ICD 08241

CQ Amateur Radio

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FLASH! CHINA OK'S AMATEUR RADIO...pg.6

SPECIAL ANTENNA ISSUE

THE RADIO AMATEUR'S JOURNAL

TR-2500

BIG performance, small size, smaller price!

The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 memories, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

TR-2500 FEATURES:

- Extremely compact and light weight 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches), 540 g, (1.2 lbs) with NiCd pack.
- LCD digital frequency readout.
- Ten memories includes "MO" memory for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5 kHz and larger (5, 10, 15, 20, 30 kHz ... etc) to be programmed.

CONVENIENT TOP CONTROLS

- UP/DOWN manual scan.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz in 5 kHz steps.
- Optional power source, MS-1 mobile or ST-2 AC charger/ power supply allows operation while charging. (Automatic drop-in connections.)
- High impact plastic case.
- Battery status indicator.
- Two lock switches for keyboard and transmit.

Standard accessories:

- Flexible rubberized antenna with BNC connector.
- 400 mAH heavy-duty Ni-Cd battery pack.
- AC Charger.

Optional accessories:

- VB-2530 25 W RF Power amp, BNC-BNC cables, and mounting bracket, supplied.
- MS-1 13.8 VDC mobile stand/ charger/power supply.

Optional accessories:

- ST-2 Base station power supply and quick charger (approx 1 hr.)
- TU-1 Programmable "DIP switch" (CTCSS) encoder.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.
- PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy-duty.
- BT-1 Battery case for AA manganese or alkaline cells.
- BH-2 Belt hook.
- WS-1 Wrist strap.
- EP-1 Earphone.

NEW

Optional accessories:

- KPS-7 DC power supply for TR-9130 base station operation. 7 A intermittent, 6 A continuous, protection circuit built-in.
- SP-40 compact mobile speaker. Only 2-11/16 W x 2-1/2 H x 2-1/8 D (inches). Handles 3 watts of audio.
- TK-1 AC adapter for memory back-up (not shown).

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/ CW transceiver, featuring six memories, memory scan, memory back-up capability, automatic band scan, all-mode squelch, and CW semi break-in. Available with a 16-key autopatch UP/ DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. The mode switch, with the digital step (DS) switch, determines the size (100 Hz, 1 kHz, 5 kHz, 10 kHz) of the tuning step.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch. Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan. Scans memories in which data is stored.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan. Scans within whole 1 MHz segments (ie., 144.0-144.999 MHz).
- Dual digital VFO's.
- Transmit frequency tuning while transmitting, for OSCAR operations.
- Squelch circuit, all modes (FM/SSB/CW).
- Repeater reverse switch.
- Tone switch.
- CW semi break-in circuit with sidetone.
- Digital display with green LED's.
- Compact size and lightweight. 170 (6-11/16) W x 68 (2-11/16) H x 241 (9-1/2) D mm (inch). 2.4 kg (5.3 lbs.) weight.
- Covers 143.9 to 148.9999 MHz.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- Transmit offset switch.
- High performance noise blanker.
- RF gain control. • RIT circuit.

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

NEW

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available. TS-130S, with FA-4 installed, also available.
- Effective noise blanker.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130SE).
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

Dyna-"mite."

Photo shown is TR-7730 in 16-key autopatch UP/DOWN microphone version.

Miniaturized, 5 memories, memory/band scan

TR-7730

The TR-7730 is an incredibly compact, reasonably priced, 25-watt, 2-meter FM mobile transceiver with five memories, memory scan, automatic band scan, and other convenient operating features. The TR-7730 is available in two variations: a 16-key autopatch UP/DOWN microphone (MC-46) version, and a basic UP/DOWN microphone version.

TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**
  Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**
  HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**
  May be operated in simplex mode or repeater mode with the transmit frequency offset ±600 kHz. The fifth memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.
- **Memory scan**
  Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Automatic band scan**
  Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**
  Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps.
- **UP/DOWN frequency control from microphone**
  Manual UP/DOWN scan of entire band in 5 kHz or 10 kHz steps is possible when using either autopatch or basic UP/DOWN microphone versions.
- **Offset switch**
  Allows VFO and four of five memory frequencies to be offset ±600 kHz for repeater access or simplex.
- **Four-digit LED frequency display**
  Indicates receive and transmit frequency.
- **S/RF bar meter and LED indicators**
  Bar meter of multicolor LEDs shows S/RF levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**

Optional accessories:

MC-46 16-key autopatch UP/DOWN microphone
SP-40 compact mobile speaker
KPS-7 fixed-station power supply

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220

KENWOOD
...pacesetter in amateur radio

Synthesized 70-cm FM mobile rig

TR-8400

- **Synthesized coverage of 440-450 MHz**
  Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**
  For ±5 MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**
  On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for accessing autopatches) or other tone-signaling device.
- **HI/LOW RF output power switch**
  Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**
  Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**
  Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/RF bar meter and LED indicators, tone switch, and same optional accessories.

Specifications and prices are subject to change without notice or obligation.

MASTHEAD

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CQ The Radio Amateur's Journal

ON THE COVER: Looking up through the antenna system of Gerry King, VE3GK. We'll have more to say about this later in an upcoming article.

APRIL 1982 **VOL. 38, NO. 4**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

FLASH!! BY1PK Will Soon Be On The Air

At press time for this issue we learned that the hope and dream of amateurs throughout the world was soon to be realized. In the January 1982 issue of Radio *magazine, a magazine published in China, the lead article is called "Good News" as well it should be. Amateur radio operation in China has been granted approval by the Chinese State Department. This is the official approval we've all been waiting for. Initially all operation will be from group or club stations with no provision for individual operator stations. The actual licensing authority for Chinese amateurs and the club stations has not been worked out yet, but it will operate within international laws governing amateur radio. Club stations will initially be within large cities and eventually progress to other areas.*

April is the kind of month that symbolizes new growth in many areas. The traditional "April showers" portend the flowers that are supposed to bloom in May, and the word "new" seems to fit everything. April is also the month for Dayton, where all the new amateur gear is on display, and the burgeoning fleamarket holds the promise of exotic parts and equipment at bargain prices.

For almost twenty years I've gone to Dayton with that expectant dream. Now don't get me wrong; it's all there just as I've said, but somehow the weather has a habit of playing tricks. Old Dayton hands expect this anomaly in the weather and joke about it during the year, but we still forget that it does happen more often than not. The Saturday anomaly at Dayton is cold weather and perhaps some rain. If this could possibly deter you from going, you are not a true ham. The anomaly does not happen on schedule each and every year, but it does happen enough times to be expected. Now, one enterprising person at the fleamarket for the past few years has sold surplus U.S. Army dress uniform jackets of WW II vintage to the crowds who venture outside. These jackets have had all buttons removed (for scrap brass), and so with epaulets dangling, and jackets bound with bits of string, our rag-tag army of Valley Forge hams still scour the fleamarket. I think that the logic involved is probably based on the superstition that if you carry a lined rain coat or heavy jacket out with you to Dayton, the Powers that be will smile down on Dayton and it will have been a wasted effort to drag that extra clothing around for three days. If that be the case, be prepared for really good weather this year, as I am going to pack a heavy jacket.

On the other hand, one hamfest (or convention if you will) that always seems to have nice weather is the Miami show. Leaving the ice and snow behind us in New York, Dick, Jack, and I spent the first weekend in February attending the Miami hamfest. The temperature was about 80 degrees and the sun was shining. The *CQ* booth was next to the prize-drawing booth, so we managed to talk to a lot of people trying to give us their prize stubs. The fleamarket was very crowded on Saturday when I went through, and I did manager to get some goodies to carry back to New York. We stayed over an extra day to rest up and make two quick visits in the area. In the morning we stopped in at Amateur Wholesale Electronics to see the folks there, and as we were about to leave Dick mentioned that he could use a carton to protect a fleamarket find for the trip home. Sherry Gregory of A.W.E. dug up a carton and packed the item herself. Now *that's* hospitality. On the way to the airport for the flight home we stopped off at N&G Distributing. The visit there brought back memories of a job I had at a local electronic distributor about twenty-five years ago. N&G is located parallel to the end of the runway at Miami International, so if you look out the rear windows, all you see are jets landing, and at that distance and height they do look big. In my day many years ago it was prop jobs coming into LaGuardia. Gene Storob is an interesting and colorful man, and talking to him and his store manager, Bob, is typical of most distributors we visit. You talk on the run; the phones, intercoms, and customers persist all day long.

We have two more shows to attend before the Dayton happening. We will be at the Orlando Hamfest and at the one in Charlotte. In early April Lew McCoy will be representing us at SAROC, so by the time you read this, a lot of *CQ* traveling will have gone on. Also by the time you read this, many of you will have worked Jack, who left Miami with his XYL, Ruth, for a vacation on Grand Cayman. Jack took two suitcases of equipment, tools, and antennas for this mini-DXpedition/vacation.

Good intentions—that's what it's all about. I think that most amateurs have projects in mind that start out with all the best intentions and seem to bog down in the mire of other responsibilities coupled with that "last thing" we need that always eludes us. I've been trying to put up an antenna for almost two years now, and I guess that I probably do have just about everything I need for the installation except time. As those of you who have followed my epic travels can attest, I'm rarely home on a consistent basis.

However, on the plus side for traveling, I have never forgotten the ultimate goal of putting up my antenna. At almost every show we've been to I have picked up some hardware, nylon rope, cable, etc., and now after all of this time I do have a garage brimming with antenna stuff. The Hy-Gain TH5DX which started the parts gathering is still unassembled, but raring to go. The roof-mounted tower is assembled, though, and alongside the house. The turnbuckles and other hardware are waiting for that perfect day when it will all come together. The Phillystran guy line is waiting patiently in its coil, and everything is set to go, including a 14-element 2-meter beam from Cushcraft. When, you may ask, is that perfect day (or days) going to come? It looks like it's finally going to happen this month. If Easter week is warm enough, the great antenna party will take place. Woody, K2UU, has agreed to head up the team of intrepid installers which will include Dick, K2MGA, and Jack, W2LZX.

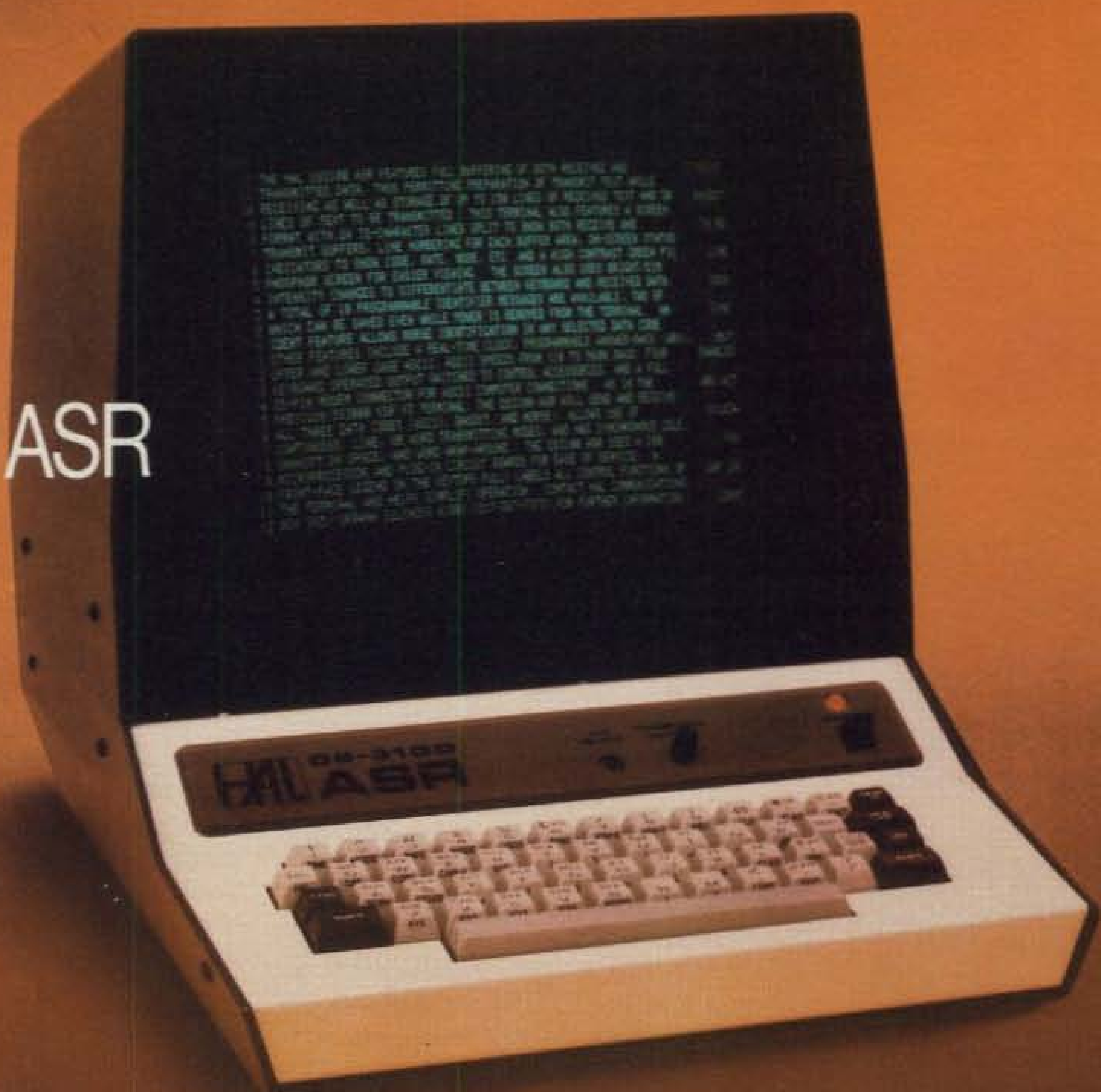
If everything measures out correctly, the TH5DX should clear the trees and, most importantly, turn within my property. That will give you some idea of my postage-stamp-sized lot. Of course, we hope to preserve all of these events on film and write up the installation when completed. Good intentions not withstanding, I should have the antennas up by Dayton. If you stop by the *CQ* booth at Dayton, I'll let you know how it turned out.

Arnie Verdow, WØLIJ

Amateur radio lost another dear friend recently with the sudden passing of Arnie Verdow, WØLIJ. Arnie was the Marketing Manager of Amateur Products for Rockwell International, which to most of us means Collins Radio. He was a walking encyclopedia of Collins products, modifications, and helpful hints, plus a veritable source of all of those hard to impossible to find parts. It may sound like a cliche, but he touched so many lives and made them better, and he was an instant friend to everyone who had the good fortune to meet him. We will all miss him.

73, Alan, K2EEK

WHEN OUR CUSTOMERS TALK...WE LISTEN.



DS3100 ASR

We've Been Taking Notes.

Combining your ideas with some of our own, we've come up with what has to be the most advanced and convenient terminal available. These are some of the conveniences you can now enjoy by putting the DS3100 ASR in your RTTY and CW station:

ASR Operation (Compose your transmission *WHILE* receiving)

- 150-line Receiver Buffer
- 50-line Transmit Buffer
- Split Screen to Show Buffers
- Internal Real-Time Clock
- 10 Programmable Messages
- Automatic Answer-Back (WRU)
- Morse, Baudot, or ASCII Operation
- RTTY and CW Identification
- Full 128-Character ASCII
- 110-9600 baud ASCII
- 60-130 WPM Baudot
- 1-175 WPM Morse

Write or call for the DS3100 ASR specifications and see how *YOU* have helped design the new standard in amateur radio terminals.

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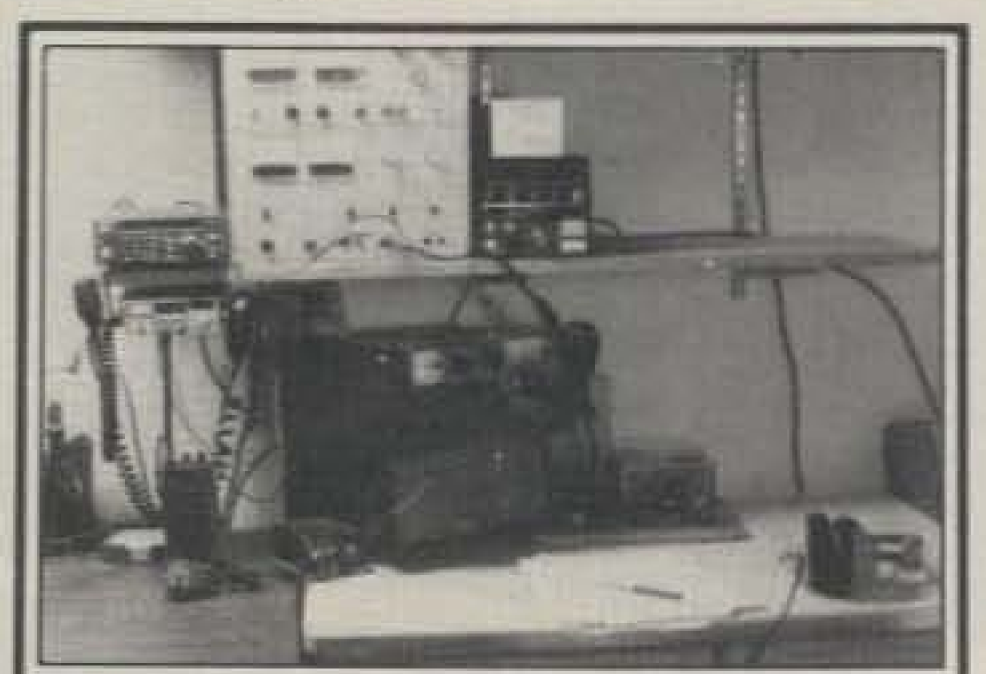
Our Readers Say

How Much Gear Do I Need?

Editor, *CQ:*

In several issues of *CQ* I've noticed you show pictures of shack setups (all quite impressive). Way back when, when I first started subscribing to your magazine, I always thought, "Do I have to get all THAT for a decent setup?" As a Novice (at that time) those giant, impressive setups left me not only impressed, but awestruck, not realizing something more modest might do.



As to a quick explanation of my picture, the shelf (actually the bottom shelf of a bookcase) contains (from left) my two meter rig (Kenwood 7800) with an 11 meter rig hanging on the shelf underneath it. Center is a dual power supply; on the bottom is a 15V-10A which supplies both the Kenwood and the 220 MHz Midland 13-509, which is to the right of the power supply, underneath a frequency counter. The top is a 40V-2A which I regulated down to 20V-50mA to charge my 2 meter H.T. (sitting underneath my 11 meter rig), which is an Icom IC-2AT. The low-bander (on desk) is a Drake TR-3 sitting on its speaker which has the power supply in the speaker box. Half hidden by this is a straight key and oscillator (code type) with the 11 meter power pack on it (the 11 meter rig makes the other supplies freaky). In parallel to the straight key is a homebrew keyer. On the edge of the desk to the left of the Drake is an AF filter. The Midland, Kenwood, and frequency counter have, since the picture, been stacked on the left of the power supply, where the Kenwood is now pictured alone. This is to save space for when, hopefully in the near future, I get a 2 meter amplifier and a KW amplifier for the lowbander (once I upgrade from Tech. to General).

