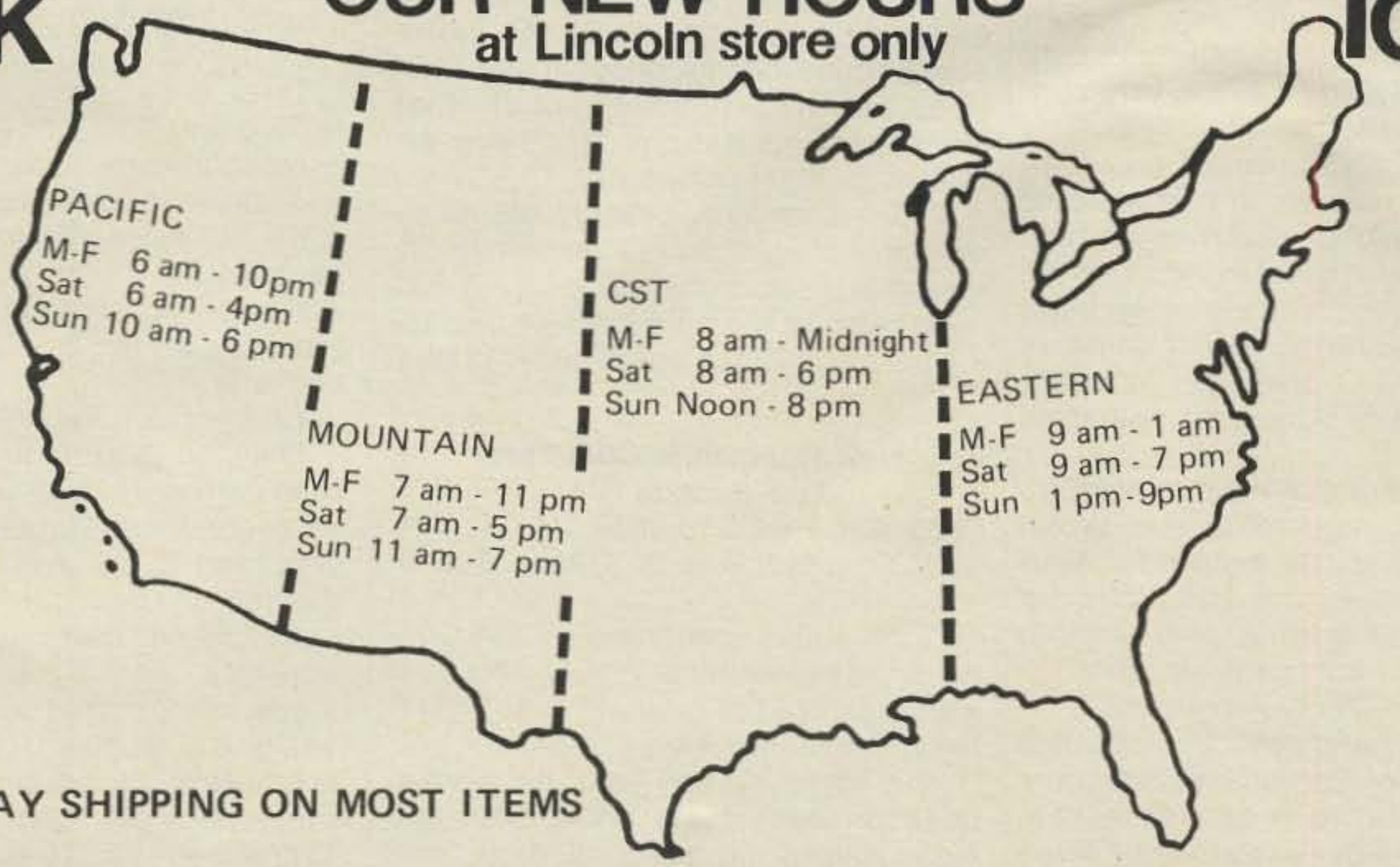

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No - 89-90

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

A recent form letter sent to the Editors of all the major U.S. Amateur Radio magazines requested that we demand quote "that contest participants adibe by FCC regulations and rules of common courtesy."

I do not know if the other publications are going to answer this challenge but speaking for *CQ's* contests program. I can refer to our disqualification clause which is quite broad and includes FCC violations and unsportsmanship conduct as items that justify disqualification of contest participants. Most contests by other organizations have similar clauses. We try to regulate our own activities.

Actually the letter was more of a tirade against contests. Quoting one paragraph, "the vast majority of radio amateurs have no interest in contests, and it is grossly unfair to have the ordinary use of the amateur bands so disrupted by the arrogant selfishness of so many contest participants."

The writer quotes "the *vast majority* have no interest in contests," and then reverses himself by saying *"so many* contest participants." Not a very consistant observation.

One paragraph I strongly object to however was: "Especially in view of the coming WARC '79. I wonder how the face of the "ugly American" is affected by contests. I certainly hope that amateurs abroad do not consider American contest operators as being representative of American operators in general."

May I point out that the participation of overseas amateurs in our World Wide DX Contest far exceeds that of stateside entries, and has done far more to create a bond of friendship and friendly competition than a reference to us "ugly Americans."

CQ awards hundreds of certificates and dozens of prominent amateurs donate valuable Trophies to winners in what they consider a worthwhile International program.

Major DX Contests occupy a very small portion of the calendar year, especially those sponsored by stateside organizations. If the writer was knowledgeable about these matters he would have noted that overseas organizations also have extensive contest programs.

I have purposely omitted his name as I do not want to get personally involved in a "donnybrook."

See you in the next contest pile-up.

73 for now, Frank, W1WY

14 Sherwood Rd. Stamford, CT 06905

Calendar of Events

Feb.	3-5	New Hampshire QSO Party
Feb.	3-11	ARRL Novice Roundup
Feb	4&11	Ten Ten Net QSO Party
Feb.	10-11	QCWA C.W. QSO Party
Feb.	18	North America "Sprint"
Feb.	17-18	YL-OM Phone Contest
Feb.	18-19	TWO Land QSO Party
*Feb.	24-25	French Phone Contest
Feb.	24-25	Forty Meter Contest
Mar.	3-4	ARRL DX Phone Contest
Mar.	3-4	YL-OM C.W. Contest
Mar.	10-11	QCWA Phone QSO Party
Mar.	10-11	Virginia QSO Party
Mar.	17-18	ARRL DX C.W. Contest
Mar.	**24-25**	**CQ WW WPX SSB Contest**
Mar.	24-26	B.A.R.T.G. RTTY Contest
Mr./Ap.	31-1	North Dakota QSO Party
Apr.	7-8	ARCI QRP QSO Party
Apr.	11-12	DX-YL to W/VE YL C.W.
Apr.	18-19	DX-YL to W/VE YL Phone
Apr.	28-29	Dutch (PACC) Contest
May	**26-27**	**CQ WW WPX C.W. Contest**

* Covered last month.

New Hampshire QSO Party

Two Periods GMT

2000 Sat. Feb. 3 to 0500 Sun. Feb. 4

1400 Sun. Feb. 4 to 0200 Mon. Feb. 5

Once again sponsored by the Concord Brasspounders W1OC, this one was organized to promote the Worked New Hampshire Award.

The same station may be worked once on each band and mode, and New Hampshire stations may work each other for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for N.H. stations, ARRL sections or country for others.

Scoring: N.H. stations score 1 point per QSO, times the number of (ARRL sections + DX countries + N.H. counties) worked.

Others score 5 points for each N.H. counties worked. (max. of 10)

Frequencies: C.W. - 1810, 3555, 7055, 14055, 21055, 28130. Phone -1820 3935, 3975, 7235, 14280, 21380, 28575. Novice - 3730, 7130, 21130, 28130. v.h.f.-50.115 and 145.015 Simplex. (no repeaters)

Awards: Certificates to the top scorers in each N.H. county, and each state, VE province and DX country. (min. of 50 points) The WNHA is awarded if all 10 counties are worked.

Mailing deadline is March 12th to: Concord Brasspounders, Inc., Att: C. Halloway, 9 Via Tranquilla, Concrod, N.H. 03301. Include a large s.a.s.e. for results and/or an award.

ARRL Novice Round-up

Starts: 0001 GMT Sat February 3

Ends: 2359 GMT Sun. February 11

This is a good opportunity for Novice and Techs to get initiated into contest activity. It is suggested that you check January *QST* or write to the ARRL for more information. If you expect to participate ask for log forms and summary sheet and for Op. Aid #6. Include a large s.a.s.e. for fast delivery)

Briefly the rules are as follows:

Only 30 hours of total operating time can be used. Time may be divided as desired, but off periods may not be less than 15 minutes, and must be indicated on the log.

All classes may participate but only contacts with Novices and Technicians, made in that portion of the band assigned to them, have any point value. Novices will be competing with other Novice, and Techs against Techs.

For purposes of identification Novice and Techs should include /N and /T in their call.

Exchange: RS(T) and ARRL section,

country for DX stations. (Novices with ARRL Proficiency credit should include that info in their exchange for extra scoring points.)

Scoring: Number of (QSOs + CP credit) multiplied by (ARRL sections + DX countries) worked for final score.

Awards: Certificates to highest scoring Novice and Technician in each ARRL section.

Entries must be mailed no later than March 15th to: ARRL Novice Roundup, 225 Main Street, Newington, CT 06111

Ten—Ten Net QSO Party
0000 to 2400 GMT Sunday, Feb 4 and 11

This is the winter edition of the Ten-Ten International Net QSO party. It's open to all amateurs but only members are eligible for awards. (Ed. How come?)

Activity is on 10 meters only, use any mode but one contact only with the same station.

Exchange: Call, 10X number, ARRL section and name. Include Chapter name if you wish your score to be credited to your chapter.

Classes: Single operator, multi-operator and QRP. (max. of 20 watts p.e.p.)

Scoring: Continental U.S. contacts 1 point, add another point if with 10X number.

DX contacts 2 points, add 1 point if with 10X number.

QRP contacts 2 points, add 2 more points if with 10X number. (DX and U.S. QRP same value)

Awards: Certificates to winners in following areas: U.S. call areas, KH6, KL7, other U.S. Pacific Is., VE call areas, Central America, Caribbean Is., So. America, Europe, Africa, Asia, Australia, New Zealand, So. Atlantic and So. Pacific.

Stations with new calls should list their old call. QPR stations should list type of equipment used.

Members only send logs to: Robert C. Mugherini, WA1AKS, P.O. Box 169, Randolph, Mass. 02368. Logs must be received no later than March 11. Results will be published in Spring Bulletin.

QCWA QSO Party
CW: Feb. 10-11 SSB: Mar. 10-11
Starts: 0001 GMT Saturday
Ends: 2400 GMT Sunday

The 22nd annual QSO Party is sponsored by the Long Island Chapter this year, and for the first time will be a two weekend affair.

The same station may be worked only once on each weekend, regardless of band. Separate logs and scores must be submitted for c.w. and phone.

Once again rules have been changed and this years are more lengthly and complicated than previous years.

Three global areas have been established for scoring purposes. They are as follows:

Area I - The USA, Canada (except Yukon and N.W.T.) Mexico, Puerto Rico, Virgin Is., Bermuda, Bahamas and West Indies.

Area II - Central America, Hawaii, Alaska, Yukon, N.W.T., and U.S. Islands in the Pacific.

Revised List (Trophy Donors)
CQ World Wide DX Contest
Single Operator

World - All Band C.W. Larry LeKashman, W2AB Memorial. (Al Kahn, K4FW)
World - 21 MHz. Phone (Lee Wical, KH6BZF)
Oceania - 21 MHz. Phone (Pacific R.A.T.S.)
Oceania - 21 MHz. C.W. (Pacific R.A.T.S.)
So. America - Single Band Phone (Rafael Ponce de Leon, CX3BR)
So. America - Single Band C.W. (Rafael Ponce de Leon, CX3BR)

CW World Wide WPX Contest
World - 21 MHz SSB (Lee Wical, KH6BZF) These changes will be effective for the recent 1978 World Wide Contest Lee KH6BZF is also donating a Trophy (Hawaiian Koa Bowl) for the 21 MHz. SSB section of the coming WPX Contest.

Area III - All other areas of the world.

Exchange: QSO no., name, membership number, and Chapter. (number or name) Members not affiliated with a Chapter may use "AL" to so identify.

Scoring: (a) Area I to Area I - 1 point.
(b) Area I to Area II - 2 points.
(c) Area I to Area III - 5 points.
(d) Area II to Area II - 2 points.
(e) Area II to Area III - 5 points.
(f) Area III to Area III - 5 points.

Multiplier: Total number of Chapters worked.

Final Score: Total QSO points X Chapters worked.

Frequencies: CW - 3540, 7040, 14040, 21060, 28060.

SSB - 3910, 7240, 14290, 21360, 28810, and 146.55 MHz. Simplex. Above suggested frequencies, plus or minus 10 kHz.

Your log should be columned as follows: Time in GMT, QSO no., station worked, his QSO no., his name, his QCWA no., his Chapter, QSO points, and multiplier. (each new Chapter worked)

To make it easier for the committee include your call, name and address, QCWA membership number and Chapter affiliation at the top of each log sheet. And remember, separate logs for c.w. and for phone. Do not combine them together.

No awards were mentioned in the original announcement but it is assumed that the usual plaques will be available, plus certificates for working 100 members and etc.

This activity of course is open to QCWA members only and the December News Letter gave all the details.

Mailing deadline for your logs is March 31st to: Long Island QCWA. P.O. Box 93, East Rockaway, L.I., N.Y. 11518

YL—OM Contest

Phone: Feb. 17-18 CW: Mar. 3-4
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

It's the YLs working the OMs in this annual contest organized by the YLRL. All bands may be used but cross-band or Net contacts do not count.

Exchange: QSO no., RS(T) and ARRL section or country. (See *QST* for section list)

Scoring: One point per QSO. Multiply total by number of ARRL sections and countries worked for your final score. The same station may be worked once only regardless of band.

There is also a power multiplier of 1.25 for stations running 150 watts or less input on c.w., 300 watts p.e.p. if on s.s.b. Multiply your final score by above factor.

Phone and c.w. are separate contests and require separate logs.

Awards: Certificates to the highest scoring YL and OM in each U.S. and VE call area and in each country. There are also 4 Trophies for the top YL and top OM in each contest.

Logs must be mailed by March 18th and received no later than April 16th. This year they go to: Margaret Williams, WA4FTJ 965 Redwood Circle, Virginia Beach, VA 23462

North American Sprint
0100 to 0500 GMT
Sunday, February 18

Previous "Sprint" contests have proved so popular that the National Contest Journal has scheduled another one. As the name "Sprint" implies it's a real shorty, 4 hours only.

No-93-94

North Americans will be working stations on other continents as well as other No. Americans. Single operator and c.w. only.

Exchange: Call, QSO no., name and QTH. (State, province or country)

Scoring: *For No. America* - Multiply total QSOs by sum of states, provinces and countries worked.

For Others - Multiply total QSOs by sum of states, provinces and countries worked.

For Others - Multiply total QSOs by states, provinces and No. American countries worked. (USA and VE not countries, KH6 not a state.) There are 8 VE provinces, Maritime plus VE2 -VE8.

Frequencies: Three bands only, 3530 - 3550, 7030 - 7050, 14030 - 14050. Same station may be worked once on each band.

Awards: A Trophy to the Top Scorer, certificates to the top scorers in each USA call area, Canada and DX country, also to the top ten scores, the winning team and each operating member.

Special QSY Rule: No. American stations calling *CQ* are permitted only one contact as a result of that call. He must thereafter move a least 1 kHz. before working another station, or at least 5 kHz. before calling *CQ* again.