Please feel free to publish this for the benefit of all those out there reading your magazine and thinking, "How much do I need before I can compete with the others on the air?" This picture is to show the simplicity of gear needed to be on what I consider to be relatively many frequencies.

Klaus Spies, WB9YBM
Niles, IL

January Zero Bias, Amen!

Editor, *CQ:*

Re Zero Bias, January 1982 *CQ*, about the ridiculous proliferation of "things" which are now called DX "countries"! Amen!

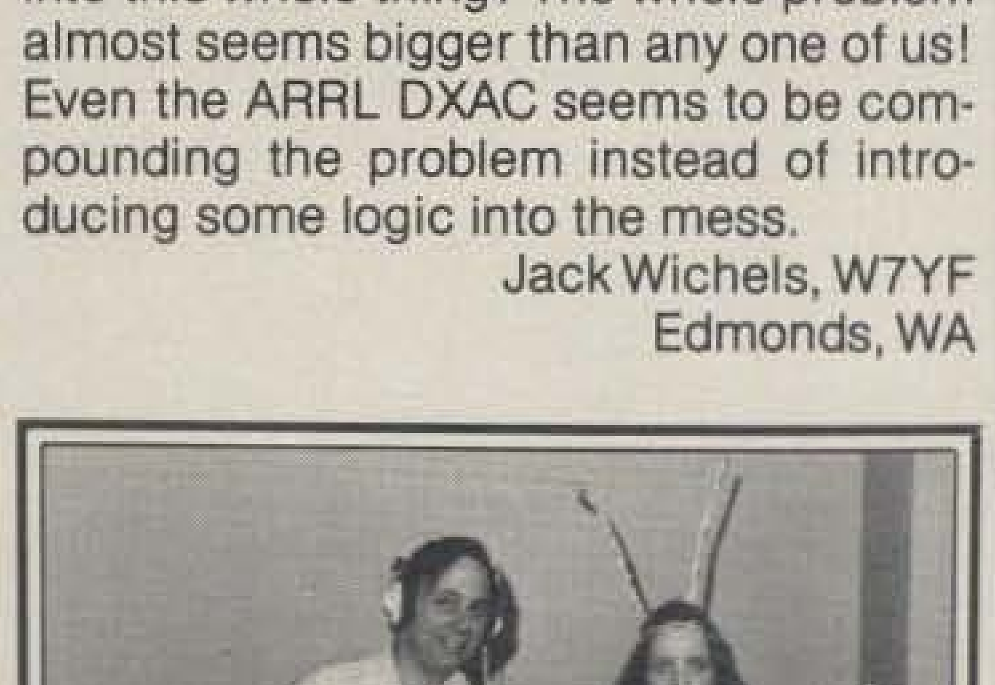
For the past couple of years, I've tried in vain to locate the "country" called "Abu Ail" or "Jabal at Tair" (see DXCC Countries List) on a map. Any map! Even a National Geographic Society map! Who knows, perhaps Jabal at Tair is really a professional basketball player for some NBA team!

What is wrong with using some readily acceptable geographical standard for defining a "country"? Even the most recent National Geographic map! One criterion I would surely recommend would be the capability of finding, or locating, *any* DX "country" on some type of readily available map. That would at least eliminate the Abu Ails and a few others.

Another point: I've always wondered why places like the Aland Islands (OHØ) and Market Reef (OJØ) were "countries" when they are located so close to Finland, while places in Alaska 2,000 or more miles apart (Attu Island, on the tip of the Aleutians, and Ketchikan, almost in British Columbia) were merely "a single country." Even Gambell, on St. Lawrence Island, Alaska, is closer to Siberia (40 miles) than it is to mainland Alaska—but it's still KL7!

So how do we begin to get some sense into this whole thing? The whole problem almost seems bigger than any one of us! Even the ARRL DXAC seems to be compounding the problem instead of introducing some logic into the mess.

Jack Wichels, W7YF
Edmonds, WA



No, they're not waiting to be carried off by the Twinky Trolley. Leo Zucker, K2LZ, and his XYL Carol proudly display the winning costumes at a Halloween party. Carol designed the costumes and they both deserve a lot of credit for sharing the joys of amateur radio with the rest of the revelers in Mount Kisco, NY.

New Drake TR5 Transceiver

far above average!

COMING SOON:
RV75 Synthesized VFO
featuring the Drake "VRTO"

• **Frequency Synthesized** for crystal-controlled stability • **VRTO (Variable Rate Tuning Oscillator*)** adjusts tuning rate as function of tuning speed. • **Resolution to 10 Hz** • **Three programmable fixed frequencies** for MARS, etc. • **Split or Transceive operation** with main transceiver PTO or RV75

* Patent pending

With the new TR5
versatility and value are spelled D-R-A-K-E . . .

DYNAMIC RANGE

The dynamic range of the TR5 is unexcelled by any transceiver in its class. The TR5's greater than 0 dBm third order intercept point (85 dB two-tone dynamic range) at 20 kHz spacing can be achieved only by the use of a passive diode-ring double balanced mixer. Drake was the first to bring this technology to the Amateur market with a high-level mixer in the TR7.

RELIABLE SERVICE

When you purchase a TR5, or any Drake product, you acquire a product of the latest production techniques, which provide reliable performance.

Yet with a product as sophisticated as one of today's transceivers, after-sales service is a must. Ask any Drake owner. Our Customer Service Department has a reputation second to none.

ACCESSORIES

Drake is the only Amateur Radio manufacturer who offers a full complement of accessories to satisfy almost every desire the HF Amateur may have. This wide selection allows any operator to assemble a station which meets his needs, and assures compatible interfacing and styling instead of a desk full of equipment with a variety of styling and poor operation as a system.

KILOWATT AMPLIFIER

Everyone wants to be heard! The accessory L75 and its 3-500Z (1200 watts PEP input) and a decent antenna will do the trick. This rugged self-contained amplifier/power supply will put the TR5 on an even footing with the best of them.

ENGINEERING

The TR5 and all Drake Transceivers, are backed by the best in engineering. The TR5 is the result of an extensive engineering effort, combining proven past techniques and ideas with new state of the art concepts.

As a result, the TR5 will not be superceded by a new model every six months. It represents a true radio communications value that will provide many years of operating enjoyment.

Features, availability and prices subject to change without notice or obligation.

See your Drake dealer or write for additional information.

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5-STORE BUYING POWER *in action!*

KLM/TRI-EX

SALE

Product No.	Description	Regular	Special
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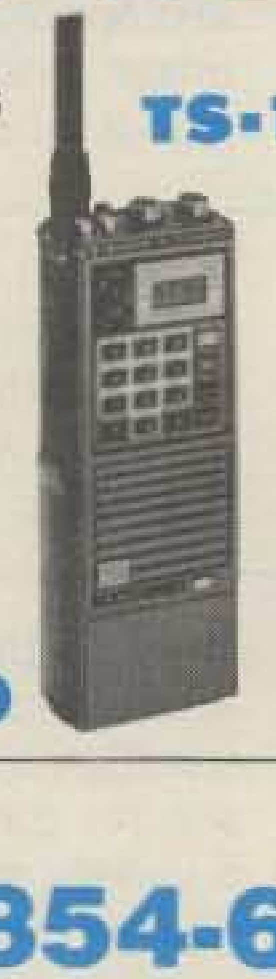

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A CQ EXCLUSIVE

Killer germs destroy bioelectronic switches.... Research in molecular electronics set back decades....

The Threat To Molecular Electronics From Microbes Produced By Genetic Engineering

BY PROFESSOR EMIL HEISSELUFT*
LAUTON INSTITUTE
GROSSMAUL AN DER DONAU, AUSTRIA

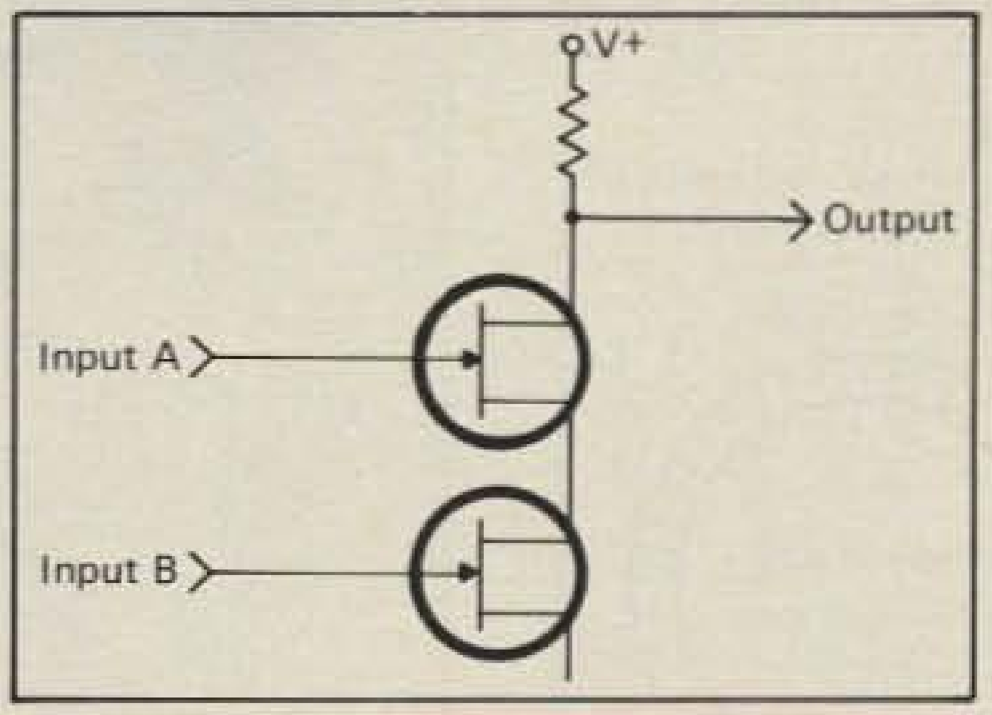
With the revolution that has taken place in genetic engineering, it should come as no surprise that scientists have developed a bioelectronic switch. These switches should make it possible to build computers with more switching elements—and capabilities—than the human brain. But the dreamed-of revolution in computers has not taken place, for reasons most scientists are reluctant to reveal. Professor Heisseluft, however, has discovered the reason behind our inability to produce a viable bioelectronic switch. The problem he has uncovered spells big trouble for the entire electronics industry. Read this exclusive expose of the bioelectronic switch industry, and the problems it has spawned.

—K2EEK

For years, scientists, engineers, and chemists have been puzzled by the lack of progress made in the field of molecular electronics.[1] This science, which promises to provide bioelectronic switches smaller than even brain cells, has yet to yield the so-called "dream computer" envisioned by generations of computer designers.

When questioned about the lack of progress in this field, specialists often cite the fact that the proposed bioelectronic components cannot be tested since it is not yet possible to arrange the substances in circuit patterns. But I have learned, dear readers, that this is not the case. Quite to the contrary, it is possible to produce the necessary bioelectronic switches using a genetic engineering approach. The only problem, however, is that *mutant forms of the switch microorganisms are eating the sought-after components as fast as they can be produced.* In fact, these microorganisms threaten the very existence of molecular electronic devices!

Fig. 1– Diagramatic representation of a transistorized NAND gate ($\overline{AB} = 1$).



To understand this startling and disconcerting revelation, it will be necessary to review briefly the science of molecular electronics and the manner in which molecular switches are produced. I will also show, for the first time anywhere, a photograph of the microbe responsible for the disappearance of molecular NAND gates!

Molecular Electronics

Perhaps the best way to explain molecular electronics is to review the molecular analog for a NAND gate. First, though, let us review the operation of a transistorized NAND gate (fig. 1).

As is seen in fig. 1, the NAND gate shown consists of two field-effect transistors, with each gate an input to the device. In operation, a "1" output will result when both inputs are "0." Conversely, a "0" output will result if either or both of the inputs are "1."

Now, consider the use of porphyrin molecules to produce such a gate. (Porphyrin may be thought of as a protein; it can combine with many metals.) Because of the way the porphyrin molecule behaves in the presence of an electric field, it can be made to act as a switch

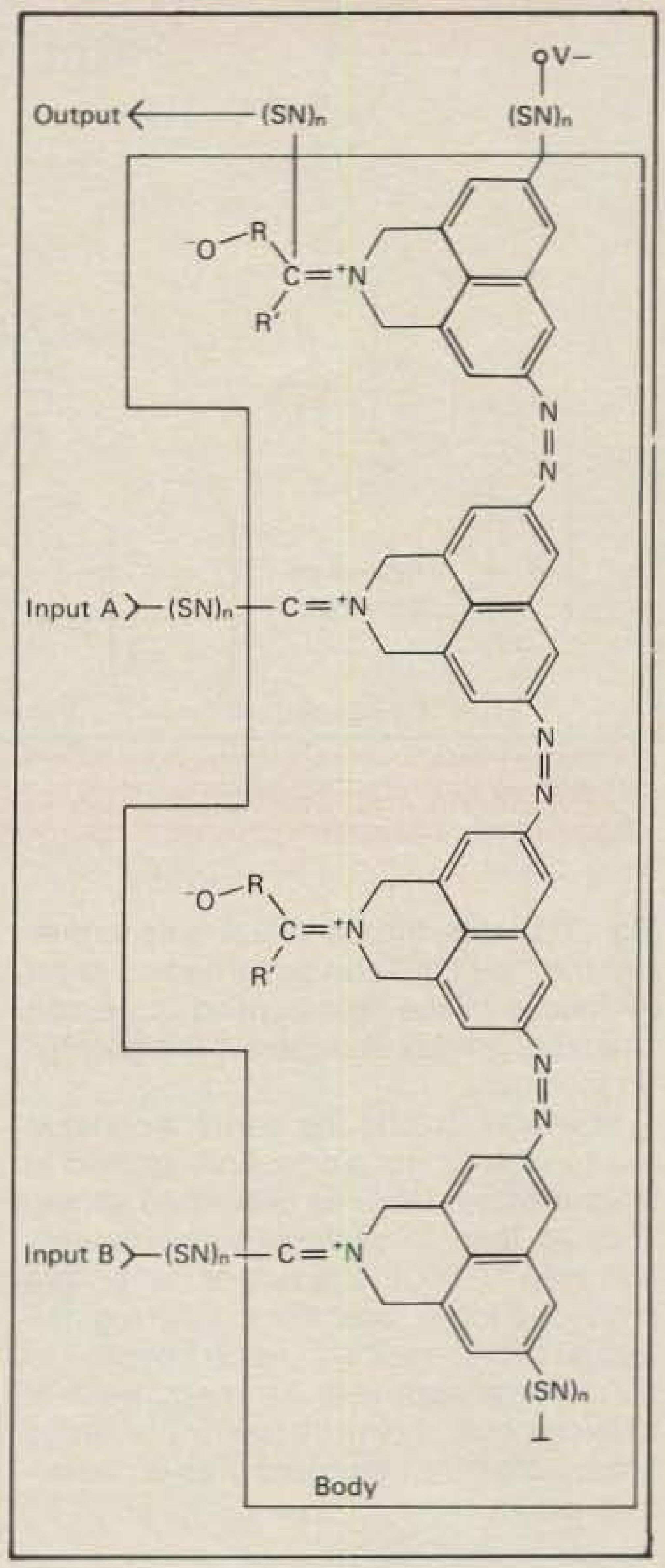
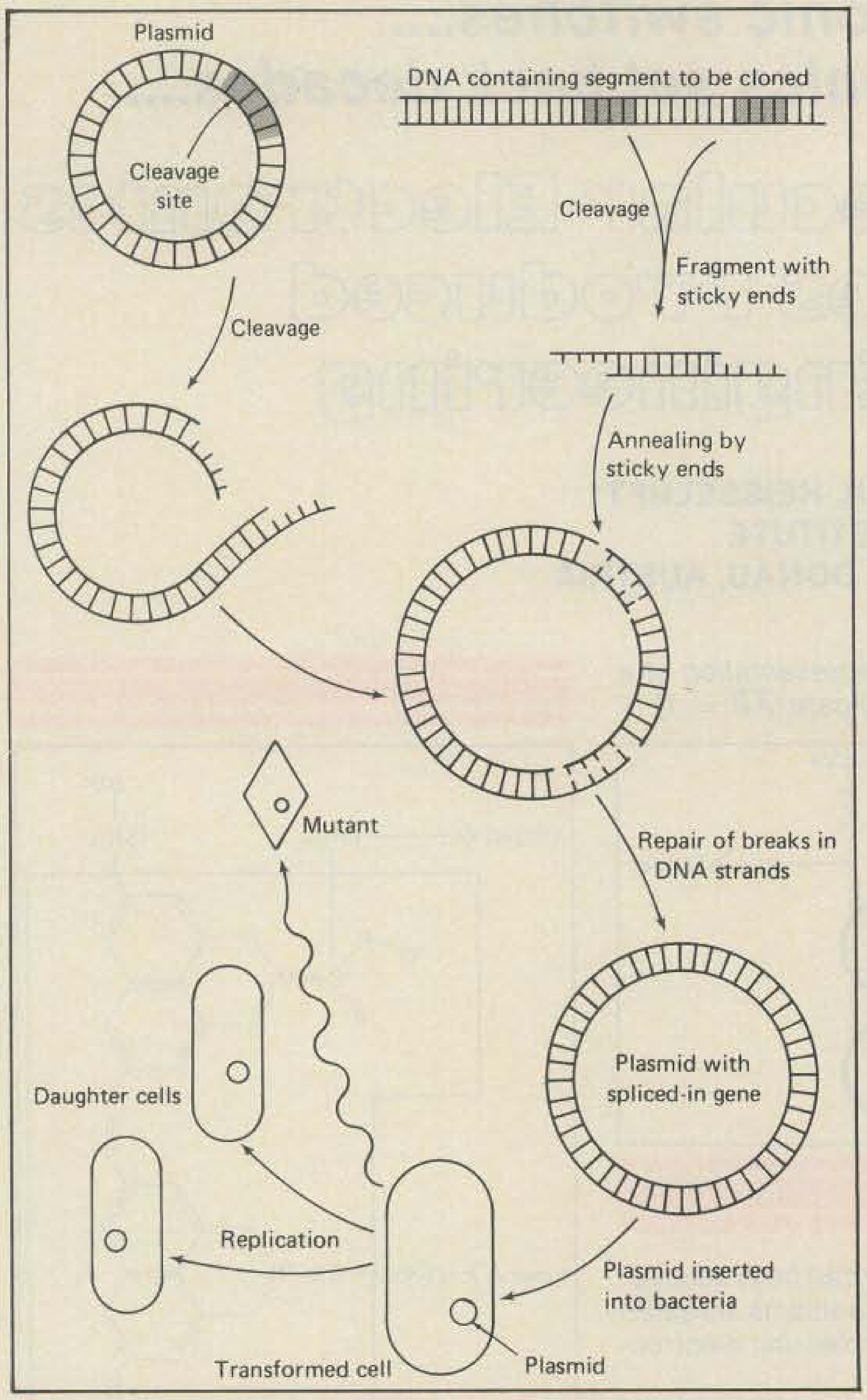


Fig. 2– Molecular analog of NAND gate. The $(SN)_n$ groups, when stimulated by an electric field, control the flow of electrons through the barrier by modifying the potential barriers in the so-called body molecule. (S, sulfur; C, carbon; N, nitrogen; and R and R', organic groups). (After IEEE Spectrum, *December 1981.)*

**Professor Heisseluft is currently in Switzerland, where he is forming an international mutual fund which will only invest in corporations engaged in genetic engineering. Correspondence may conveniently be directed to the professor c/o* CQ.

Fig. 3– Procedure used in gene splicing (modified after Wade, 1977). (See reference 2.)



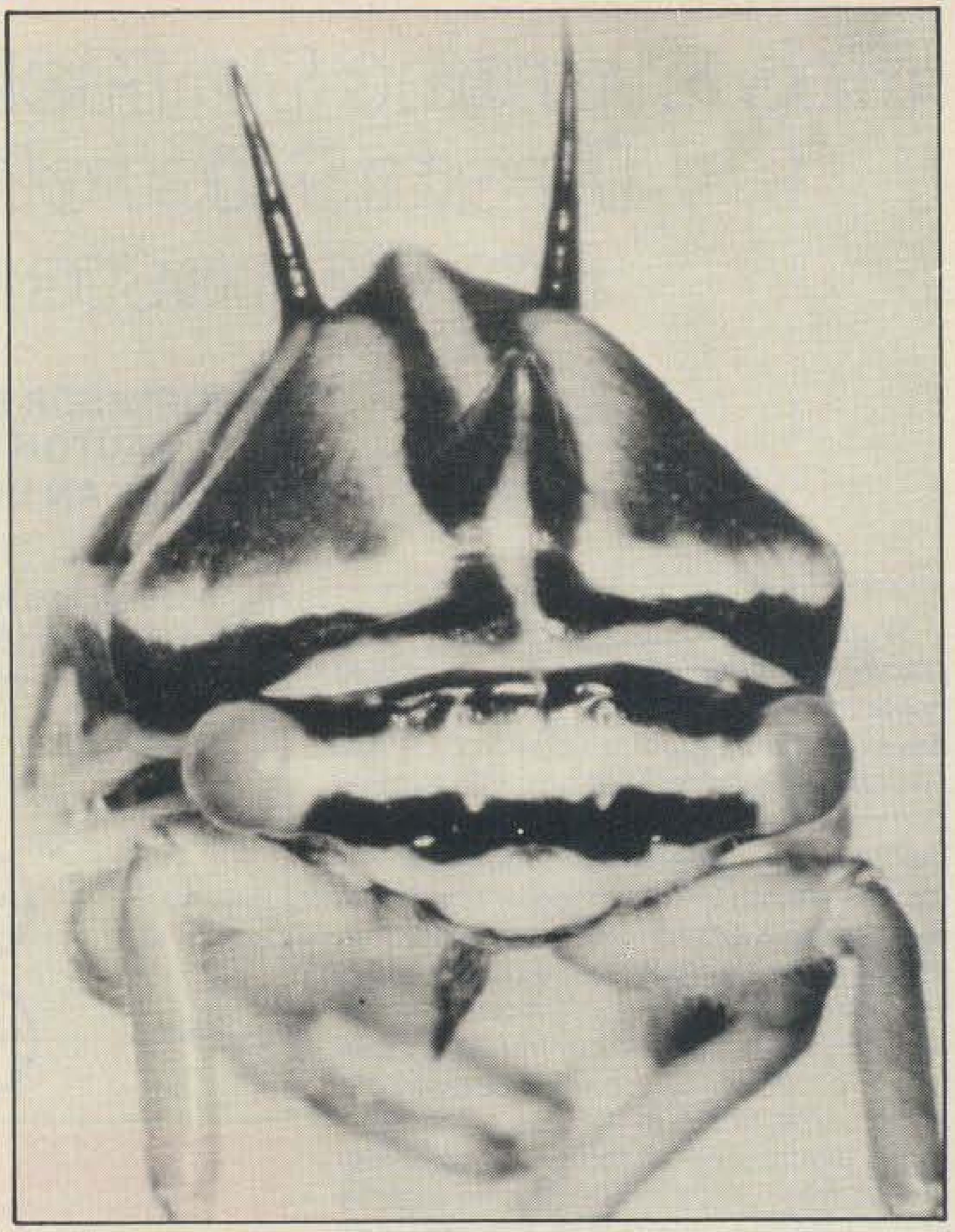


Fig. 4– This NAND-gate-eating microbe is capable of eating 10^{12} NAND gates per hour. The existence of this mutant bug threatens the very existence of molecular computers!

(fig. 2). That is, through electronic tunneling, the "switch" can be turned on or off by means of the field applied to certain chemical groups attached to the porphyrin molecule.

In a way, this is the same technique used in the tunnel diode. And, applied at the molecular level, as described above, it could lead to switching components less than 1/1000th the size of transistors produced today. Just think . . . using molecular switches, it should be possible to build computers with as many as 10^{18} cells per cm^2, a density ten million times greater than the cell count of an entire human brain!

Enter Genetic Engineering

After studying the production of molecular switches using conventional chemical reactions (such as those involving porphyrin molecules), genetic scientists developed a method to make bioelectronic switches using recombinant DNA (deoxyribonucleic acid) technology. This technology is also known as "gene splicing." And here, my dear friends, is where the problem began.

You see, some time ago, scientists successfully created a molecular switch made of microorganisms. Basically, they modified the genes of bacteria so that the microorganisms manufactured molecular switches. This was done by inserting plasmids (little circles of DNA) into selected bacteria. On the plasmids were genes that gave the bacteria their sought-after switching properties. A series of chemical reactions were then used to produce metallic bridges between the switches and other circuit conductors. The whole process is shown in fig. 3.

In the process of producing molecular NAND switches, however, a mutant form of the switching microbe evolved. And, much to the astonishment of the genetic community, the mutant form of the switch gobbled up the NAND-gate molecular switches from which they had evolved.

It was terrible! Entire computers, each a thousand times more powerful than even today's largest computers, disappeared overnight. And the more NAND gates that the little mutant bugs gobbled up, the more they wanted.

The Mutant Problem

So bad was (and is) the problem with the mutant microbes that in late 1981, a delegation of genetic scientists made a secret trip to the Lauton Institute in order to consult with the Institute's scientists. The Institute's prestigious Genetic Engineering and Research Center (GERC) has long been recognized as a world leader in the development of new microbes using gene-splicing techniques[3], and if a solution to the problem of the NAND-gate eating mutants was to be found, only the Center could find it.

It was first necessary, of course, to determine what, exactly, was causing the problem. To this end, the Center's scien-

tists, working around the clock, finally isolated the bug using a new, experimental, electron-beam microscope (see photo). This ugly creature, which by itself is capable of eating 10^{12} NAND gates each hour, threatens the very existence of molecular NAND gates, and, possibly, the entire science of molecular computers!

While it is still too early to be certain as to whether the threat can be countered, a late-breaking news release from the Lauton Institute announced that the NAND-gate eating bugs, which are male, become most docile in the presence of the NOR-gate eating bugs, which are female. In fact, these two mutant germs, when together, have little interest in anything but each other, and under these circumstances, they permit genetic NAND (and NOR) gates to be produced without limit.

One Remaining Problem

There appears to be only one remaining problem to be solved at this time. Specifically, it appears that the offspring of the NAND- and NOR-gate eating germs are themselves mutant microbes which exhibit insatiable appetites for polyethylene and polytetrafluoroethylene. Tests to confirm this finding were terminated abruptly, however, when all of the dielectric material in the Institute's supply of coaxial cable mysteriously disappeared shortly after research was begun on the second-generation mutants.

Summary

Using molecular analogs of NAND gates, it should be possible to create computers with more switching elements than are contained in the entire human brain. Bioelectronic molecular switches of the type needed have been produced using genetic engineering (gene-splicing) techniques. Unfortunately, mutant forms of the NAND-gate microbe eat nothing but NAND-gates. The problem has been overcome by distracting the male, NAND-gate-eating microbes with female, NOR-gate-eating microbes. Unfortunately, the offspring of these two mutants have a fondness for polyethylene and polytetrafluoroethylene, dielectric materials used in virtually all of the world's coaxial cable. Scientists at the Lauton Institute's Genetic Engineering and Research Center are working on the problem, but the prognosis for an early solution is not good.

References

1. Anon., "Whatever Happened to Molecular Electronics?", *IEEE Spectrum*, December 1981, p. 17.
2. Wade, N., *The Ultimate Experiment, Man-Made Evolution*, Walker Publishing Company, Inc., New York, NY 1977.
3. Heisseluft, E., and J. Ostermond-Tor, "Fundamental Principles behind the Use of Genetic Engineering to Create New Life Forms," Lauton Institute Report LI-1-71.

How about a quad that works seven bands (with full-size elements—no traps), uses a single feed line, has nothing to adjust at the antenna, and is inexpensive?! Sound incredible, but it is a fact. It works 2, 6, 10, 12, 15, 17, and 20 meters.

A Seven Band Boomless Quad

BY RICHARD E. JAMES, JR.*, W4DQU

Here's a boomless quad built around a three-piece hub (manufactured by MFJ Enterprises) which makes it possible to do all the final assembly near the top of the tower (for those of us who can't afford a crank-over or lay-over tower). The MFJ hub is composed of the following:

1. A center piece made up of a piece of metal tubing about 18 inches long with two short pieces of angle iron attached to it with two bolts and a threaded rod.

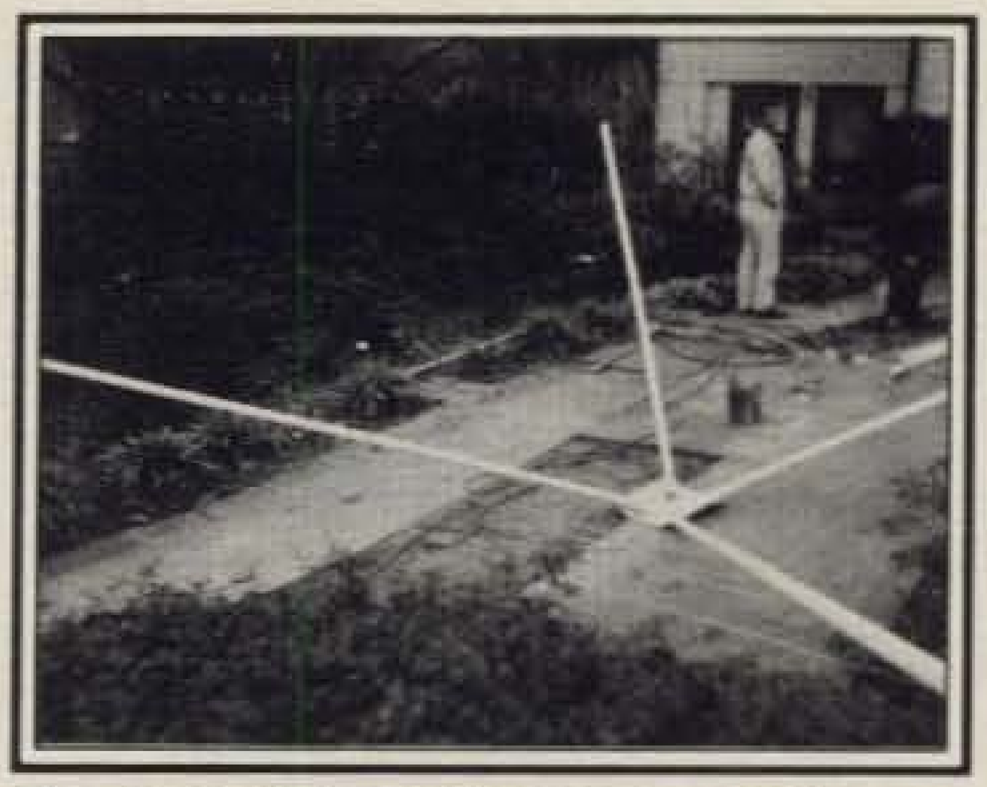
2. Two aluminum plates, one for the driven element and one for the reflector.

Let me tell you why I think this quad is the best two element quad ever presented to the amateur fraternity.

About 1954 I became interested in quad antennas, and during the next fifteen years I built several utilizing the information available at the time. In 1969 I gathered together all the information I had been able to find and began a serious study, with the goal of trying to design a perfect two element quad. It soon became evident that such a quad would have to have:

1. A spacing between driven element and reflector of $\frac{1}{8}\lambda$ because this spacing gives the maximum gain. If elements for more than one band were to be put on one frame, a "boomless" quad would be called for in order to maintain $\frac{1}{8}\lambda$ spacing between driven element and reflector on each band. None of the boomless quads on the market met this requirement, then or now, because in order to do so an imaginary extension of the base of each pole must intersect its counterpart at the exact center of the hub. The boomless quad concept also has a side benefit of being much more rigid, thus holding its shape better than a boom-type quad.

2. Reflectors about 3% larger than their driven elements. The popular idea of using an adjustable reflector stub was discarded because it doesn't work well unless you use a stub in the top center as well as one in the bottom center. The reason for this is that a quad loop can be considered as a $\frac{1}{2}\lambda$ stacked over another $\frac{1}{2}\lambda$ with the ends bent towards each other. Just increasing the length of one of the two $\frac{1}{2}\lambda$ sections does not give the response one desires. Each of the $\frac{1}{2}\lambda$ sections needs to be increased in effective length. To get away from using two adjustable matching stubs, I decided to use reflectors that were larger than the driven elements. I found very little information on how much larger a quad reflector should be than a quad driven element.



The driven element after assembly, prior to installation.

*3653 Crestside Road, Birmingham, AL 35223

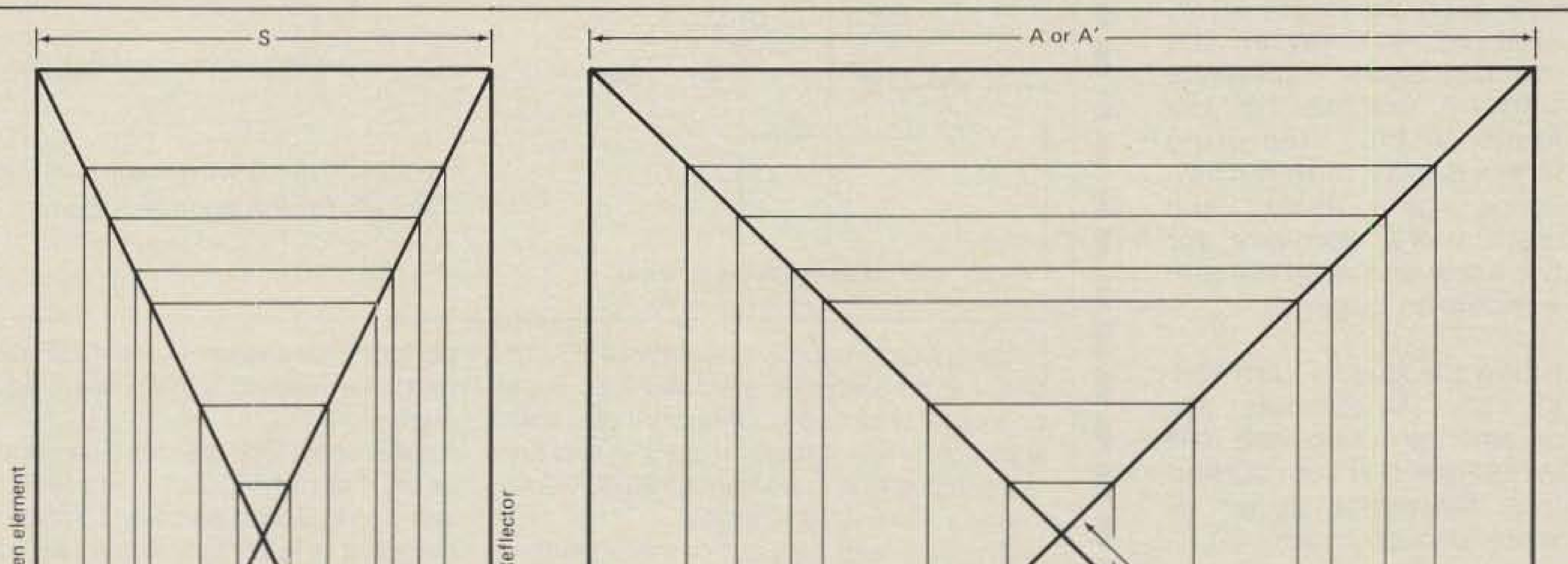


Fig. 1– A two-dimensional look at the boomless quad.