Club competition is limited to a total of 10 members as a single unit. A club may enter more than one unit. To qualify each operator in the unit must be registered with contest coordinator N6SF at least 24 hours before the contest.

Use a separate log for each band, indicate the multiplier the first time it is worked, and include a summary and check sheet with your entry.

Entries must be received no later than 30 days after the contest and go to: Rusty Epps, N6SF, 1030 Bush Street, Apt. #6, San Francisco, CA 94109

TWO Land QSO Party

Two Periods GMT
2100 Sat. Feb 17 to 0700 Sun. Feb 18
1300 Sun. Feb 18 to 0300 Mon. Feb. 19

This is a new one organized by the South Jersey Contest Coalition. The states of N.J. and N.Y. will be working the rest of the world.

There is no time limit within the time periods listed above but there is a mandatory rest period from 0700 to 1300 on Sunday.

The same station may be worked once per band and mode, and mobiles and portables each time they change counties.

Exchange: RS(T) and QTH. County and state for TWO Land stations. State, province or country for others.

Scoring: Each QSO is worth 2 points. TWO Land stations multiply total QSO points by the number of states + VE provinces + DX countries + TWO Land counties worked. All others will multiply total QSO points by the number of TWO Land counties worked. (possible 83 max.)

Freqencies: CW - 1805, 3560, 7060, 14060, 21060, 28060. SSB - 1815, 3900, 7230, 14280, 21355, 28600. Novice-3725, 7125, 21125, 28125.

Awards: Certificates to top scoring station in each TWO Land county, and each state, province and DX country. Also for top mobile, portable, novice, multi-operator and club.

Logs with over 200 QSOs should include a dupe sheet. Indicate each new multiplier as worked. A summary sheet and the usual signed declaration is also requested. A large s.a.s.e. will get the results.

Logs go to: South Jersey Contest Coalition, c/o Darrell Neron, AB2E, 322 S. Cummings Ave., Glassboro, N.J. 08028

Forty Meter Contest

Starts: 1700 GMT Sat. February 24
Ends: 2300 GMT Sun. February 25

Sponsored by the Farout Amateur Radio Club the purpose of this contest is to increase knowledge of the propagation characteristics of the forty meter band, and to encourage the efficient use of that band.

There is a limit of 24 hours of operating time out of the 30 available contest hours. Off periods must be at least 15 minutes in length and clearly marked on the log.

Exchange: RS(T), consecutive QSO number starting with 001 and ARRL section or country.

Scoring: Each QSO is worth 1 point, 5 points if it's with a Farout member. The multiplier is determined by the number of ARRL sections (max of 75) and DX countries worked.

Final Score: Total QSO points multiplied by the ARRL sections and DX countries worked.

Same station may be worked once on phone and once on c.w. for QSO points but the multiplier is counted once only.

Awards: Certificates to the top scorers in each section and country for both single and multi-operator (single xmtr. only) stations. The Top Scorer in the contest will receive an engraved goblet.

Stations making over 200 contacts are required to submit a dupe sheet with their log.

Mailing deadline is March 31st to: Frank Stilwell, WB8OFR, 5326, Brainard Drive, Kettering, Ohio 45440

Introducing A Wide Band 10 thru 40 Meter Vertical

Taylor

WIDE BAND TRAP VERTICAL HQ-1040-AV

The HQ-1040-AV is a self supporting trapped antenna with automatic band selection. It provides omni-directional performance 40 thru 10 meters. The traps are all High-Q with optimum band width characteristics, and provides peak performance by isolating the unused portion of the vertical. ¼ wave vertically polarized performance is provided.

Extra strong aluminum alloys and extra built-in mechanical strength in the traps make this antenna a winner. We use circular aluminum clamps for full circumference clamping at all tubing joints. Mounting bracket is a full 12" of heavy gauge aluminum, with 5/16" U-bolts will secure on any ground mast up to 1 5/8". The HQ-1040-AV will become your favorite vertical, and a sample of products to come from TAYLOR.

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- •Omnidirectional
- •Automatic band selection
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- •High-Q — High performance traps
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- •SO-239 connector
- •Input impedance 50 ohm (nominal)
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A combination of High-Q Performance—
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CIRCLE 6 ON READER SERVICE CARD

modern electronics

Five Construction Projects

For Five Winter Weekends

BY JEFFERY A. SANDLER

10 Idell Rd., Valley Stream, NY 11580

Multi-stage Timer

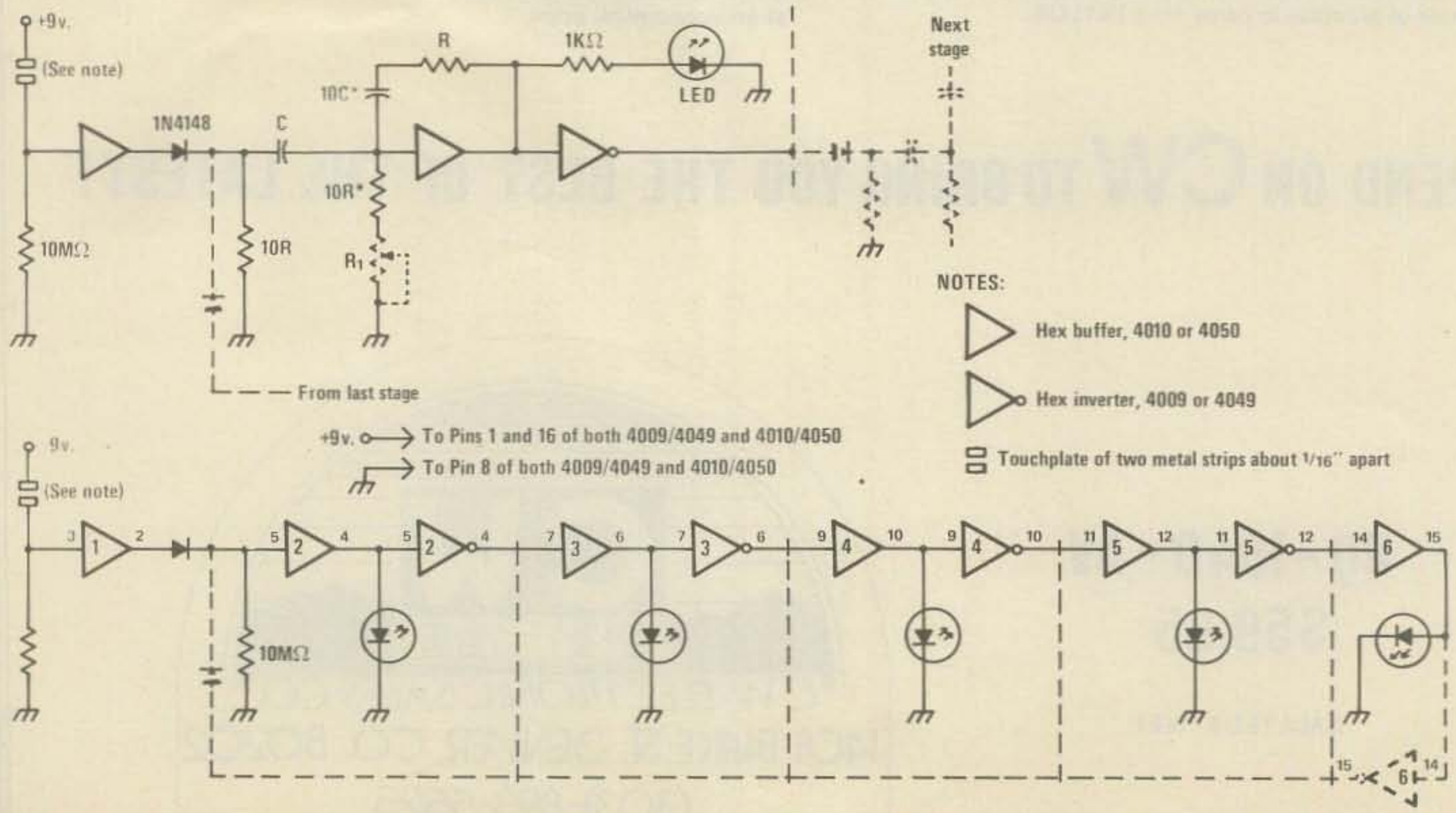
Here's a nifty multi-stage timer you can use to time up to five sequential periods each ranging from a few seconds to 15 minutes or more. The circuit has just two ICs, five LEDs and a handful of common resistor and capacitor values. The whole project costs under $10.

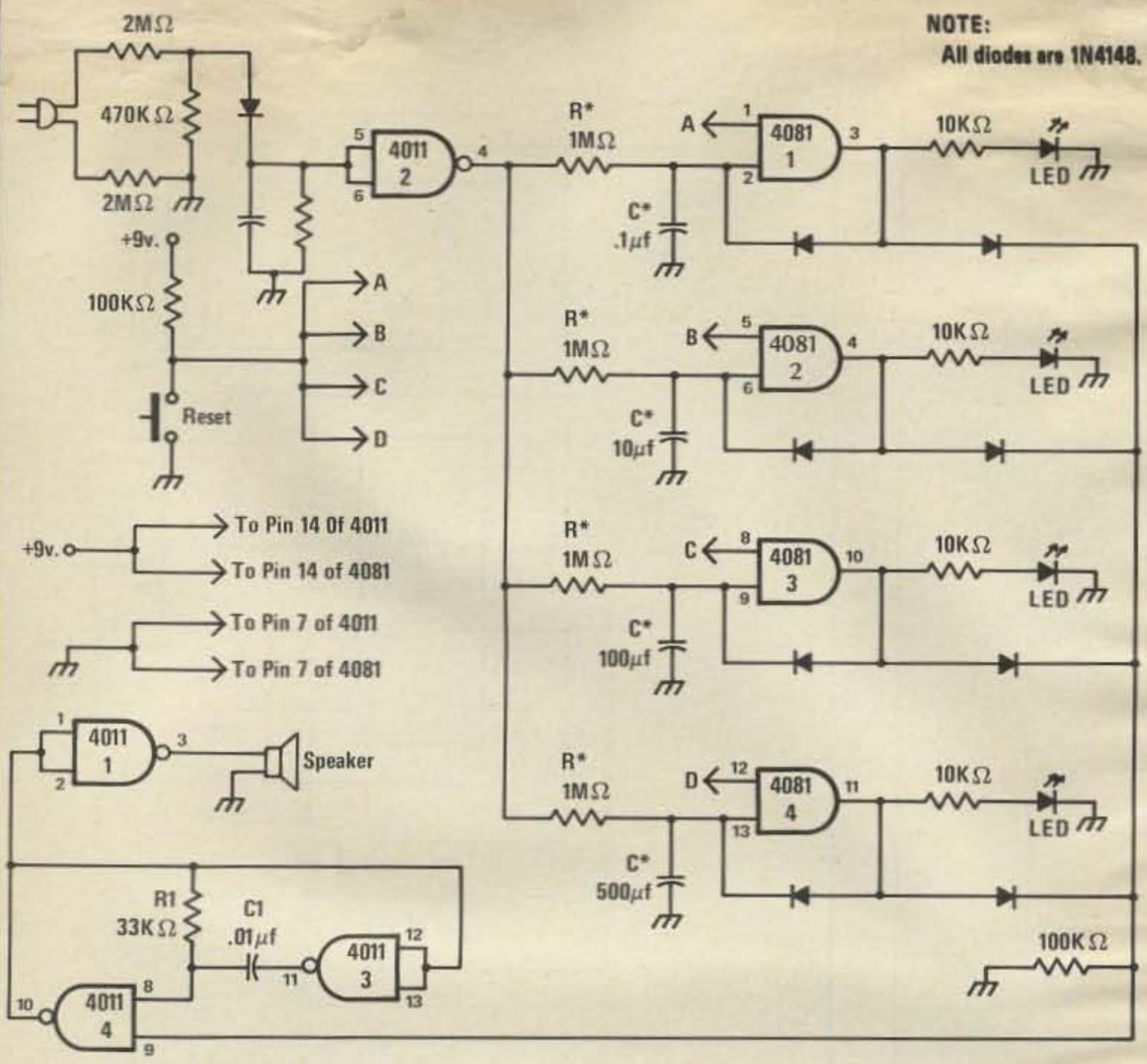
Each time period is indicated by different LEDs, which light in sequence. The period each LED stays on depends on the values of 10R and 10C, each of which must be at least 10 times greater than the values of R and C. So, if R is 1000 ohms, 10R must be at least 10,000 ohms. And if C is .01 uF, then 10C must be at least .1 uF.

As a rough guide, the value of 10R in ohms multiplied by the value of 10C in farads will give you the time in seconds its LED is on. You can add a variable resistor, shown in dashed line in the diagram, to fine tune the time period.

The timer is turned on by bridging the gap in the touchplate with your finger. Once on, the first LED will light for the predetermined time period. When the first LED goes out, the second LED lights for its time period, and so on until the last LED lights. If you want the sequence to repeat, you can add a feedback line from the output stage back to the input through the spare 4009/4049 inverter and a diode, as shown in dashed line in the lower diagram. With this line installed, the first LED will light when the fifth LED goes out, and the entire sequence repeats until the line is opened.

Although parts layout is not critical, some care should be taken to keep wiring between components as short as possible, with a minimum of crossovers.





Power Failure Detector

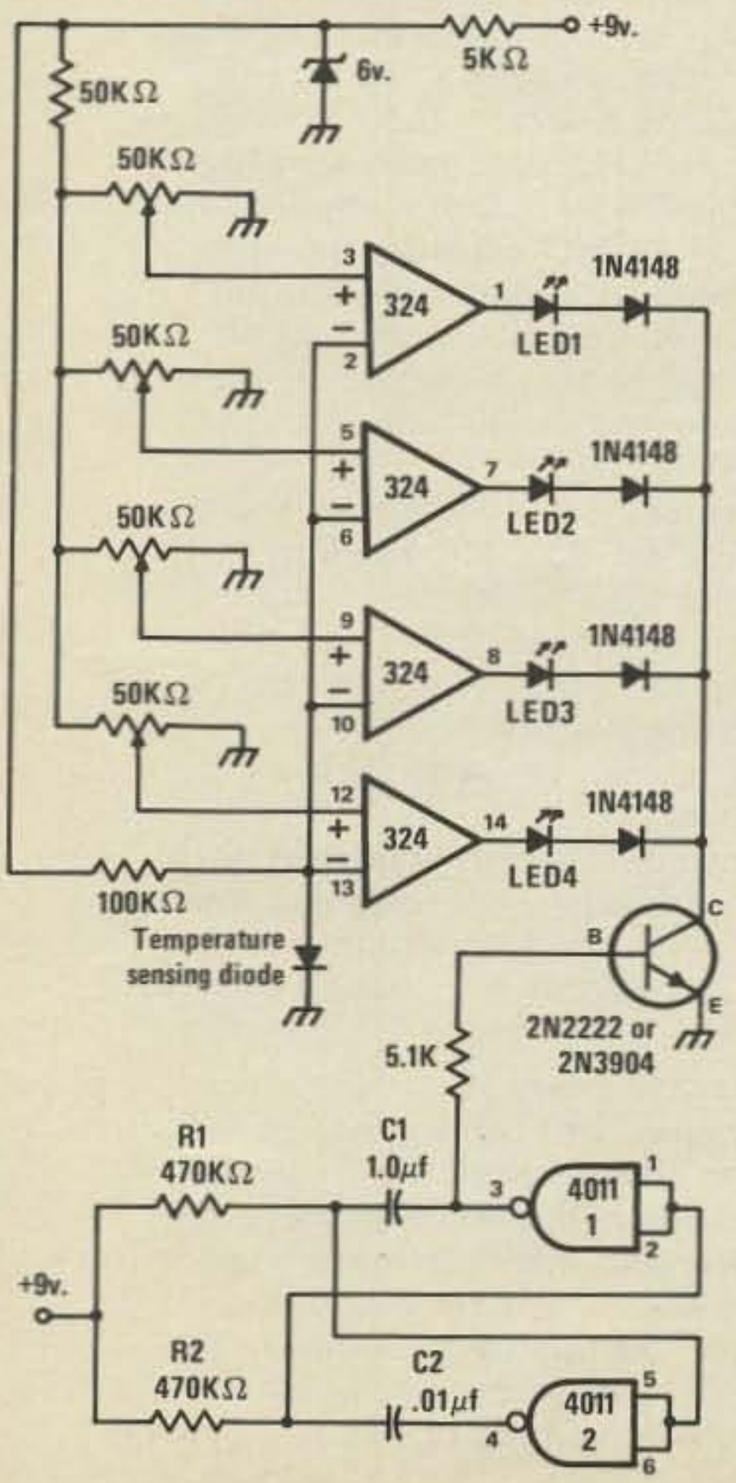
Ever come home and find all your digital clocks reading "eights" leaving you wondering how long the juice was off? Well this inexpensive circuit can give you a good idea. All you have to do is connect it to any outlet.