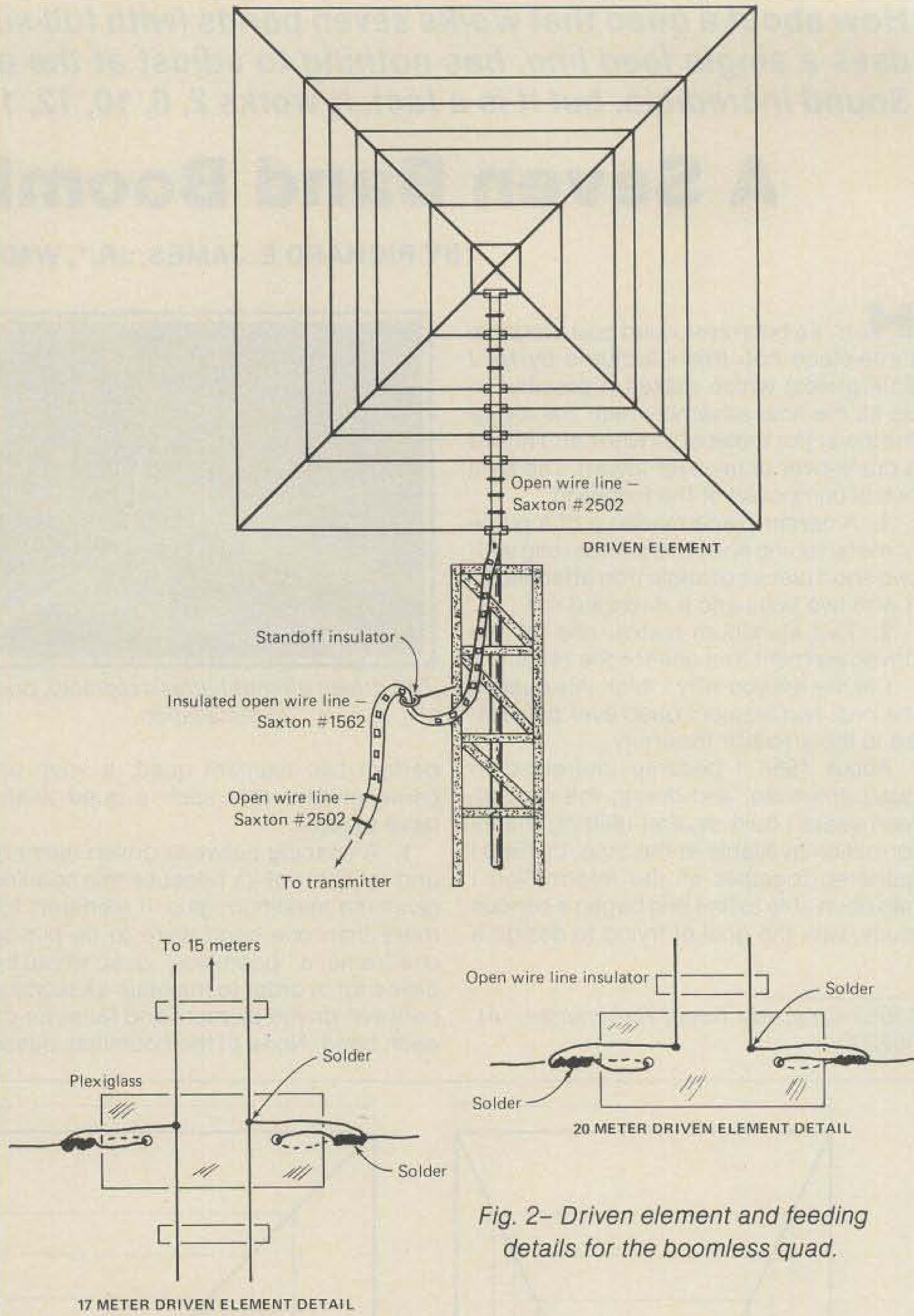


Fig. 2– Driven element and feeding details for the boomless quad.

Since a beam usually uses about 5% or 6%, I estimated that a closed loop such as a quad should probably work well with about one-half of that. I tried 3% and the front-to-back ratio was about 25 dB! (And there is nothing to adjust!)

3. Coax feed was out of the question. How could several driven elements be fed with one coaxial feed line? Also, I didn't want to use any heavy baluns on the driven elements. I had an inspiration: why not buy a roll of Belden #8210 (72Ω twin-lead), put a one-to-one ratio balun on the output of my linear, and tap each driven element into the feed line at the point where the feed line crosses each driven element (see drawings)? This feed system works perfectly. If, for example, a 15 meter signal goes up the feed line, it goes to the 15 meter driven element because the other driven elements offer more resistance to the 15 meter signal. The 72Ω twin lead matches each driven element perfectly because it is a 72Ω balanced feed line feeding a 72Ω balanced driven element.

Like coax, 72Ω twin lead has one drawback: it is rather lossy and I feel it is too lossy on 2, 6, and perhaps 10 meters. The reason it is lossy is that the two conductors are very close together (capacitive and inductive reactance losses), and they are separated by a dielectric material much less efficient than air. I have since used 300Ω open wire line (Saxton #2502) from an antenna tuner to a point near the antenna where I use a short length of Saxton #1562 "insulated open wire line" (about 10 or 15 feet) where the line must wrap and unwrap around the tower as the quad rotates. With this setup, if the insulated line touches the tower or rotator, it won't short out to ground because it is insulated.

If you do not wish to use an antenna tuner, you can still use the 300Ω line in the

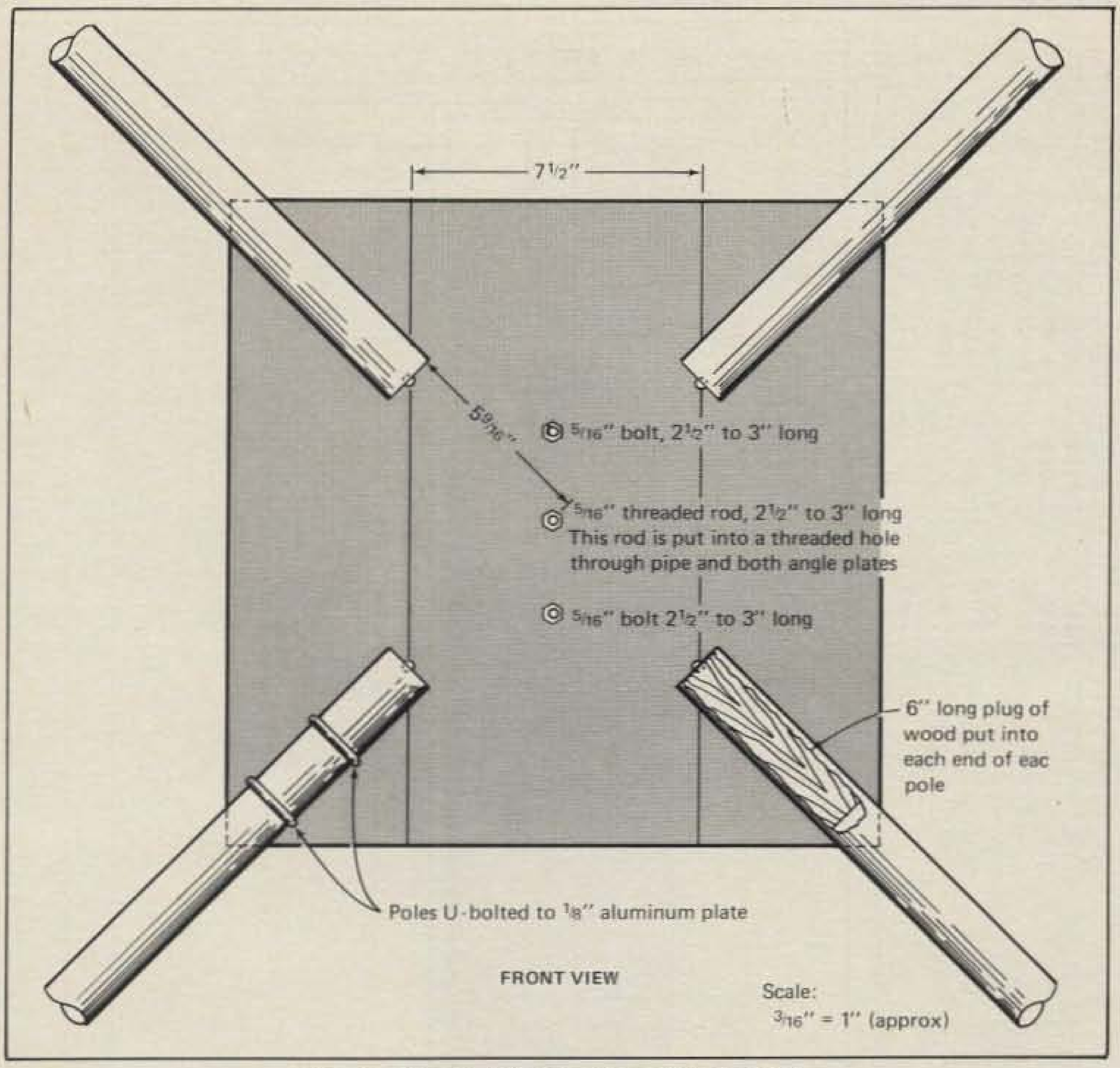


Fig. 3– Single hub construction details.

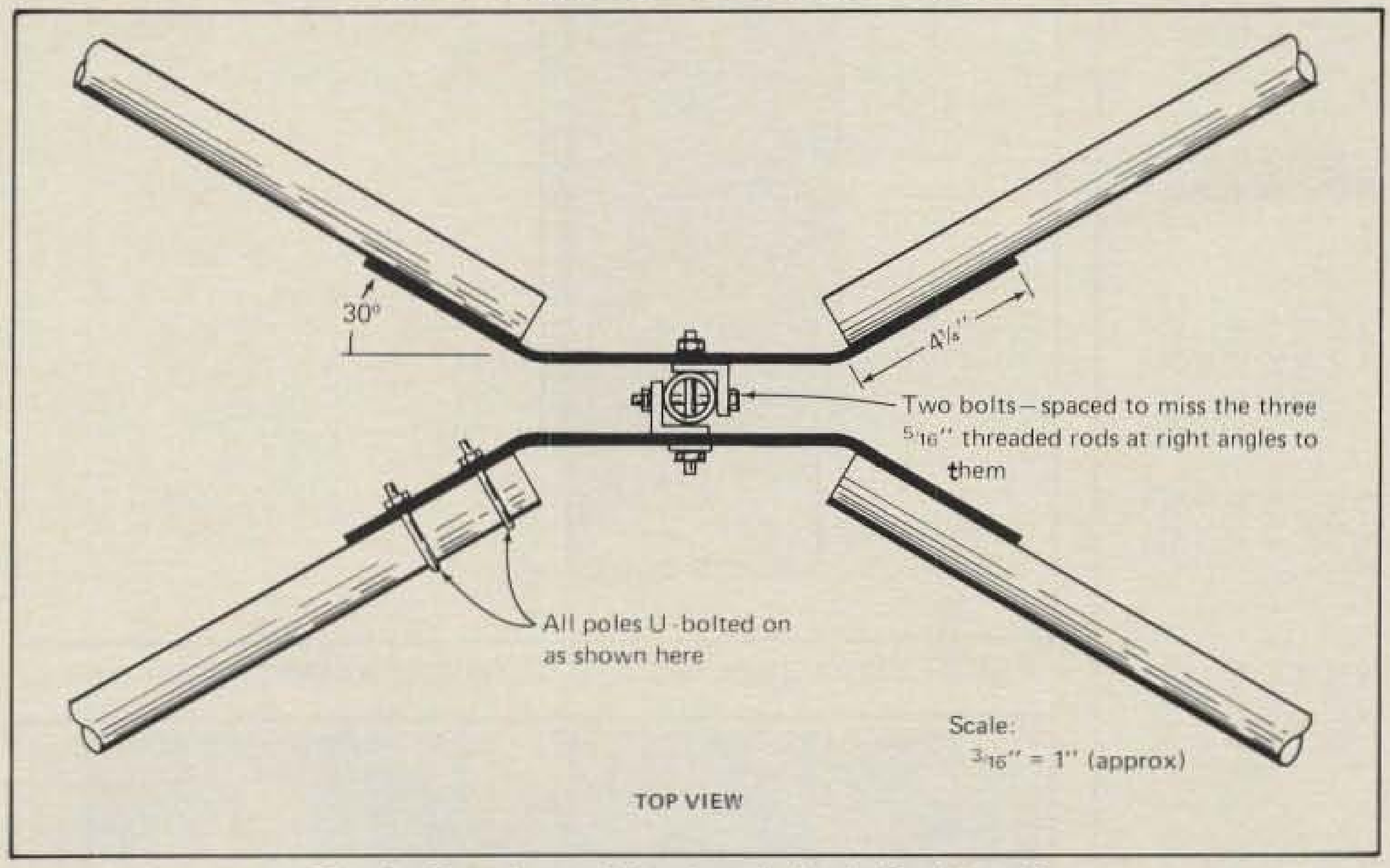


Fig. 4– Top view of the two hubs bolted together.

following manner: Put a 4:1 balun on the output of the linear (or output of the transceiver if you don't have a linear) and connect the 300Ω line to the antenna terminals of the 4:1 balun. Wrap a double loop for each driven element instead of a single loop and it will have a feed point impedance of about 300Ω.

If you use an antenna tuner, I don't see any need to wind double loop driven elements instead of single loops. A single loop driven element has a feed point impedance of about 72Ω, giving a 4:1 s.w.r. when a 300Ω feed line is used. A study of the feed line loss charts in the handbooks will show that the 300Ω feed line terminating with a 4:1 s.w.r. gives much less total loss than a 72Ω feed line with a 1:1 s.w.r.! (The 300Ω line terminating into 300Ω would have about 0.2 dB loss. The 72Ω twin lead terminating into 72Ω would have about 2 dB loss. The 300Ω line terminating into 72Ω [4:1 s.w.r.] would have 0.2 dB loss plus an additional loss of 0.2 dB because of s.w.r., making a total loss of 0.4 dB. Using a 300Ω line terminating into a 72Ω load would give 1.6 dB less loss or 45% more power into the antenna than a

Chart	Band Meters	Position	Design Freq. MHz	Driven Ele. Side 1/4 λ Meters	Reflector Side 1/4 λ Meters	Spacing Between Ele. 1/8 λ Meters	Distance—Center of Hub To Drilled Hole: Driven Ele. (Actual) Meters	Distance—Center of Hub To Drilled Hole: Ref. (Actual) Meters	A Driven Ele. Side 1/4 λ	A' Reflector Side 1/4 λ	S Spacing Between Ele. 1/8 λ	Z Driven Element Actual	Z' Reflector Actual	Distance from Butt of Poles to Drill Holes: D.E. Meters	Ref. Meters	D.E. Ft & In.	Ref. Ft. & In.
(A)	20	Center of Each Band	14.175	5.2896	5.4483	2.6844	3.9672	4.0862	17'4 1/4"	17'10 1/2"	8'9 11/16"	13'0 9/16"	13'4 7/8"	3.8258	3.9448	12'6 5/8"	12'11 5/16"
(A)	18	Center of Each Band	18.118	4.1384	4.2626	2.1002	3.1038	3.1969	13'6 15/16"	13'11 13/16"	6'10 11/16"	10'2 3/16"	10'5 7/8"	2.9624	3.0555	9'8 5/8"	10'0 9/16"
(A)	15	Center of Each Band	21.225	3.5326	3.6386	1.7928	2.6494	2.7289	11'7 7/16"	11'11 1/4"	5'10 9/16"	8'8 5/16"	8'11 7/16"	2.5080	2.5875	8'2 3/4"	8'6 5/16"
(A)	12	Center of Each Band	24.94	3.0064	3.0966	1.5257	2.2548	2.3224	9'10 3/8"	10'1 15/16"	5'0 1/16"	7'4 3/4"	7'7 7/16"	2.1134	2.1810	6'11 3/16"	7'2 5/16"
(A)	10	Center of Each Band	28.85	2.5989	2.6769	1.3189	1.9492	2.0076	8'6 5/16"	8'9 3/8"	4'3 15/16"	6'4 3/4"	6'7 3/8"	1.8078	1.8662	5'11 3/16"	6'1 13/16"
(A)	6	Center of Each Band	52.0	1.4419	1.4712	0.7317	1.0814	1.1138	4'8 3/4"	4'9 15/16"	2'4 13/16"	3'3 11/16"	3'7 7/8"	0.9400	0.9724	2'11 7/8"	3'1 1/8"
(A)	2	Center of Each Band	146.0	0.5135	0.5289	0.2606	0.3851	0.3966	1'8 3/16"	1'8 13/16"	10 1/4"	1'3 3/16"	1'3 5/8"	0.2437	0.2552	9 5/8"	10 1/16"
(B)	20	Middle of Bottom Half	14.0875	5.3225	5.4821	2.7011	3.9924	4.1122	17'5 9/16"	18'0 1/16"	8'10 5/16"	13'1 3/16"	13'5 7/8"	3.8510	3.9708	12'8 5/8"	13'0 5/16"
(B)	18	Middle of Bottom Half	18.0930	4.1464	4.2708	2.1043	3.1102	3.2035	13'7 1/4"	14'0 1/8"	6'10 7/8"	10'2 7/16"	10'6 1/8"	2.9690	3.0621	9'8 7/8"	10'0 9/16"
(B)	15	Middle of Bottom Half	21.1125	3.5514	3.6580	1.8023	2.6639	2.7439	11'7 13/16"	12'0 1/8"	5'10 15/16"	8'8 7/8"	9'0"	2.5225	2.6025	8'3 5/16"	8'6 7/16"
(B)	12	Middle of Bottom Half	24.9150	3.0094	3.0997	1.5272	2.2573	2.3251	9'10 1/2"	10'2 1/16"	5'0 1/8"	7'4 7/8"	7'7 9/16"	2.1159	2.1837	6'11 5/16"	7'2"
(B)	10	Middle of Bottom Half	28.4250	2.6378	2.7169	1.3386	1.9786	2.0380	8'7 7/8"	8'10 15/16"	4'4 11/16"	6'5 7/8"	6'8 1/4"	1.8372	1.8966	6'0 5/16"	6'2 11/16"
(B)	6	Middle of Bottom Half	51.0000	1.4702	1.5143	0.7461	1.1027	1.1358	4'9 7/8"	4'11 5/8"	2'5 3/8"	3'7 7/16"	3'8 11/16"	0.9613	0.9944	3'1 7/8"	3'3 1/8"
(B)	2	Middle of Bottom Half	145.0000	0.5171	0.5326	0.2624	0.3879	0.3995	1'8 3/8"	1'8 15/16"	10 5/16"	1'3 1/4"	1'3 3/4"	0.2465	0.2581	9 11/16"	10 3/16"
(C)	20	Middle of Top Half	14.2625	5.2571	5.4148	2.6679	3.9434	4.0617	17'3"	17'9 3/16"	8'9 1/16"	12'11 1/4"	13'3 15/16"	3.8020	3.9203	12'5 11/16"	12'10 3/8"
(C)	18	Middle of Top Half	18.1430	4.1327	4.2567	2.0973	3.0999	3.1929	13'6 11/16"	13'11 9/16"	6'10 9/16"	10'2 1/16"	10'5 11/16"	2.9585	3.0515	9'8 1/2"	10'0 1/8"
(C)	15	Middle of Top Half	21.3375	3.5140	3.6194	1.7833	2.6358	2.7149	11'6 3/8"	11'10 1/2"	5'10 3/16"	8'7 3/4"	8'10 7/8"	2.4944	2.5735	8'2 3/16"	8'5 5/16"
(C)	12	Middle of Top Half	24.9650	3.0034	3.0935	1.5242	2.2527	2.3204	9'10 1/4"	10'1 13/16"	5'0"	7'4 11/16"	7'7 3/8"	2.1113	2.1790	6'11 1/8"	7'1 13/16"
(C)	10	Middle of Top Half	29.2750	2.5612	2.6381	1.2998	1.9212	1.9788	8'4 13/16"	8'7 7/8"	4'3 3/16"	6'3 5/8"	6'5 7/8"	1.7798	1.8374	5'10 1/16"	6'0 5/16"
(C)	6	Middle of Top Half	53.0000	1.4147	1.4571	0.7179	1.0611	1.0930	4'7 11/16"	4'9 3/8"	2'4 1/4"	3'5 3/4"	3'7"	0.9197	0.9516	3'0 9/16"	3'1 7/16"
(C)	2	Middle of Top Half	147.0000	0.5100	0.5253	0.2588	0.3826	0.3940	1'8 1/16"	1'8 11/16"	10 3/16"	1'3 1/16"	1'3 1/2"	0.2412	0.2526	9 1/2"	9 15/16"

Table I– Charts (A), (B), and (C) and dimensions for boomless quad. The charts represent various operating areas within each band.