When the power fails, an alarm will sound and from one to four LEDs will light, depending on how long the outage lasts.

You can select the time required for each LED to light by carefully choosing the values of each R*C* pair. The values given here are for 1 second, 10 seconds, 100 seconds, and 500 seconds. The tone of the alarm is determined by R_1C_1.

Current drain is quite low when the alarm is off. A single 9-volt battery should last a year.

After a power failure has occurred, you can reset the alarm by momentarily depressing the pushbutton "reset" switch.



Temperature Indicator

This inexpensive temperature indicator is easy to build, and at the same time, makes an interesting conversation piece. Temperature is indicated by a flashing LED. The circuit shown provides four temperature ranges, but you easily can add another 324 integrated circuit and associated components to provide a total of eight.

Each amplifier segment of the 324 monitors the voltage across a temperature sensing diode, and compares it to a preset voltage. When the diode voltages rise above the preset level, the amplifier output swings positive, turning on the associated LED.

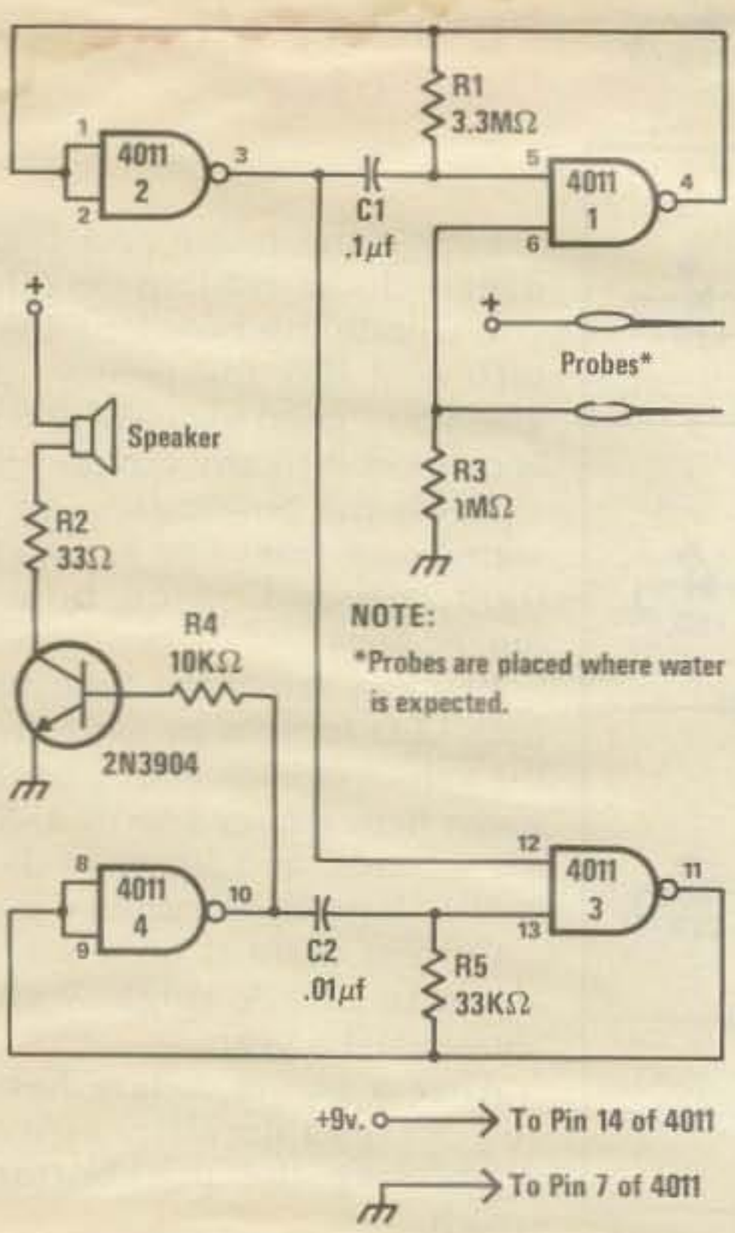
The temperature at which each LED is turned on depends on the setting of the associated variable resistor. To calibrate the setting, you'll have to use a standard thermometer. Although it is possible to set the amplifiers to turn on the LEDs over a range of a few degrees, it is more practical to set them for at least five degree steps, with 10 degree steps preferable.

The LEDs, when turned on, blink at a rate determined by the value of R1 and C1. The values given provide a flash rate of about one-half second. Blinking the LEDs conserves battery power. However, if you power the circuit from a dc power supply, you may prefer to have the LEDs remain on, rather than blink. All you need to do is connect the cathodes of the LEDs directly to ground. Removing the oscillator and transistor circuits will not otherwise affect the operation of the temperature indicator.

Use of a dc power supply will be necessary if you expand the circuit by adding a second 324 integrated circuit. The total current drain will then be near a tenth of an ampere when all the LEDs are on.

The temperature sensing diode can be any silicon diode. However, germanium diodes will not work in this circuit. If you do expand the circuit to include a second 324, use the 2N2222 or 2N2222A transistor. The 2N3904 current handling capability will be marginal at best.

Scope Calibrator



If you're worried about a flooded basement, or your swimming pool overflowing, you'll really like this inexpensive flood alarm.

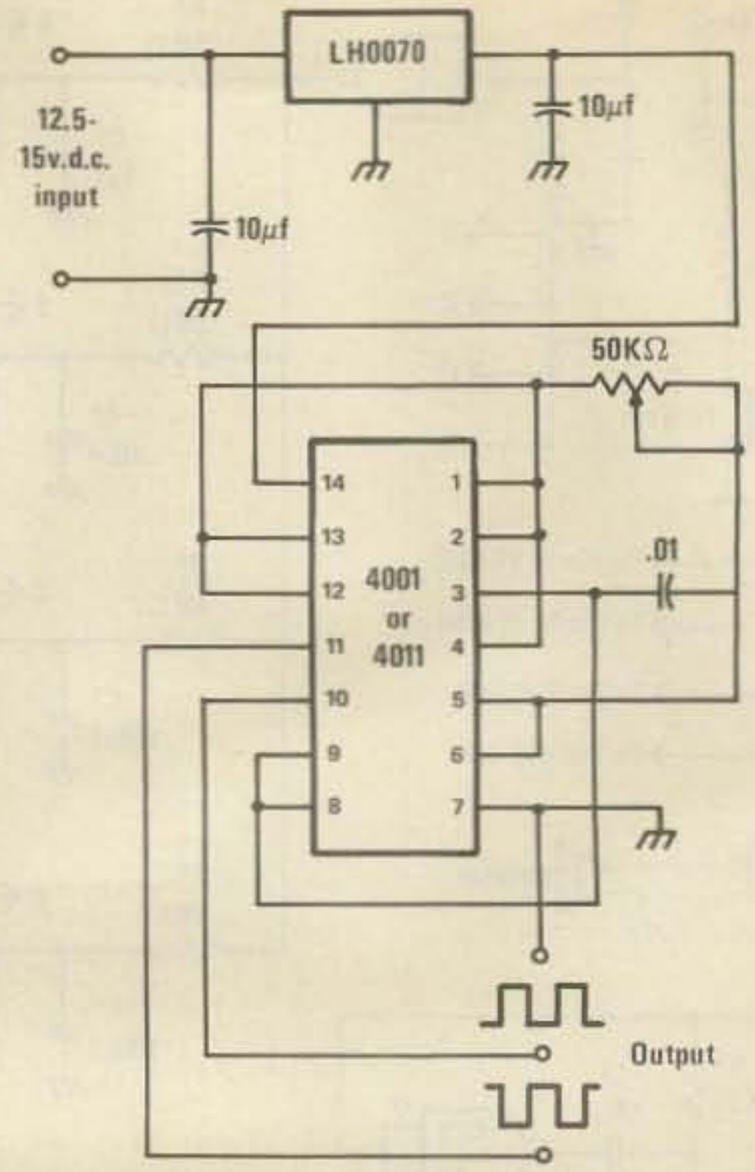
The alarm is built around two audio oscillators, each using two NAND gates. The detection oscillator, shown at the top of the schematic, is gated on by a pair of remote probes, which you locate in the area you want to protect. One of the probes is connected to the battery supply, the other to the input of one of the gates. When water flows between the probes, the detection oscillator is gated on.

The alarm oscillator, shown at the bottom of the schematic, is similar in design and is gated on by the output of the detection oscillator. The values given produce an audio tone of about 3000 Hz. The detection oscillator gates this audio tone at a rate of about 3 Hz. The result is a unique pulsating note, sure to draw your attention. You can change the audio tone by changing the values of R5 and C2, and the bleep speed by changing the values of R1 and C1.

You can use any small eight-ohm speaker to sound the alarm. The 2N3904 can be replaced by any similar NPN transistor.

The circuit will work from any six to 12-volt supply—a standard nine-volt transistor battery is ideal. Current drain in the off condition is negligible, so battery life should be well over a year.

Flood Alarm



Many oscilloscopes, designed primarily to display waveforms, provide only relative amplitude measurements. These scopes easily can be used to measure amplitude with the addition of this handy scope calibrator.

The heart of the calibrator is an LH0070 integrated circuit voltage regulator. Operating from any 12.5 to 15-volt dc source, the LH0070 produces exactly 10 volts. This 10-volt output is applied to a 4001 or 4011 CMOS quad gate, connected to produce square wave output. Because CMOS logic has no voltage offsets, the square wave output swings between zero and the 10-volt output of the LH0070.

The frequency of the square wave produced by the 4001/4011 flip-flop circuit is determined by the .01 uF capacitor and the setting of the 50,000 ohm variable resistor. The switching rate of the CMOS logic is fast enough to provide a square wave with reasonably sharp corners.

Two outputs are provided, on the inverse of the other. The arrangement can prove very useful for setting gain on inverting amplifiers when using a dual-trace scope.

Calibrating your scope with this calibrator is very easy. Just connect one of the outputs to the vertical input of the scope, and adjust the vertical sensitivity to a convenient measurement standard—one division of trace deflection, for example. In this case, a waveform deflecting 3-½ divisions would have a peak-to-peak amplitude of 35 volts.

Here's an interesting and novel idea for those of you who would like to build a speaker system for your hi-fi.

Build A Superthruster Loudspeaker

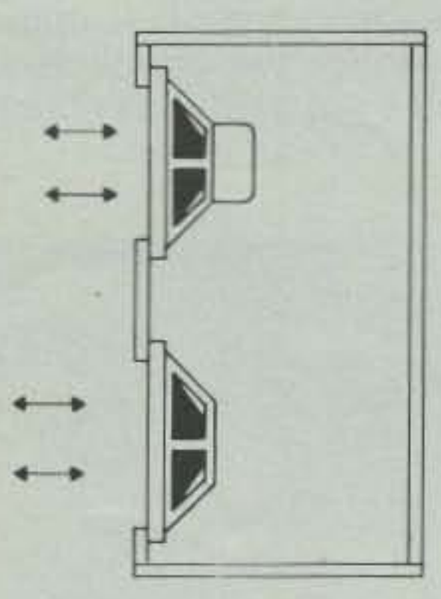
BY THOMAS L. CLARKE*

The passive radiator type of speaker system has recently become popular. Until a few years ago passive radiators were used in only a few exotic systems, but a number of affordable passive radiator systems (such as Panasonic's Thrusters) have appeared. The components of a passive radiator are still hard to come by, however, so it is not usually considered for home construction.

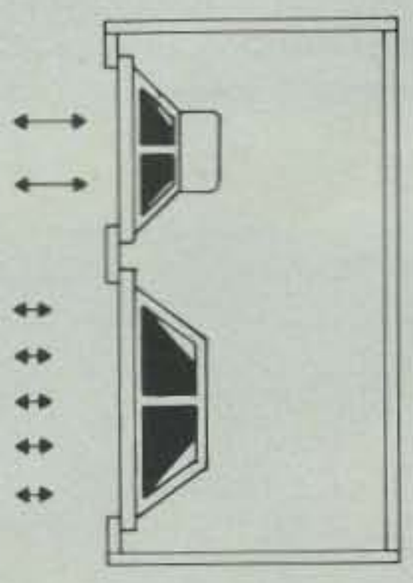
Recently I invented a new form of passive radiator that not only offers improved performance, but is well suited to home construction. This new type of passive radiator, which I call an **augmented radiator**, is not available commercially and the only way you can reap its benefits is to build one yourself. The augmented radiator is covered by U.S. Patent #4,076,097, but I have no objection to

*12110 S.W. 108 St., Miami FL 33186

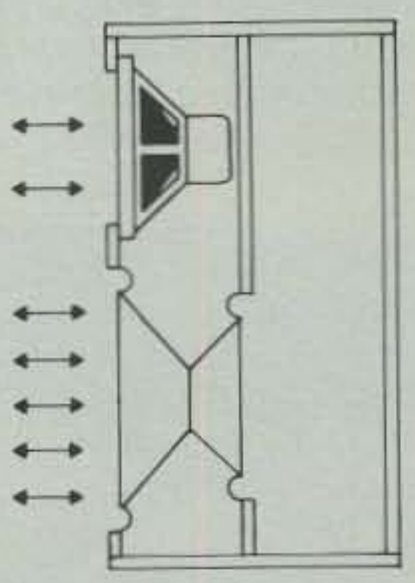
How The Super Thruster Works



Passive radiator vibrations produce additional bass sound.



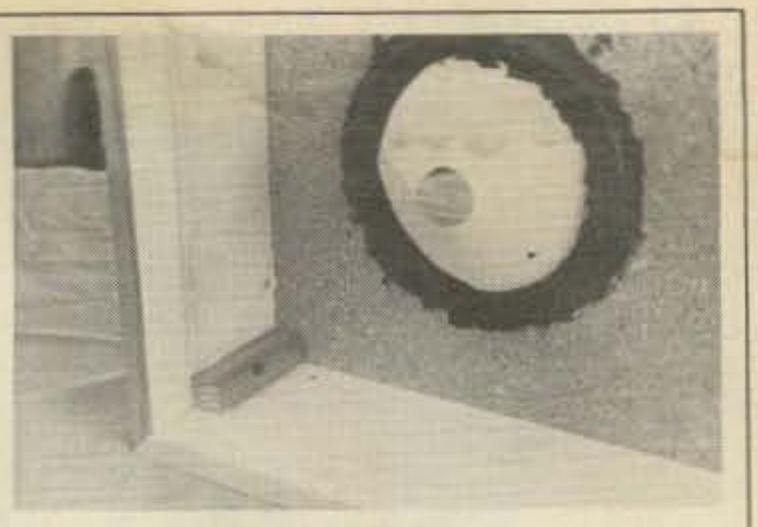
Increasing passive radiator area decreases the magnitude of vibrations so there is no net gain in bass sound.



Augmented radiator maintains vibrations while increasing area to produce an increase in bass sound.

The augmented passive radiator is well suited to home construction using easily available materials.

Lay a sheet of plastic food wrap over the mold and press the cone down onto the mold.



Use screws through the corner braces to draw the miter joints tight.

you constructing the one presented here for your private use.

A passive speaker system basically consists of two speakers in a box, but only one of the speakers has a voice coil and magnet and is driven by the amplifier. The other speaker responds passively to the pressure wave set up within the box by the driven loudspeaker. The vibrations of the passive speaker (or radiator) produce additional sound which reinforces the direct sound from the driven speaker. When everything is adjusted properly, there is a considerable improvement in low frequency or bass sound output.

You might think that the area of the passive radiator would increase its sound radiation, and thus, improve bass response even more. Unfortunately, increasing the area of the passive radiator reduces the size of its vibrations, so that sound radiation remains the same. The augumented radiator gets around this limitation by providing a separate baffle for part of the passive radiator area. Only part of the passive radiator interacts with the driven speaker enclosure so that the passive radiator vibrations are not reduced when its area is increased. The result is more sound from the passive radiator and improved bass response.

The augmented radiator system presented here is not difficult to construct and uses no exotic materials or components. It is a smallish system, 17 1/4 × 11 1/4 × 9 1/4 inches outside, but its performance equals that of many larger systems. The tweeter used responds to the limits of human hearing, and that the woofer responds down to 40 Hz to inaudibility is quite remarkable for a small system costing only about $20 to build.

The enclosure requires a 10″ × 48″ piece of 5/8″ plywood or particle board, and 5 feet of 1 × 10″ nominal (3/4 × 9 1/4 actual) solid lumber. The 1 × 10″ lumber forms the sides of the enclosure and can be almost any species depending on your taste. Pine or spruce can be stained to match your decor, but if you can obtain hardwood of the correct dimensions, so much the better. The use of solid lumbar for the sides eliminates the awkward problem of covering plywood edges encountered on other speaker enclosure designs.

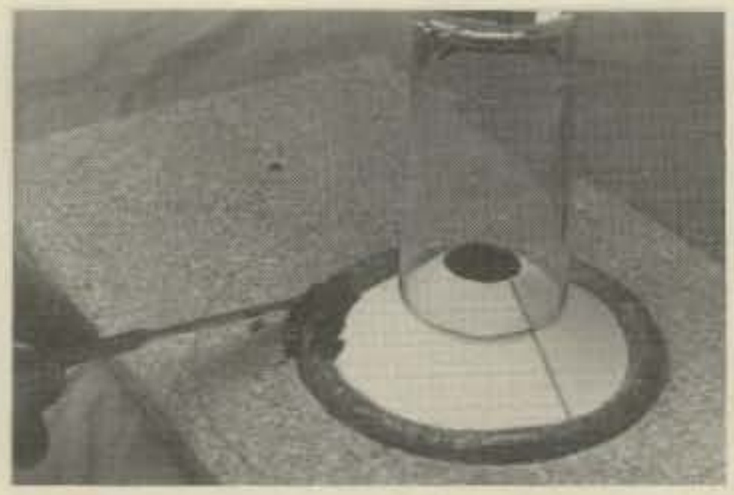
Begin by cutting the particle board into three (3) 15 7/8 × 10″ panels. Cut the necessary radiator, speaker, and wiring openings in these pieces. Save the large radiator cutouts as these will be needed later. If your sound system uses RCA phono plugs for speaker connection, cut a 1″ hole in the rear panel. If you use binding posts cut a 2 1/2″ × 1 1/2″ opening in this panel. Paint the front and rear panels now if desired.

Next cut the 1 × 10″ into two (2) 18″ and two (2) 12″ lengths. Miter the ends of these pieces so that they are the correct size to form the sides of the enclosures. These cuts are most easily done on a table saw but can be done with a circular saw, a guide, and care. These pieces have a 1/8 × 5/8 dado, a 1/8 × 5/8 rabbet, and a 1/8 × 1 1/8 rabbet to take the particle board pieces. These are easiest also on a table saw, but can be made with a router and a guide. Do any necessary sanding at this time.

Also prepare the 3/4 × 3/4 corner braces by cutting them to size and drilling a 1/8 screw clearance hole in them. These braces are nailed and glued to the long sides so that they are even with inside of the miters, and the clearance holes are parallel to the long sides.

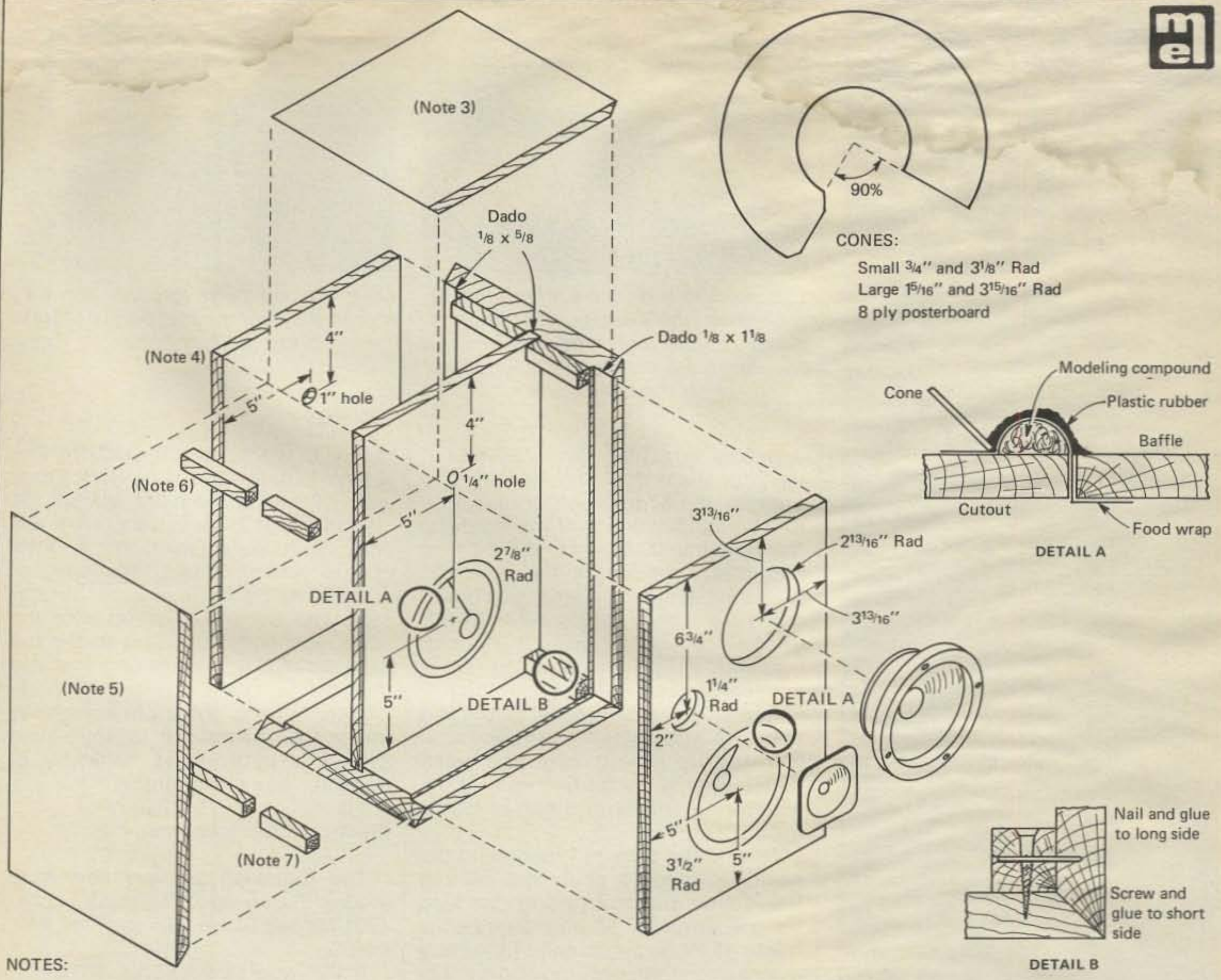
The most unusual part of the construction is building the augmented radiator. Cut the cone patterns from eight (8) ply poster board and, after bending them into conical shape glue the tabs under the opposite edges. Clothespins are useful as clamps un-

Model of a 3/8″ Play-Doh *rope into a semicircular rim around the edge of the cutout to make the mold.*



Use a butterknife to spread plastic rubber over the wrap covering the rim.

The phono jack is attached to a piece of 1/8″ plywood and glued over the inside of the panel opening.



NOTES:

1. All 3/4" stock solid hard or soft wood. 5/8" stock particleboard or plywood.
2. Assemble around central 10 x 16 baffle by gluing and screwing, then attach front and rear baffles with a bead of construction adhesive.
3. 3/4" x 9 1/4 x 11 1/4 (2 req'd).
4. 5/8 x 10 x 15 7/8 (3 req'd).
5. 3/4 x 9 1/4 x 17 1/8 (2 req'd).
6. 3/4 x 3/4 x 4 (4 req'd).
7. 3/4 x 3/4 x 2 7/8 (4 req'd).

Exploded diagram of the Superthruster.

til the glue dries. The large radiator cutouts are used to form molds for the augmented radiator suspension. Roll some 3/8" rope from the *Play-Doh* and after smearing a little white glue around the edge of a cutout (*Play-Doh* doesn't stick to wood), model the rope into a semicircular rim even with the edge of the cutout. If you can't borrow a little *Play-Doh* from the kids, it is available at toy stores. If more than one system is to be built, only one set of molds needs to be made.

Next lay a sheet of plastic food wrap over the mold and them press the corresponding cone down the mold so that the food wrap is pulled down into the rim. Weight the cone with a glass or a saucer and lower the panel over the mold so that the wrap is pulled over the rim and under the panel. Eliminate wrinkles as much as possible. Draw a bead of plastic rubber on both the cone and the panel next to the rim and use a butterknife to spread the rubber over the wrap covering the rim, trying for a uniform layer. After allowing the plastic rubber to dry, the mold is removed and excess food wrap is torn away from the panel and from the cone.

The enclosure is assembled by inserting the panel with the small cone into the dado on a long side, being sure that the small cone points to the front. The short sides are attached with glue by aligning them with the long side and using 1 1/4" #8 wood screws through the corner braces to draw the joints tight. The remaining long side is aligned and also drawn tight with screws. Be sure to use plenty of glue on the edge of the panels and on the corner braces to insure airtight joints.

The front panel is glued into the large rabbet. Brads into the corner braces will help hold it in place. The two cones should now just touch so that a bead of glue will join them into the augmented radiator. Also glue three (3) #4 lead shot in the groove where the two cones join. Complete the radiator by gluing a 3" disc of poster-board over the opening in the radiator.

$1,000 Reward Offered by Mad Train Collector

For the reader who can come up with the following old Lionel Electric train for my fast-growing collection:

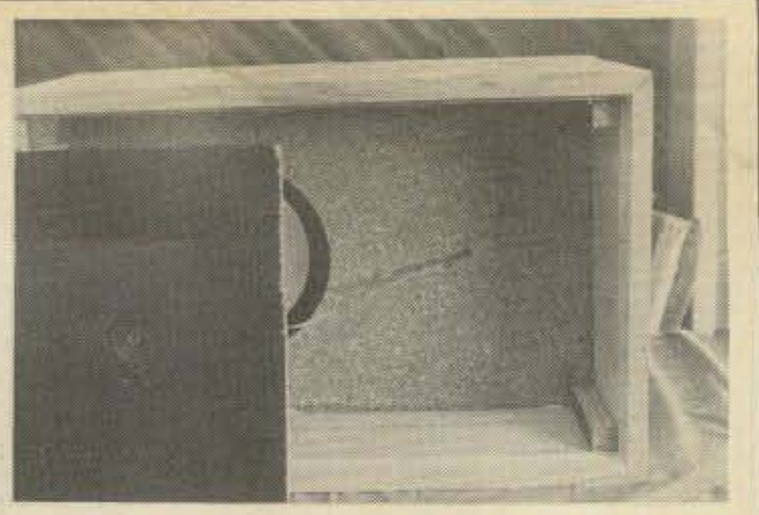
Model No. 700E Scale Hudson (No. 5344 appears on the side of the cab). If any reader can get this set for me together with either the scale freight cars No. 714–717 or the passenger cars No. 792, 793, and 794, I will gladly pay up to $1,000 for the set. Actual price will be based on condition.

There are many other old pre-WW II Lionel engines and cars that I need, both in Standard Gauge and in "O" Gauge. Blue Comet sets, state cars, and Stephen Gerard cars are desirable Standard Gauge items. Hiawatha and others of the better passenger sets are worth lots of dollars to me in clean condition.

Old trains are not just my hobby. They're an obsession that I simply cannot overcome. So, if you've got old Lionels around, don't be bashful. Give me a call or drop me a note. To determine the value of your trains I'll need the numbers that appear on all the cars, the colors, and the approximate condition. Remember, those old trains that are gathering dust in the attic could be bringing joy and pleasure to a mad collector.

Dick Cowan, Mad Train Collector
Publisher, Modern Electronics
14 Vanderventer Avenue
Port Washington, NY 11050
Phone: 516/883-6200

The zip cord from the enclosure is attached to the woofer and an additional length joins the woofer and tweeter. Note the absorbant material in the enclosure.



Lead the zip cord through the 1/4" hole in the center panel before installing the rear panel.

Before attaching the back attach the phono jack or the terminal strip to a piece of 1/8″ plywood or masonite and glue this piece over the inside of the opening in the rear panel. The phono jack requires a 1/4″ hole and the terminal strip requires two (2) 1/4″ holes 3/4″ apart. Attach a 13″ length of color coded zip cord to the jack or terminal. If using a jack, the silver conductor goes to the central lug. If using a terminal, it goes to the red post. As you install the rear panel lead the zip cord through the small hole in the center panel and seal the wire in the hole with a dab of caulking.

Now is the time to finish sand the enclosure and to apply the desired finish. The grill cloth cover can also be prepared by nailing together a frame of 3/4 × 3/4 stock to fit loosely within the front opening. Cover this frame with a loose weave fabric and glue and staple it to the rear of the frame. A little glue on the edges of the frame makes it possible to finish the corners off by simply cutting away the excess.

After loosely lining the upper half of the enclosure with fiberglass insulation or other absorbant material, such as cotton felting, divide the zip cord from the enclosure and add an additional 11″ length to the woofer. The silver conductors should be attached to the lug with the red dot. The woofer is screwed to the front panel with 1/2″ #6 round head screws. Be careful, as it is easy to puncture a cone with a screwdriver. A little plastic rubber around the speaker cutouts helps to insure an airtight seal. The tweeter is wired with the silver conductor attached to the lug with the blue dot and is screwed into the opening.

Inserting the grill cloth completes the speaker. Attach it to any sound system with at least 10 watts of amplifier power and enjoy.