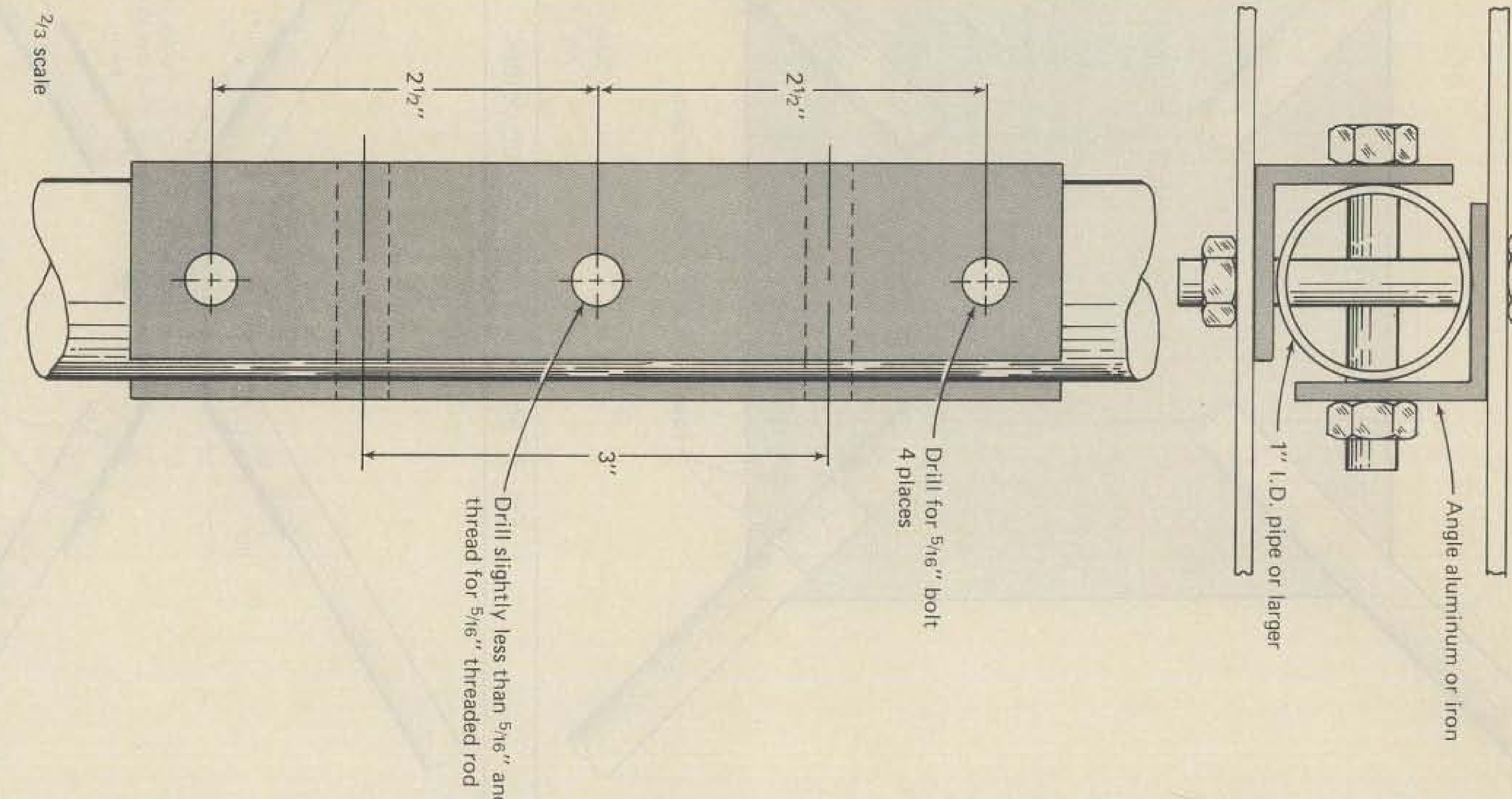


Fig. 5– Close-up mechanical of the hub-support center piece.

The reflector being assembled on the ground.

72Ω feed line terminating into a 72Ω load.)

Three kinds of poles can be used:

1. Fiberglass (best, but expensive);

2. Bamboo (cheap, but not durable like fiberglass or P.V.C.);

3. P.V.C. (use 200 PSI, not 160 PSI; 160 PSI is too light.)

The least expensive poles would be 1¼ inch nominal inside diameter P.V.C. plastic hot water pipe. It comes in 20 foot lengths which would be cut down to 13½ foot lengths. Eight poles would be needed and there would be 6½ feet wasted from each piece. Another way to do it would be to buy three 1¼ inch pipes and three 1 inch pipes. Then, using eight couplings and eight 1¼ inch to 1 inch pipe reducers, each pole could be built up as a "tapered" pole using:

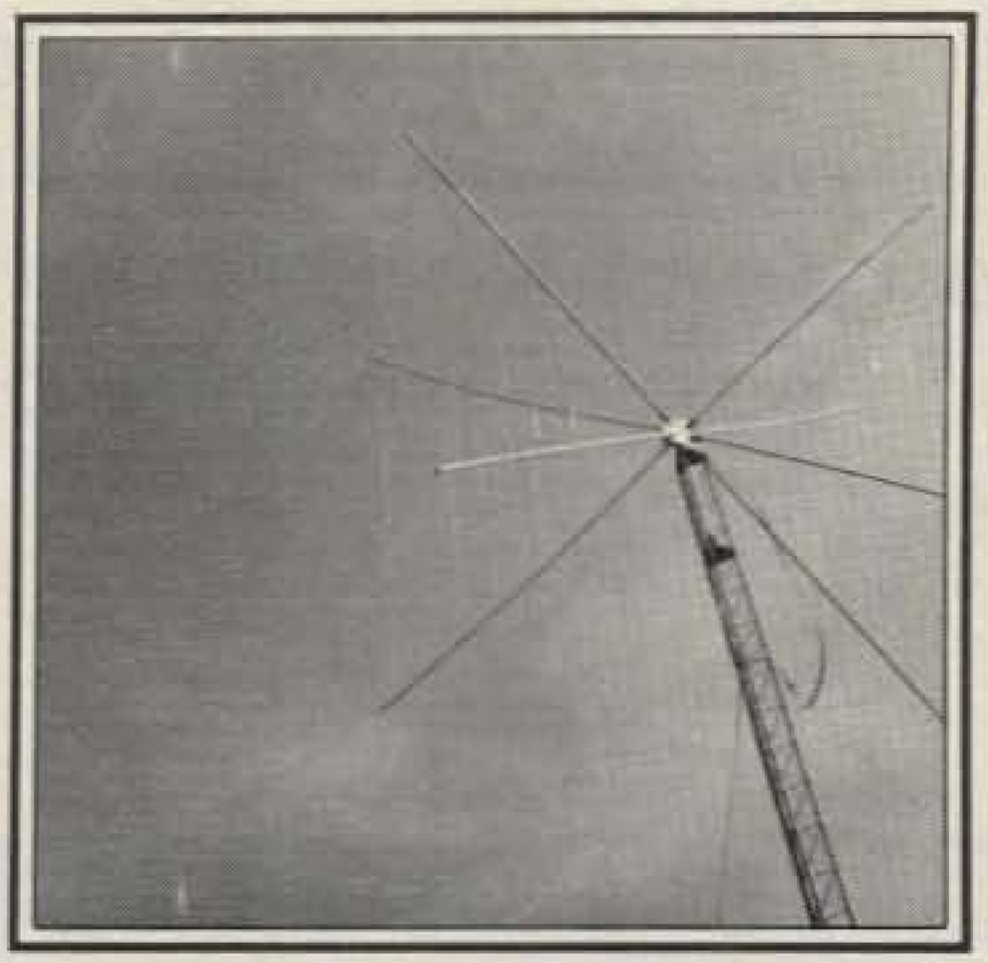
1 pipe 1¼" I.D. × 6′8″
1 coupling 1¼ inch to 1¼ inch
1 reducer for reducing from 1¼ inch pipe to 1 inch pipe
1 pipe 1" I.D. × 6′8″

Both methods have been tried, both work, and there is about the same expense for each method. The latter method uses six 10 foot pieces of pipe instead of eight, but you have the added expense of the couplings, reducers, and P.V.C. cement.

The holes for the wires (#18 or #16) are drilled directly through the pipes. The measurement of the distance (from the chart) is not from the base of each pipe, but from the center of the hub, which is 152mm or 6 inches from the base of each pole in the case of the MFJ hub. I find it easier to work with metric measurements; however, charts are given in feet and inches also.

Three charts are given under one heading, Table I. The first chart (A) gives the dimensions for the middle of each band. On any band except 10, 6, and 2 meters, a quad is "broad banded" enough so that the dimensions in Chart (A) are adequate for use anywhere in the band. The dimensions in Chart (B) are for the middle of the bottom half of each band and, if you are strictly a c.w. operator, you may use these dimensions. Chart (C) has dimensions for the middle of the top half of each band, and an amateur who works only in the upper half of each band may choose to use these dimensions. When you look at 10, 6, and 2 meters, it is definitely desirable to pick the dimensions for the part of each band in which you plan to operate most. The formulas for each column in the charts are given so that anyone desiring to make a quad for any frequency can calculate his own dimensions.

In any case, substract the 141mm or 5⁹⁄₁₆ inches from the chart figures and measure from the bases of the poles. String the 20 meter wires and the 10 meter wires, carefully measuring the length of each of the four sides to make sure it is exactly right. Now, wrap and solder a "tie down" wire to each wire on each side of each pole at each of the four corners (both on the 20 meter and the 10 meter elements—reflector and driven elements, of course). Now string the wires for any other bands you wish. You won't have to measure the wire lengths carefully because the 20 and 10 meter windings have locked the poles into position. However, for rigidity and to keep wires from shifting, by all means wrap and solder corner wires on all elements just as you did on 20 and 10 meters.



The seven band boomless quad is up in the air. Sunlight reflects from the vertical wires of the quad. The driven element is in front. The section of open wire feed line can be seen draped in front.

Now solder the feed line to each driven element after putting an insulator in the center of the bottom of each driven element as illustrated. You can bring the feed line over from the back of the hub and feed the 2 meter element first and the 20 meter element last, or you can feed the 20 meter driven element first and terminate the feed line at the 2 meter element. It will work either way.

If you do not have a fold-over tower, you can still do the final assembly of the quad by climbing your tower. First mount your rotator on the tower. Then mount the quad hub on top of the rotator using a short piece of pipe or tubing about 18 inches long. Now the driven element plate with the four poles and driven elements can be lifted up to the center piece of the hub and mounted onto the center threaded rod and a nut put on loosely at this time. Carry the reflector elements up and mount on the other side of the threaded rod, securing it loosely with a nut also. At this time take up a measured corner spacing string of nylon line (about 150 to 210 lb test line) for one of the 20 meter corners and for one of the 10 meter corners. Rotate the driven element and the reflector element around until you can reach what is going to be the top left corner of the quad. Tie the 20 meter and the 10 meter strings. (The dimensions are given in the chart, but allow a few inches excess at each end for the knot.) Now rotate the two elements back 180 degrees the other way and tie the top right corner tie strings. At this time tie the spacing strings on the left and right bottom corners.

After finishing with the spacing strings (only the 20 meter and 10 meter strings are necessary), put the two lock bolts and nuts in the hub and tighten the nuts. Also tighten both nuts on the threaded rod.

To increase the rigidity and strength of this quad, particularly in windy areas, I recommend that four brace rods be substituted for the 10 meter tie strings. These rods are attached to clamps placed just below the 10 meter wires at 5 feet 8⅛ inches from the butt end of each pole. The clamps are made from pieces of pipe strapping about 7 inches long. Each of the eight straps is wrapped around its pole and bolted tight with a ¼" × 2" galvanized bolt. Each of the four rods is made of ½ inch 315PSI P.V.C. pipe 4 feet long with a ¼ inch hole drilled ⅝ inch from each end. When assembling the quad, and when you are ready for the tie strings, slip one of the rods in place first using a ¼ inch hex nut finger tight followed with a ¼ inch wing nut jammed down against it to keep it from working loose. All of this substitutes for a 10 meter tie string. Now proceed to put on a 20 meter tie string. This completes one of the four corners of the quad. Repeat this procedure at the other three corners as outlined above and in the article.

The quad is ready to use. It *is* beautiful and *performs* beautifully. Good DXing!

You don't need a direct hit by lightning to destroy your equipment (although it would be easier to see). Near misses or the ones you don't see or hear can knock out your station, too. Read about the nature of lightning and some possible preventions.

Lightning Protection A New Era

BY DON R. TYRRELL*, W8AD

From Kites To Transistors

If you've found yourself thinking, "I don't need a lightning protector because I don't recall ever having my antenna take a lightning strike," or "I don't need one of those things because I hear they don't really work, and besides, I always disconnect my coax or ground my antenna during a storm," guess what? Mother Nature is waiting around the corner with a "GOTCHA"!

The GOTCHA is often delivered swiftly and without warning (or mercy), particularly since solid state components have come into such common use in receivers and transceivers. It is based on the fact that while solid state devices have many obvious technological advantages over vacuum tubes, their internal junctions are far more fragile and sensitive to voltage spikes and discharges.

It is the very origin of these spikes and discharges (called transients or surges) that make the two lead-off excuses invalid. First, surges of damaging amplitude and width can be generated by *nearby* lightning strikes and static build-up, even from several miles away (see fig. 1). Second, these sources are typically out of the operator's sight, giving no *time* for mechanical grounding or disconnect.

Even less understood is the fact that this same type of damage can result from static discharges produced by such diverse sources as high-wind-driven snow, high wind in dry climates, and clouds on a still day. In fact, statistically speaking, damage to solid state components is 1,000 times more likely to occur from these sources than from a direct strike.

*Alpha Delta Communications, P.O. Box 571, Centerville, OH 45459

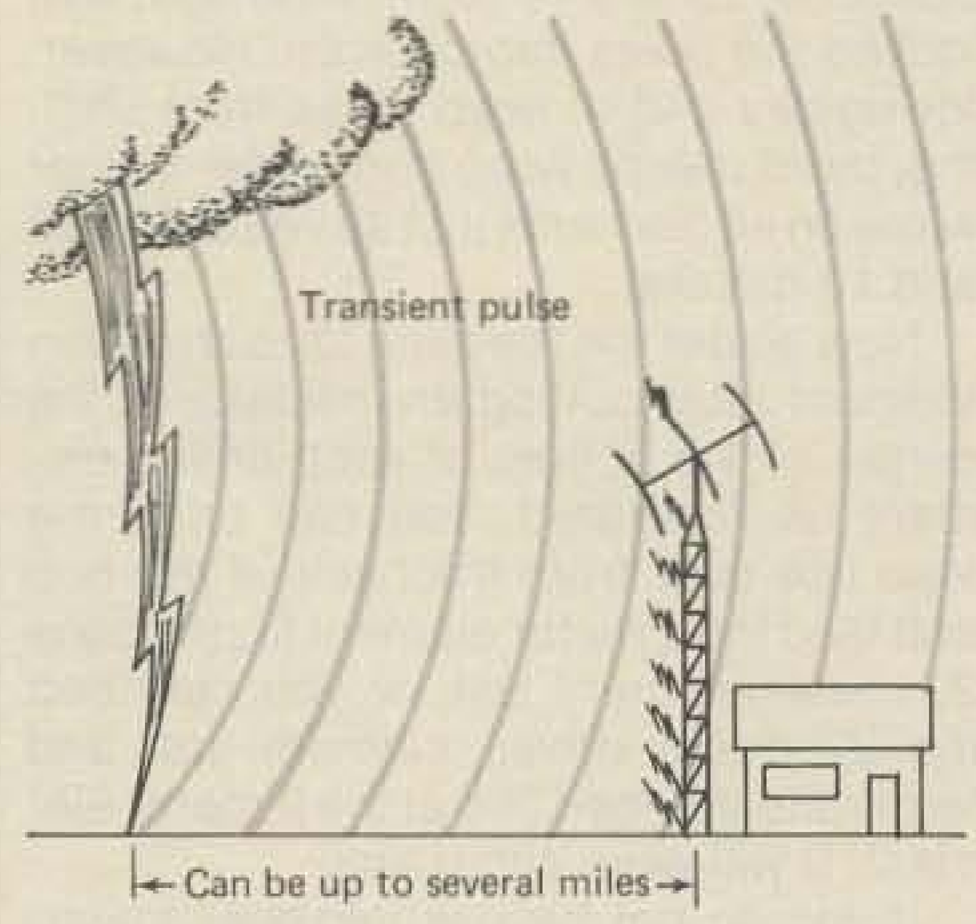


Fig. 1– The energy from a distant lightning strike or static discharge can sweep across your antenna with a rate of rise of 10 to 20 KV/usec, a pulse peak of 5 KV, and several hundred amps of current.

I recall operating a "state-of-the-art" solid state receiver on a cloudy afternoon and observing a sudden decrease of S-meter reading. It was caused by a "popped" front-end PIN diode from some discharge I never saw. A few weeks later, the diodes in the matching-network wattmeter suffered the same fate.

The knowledge of surges from distant, nondirect hit sources is not from any new engineering breakthrough. On the contrary, it was this very type of surge that Benjamin Franklin witnessed during his famous 1752 kite and key experiment. He showed the effects of cloud-stored static charges when this energy travelled down the line and "jumped" from the key to his hand. If a modern solid state device had been connected from the key to his hand, its junction surely would have been punctured, with the attendant avalanche and failure. Today, your antenna, equipment, and ground simulate that 1752 system very nicely.

If such a discharge caused a catastrophic failure in a solid state device, it would be obvious because the operator would find a "dead" receiver as a result. What is worse, the effects can be far more insidious than that. Depending on the surge, a slight junction puncture can occur causing a shift in Beta or switching characteristics. The result can be some loss of receiver gain, as in my case, where the operator simply thinks band conditions are poor or suspects an antenna problem. Shifted switching characteristics can cause serious transmit problems with regard to frequency and r.f. output. The component parameters continue to gradually degrade until proper operation is not possible.