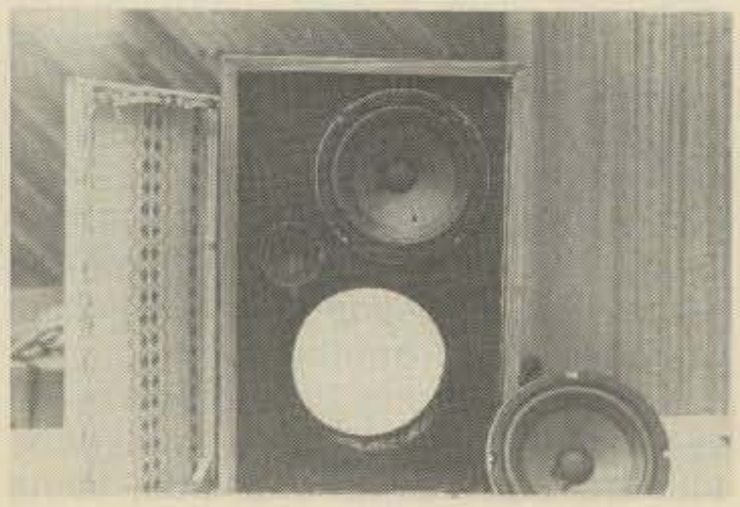
Electronic Components

The following are available from McGee Radio and Electronic Corp., 1901 McGee Street, Kansas City, MO, 64108:

6 1/2″ woofer, #BO-EX-6, $9.95
3″ tweeter, #59070, $4.95
binding posts, #90-754, $ .59
phono jack, #3501FP, $ .40

The woofer is also available from Poly Paks, P.O. Box 942, South Lynnfield, Mass., 01940 as stock #92CU5240, $14.95. The binding posts or phono jack are also available from Radio Shack.

The tweeter is also available from B&F Enterprises, 119 Foster St., Peabody, Mass. 01960 as stock #8H30329, $4.88.



Cloth stapled to the wooden frame forms a grill cloth and completes the speaker.

A bead of glue joins the two cones to form the radiator and three #4 lead shot provide the proper mass.

Showcase

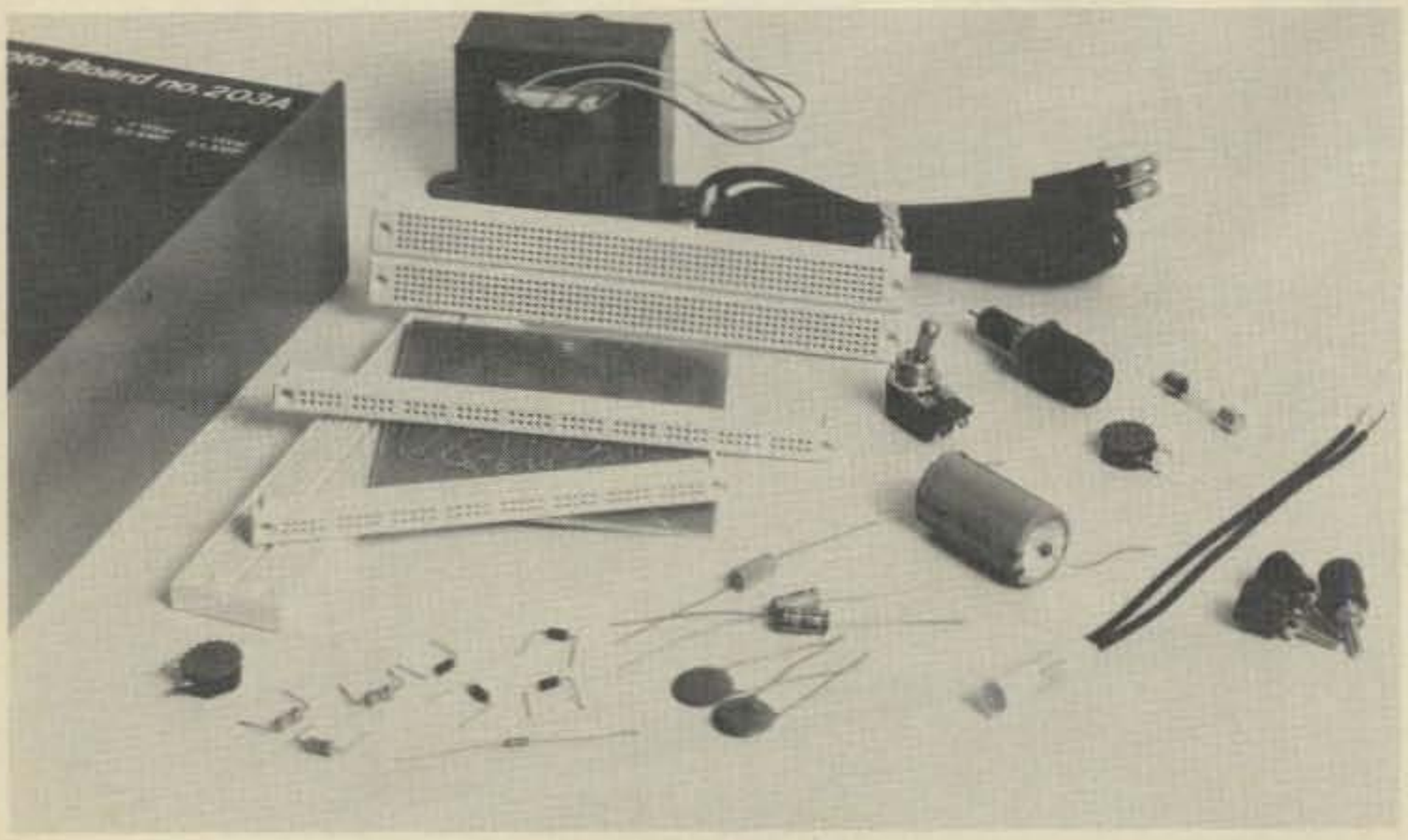
B & K Precision (Dynascan Corp.) Low-Cost Portable Digital Capacitance Meter

Dynascan Corp. has just announced the introduction of the B & K -Precision Model 820 portable digital capacitance meter. The 820 is a compact instrument capable of measurement over a range from 0.1 pF to 1 F. Accuracy of the meter exceeds the tolerance requirements of most users.

The unit features a bright 4-digit LED display for easy reading.

The B & K - Precision Model 820 comes with a 26-page detailed manual. Optional accessories include the BP-28 rechargeable battery pack, BC-28 charger and LC-28 carrying case. The meter itself costs $130.

Contact B & K - Precision at 6460 W. Cortland St., Chicago IL 60635 for more information, or circle number 62 on the reader service card.



Continental Specialities' Kit Version of the PB-203A Powered Breadboard

The most advanced of the solderless breadboard products offered by Continental Specialities Corp. is their model PB-203A solderless breadboard. Now this same package is available in kit form as the model 203-AK Proto Board Kit.

The three on-board supplies deliver 5 v.d.c. with 1% regulation at 1 amp. Separately adjustable plus and minus supplies (15 v.d.c.) rated at one-half amp are also included. The kit sells for $124.95.

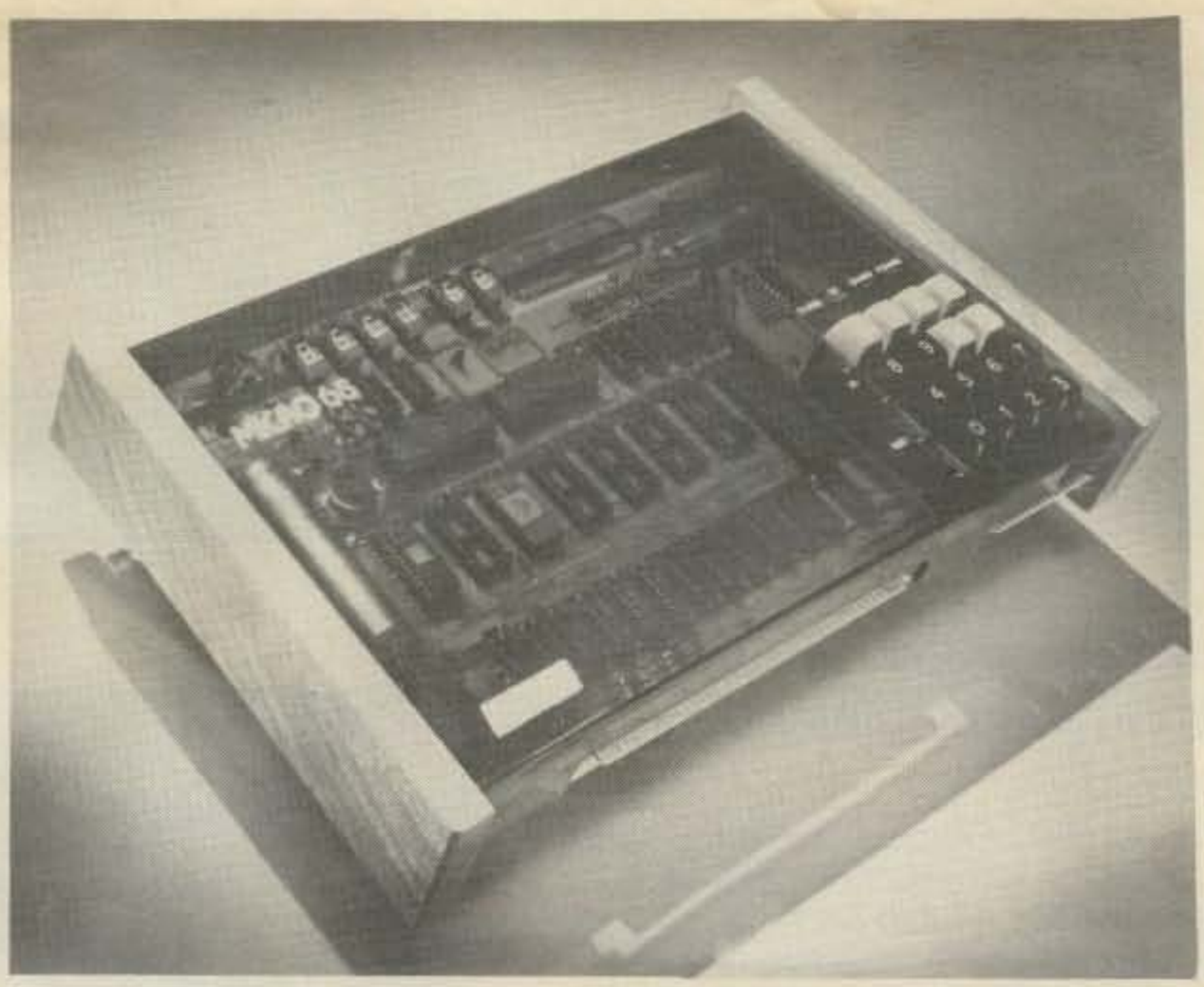
For additional information contact CSC at 70 Fulton Terrace, New Haven CT 06509 or circle number 74 on the reader service card.

Panasonic's P.C. Board Aluminum Electrolytic Capacitors

The Electronic Components Division of Panasonic Co. has introduced a series of low-profile aluminum electrolyte capacitors. Designated as the "TSL Series," some of their more outstanding features include very low profile (body length is less or equal to the body diameter) and improved frequency and temperature characteristics.

The TSL Series capacitors offer a wide range of capacitance values (100 to 15,000 microfarads), with rated d.c. working voltages of 16 to 63 v.d.c., low dissipation factor, temperature range of -40 to +85 degrees C, small size, and much more.

For more information, contact Panasonic, One Panasonic Way, Secaucus NJ 07094 or circle number 72 on the reader service card.



Electronic Product Associates, Inc.'s Micro 68 Computer System With On-Board EPROM Capability

Electronic Product Associates, Inc. is now offering a low-cost, complete, ready-to-use microprocessor as an economical solution for both scientific applications and industrial use.

Built around the Motorola/AMI/Hitachi 6800 microprocessor, the Micro-68 comes with its own integral power supply, 16 button hexadecimal keyboard, 6-digit LED display, 128 words of RAM (expandable up to 768 words) and 2K of user programmable EPROM.

The 512 word MON-1 bus PROM contains all the service routines necessary to load programs easily, inspect and edit them as necessary, insert break points for debugging and execute programs.

The unit is available from stock from Electronic Product Associates, Inc., 1157 Vega St., San Diego CA 92110, or circle number 70 on the reader service card.

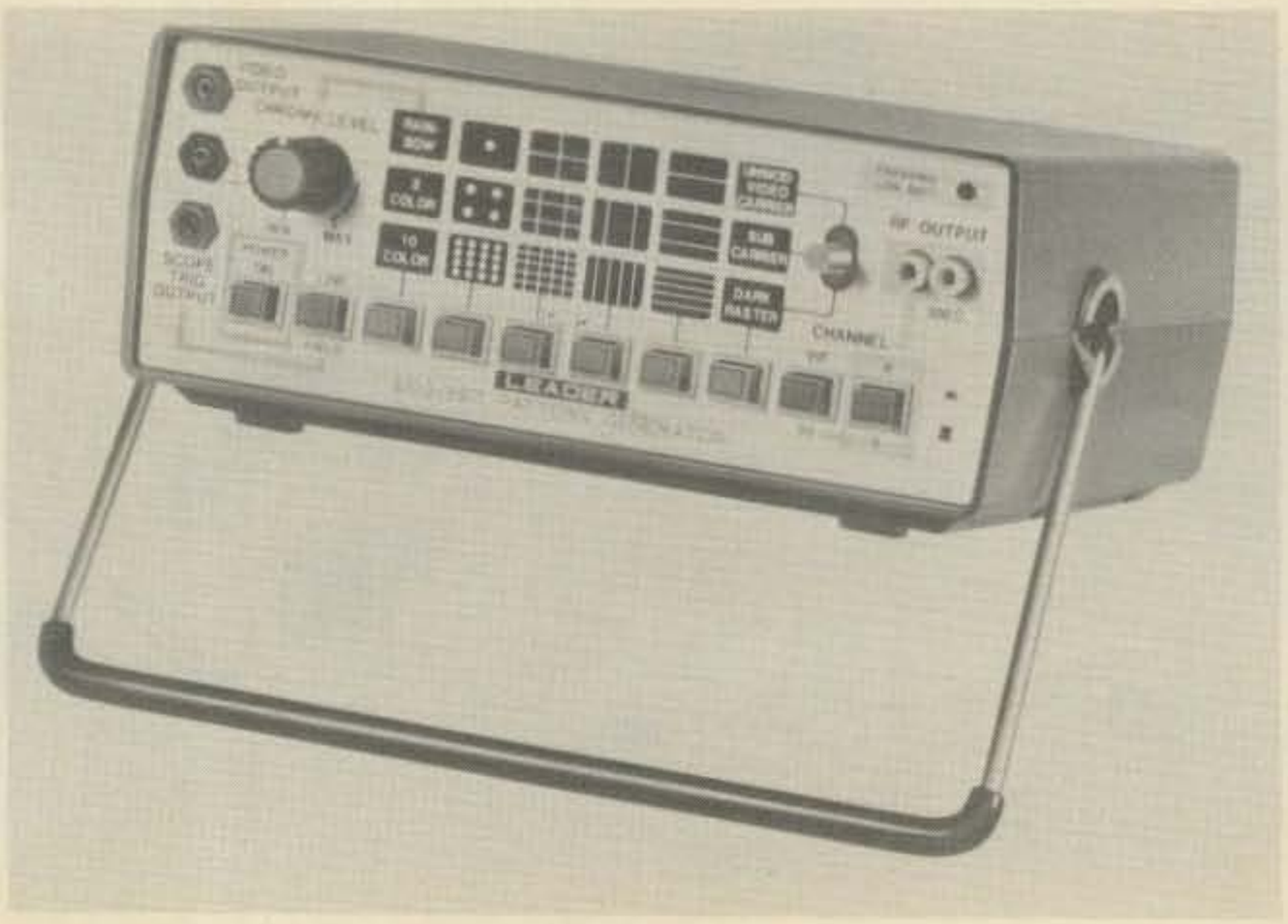
Leaders Instruments' Color TV Analyzer

Leader Instruments Corp. has introduced its new LCG-397 battery-operated color analyzer.