The Nature of the Beast

To understand why solid state devices often fail in the presence of lightning- and static-induced transients, we must first understand the nature of the thing that "kills" such devices.

Transients, simply defined, "result from the sudden release of previously

The Transi-Trap model R-T lightning protector.

stored energy," and these sources can be lightning strikes, static build-up, clouds, and wind. The release is in the form of a voltage pulse having a certain rise time in microseconds, rate of rise in microseconds/KV, crest value in KV, decay time to 50% of crest on the trailing edge, current content in KA, and pulse width or duration defined from time "0" to the 50% trailing edge point.

A "typical" lightning pulse is hard to define, since it depends on whose specs you read (transients are variable and unpredictable by nature). Specs on this subject from the IEEE, FCC, Rural Electrification Administration, NASA, and MIL-STD-704 yield a composite roughly as follows (see fig. 2):

1. Rise time: 2 to 10 microseconds
2. Rate of rise: 5 to 20 KV/microseconds
3. Crest value: 3 to 5 KV
4. Decay to 50%: 50 to 1,000 microseconds
5. Current content: 500 to 20,000 A
6. Pulse duration: same as #4

At the expense of a sweeping generalization, we can say that a transient pulse has a very fast rise time, can be as much as 5 KV high, and has a pulse width of about 250 microseconds.

So here's where the "GOTCHA" comes in. Semiconductor junctions typically cannot withstand a pulse of this amplitude and width without damage—either catastrophic or gradual. However, all is not lost. If we can find a device that will reliably clip off the head of the pulse and keep it out of the circuitry and off the chassis (a strong pulse can raise the chassis nearly 1,000 volts above ground, inducing damage), and do it with a predictable response time of 100 nanoseconds, or less, we can pick up a "pulse power multiplier" of about 1,000. This means the junction is 1,000 times less prone to damage than before, and tests show the survivability to be nearly 100% against a typical near-hit transient.

Protectors Past and Present

The conventional air-gap lightning protector design affords practically no protection to solid state components, since its breakdown voltage and response time are unpredictable due to the arc-forming characteristics of the molecules of air that exist between electrodes in an air-gap.

Also, the mechanical setting of the air-gap electrodes can, at best, be adjusted only at STP (standard temperature and pressure of 72° F and 14.69 PSI). Any variation of these conditions will cause a different firing point and firing delay (response time), and the product of these parameters may be at an ineffective level.

When a sufficient lightning transient, or surge voltage, first occurs across the electrodes in an air-gap, the molecules of air are ionized along the surface of the "hot" electrode, and are set in scattered, non-straight-line motion. Cascading, the process of increasing the ionization rate, sets more ionized particles in motion at such an accelerated rate that severe air turbulence, just like a mini-tornado, sets in between the electrodes and causes further scattering of the ionized particles.

Eventually, the ionized particles reach the "ground" electrode, an arc is formed, and at that time the lightning pulse voltage is shorted to ground. Since the actual path length (which determines the breakdown voltage) is variable in nature due to the turbulence and scattered motion of the ionized particles, a precise breakdown voltage, set at a low enough level to protect solid state components, cannot be assured. Also, since the finite time necessary to traverse this path (which determines the response time of the gap) is unpredictable, proper firing speed cannot be assured, which would eliminate enough of the transient waveform to prevent damage. Also, when the gap does fire, a fairly high voltage still exists across the arc.

By comparison, special gas tube protectors, such as the Alpha Delta Transi-Trap Protector series, solve these problems by enclosing the gap in a hermeti-

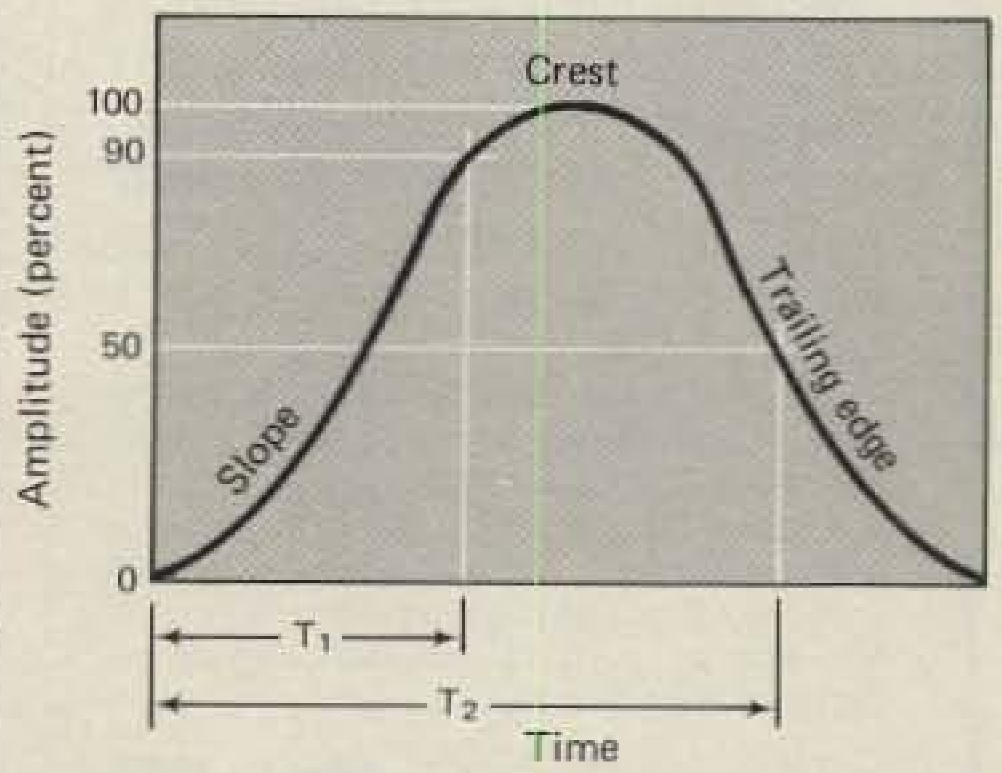


Fig. 2– The waveform of a typical lightning transient. T_1 = Rise Time, T_2 = Time to 50% decay on trailing edge. T_2 is also the pulse duration or pulse width. The rate of rise is determined by the shape of the slope (see text).

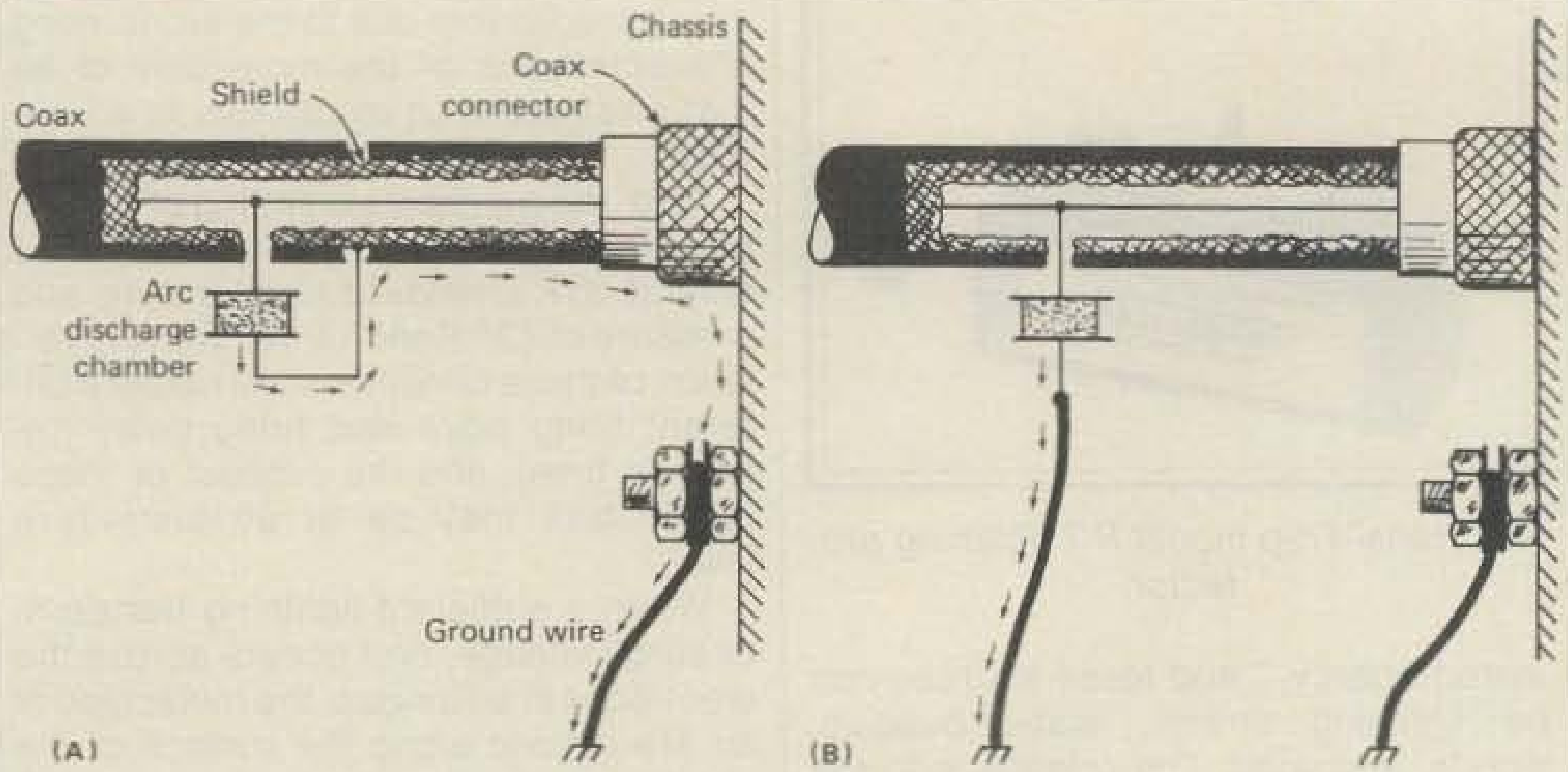


Fig. 3– The comparison of conventional protector design, which allows arc energy to flow on chassis (A) to "isolated ground" design, which by-passes damaging transient directly to ground (B).

The Alpha Delta Communications Transi-Trap model LT protector.

cally sealed ceramic tube filled with an isotope of known breakdown characteristics and response time. The path between electrodes is restricted and controlled by the tube design. As a result, the variable and unpredictable nature of the ionized particles is minimized. This concept yields a protector design with a known response time of 100 nanoseconds and a predictable breakdown voltage. Also, due to the nature of the gas in the ceramic tube, breakdown voltage and response time are not affected by humidity, temperature, altitude, and pressure changes, as in the air-gap. When the gas fires, the voltage drop across the arc is at a low, harmless level.

This protector design concept allows devices to be set to fire at the lowest possible lightning pulse level for maximum protection of solid state receivers, transceivers, and amplifiers.

Although not new to military or aircraft applications, this class of protector has only recently been introduced to amateur and commercial communications. Their performance and characteristics have been well studied and documented by groups such as the "Lightning and Transients Research Institute" of St. Paul, Minnesota.

Other Design Considerations

To provide maximum protection, the protector should employ a feature known as "isolated ground." This technique keeps damaging arc energy off the equipment chassis and routes it directly to ground. It accomplishes this by not allowing the ground side of the arc chamber to be common to the coax shield in the protector.

You might think this to be unnecessary when there is a ground wire on the chassis. However, it should be noted that if the ground of the protector is common with the coax shield and thus the chassis, the arc energy must pass through the chassis on its way to the ground wire. Depending on the size of the transient, chassis potentials of over 600 volts to ground have been measured. If this occurs, the same damage to semiconductor junctions can result as if there was no protector in the circuit at all. Even if the protector ground wire is routed to the same ground connection as the far end of the chassis ground wire, the chassis is still by-passed satisfactorily (see fig. 3).

So, tip your hat to Benjamin Franklin, and let's learn from his experiment. After all, from 1752 to now is only 230 years.

Not quite as fast as a speeding bullet, but a lot faster than you is this over-voltage warning device.

Warning! Over-Voltage Ahead

BY PAUL M. DANZER*, N1II

Ever worry that the B+ in your amplifier is slowly creeping up in value? Or that your line voltage is too high from time to time? Perhaps you would like to monitor a voltage and have an alarm go off or a light go on when the voltage exceeds some value.

Years ago a handy little instrument consisting of a meter with a set of contacts (fig. 1) was available. The meter continuously measured the voltage, and the contacts were adjusted from the front of the meter to some selected value. When the meter reading exceeded the selected value, the contacts closed and an alarm, light, or relay would be energized.

Today the same function is performed by any number of voltage sensing circuits, such as Schmidt triggers. However, these have the disadvantage that nothing happens until the over-voltage is sensed. Thus, you never know if the circuit is working or not, nor do you know how close to the preset value you are at any time.

The circuit in fig. 2 is a solid state equivalent of the old contact meter. Neither the wiring nor the part values are critical, and each of the parts is available at Radio Shack and elsewhere.

*2 Dawn Road, Norwalk, CT 06851

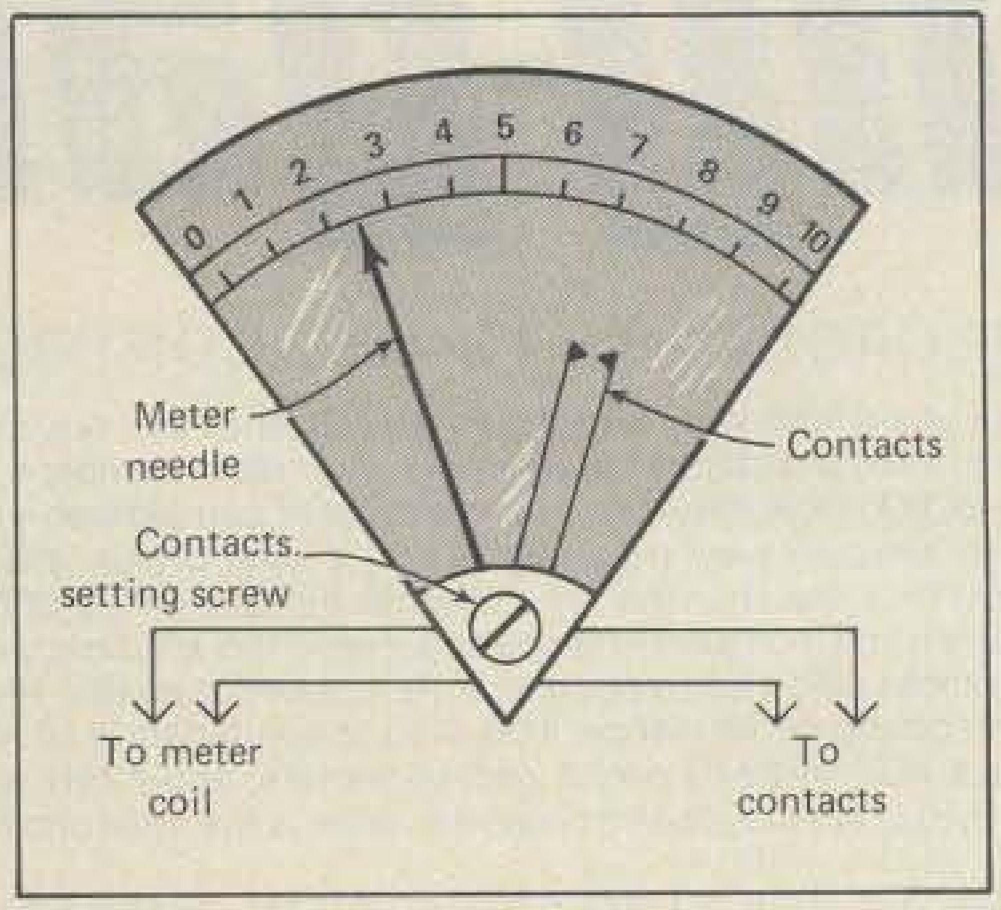


Fig. 1– A simple contact meter.

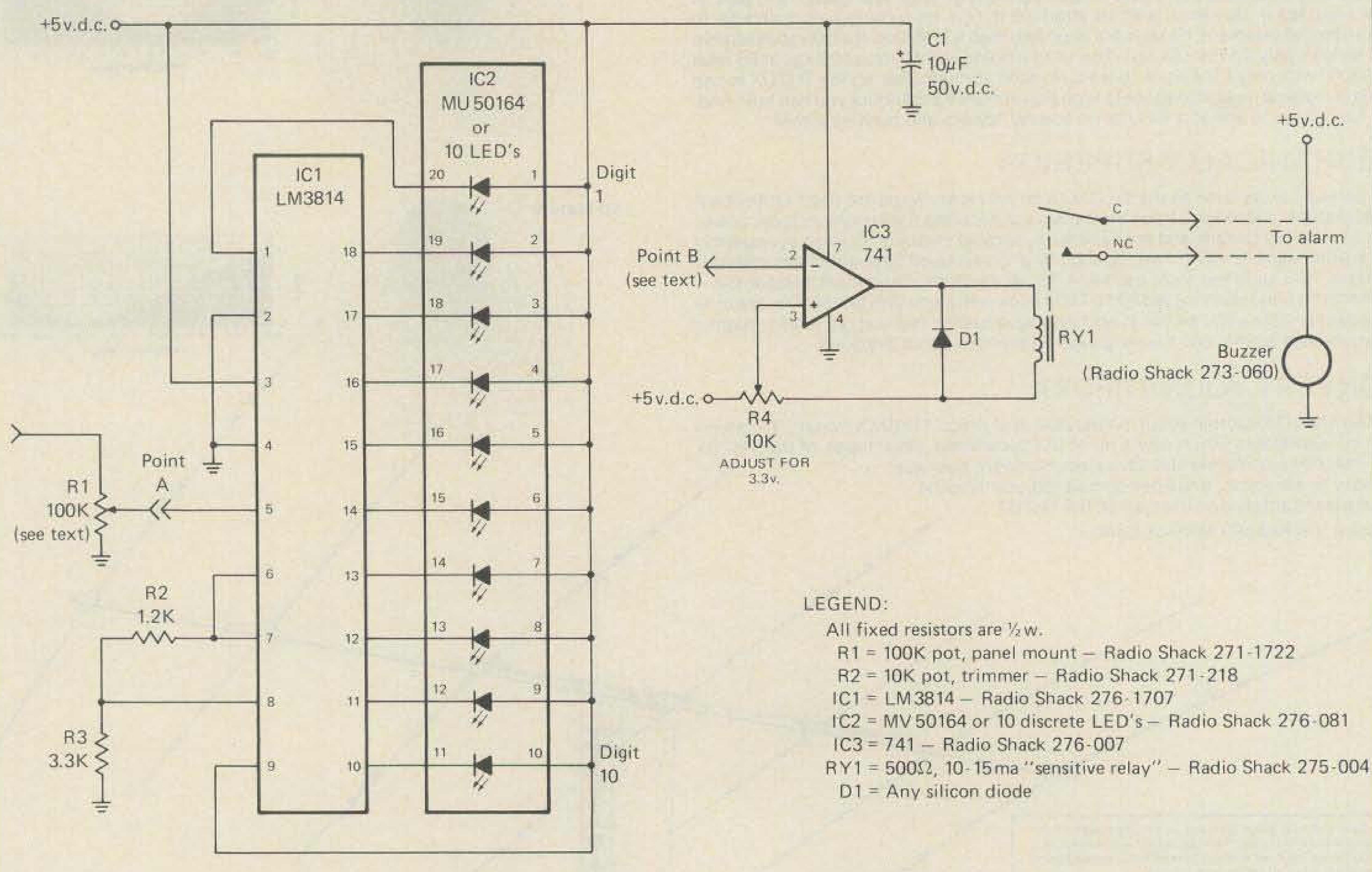
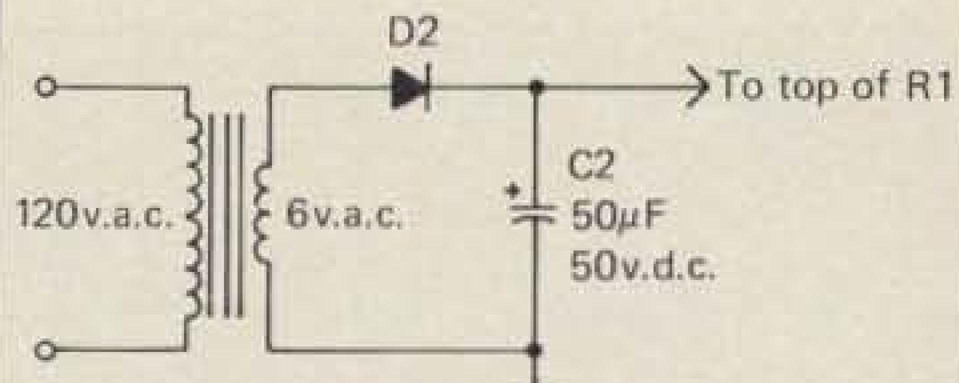


Fig. 2– An over-voltage sensing circuit based on an LED voltmeter.



LEGEND:
D2 = 1 amp rectifier diode – Radio Shack 276-1101
T1 = 120v.a.c./6v.a.c. transformer – Radio Shack 273-1381

Fig. 3– An a.c./d.c. converter to monitor line voltage.

IC1 and IC2 form a conventional LED voltmeter with a range of approximately 0 to 4.5 volts d.c. Ten discrete LEDs may be substituted for IC2, and a logarithmic voltmeter may be utilized by substituting LM 3915 for IC1.

Potentiometer R1 forms a voltage divider to set the scale of the voltmeter. Since virtually no current is drawn by pin 5 of IC1, any simple divider may be used in place of R1.

Op amp IC3 acts as a voltage comparitor. Normally, point B is connected to pin 10 of IC1. When the digit 10 LED is *off*, pin 10 sits at approximately 3.6 volts, and when this LED is *on*, pin 10 is at approximately 2.9 volts. Therefore, R4 is set so that 3.3 volts is measured on pin 2 of IC3. This acts as the threshold voltage, thus determining if the output of IC3 is high (relay RY1 on) or low (RY1 off).

Any alarm may be connected to the normally open contacts of RY1, such as the miniature buzzer shown.

Two modes of operation are possible. With point B connected to pin 10 of IC1, a test voltage is applied to the top of R1 and R1 is adjusted so that all of the LEDs are illuminated, including the tenth digit LED. In this mode the circuit will now monitor the voltage you select, and when this voltage now equals or exceeds the voltage needed to turn on the tenth LED, the relay will close.

An alternate mode may be selected by connecting point B to pin 15 of IC1 (fifth digit LED). Operation and adjustment are now the same, using this fifth digit, but when the input voltage exceeds the setting you selected to light the fifth LED, you can see how far over the setting the input has climbed.

Wiring is not critical. A universal board such as the Radio Shack 276-170 is suitable.

Fig. 3 shows a simple a.c. to d.c. converter which can be connected to the input if you wish to monitor the line voltage. T1 serves to isolate the a.c. line from the circuit.

Don't expect the circuit to interrupt a solid state power supply in time to save the semi-conductors. It is not fast enough; *a simple SCR crowbar is a better bet.* But if you want to monitor a voltage, and set off an alarm, this gadget may just be the ticket.

CQ Reviews:

The Daiwa Cross-Needle Power/S.W.R. Meters And Automatic Antenna Tuners

BY JOHN J. SCHULTZ*, W4FA

One of the advantages of being an old timer (there are some, you know) is to see technical ideas recycled. For instance, many newcomers might marvel at the cross-needle type of meter indication for s.w.r. or the idea of an automatic antenna tuner. In reality, the cross-needle meter idea for s.w.r. indication was built into commercial broadcast transmitters well over 30 years ago; automatic antenna tuners date back to WW II and before. Of course, those ideas in their original days were not seen in a ham shack due to their expense and complexity. What is new is that those ideas have now been incorporated into products which most amateurs can both afford and find useful in a modern amateur radio station.

This review concerns itself with the Daiwa CN-620 s.w.r. meter and the Daiwa CN-1001 Automatic Antenna Tuner. Since the introduction of those models there have been some cosmetic changes made in that the CN-620B and CN-1001/2 are now currently available. The CN-620B eliminates some LED indicators and has a slightly different power scale (details are covered later). The CN-1001/2 has a slightly different push-button arrangement for selecting the power scale to be read on its meter. However, in every case the fundamental circuitry involved has remained the same, so the comments made concerning technical performance of the original models remain true for the currently available models.

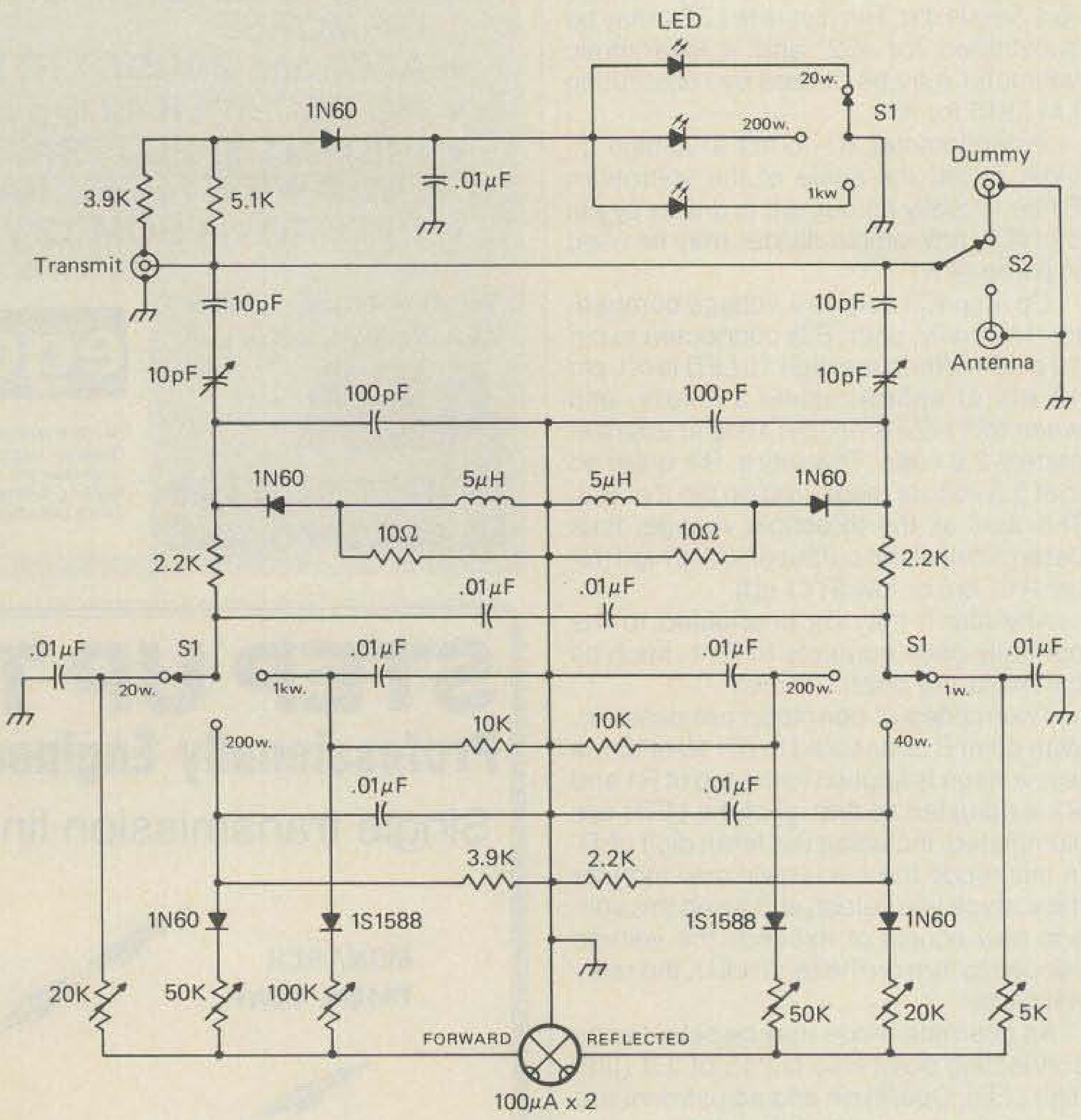


Fig. 1– Circuit diagram of the CN-620.

The CN-620 power/s.w.r. meter (and its brother CN-720/CN-720B model with just a larger meter) consists, like any meter of this type, of the forward/reverse power detector circuitry which samples transmission line current flow and the meter movements themselves. The circuitry of the CN-720 is shown in fig. 1. The CN-720B circuitry is the same except that the LED circuitry has been eliminated. Also, instead of having a 20/200/1 kw watt power selection range, the CN-720B has a 20/200/2 kw watt power selection range. The reverse power ranges (automatically selected by the one power range switch) have also been changed from 4/40/200 watts to 4/40/400 watts. These changes are not really significant, of course, except to the amateur who is running the absolutely maximum legal 2 kw p.e.p. input such that the maximum output power might sometimes exceed the 1 kw p.e.p. level. Fortunately, the 20/200 forward and 4/40 watt reverse power scales have not been changed. Most amateurs who use a barefoot transceiver or who run QRP will be using those scale ranges anyway.

Getting a little more into the specifics of the circuitry used, it is interesting to note from fig. 1 that separate toroid coil pickups are used to sense the forward and reverse transmission line current flows. Apparently, this is done because of the different power sensitivities for the forward and reflected power ranges. The rest of the circuitry consists of the usual rectifier, bypassing, and meter range components. There is no skimping on bypass capacitors, and it is interesting to note that variable resistors have been provided to calibrate the meter in both the forward and reverse directions on all power ranges, and variable capacitors have been provided to balance out stray capacitance in both directions. Most similar circuits do not provide for all these calibration/adjustment possibilities.

Physically, the CN-620 is housed in a

*c/o CQ Magazine

case measuring about 3 × 4 × 6½ inches. The housing is very rugged with thick aluminum front and back panels and steel top and bottom covers. Inside, the line pickup elements are housed in a separate shielded compartment which is mounted on the real panel along with the SO-239 input/output connectors. The variable power range calibration resistors are mounted on a PC board supported by the front panel power range switch. The resistors are sealed after calibration. Overall, the construction and wiring are very well done and the unit is an attractive piece of equipment.

Performance-wise it easily measures up to its claims. The rated frequency range is from 1.8 to 150 MHz with a ± 10% full-scale tolerance. Measurements made confirm that the power readings are well within the ± 10% tolerance on all power ranges and on all amateur band frequencies. The only range that could not be checked was the 1 kw range on 2 meters because suitable equipment was not available. Five watts minimum output from a transmitter is required to make meaningful s.w.r. measurements, although forward power levels down to a watt or so can be read on the meter. In fact, if one were just interested in measuring QRP power levels on a line known to be "flat," one could turn the meter "around" (in/out connectors reversed) so that forward power was measured on the reverse power scale. Then, one could read power levels easily down to the 200–400 milliwatt range.

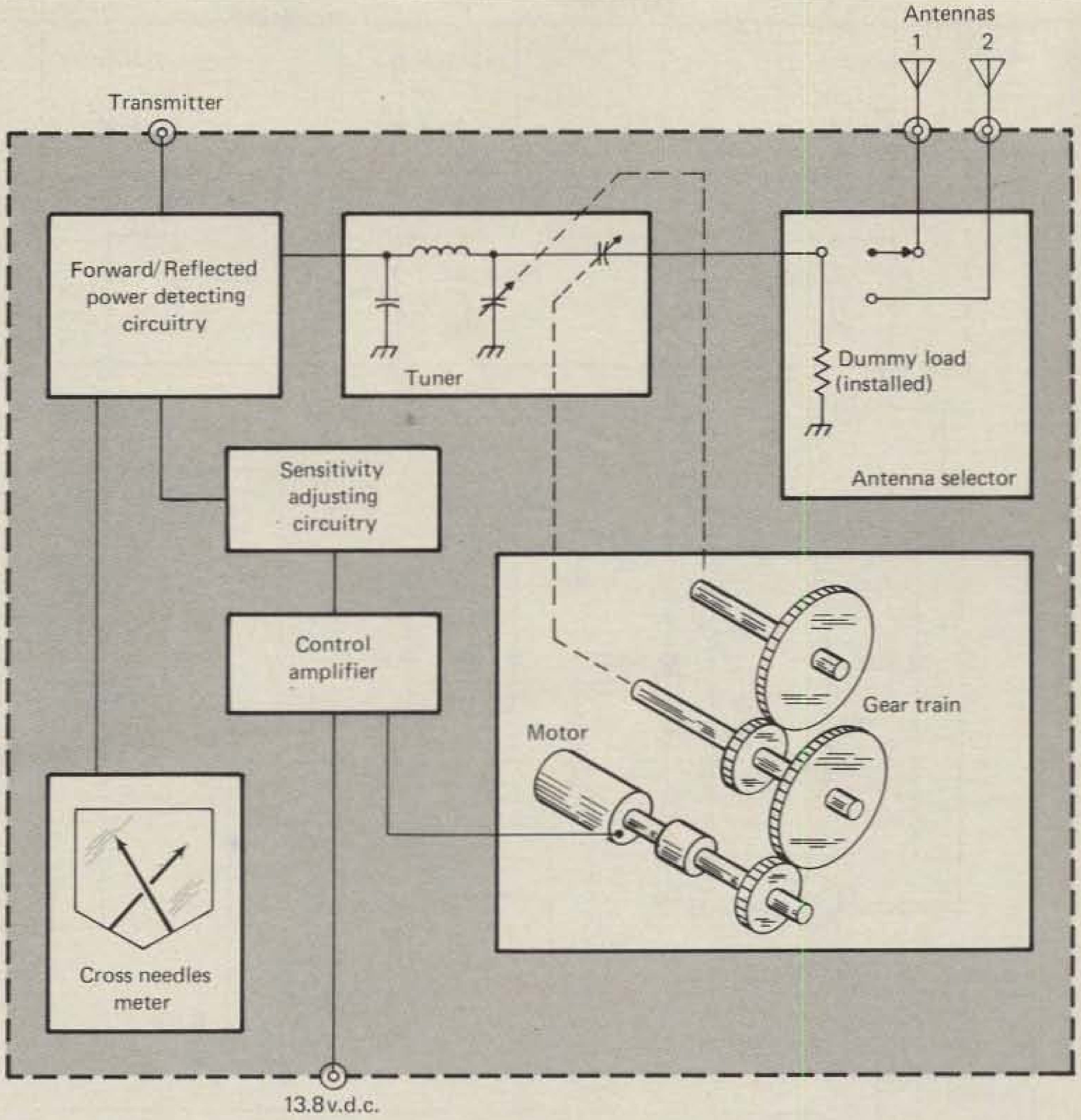
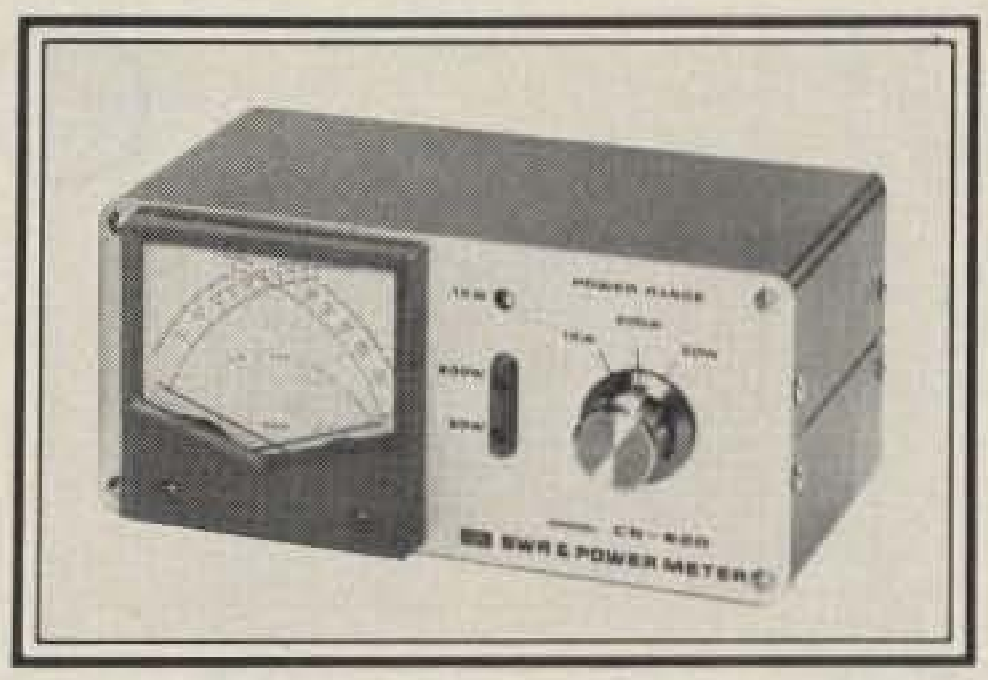


Fig. 2– Functional block diagram of the CN-1001. Note that the gearing is arranged so the series variable capacitor turns faster than the parallel variable capacitor.