The LCG-397 features a variable color burst control which is said to allow for adjustment of color killer circuits and AFPC, quickly and efficiently. It provides a total of 18 patterns — 12 convergence and 3 color bar, as well as an r.f. carrier, color subcarrier and zero level black raster.

The LCG-397, made to sell for around $230, operates on four 1.5 volt "C" cells and will accomodate an external d.c. power supply of 6 volts. An optional a.c. adapter may also be used.

For more information contact Leader Instruments Corp. at 151 Dupont St., Plainview NY 11803, or circle number 65 on the reader service card.



SST Electronics A-1 Two Meter Amplifier Kit

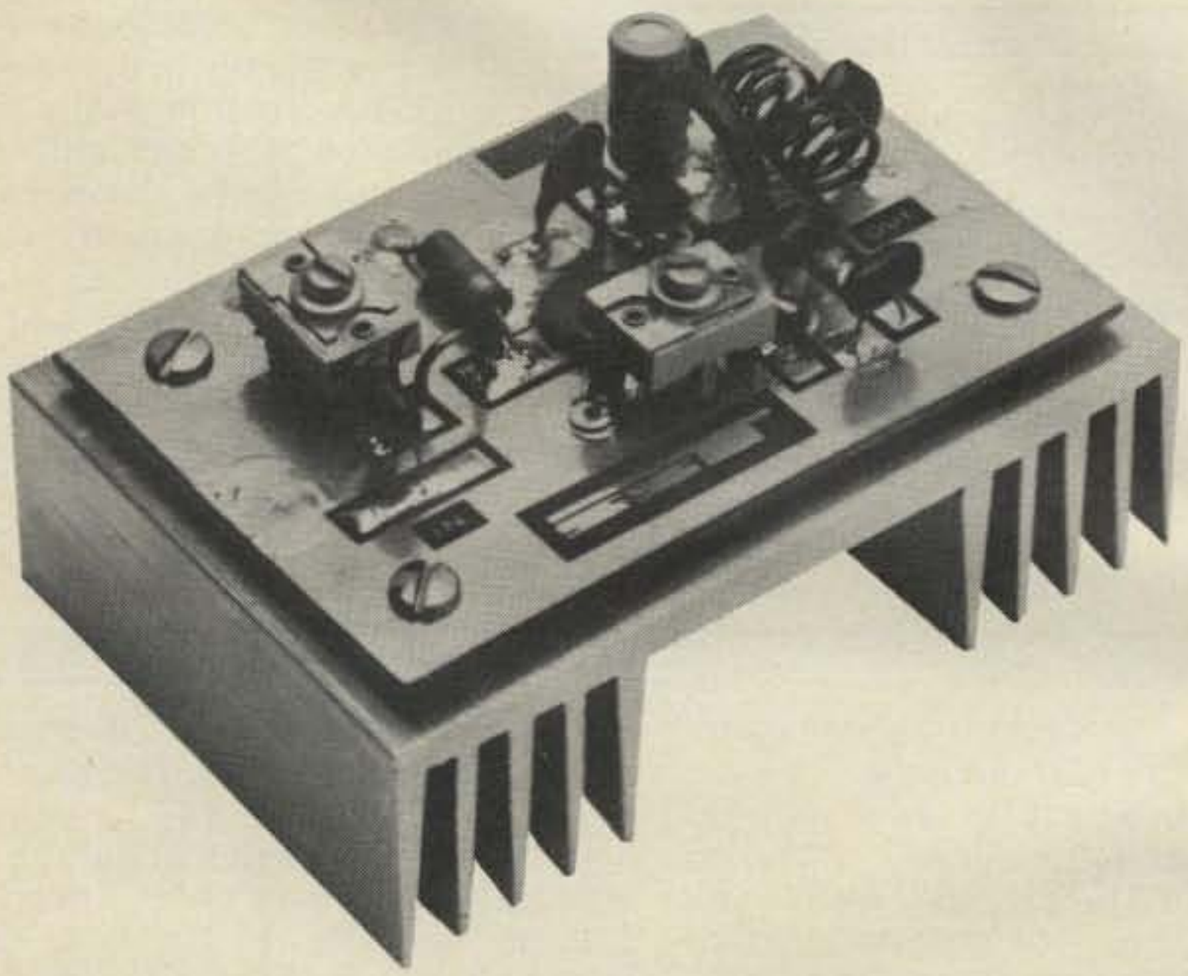
SST Electronics has added a two meter amplifier kit to their line of amateur radio equipment. The SST A-1 amplifier kit provides 15 watts of output with one watt in.

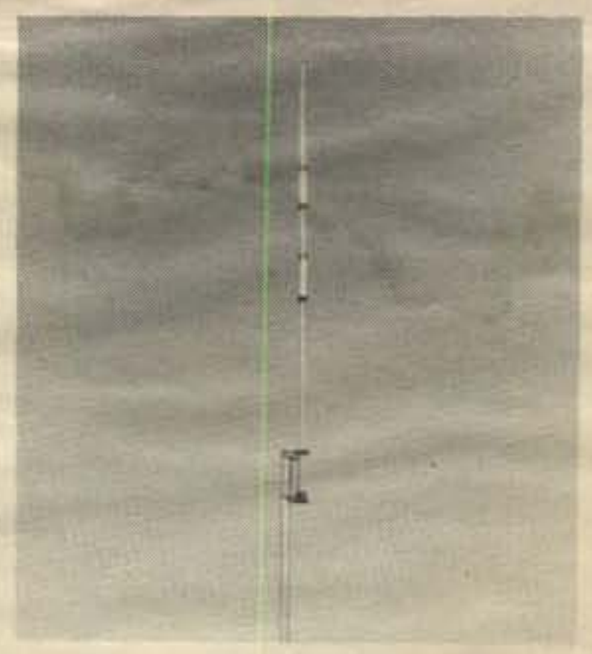
The SST A-1 includes everything necessary for a complete amplifier. A drilled G-10 epoxy solder plated printed circuit board (2″ × 3″) makes assembly easy (approximately one-half hour!) with the comprehensive instructions. Also, for ease of assembly, the coils are prewound.

The SST A-1 is short and open protected and not damaged by high s.w.r. It is compatible with all one to three watt meter transcievers.

The SST A-1 sells for $29.95 in kit form and for $49.95 wired and tested.

The unit can be obtained from SST Electronics at P.O. Box 1, Lawndale CA 90260, or circle number 69 on the reader service card.





Wilson Electronics Corp's WV-1 Vertical Trap Antenna

No bandswitching is necessary with the new Wilson WV-1 antenna. This is a low-cost 10-40 meter vertical that offers an electrical quarter wavelength and a low angle of radiation. Advanced design assures a low s.w.r. on each band. The antenna's large-diameter high-Q traps will maintain resonant points with varying temperatures and humidities. A hot-dipped galvanized base mount bracket and a full radial kit is supplied with each WV-1.

For more information, see your dealer, or contact Wilson Electronic Corp., Consumer Products Division, P.O. Box 19000, Las Vegas NV 89119, or circle number 68 on the reader service card.

A.E. Corp.'s Time Marker/Frequency Sweep Generator

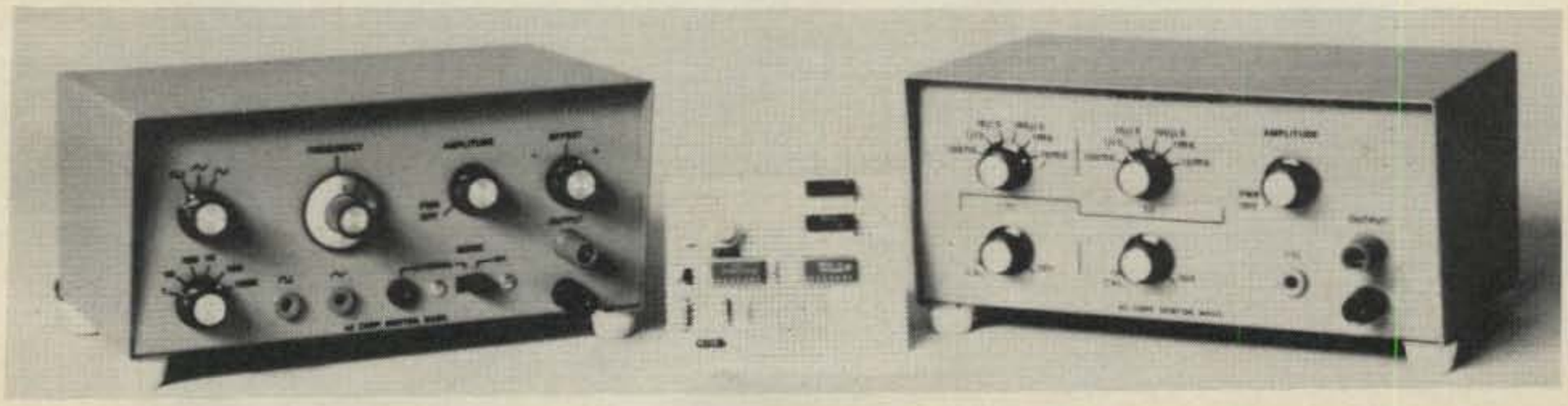
A low cost, time marker/frequency sweep generator for the use in calibrating oscilloscopes is being offered by A.E. Corp. of Needham, MA.

The time marker/frequency sweep generator lets an oscilloscope simultaneously display the amplitude of a given signal at a number of different frequencies marked by a calibrated reference reticle. Adjustable from 1 Hz to 100 kHz in factor-of-ten increments, the system operates on an input voltage of 105 to 125 v.a.c. at 60 Hz. 230 v.a.c. at 50 Hz is optional.

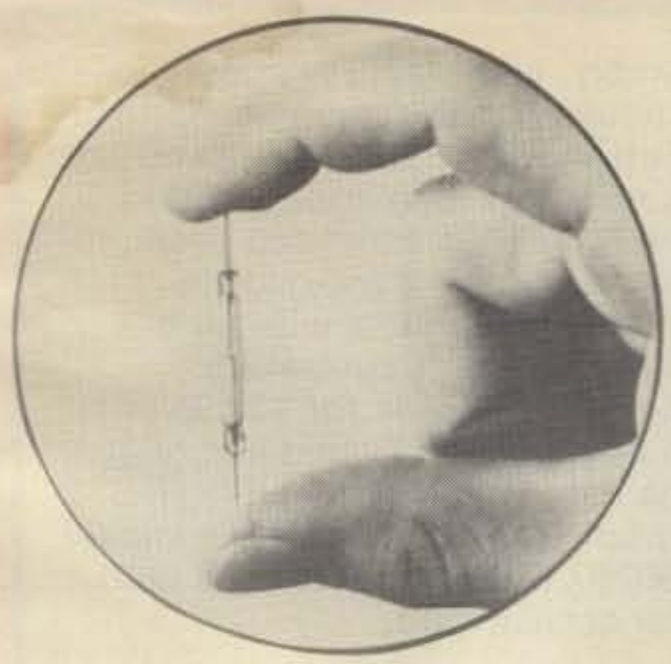
The time marker/frequency sweep generator consists of a model 12 Sweep Function Generator and a Model 20 Pulse Generator linked by a ramp and marker interface.

The A.E. Corp. time marker/frequency sweep generator retails for $155 as a kit and $240 assembled.

More information is available upon request from A.E. Corp., 65 Wellesley Ave., Needham MA 02194 or circle number 73 on the reader service card.



Amperex Electronics Corp.'s Microminiature Reed Switch For DIP Relays



Amperex Electronics Corp. is introducing the RI22 series reed switch. The RI22 is suited for computer and instrumentation applications where production consistency from batch to batch is very important.

The reed switch has a 0.6 mm wire diameter which reduces contact resistance to only 60 milliohms typically. The use of ruthenium over gold as the contact layer offers high stability of contact resistance over life. It is available in three different ampere-turn selections: 16-27 a-t (RI22-3A), 23-39 a-t (RI22-3B) and 37-55 a-t (RI22-22-3C).

For complete data contact Amperex Electronics Corp. in Hicksville NY 11802, or circle number 64 on the reader service card.

Staco, Inc.'s Budget Priced Power Supply

Staco, Inc. has introduced a new budget priced power supply. The model FPS-4 Filtered Power Supply operates on 120 v.a.c., 60 Hz input and provides 12 v.d.c. output at 5.5 amps surge, 4 amps continous duty.

The new supply features automatic overload protection and is housed in a ventilated steel cabinet.

The unit comes complete with an input power cord, on-off switch, pilot light and instructions. A terminal board on the rear of the unit provides easy-to-make output connections.

The FPS-4 is priced at $19.95. For further information contact Staco, Inc. at 301 Gaddis Blvd., Dayton OH 45403 or circle number 66 on the reader service card.

Heath Co.'s Computerized Weather Station

Heath has announced the availability of its new ID-4001 Computerized Weather Station. The microprocessor based ID-4001 indicates time, indoor and outdoor temperatures, wind speed and direction, and barometric pressure on an upright display panel utilizing large LED readouts.

It will also display average wind speed and automatically calculate wind chill factor as well. The ID-4001's memory allows instant recall of date and time of maximum temperatures, date and time of wind gusts, and the date and time of maximum and minimum barometric pressure. It can even indicate the barometric pressure's rate of change per hour and tell if it is rising or falling.

For more information about the ID-4001, which is mail order priced at $369.95 for the kit and $595.00 assembled, send for your free copy of the latest Heath catalog. The address is Heath Co., Dept. 350-730, Benton Harbor MI 49022, or you can circle number 67 on the reader service card.

Boris . . . The World's Smallest Talking Chess Computer

Chavitz, Inc. of Rockville MD has introduced two new battery-operated models of *Boris*, the talking chess computer. Both models are designed to teach chess by suggesting moves for beginners and play at various levels.

During each game, *Boris* flashes messages to his opponents from his seemingly-human brain. Both models know all classic chess rules and solve any mate-in-two problems.

Boris Master, housed in a solid walnut case, operated for 8 hours on rechargeable batteries. *Boris Jr.* operates for over 10 hours using AA batteries.

Currently, *Boris* is regarded as the most advanced personal chess computer available.

Retail prices start at $99.95. For further information, contact Chavitz at 1055 First St., Rockville MD 20850 or circle number 75 on the reader service card.

DenTron's GLA-1000 Linear Amplifier

DenTron Radio Co. has announced its latest amateur radio linear amplifier. Powered by four D-50A (6LQ6) final amplifier tubes, the GLA-1000 is rated at 1200 watts p.e.p. for s.s.b. and 1000 watts for c.w. with features like a reverse scale black-out multimeter for monitoring of critical currents and voltages, complete compatability with any exciter or transciever, front panel bypass, transmit indicator light, and a built-in relative power monitor for easy tune-ups.

The GLA-1000 is very compact and is ideal for portable or fixed operation.

The unit can be plugged directly into 117 v.a.c. mains and has 80 through 15 meter frequency coverage.

Suggested retail price is $379.50 and it is immediately available.

For more information, contact DenTron Radio Co., 2100 Enterprise Pkwy., Twinsburg OH 44087, or circle number 63 on the reader service card.

Exact Electronics, Inc.'s Combination Pulse/Function Generator

Exact Electronics announces a new 30 MHz Pulse/Function Generator, designated the Model 734. It combines a true pulse generator with a single pulse, double pulse, pulse delay, $\overline{\text{ECL}}$, ECL, $\overline{\text{TTL}}$ and TTL outputs available simultaneously along with the main output.

Pulse delay covers a range of 20 ns to 10 ms in six overlapping ranges. Pulse width covers a range of 10 ns to 10 ms in six overlapping ranges.

Normal and complement simultaneous TTL outputs are provided at 3 volts (peak) capable of driving 50 ohm loads.

Period repetition rate is variable from 1000 seconds to 33 ns in 13 overlapping ranges.

As a function generator, the Model 734 offers square and triangle waveforms over a frequency range of 0.0001 Hz to 33 MHz. Output amplitudes are 30 V p.e.p. open circuit and 15 V p.e.p. into 50 ohms.

The Model 734 Pulse/Function Generator is designed for the most discriminating user and is priced at $995. For more information contact Exact Eletronics at 455 S.E. 2nd Ave. Hillsboro OR 97123, or circle number 61 on the reader service card.

VIZ's Relay-Protected 100 Kilohm/volt V.O.M.

VIZ Test Instruments Group of VIZ Manufacturing Co. has added a new high-quality, moderately-priced v.o.m. to its line of electronic test instruments.

The WV-520B general-purpose 100 kilohm/v.d.c. v.o.m. is a fully protected (both relay and fuse) unit against overload on all ranges and functions.

The instrument measures d.c. voltages as low as 1 mV — up to 1000 volts in eight ranges. It also measures a.c. from 100 mV to 1000 V in five ranges, d.c. current from 0.1 microamps to 10 amps in seven ranges, resistance from 0.25 ohm to 20 megohms in four ranges, and decibels from -20 to +36 dB. In addition, it has a special jack that can be used to measure a.c. current from 0 -10 amps, and a polarity switch to permit d.c. measurements without reversing the test leads. It has many other interesting features.

The WV-520B sells for $68 from VIZ Test Instrument Group, 335 E. Price St., Philadelphia PA 19144, or circle number 71 on the reader service card for more information.

Heuer Time & Electronics' World's Smallest Digital Multimeter

Heuer Time & Electronics has announced the availability of a microminiature digital mutimeter. The new instrument, designated DMM 2000, is the smallest, thinnest, most compact digital multimeter available anywhere. It weighs less than three ounces (80 grams), including the probe and batteries, and measures 4″ × 1.87″ × 0.55″ for the base unit and 4″ × 0.78″ × 0.47″ for the standard probe.

The instrument provides four measuring ranges for every mode: d.c. up to 1000 volts and a.c. up to 700 volts; a.c. and d.c. current up to 2 amps; resistance up to 20 megohms, with a typical accuracy of 0.5% on d.c. ranges.

The Model DMM 2000 retails for $450.

For further information contact Heuer Time & Electronics at 960 S. Sprinfield Ave., Springfield NJ 07081, or circle number 60 on the reader service card.

Mura Corp.'s High Velocity Stereo Headset

Mura Corp. has recently announced a new stereo headphone set, the HV-100.

Lightweight in design, the HV-100 offers fatigue-free listening and an unusually broad range frequency response (virtually flat from 30 Hz to 15 kHz).

The Mura headset is equipped with super thin mylar diaphragm speakers and its vented high velocity construction eliminates pressure on the listener's eardrums. The HV-100 also features individual ear volume controls and a full bass response down to 30 Hz.

Suggested list price is $22.95.

For more information, contact Mura Corp. at 177 Cantiague Rock Rd., Westbury NY 11590, or circle number 76 on the reader service card.

Pearce-Simpson's Freeport™ Radiotelephone

Pearce-Simpson (a division of Gladding Corp.) has recently marketed a fully synthesized and preprogramed radio telephone. The unit can be used on every domestic marine frequency in both receive and transmit modes.

A moisture-resistant, lighted touch pad allows the user to select any desired channel. This includes any of the five weather channels - 3 domestic, 1 Canadian and 1 international.

The unit features a lighted channel and status display which is visible even in direct sunlight. The large, easy-to-read LCD also indicates whether the Freeport™ is in transmit, weather-monitoring, revert-to-16 or hail mode.

For more information, write to Pearce-Simpson, Division of Gladding Corp., 5101 N.W. 36th Avenue, Miami FL 33142, or circle number 77 on the reader service card.

If your checkbook never balances or your family budget gets the best of you, try this solution.

BASIC Personal Financing

BY CARMINE PRESTIA*

"What are you going to do with it?" was the first question my wife asked when I said, "I'm going to get a home computer." After my new Heathkit H-8 computer system arrived, I found out it might not be such a bad question.

One of the first ideas to come to mind was the family checkbook. In our case there are monthly statements to reconcile that require tallying the outstanding checks and deposits, computing a final balance and comparing it with the balance in my checkbook.

A program is a sequential set of instructions that tell the computer what to do. The checkbook program is written in "Extended Benton Harbor BASIC," a Heathkit version of the original Dartmouth BASIC computer language. Although very easy to use, BASIC (Beginner's All-Purpose Symbolic Instruction Code) is also extremely powerful, making program writing much simpler than with the more complex computer languages.

The program, called Checkbook, is stored on magnetic cassette tape and takes less than a minute to *load* into the H-8 from a regular cassette tape recorder/player, also purchased from Heathkit.

To start the program I enter the BASIC *command* RUN. The program then asks me to enter the checkbook balance and the bank's closing balance. It then goes to or *calls* two *subroutines*; one to enter and tally the outstanding checks and the other to do the same with the outstanding deposits. Then it returns to the *main* program. Subroutines are smaller programs that perform a task that is needed repeatedly throughout the main program.

The main program figures out the final balance, then prints both the final balance and the checkbook balance. It makes a comparison between the two balances; and if they are the same, the computer prints, "The Checkbook Balances!" If the figures do not agree, the

*1206 S. Allen St., State College PA 16801

program

```
100 REM CHECKBOOK, VER. 1, 10/24/77, CWP
101 REM CHECKBOOK BALANCING PROGRAM  THE MACHINE WILL
102 REM CALL FOR DATA FOR YOU TO ENTER  WHENEVER YOU
103 REM REACH THE LAST CHECK OR DEPOSIT ENTER THE FLAG
104 REM NUMBER 00.00  THE MACHINE WILL THEN COMPUTE
105 REM THE BALANCE AND ADVISE YOU IF THE CHECKBOOK BALANCES
106 INPUT "THE BANK BALANCE IS    ";B1:PRINT
110 INPUT "THE CHECKBOOK BALANCE IS    ";B2
115 REM THE PROGRAM NOW CALLS A SUBROUTINE TO
116 REM ENTER THE OUTSTANDING CHECKS
120 GOSUB 200
125 REM THE MACHINE NOW CALLS ANOTHER SUBROUTINE
126 REM TO ENTER THE OUTSTANDING DEPOSITS
130 GOSUB 300
135 REM THE MACHINE NOW COMPUTES THE FINAL BALANCE
140 F1 = B1 + D1 - C1
145 PRINT:PRINT:PRINT:PRINT
146 PRINT "THE FINAL BALANCE IS",,F1
150 PRINT "THE CHECKBOOK BALANCE IS",,B2
151 PRINT
152 REM THE MACHINE NOW COMPARES THE BALANCES
155 IF F1    B2 THEN 170
160 PRINT "THE CHECKBOOK BALANCES!"
165 END
170 PRINT "THE CHECKBOOK DOES NOT BALANCE,"
175 PRINT "THERE IS SOMETHING WRONG !!!!!!"
180 END

200 INPUT "OUTSTANDING CHECK    ";C2
205 IF C2 = 00.00 GOTO 220
210 C1 = C1 + C2
215 GOTO 200
220 RETURN

300 INPUT "OUTSTANDING DEPOSIT    ";D2
305 IF D2 = 00.00 GOTO 320
310 D1 = D1 + D2
315 GOTO 300
320 RETURN
```


NO-111-112

machine prints, "There is something wrong, the checkbook does not balance!" Then I have to go back and find out where *I* subtracted wrong in the book.

A *listing* of my program is included for those who would like to try it. Of course, there may be other ways to program this problem (in addition some modifications might be necessary under different versions of BASIC). Part of the challenge of program design is finding better ways to make the computer do the things you want it to do, the way you want them done.

Learning the multiplication table can be boring fare.
Turn your child's frustration into fun with Pete Stark's program!

Learning Multiplication

The BASIC Way

BY PETE STARK*, K2OAW

One of the many uses for a small, personal computer is in Computer Aided Instruction (CAI). A very popular concept about a dozen years ago, CAI never became widely used because of the high costs involved with the traditional computer approach. But now, with the aid of inexpensive small computers, computer aided teaching and drill may finally come into its own.

Most of the program is easy to follow. Line 1 prints out the words MULTIPLICATION DRILL. Line 2 makes a number S equal to zero; S will be used to keep score by indicating the number of correct answers. It is initially set to zero because at the very beginning the youngster has not answered any questions correctly.

Lines 4 and 5 select two random numbers called A and B. Unless you are familiar with Basic, these two lines are a bit difficult to follow, so let us just assume that they work. Both A and B will be numbers between 1 and 12, different for each problem. Line 6 then multiplies them to get the number P, which is the correct answer. But note that the computer doesn't yet print out the answer.

In line 7, the computer prints out the words WHAT IS, then the value of A followed by the word TIMES, and finally the value of B. This is followed by line 8, when the computer waits for the youngster to type in (or *input*) his guess G. If the guess is right, then line 9 tells the computer to go to line 12, which prints the word GOOD! On the other hand, if the guess is wrong, the computer continues from line 9 to line 10 and prints out WRONG. THE ANSWER IS followed by the real, correct product P.

Lines 3 and 14 work together to repeat this entire series of steps exactly 10 times. Each time the youngster answers correctly, line 13 adds 1 to the value of S, so that after 10 tries S is equal to the number of correct answers. Then line 15 prints out YOU GOT, the value of S, and the word RIGHT.

Lines 16 through 18 now examine the number of correct answers. If this number is less than five, line 16 instructs the computer to print the words THAT'S TERRIBLE! If the number is less than 10, then it prints YOU NEED MORE PRACTICE. Only if the number S is exactly equal to 10 does line 18 print FANTASTIC. YOU'RE AN EXPERT.

Finally, line 19 tells the computer to ask whether the youngster would like to try again with another 10 problems, and line 20 waits for an answer which the computer calls A$. If the answer is YES, then line 21 tells the computer to go back to step 2 and run the program again. Otherwise, the computer is told to print OK, SEE YOU LATER, and the program ends at line 23.

The program could easily be changed to provide drill in addition or subtraction instead of multiplication just by changing line 1, and also by changing the * in line 6 (which means *times*) to either + or −.

*196 Forest Dr., Mount Kisco NY 10549

program

```
0001 PRINT "MULTIPLICATION DRILL."
0002 LET S=0
0003 FOR I = 1 TO 10
0004 LET A = INT (12*RND(0)+1)
0005 LET B = INT (12*RND(0)+1)
0006 LET P = A*B
0007 PRINT "WHAT IS "; A; " TIMES "; B;
0008 INPUT G
0009 IF G=P THEN GO TO 12
0010 PRINT "WRONG.  THE ANSWER IS "; P
0011 GOTO 14
0012 PRINT "GOOD!"
0013 LET S=S+1
0014 NEXT I
0015 PRINT "YOU GOT "; S; " RIGHT.  ";
0016 IF S<5 THEN PRINT "THAT'S TERRIBLE!"
0017 IF S<10 THEN PRINT "YOU NEED MORE PRACTICE"
0018 IF S=10 THEN PRINT "FANTASTIC.  YOU'RE AN EXPERT."
0019 PRINT "WANT TO TRY AGAIN?  YES OR NO?"
0020 INPUT A$
0021 IF A$=" YES" THEN GO TO 2
0022 PRINT "OK, SEE YOU LATER."
0023 END
```

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FREE ELECTRONICS SURPLUS Catalog. Bargain Packed. Fascinating items, many never before advertised. ETCO-003, Box 762, Plattsburgh, N.Y. 12901. Surplus wanted.

CUSTOM EMBROIDERED EMBLEMS, your design, low minimum, Emblems, Dept. 10, Littleton, New Hampshire 03561.

QSL CARDS—500/$10. 400 illustrations. Samples: Bowman Printing, Dept. CQ, 743 Harvard, St. Louis, Missouri 63130.

ROHN TOWERS—Buy wholesale from World Wide distributor 25G sections $35.97 each—45G sections $54.89 each, 100 foot tower kit $628.22, 48 foot fold over tower $515.50, freight paid—40 foot free standing BX $171.97. Hill Radio, 2503 G.E. Road, Bloomington, IL 61701, (309) 663-2141.

SWAN 750CW with P/S new and unused. $700.00 UPS Switching to solid state. W1GWA, Dennis, 144 Golden Hill Street, Bridgeport, CT 06604. (203) 334-4837.

VP2M DXpedition! Villa with HW-101, SB200. Rebuilt Hy-Gain quad at 60 ft.; $90 weekly summer, $135 winter, $40,000 for keeps. Great for retirement. "Doc" Beverstein, 60 Amsterdam, Toronto, M4B 2C2. Tel (416) 755-2117.

WANTED: Hallicrafters S-1 through S-7, HSPA, S-T, SX-10, SX-12, and other early Hallicrafter gear, parts, and manuals-any condition, for private collection. Price and condition first letter. C. Dachis, WD5EOG, 4500 Russell Drive, Austin, Texas 78745.

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MOBILE IGNITION SHIELDING provides more range with no noise. Available most USA engines, some imports. Free literature. Bonding straps on sale now. Estes Engineering, 930 Marine Drive, Port Angeles, Wash. 98362.

WANTED: RSGB Handbook 3rd Edition—RSGB Bulletin 1961-71 any or all. Millen IF's no. 61160 several needed-used OK. Owen Laughlin, (313) 547-5765 call collect after 6 EST.

TRAVEL—PAK QSL KIT—Send call and 25 cents; receive your call sample in return. Samco, Box 203, Wynantskill, N.Y. 12198.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts. Small quantities, free catalog. Elwick, Dept. 312, 230 Woods Lane, Somerdale, N.J. 08083.

FOR SALE: Heath 1680 receiver. $150.00. I ship. Richard Nendick, Star Route 2809, Winnemucca, Nevada 89445.

YAESU FT227R Memorizer 2 meter synthesized, with Heath autopatch mike. Mint condition, $300. WB1DXL, 37 Franklin St., Lewiston, ME 04240.

WANTED: Hallicrafters SX-88 must be absolutely mint. G. Ligure, 155-22 89 St., Howard Beach, N.Y. 11414.

MORSE CODE—The "How to Learn" Booklet and cassette by a professional. Learning tips the professionals use. Slow and fast exercises. Send $5 to Dillon, 11 Vine St., Bronxville, NY 10708.

BEARCAT 250, $279.95. Regency K-500, $299.95. J.I.L., $219.95. Others. WILSON, Save up to 20 percent on antennas, rotors, and towers. SASE (large) speeds more specials. Visa/Master. McDonald Electronics, Box 1385(C), Rohnert Park, CA 94928, (707) 544-4388.

CALLBOOKS...1979 Foreign $14.95, U.S. $15.95. Drake TVI Filters TV-3300 $26.50, TV300 $8.50. Plus 75 cents shipping. ACE Electronics, P.O. Box 8171, New Fairfield, CT 06810.

CRYSTALS...Bomar, two meter, $4.00 monitor crystals $4.00, marine $5.25, (plus 35 cents shipping). ACE Electronics, P.O. Box 8171, New Fairfield, CT 06810.

CLUB CALL PINS 3 lines 1 1/4 x 3 1/4, $1.55 each call, first name and club. Colors: Black, Blue, or red with white letters. (Catalog). Arnold Linzner, 2041 Linden Street, Ridgewood, N.Y. 11227.

G & G RADIO ELECTRONICS new catalog available of government surplus equipment, tubes & parts. Send 50 cents for handling to: 45 Warren St., New York, NY 10007.

SALE: ALPHA 76P, unused, 160-10M, three 8874's, $1,500; Yaesu FR-101S receiver with $230 accessories, $450; Bird Wattmeter, $80; 2 meter Bird coil, $10; Amcomm S225 transceiver, $225; Say SPS 8M 8-amp power supply, $50; Heath IM-18 VTVM, $20; ERC SL-55 audio filter, $30; all pieces mint; will ship free; Bob Miller, N5AHY, 7979 Westheimer, Apt. 631, Houston, Texas 77063; (713) 783-5519 at home.

COLLECTOR WANTS Callbooks and Handbooks before 1946. Write for my offer. State condition and year. WB6DQJ, P.O. Box 5333, Walnut Creek, CA 94596.

FOR SALE: Cushcraft A147-22, stacked 11 element, 2 meter beam. New in carton. $70.00. A. Dorhoffer, K2EEK, 14 Vanderventer Ave., Port Washington, NY 11050.

SSTV AND PHOTOGRAPHERS—Make offer-1 each, like new-Fujitar lenses, 135 mm, f 4.5 telephoto, 35 mm, f 3.5 wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

SELL: CQ Magazines complete. Reasonable offers, cash or trade. Nagle, 12330 Lawyers Rd., Herndon, VA 22070.

WANTED: Pre-war issues of Short Wave Craft Magazine. Bill Orr, W6SAI, Eimac, 301 Industrial way, San Carlos, CA 94070.

WANTED: Collins 51-R receiver (VHF). Bill Orr, W6SAI, Eimac, 301 Industrial Way, San Carlos, CA 94070.

The Rochester Hamfest & NY State ARRL Convention will be held on May 25-27, 1979. Add your name to mailing list. Send QSL to Rochester Hamfest, Box 1388, Rochester, NY 14603. Phone (716) 424-1100.

SELL: 2 mtr FM Sonar transceiver, AC P/S, mobile bracket $150. George Pataki, WB2AQC, 34-24 76th St., Jackson Hgts., NY 11372.

QSL—QSL—QSL—Please send QSL cards to: Philip Steven Kurland, P.O. Box 1686, New Haven, CT 06507.

The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., NW, Albuquerque, NM 87114. Please enclose $1 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50 postpaid.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906. (617) 233-1234.

LOOKING FOR old Lionel trains. Interested only in "O" Gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap for radio gear to meet your needs. Write: Dick Cowan, WA2LRO, c/o CQ Magazine, or call (516) 883-6200.

FOR SALE: Old issues of Ham Radio, 73, CQ, QST. Some complete runs. Send SASE for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SALE: Sony ICF-5900W multi-band receiver designed for SWL's. Like new condition w/manuals. $100. Schultz, W4FA, Box "L", FPO, New York 09544.

FOR SALE: Tektronix 535 oscilloscope with dual trace and fast rise-time plug-ins. Very good condition. $425. Prefer local pick-up. Irwin Schwartz, K2VG, c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

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SELL: Drake SPR-4, calibrator, MS-4, mint $425. Dennis Filka, KA8CWC, 6324 Mandalay Dr., Parma Hts., OH 44130, Phone (216) 884-1175.

COLLINS mechanical filter wanted for 75A3 receiver, 600 Hz or narrower. N2AMV, 355 Spaulding St., Elmira, NY 14904.

DEC PDP 8 m/tty intfc/4K $1100, 8K $1700. 8K mos. bd. $475. many peripherals, trades. Portacom, briefcase, impact, ascii terminal/modem $595. ARS33, R4A $275. R-P MFA-22 synthesizer. $99 Mdl. 19 tty in Vermont $99. K2DCY. Box 632, W. Caldwell, NJ 07006. (201) 226-9185.

WANTED: QST 1916 March, April, July. Please airmail info to: Jock, ZL2GX, 152 Lytton, Gisborne, New Zealand.

HW-101 Heath Xcvr factory aligned, built-in CW filter, power supply plus HM-16 SWR bridge, $489 Xanadian or US equivalent. Jim Prior, VE7CKF, 806 W. 18th Ave., Vancouver, B.C. V5Z 1W3. (604) 876-2360.

CLEANING HOUSE QST's, CQ's, 1940 up no. 7 old ARRL handbooks, kw xformers. SASE for list to: K8CV, 4612 Woodland, Royal Oak, MI 48073. (313) 549-2353.

COLLINS SERVICE MANUALS: 1976 edition with all changes 1963-present for KWM-2/2A, 30L-1, 312B-4, 312B-5, waters Q-mult/notch filter, and all power supplies. Make offer. N4ATM, 938 Grove Park Dr., N., Orange Park, FL 32073.

FOR SALE: Complete station-Eico 723 and Hallicrafter SX-140 with Dow-key relay, $175. J. Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355. (212) 461-5933.

WANTED: DPDT coaxial switches and relays and SP6T coaxial switches w/'N' type connectors. WB8NLM, C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

WANTED: Antique Glass—looking for old milkglass-purple, slag, carmel, and greentown. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing, 14 Vanderventer Ave., Port Washington, NY 11050.

SALE: Heath IM-28 VTVM Kit. New, perfect. Ordered by mistake. $40. Schultz, Box "L", FPO, New York 09544.

FOR SALE: Heathkit HW-16 transceiver kit in original carton, $150. A. Hordo, 3646 W. 180th Pl., Torrance, CA 90504.

SALE: CWF-2BX CW filter used one week, $19. MFJ-8043 IC keyer mint condition, $55. WD9DSG, 5313 S. Maryland, Chicago, IL 60615, (312) 667-7476.

WANTED: Bird 43 Wattmeter, Send description and price to: K9BSL, 122 Country Club, LaPorte, IN 46350.

CENTRAL ELECTRONICS, Multiphase exciter, model 20-A, need manual and/or schematic. A. McGinnis, WA2DTQ, 55 Patton St., Iselin, NJ 08830.

SELL: Remote control box for CDE ham ant. rotor. New, $25. SASE for info. W4JGO, 643 Diamond, Salem, VA 24153.

FOR SALE: (2) Realistic DX-160 receiver w/speakers, $80 each. G.W. Adams, P.O. Box 157, Stacyville, IA 50476. Phone (515) 737-2455.

WANTED: Tek 2B67 time-base plug-in and other Tek 2 or 3 series vertical and time base plug-ins. Paul Acklin, 4806 Woodlawn Dr., Landover Hills, MD 20784. Phone (301) 772-2226.

WANTED: Signalizer, Ten—Tec mdoel S-20/S-30. George Scott, 34 Chatham, Vincetown, NJ 08088. (609) 859-8676.

XTALS for Heath HW2021, 85, 76, 73. $2 each. Available QSL Manager. Wanted: Cheap local linear. G.F. Gargiulo, WA1GFJ, 17 Whitney St., E. Hartford, CT 06118.

SSTV Keyboard. Very good condition. Wanted new 811A tubes. W2WHK, 210 Utica St., Tonawanda, NY 14150. (716) 692-5451.

WANTED: Any National receiver. Sell: 6M kw anp. (no p.s.), $150. SX-117 plus HT44/AC PS spkr., $350. Viking ranger w/PTT, $75. T.N. Colbert, 1800 Rhodes, RD no. 612, Kent, OH 44240.

FOR SALE OR TRADE: Drake TR-4 with noise blanker. AC-4 supply. Speaker and manual. High ser. no. nice condition, $425. Trade for FT-221-R late series. Jim, W1VYB, (617) 922-3850.

KENWOOD TR7400A. 2 months old. Mont condition, $335. N5UX, 1432 Pamela, Hurst, TX 76053.

WANTED: Info from May or June '78 "HRH" Magazine. Mike Lawrence, WB7UMA, 713 E. Joan Pl., Tuscon, AZ 85719.

WANTED: SX-28 super skyrider, NC-81X SX-17 skyrider. K0CAB, 1940 Grand Ave., Marion, IA 52302.

HALLICRAFTERS S-40A broadcast thru 40 MHz, new tubes, (9) excellent condition, $65. WA2PCL, 101-23 Leffert Blvd., Jamaica, NY 11419.

CARDWELL Var. Capacitor No. 155-6 17-252 P.F. $11.00 postpaid. Lafayette SWR F.S. Meter $12.00 postpaid. Bob Craig, 4950 Sunshine Ave., Santa Rosa, CA 95405.

TRADE: Complete 21 vol. Science and Invention "How it Works" encyclopedia. Set value $100. Swap for used ham receiver. Dr. Eric Palmer, W2RD, 1602 Mermaid Ave., Coney Island, NY 11224.

WANTED: Heath HM-2103 dummy load/Wattmeter. Bert, VE3GVH, RR3, Site 4, Box 56, Sudbury, Ont., P3E 4N1 Canada.

WANTED: Early AC radio, state condition, make, model, and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

WANTED: XCU-27 crystal calibrator for NCX-5. Also, plug-in inboard power supply for BC348 receiver. John M. Vasicak, W9ZEN, 124 North Glen Ave., Oglesby, IL 61348.

WANTED: Regency HR-2, AR-2, HR440, SBE450, Sell: New Ringo AR-2 antenna, $16. G.E. 30/50 mc mobile rec. $6. K6KZT, 2255 Alexander, Los Osos, CA 93402.

WANTED: US Callbooks-winter issues, vols. 27 (1949) 32, 33, 38, 40, 41, 44. K7MF, Rt. 1, Box 114, Vaughn, WA 98394.

WANTED: Heath HW-16 transceiver in excellent condition. State price. Caswell Davis, Jr., 601 Delmar Apt. 2, San Antonio, TX 78210.

QSLs: Design your own or copy your present card at low prices. Write; Rick Dittmer, 1635 Norton Ave., Grissom, AFB, IN 46971.

FOR SALE: Clegg 22er FM, $65. Hammarlund HQ100 clean, $65. Henry TM400 DC supply Huskey, $30. WB6VNR, 7104 Deveron Ridge, Canoga Park, CA 91307. (213) 346-5871.

NEEDED: Schematic diagram and service manuals for ICOM DV-21, digital VFO, Amplidyne Labs, model C14, 220 MHz. converter. Centi Meg 432 MHz. converter. Jung Lem, KB6BO, 5222 Coringa Dr., Los Angeles, CA 90042.

SELL: Heathkit SB-313 solid-state SWL receiver. Will ship. P. Wumer, 3235 Chestnut, Coloma, MI 49038.

SELL: R-390A, very dood, you pay shipping, $475. C. Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

TEST EQUIPMENT collector's surplus, HP, GR, Tek. Excellent stuff. Free list. PH.D., 5220 Carlingford, Riverside, CA 92504.

WANTED: Caribbean villa, must be in excellent condition, self-sufficient with enough land for antennas. Prefer elevated location on windward side of island. Send history, maps and photos to: W1CDC, 43 Dover Rd., Manchester, CT 06040.

OLD BOOK And Gear. SASE for list. R. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

SELL: Osborne hypersil core type 5962 pwr xfmr 110/220 VAC Pri with Sec. CT 5650 and 4000 VAC at .5 amps. Will ship for $55. A. Polityka, 248 Western, Allegan, MI 49010.

WILL TRADE a 75 by 125 lot in Northern Fla. for a modern ham station. Let's deal. Albert, 2256 Claude, S.E. Salem, OR 97301.

SELL: Wilson 1402SM HT in mint condx comes w/batteries, charger, case, es more. Mike, WA2DNF, (212) 261-6177.

WANTED: SB2LA (linear Ampilier for SB-34 Transceiver) in good working condx. Russell A. Garlin, W5UKA, 11533 Key West Dr., NE, Albquerque, NM 87111.

DRAKE LINE: T-4XB, R-4B, AC-4 and MS-4 $685. Conar 2 meter FM rig $195. Clem, W8VO, 33727 Brownlea, Sterling Hghts., MI 48077. (1-313-268-2467.

HW-101 factory aligned. HP-23B, SB-600, crystal filter, GD104 microphone, all mint, $345. All postapid. Bob Mayo, WB2VUB, 1011 Southern Pines Dr., Apt. 3, Endwell, NY 13760.

4-1000A Tubes and chimneys wanted. Sell: TR-4CW, R-B, T-4XB, both with MS-4 and AC-4 supply. Tom Neill, K4XG, Box 847, Brentwood, TN 37027.

SELL: Heathkit DX-60, $60. KR-5A keyer, $20. WB2MJQ, Box 490, Chester, NY 10918.

DXERS! Ham sentences in 54 languages on your QSLs , get returns. K3CHP's DX QSL Guide, $3.95. J. Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

SELL: Complete Robot SSTV. Mont, $650 FOB. R. Huntington, 5014 Mindora Dr., Torracne, CA 90505.

WANTED to buy, trade, or copy. Complete set or part, Novice Magazine. (Defunct). H. Basch, WB2JOH, 335 Carnegie Ave., Wenonah, NJ 08090.

KENWOOD TS-820S digital transceiver, CW filter, installed, only 6 months old. $850. in original box. Wm. D. Shevtchuk, One Lois Ave., Clifton, NJ 07014.

WANTED: AC power supply trips for Motorola 41-V in good condition. Front mount panels for same unit. Info on Switching this unit from AC to DC. Jim Herteen, WA0NAA, 119 W. 2nd St., N., Newton, IA 50208.

GOV'T SURPLUS circuit boards, large size. Many parts, including many with transistors and sockets! $2 each, plus postage. Other ham items sale or trade cheap. SASE to: D. Testa, "mark CQ" P.O. Box 9064, Newark, NJ 07104.

COMP. Line of IC's and Elec. Components no minimum, no shipping. Chgs. free catalog. Write: Ham Shack, P.O. Box 1313, Donaldsonville, LA 70346.

SB-200 with 10 meters, new in unopened box from Heathkit. $380. Postage collect. KA1AES, Box 6, Chocorua, NH 03817.

COMPLETE HAL RTTY Station for sale. DS-3000 KSR, ST-6000. WB4BYO, Send SASE to: 135 W. 9th St., Jacksonville, FL 32206.

NOVICE ALL—AMERICAN certificate: Work a novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

FOR SALE: Drake SPR4 Receiver, $400. Drake TR22C two meter transceiver, $180. LeRoy E. Youngs, Rt. 2, Box 177, Tracy, MN 56175.

SEND Large Stamped Envelope for list of VHF/UHF transmitters, preamps, test gear, etc. Excess my needs. W4API, Box 4095, Arlington, VA 22204.

HEATH IM4100 freq. counter, used very little, $70. Bob Cregar, WD8NKT, 1103 S. Jefferson St., Bay City, MI 48706.

GONSET G-63 rcvr 80 thru 6, double conversion, ssb, cw, am, manual, nice. Prepaid UPS, $125. WA2PCL, 101-23 Lefferts, Jamaica, NY 11419.

SELL: Ameco PT-2 Preamp, like new condition, $40. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

WANTED: HP-150A scope for parts, also other HP and Tek scopes for parts. W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

CDE Ham III Rotor and Rotator. Never used Bum Directional Meter, $75. Tim McCullough, 1319 Anna Court, Erie, PA 16504.

WANTED: Field Stength meter covering all VHF and UHF channels and FM bands. State make, model, condition, and price. T.K. Brown, RD 1, Box 102, Forksville, PA 18616.

SELL: Ameco TX62, Manual, good clean $50. W2AU Balun unused $10. Both shipped p.p.d. Sever, 248 Sheraton Dr., NW, North Canton, OH 44720.

SELL: 75A4 late and all ACC, $495, Ameco 2 mtr. conv., $25. Tecraft 6 mtr. xmtr., $25. Bob Sherman, 83 Fox Blvd., Massapequa, NY 11758.

RACAL AND CEI receivers, accessories and modules wanted, any condition. Cash or swap for computer equp. Webb, WA2MOT, (201) 267-1117 (NJ).

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