In normal operation, the cross needle meters are, of course, the big feature of the CN-620. Basically, the meter consists of just two 100 microampere meter movements in one housing. However, since the individual meter needles cross each other, the intersection points can be calibrated in terms of s.w.r. according to the formula which derives s.w.r. from the known forward and reflected power levels on a transmission line. In reality, the unit is far easier to use than any conventional s.w.r. or s.w.r./power meter using separate meters, since one has to concentrate on only one meter scale. Tuning adjustments are made on a tuner or transmitter while one watches one meter needle (for reflected power) dip to a minimum and the other meter needle (for forward power) simultaneously peak to a maximum indication. One has constant monitoring of the output power level of a transmitter after it is tuned up on the forward power scale of the meter. The LED indicators found on the CN-620 but not on the newer CN-620B were really not too useful, and it is just as well that they were eliminated. About the only purpose they served was to indicate that an s.s.b. transmitter was being modulated, since they would flash on modulation peaks.

Progressing further, if one were to take the CN-620 and add to it an antenna tuner network and circuitry/controls for automatic tuning of the network, one would come up with the CN-1001 Automatic Antenna Tuner. The CN-1001 is basically meant to function as a complementary accessory to a "no-tune" solid state transceiver, although it can be used with any type of transceiver. Tuning adjustments with solid-state transceivers have, of course, been transferred from the transceiver itself to the antenna tuner, since practically no multi-band antenna presents a perfectly flat s.w.r. curve across each band to allow a transceiver to constantly deliver maximum output power. So, the next step to achieve a "no-tune" station had to be a "no-tune" antenna tuner.



The CN-620 s.w.r. and power meter. Some currently available models are housed differently, and one (the CN-720) contains a larger meter, but all use the same basic circuitry.

As mentioned, the CN-1001 (or the cosmetically different CN-1001/2) takes off on the basis of the forward/reverse power measuring circuitry of the CN-620, but then goes a lot further. Fig. 2 shows the block diagram of the CN-1001. The power measuring circuitry is followed by a pi-type tuner network and then an antenna selector switch. As shown, two capacitor arms of the pi-network circuitry are variable and are motor driven. The circuitry which controls the motor uses information supplied to it by the power measuring circuitry. The CN-1001 can handle transmitter power *output* levels *up to 500 watts p.e.p.*, and it covers all the bands from 80–10 meters, including the new 30, 17, and 12 meter bands. It is not a match-anything-to-anything tuner, however. The antenna mismatch without using the tuner must produce an s.w.r. not greater than 5:1 if the tuner is to function properly. In reality, this means that the tuner is ideal for use with multi-band trap dipoles and verticals where the s.w.r. may range up to 3:1 or 4:1 at band edges, but it cannot be used with random-length single wire antennas where one might easily encounter s.w.r.'s of 20:1 or more

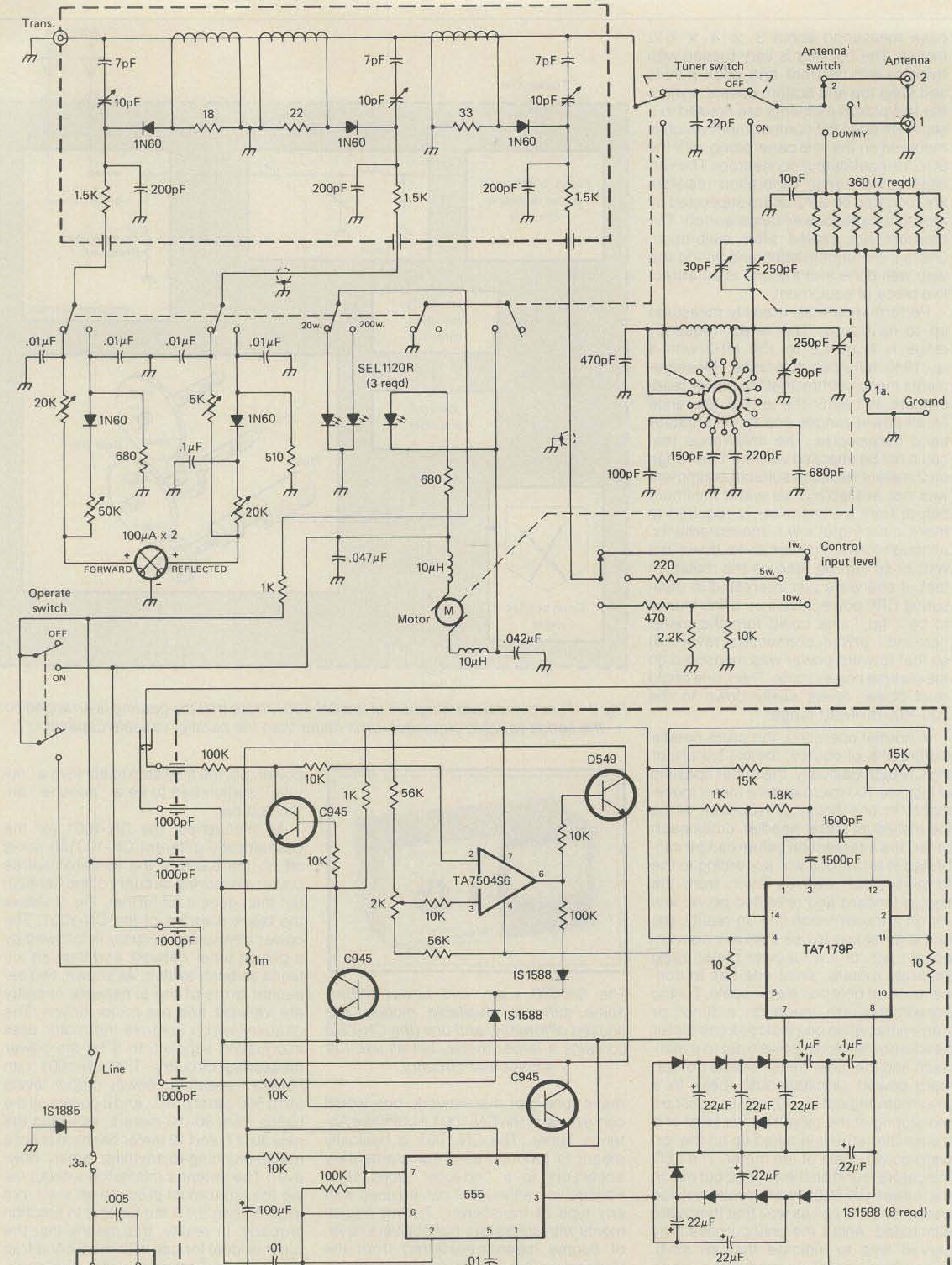
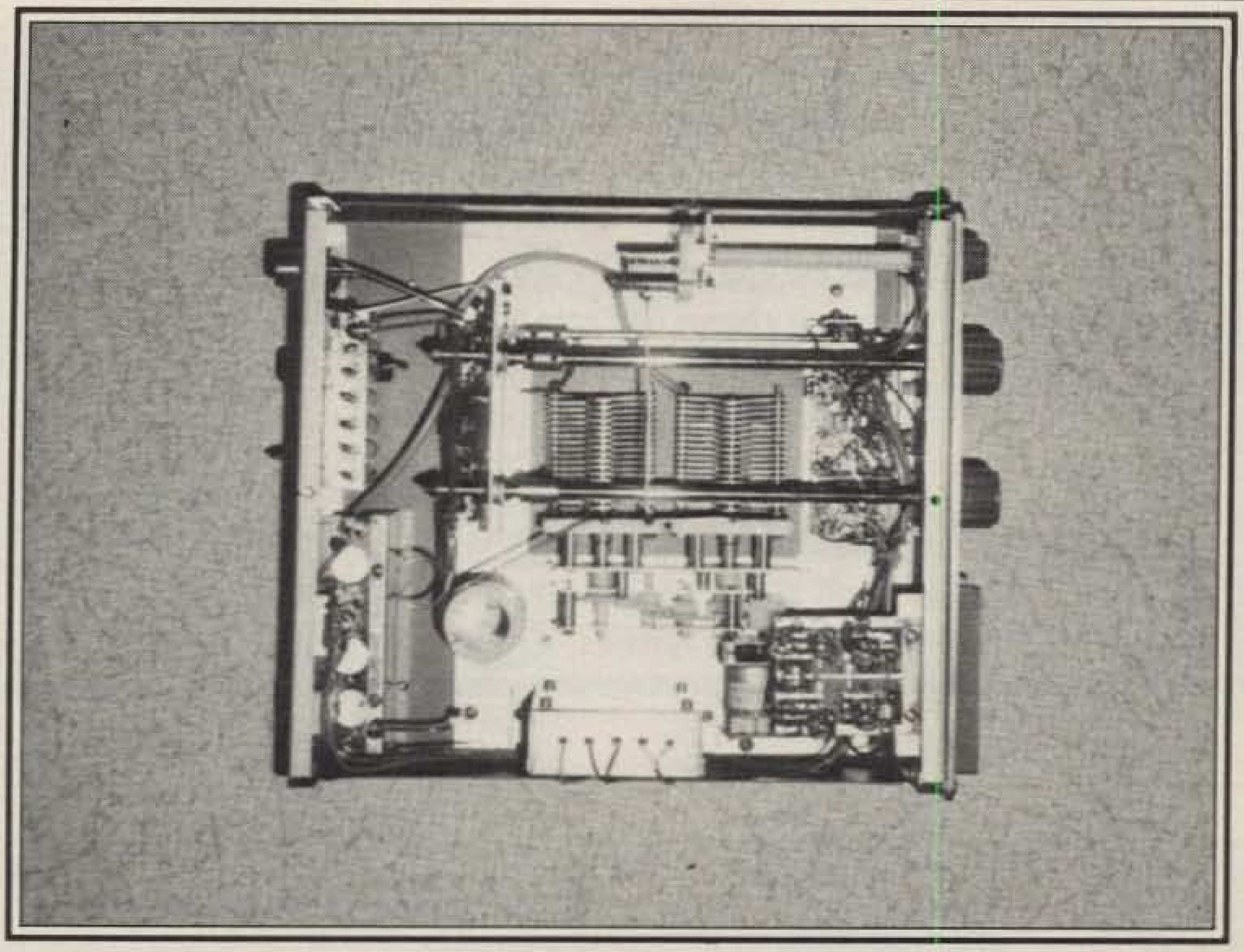


Fig. 3– Actual circuitry of the CN-1001.

depending on the length of the wire and the band being used. The tuner measures about 9 × 9½ × 3½ inches and is housed in the same sturdy manner as the CN-620.

The photo shows the inside of the CN-1001 and fig. 3 shows the circuitry details. Glancing back and forth between the two one can see the arrangement inside the CN-1001. The forward/reverse power measurement circuitry is in a shielded enclosure on the lower rear panel of the unit. Also on the rear panel above the circuitry enclosure is a bracket which holds six paralleled 360 ohm resistors which constitute a 60 ohm/50 watt dummy load. The motor control circuitry is in another shielded enclosure on one of the side panels (one can see five leads going to feed-through connectors on top of the enclosure). The actual matching network components are in the middle of the enclosure. One can clearly see the two 250 pf variable capacitors. Above them are two stacked 30 pf variable capacitors which are front-panel controlled for fine tuning. The pi-network coil is mounted vertically, and the bandswitch for it is on a bracket just above the coil. Overall, the unit is well laid out with plenty of spacing around the r.f. components.



A view inside the CN-1001 with the top cover removed.

As shown in fig. 3, the matching network uses a pi-circuit where the input character is fixed but the output parallel and series capacitors are variable. In operation, the gearing to the two capacitors is arranged such that when the drive motor runs, the series capacitor will turn several times faster than the parallel capacitor. In essence, the series capacitor seeks a setting for minimum s.w.r. for a given setting of the parallel capacitor. The control circuitry basically consists of a comparator which senses the ratio of forward to reflected power and stops the motor from rotating the capacitors when the power ratio is such that it represents an s.w.r. of 1.5 to 1 or less. The 555 IC and its associated components in the control circuitry constitute just an oscillator to generate the positive and negative voltages necessary for the operation of the operational amplifier which is wired as a comparator. The tuner can operate with as little as 1 watt of transmitter output power, and there is a sensitivity switch to select tune-up input levels of 1, 5, or 10 watts.

Using the tuner requires, first of all, an external power source of about 12–14 volts d.c. at 200 ma. Almost any plug-type power supply will suffice, since there are no special filtering or regulation requirements. But, the external supply is essential, since there is *no way that the tuner can be manually tuned.* To operate the tuner one should first check if the s.w.r. produced by an antenna load is 5:1 or less. This can be done easily, since the meter circuitry is still active when the matching network in the tuner is bypassed ("tuner" push button in "off" position). If the s.w.r. is less than 5:1, the tuner should be able to match the load. The tuner is turned on, the "operate" button depressed, and about 1, 5, or 10 watts c.w. power fed into the tuner depending on how the rear panel senstitivity switch is set. One then hears the drive motor rotating the capacitors, and the meter needles go through all sort of gyrations until a tuning point is found which represents an s.w.r. of 1:5 to 1 or less. At that point the motor shuts off and one can use the fine tuning controls, if desired, to get the s.w.r. down to an absolute 1:1. One can then proceed with normal full-power operation in any desired mode.

The CN-1001 Automatic Antenna Tuner. The CN-1001/2, which is also available, is internally similar.

The length of time it takes for the tuner to tune will vary greatly—from a few seconds up to 45 seconds. The capacitor drive motor turns in *one direction only,* and so if it is just a touch beyond the correct tuning point, it has to cycle through its entire rotational program to find the correct tuning point.

A CN-1001 was tried using an IC-720A transceiver and a multi-band parallel dipole type antenna, the latter probably being typical to using a multi-band trap type antenna for 80–10 meters. The IC-720A has a variable power output level control, so for tune-up it was very easy to put the IC-720A in the c.w. mode, set it for a few watts output power, and activate the tuner. The tuner took from about a second to 15 seconds maximum to tune itself when either going from band to band or when making frequency excursions within a band. The s.w.r. reading when it stopped tuning was always less than 1.5 to 1 and frequently even better. Touch-up of the fine-tuning controls on the tuner was not really necessary, since the IC-720A delivered almost maximum power output when the s.w.r. was below 1.5 to 1. One could manipulate a manual tuner faster in some circumstances, but then one would have to develop careful logging data for the setting of the controls. In the case of the CN-1001, one just lets it do its job. Unless one has a need for an almost instant QSY capability, the CN-1001 can be a great operating convenience for the casual operator. The only operating precautions to be observed, aside from not exceeding its power handling capability, would seem to be:

1. Don't forget the bandswitch. One tends to think of the tuner as being so automatic that the bandswitching function can be forgotten. If so, the tuner will just cycle endlessly.

2. Don't use too much drive power while the tuner is adjusting itself. If too much drive power is used, the comparator circuitry will apparently not sense when the lowest s.w.r. point is reached, and the tuning will continue to cycle. In fact, after using the tuner a while, it was found easiest to set up the tuner for operation and then just apply enough drive power to get the tuner control circuitry activated and the tuning motor turning. In this manner, correct operation was achieved every time.

3. Don't set the automatic tune feature into operation if a very small frequency excursion is made. It could just happen that the tuner will run through its complete rotational cycle. It is much easier to touch up tuning with the fine-tuning controls in such a case.

The CN-1001 is basically a home station accessory, although it can be used anywhere a 12 volt d.c. supply is available. After using it some time, the only modifications that were made were to build in a small 110 v.a.c./12 v.d.c. power supply so a plug-type supply was not necessary and to build in a toroid core balun so the tuner could be used with balanced transmission lines. There was plenty of room inside the CN-1001 enclosure to house these items while still maintaining good spacing from the other components in the tuner.

Although parts of it resemble a strange blade for a food processor, it's actually a short tri-band antenna. N9AU takes us through his design considerations for this 12 foot roof-mounted antenna.

A 12 FOOT ROTATABLE ANTENNA FOR 20, 15, AND 10 METERS

BY RONALD J. GORSKI*, N9AU

For more than twenty years, I have been experimenting with antennas of all kinds, and I have formulated two very strong opinions:

1. It's not what you've got, but where you've got it.

2. Height above ground is not nearly as important as height above surrounding objects that can adversely affect performance.

Why Small Antennas?

A great many amateurs in this country live in urban areas that are unkind toward h.f. operation. City lots 30 feet wide are not conducive to 60 foot towers. Dipoles strung between the house and garage, parallel to utility lines, don't do the trick. Roof-top mounting of a yagi close to a building where there are gutters, wiring, aluminum siding, etc., causes performance to be marginal at best. Roof tower mounting is an expensive proposition, and the neighbors or XYL may not think highly of your house being dwarfed by a monster array. There are a couple of ways to deal with these problems: design an array that is small and light enough to be mounted at a substantial distance above roof-top level using TV-type hardware, or trade the h.f. equipment in for 2 meter gear. I chose the former.

Performance: Small vs. Large

A lot of information has been published on short antennas. Some of this information would lead one to believe that an antenna less than full size has serious shortcomings with respect to efficiency and bandwidth—*i.e.,* that you are sacrificing a great deal to get a small physical size. Let me say that the shortcomings are with the people who write these things. Efficiency is simply related to the loss resistance (R_L) of the inductive reactance necessary to resonate the short antenna. If this R_L can be made to go toward zero, the efficiency can be made to go toward 100%. If the coil is wound with small diameter wire on a lossy form, you're in trouble.

Bandwidth is a function of the reactance necessary to resonate the short antenna as compared to its radiation resistance. If only inductance is used to load the short antenna, the X_L will be high, the Q will be high, and the bandwidth will be small. On the other hand, if the antenna is totally end-loaded using large capacity hats, the necessary X_C will be small, the Q low, and the bandwidth large. It is that simple. For a very short dipole (0.17λ), the predominant use of capacity hats is not practical, as the size required would assume monstrous dimensions. The alternative is to use the largest practical-size capacity hats together with ultra-low-loss coils. Efficiency will be very near 100%, and the bandwidth will be more that enough to cover the amateur bands.

Initial Experiments

Initial experiments involved a short dipole helically wound with ½ inch wide copper tape with capacity hats at the ends. The test model was designed for 100 MHz and is fully described in a previous article.[1] Next, a 20 meter half-size dipole was built using fiberglass quad spreaders as the form for the copper tape winding with 18 inch diameter capacity hats at the tips. The efficiency was excellent, but the 18 inch hats were not large enough to secure a really good bandwidth. Radiation resistance was 18 ohms. It was felt that the fiberglass tubes could not support larger capacity hats in heavy ice. Also, some form of multi-banding was wanted, and it was thought that perhaps capacity hats, strategically placed along the helical winding, would have the effect of a parallel resonant decoupler. This proved only slightly productive in that adjusting resonance for one band affected resonance on other bands. The helical approach was abandoned.

Since larger capacity hats were needed for increased bandwidth, it was thought that a high-strength aluminum tube with lumped constants at the ends would be a better approach. Full end-loading yields a nearly constant current distribution, which will give the highest possible radiation resistance (R_r) for a given small physical size. The combination of large capacity hats and a larger R_r should give a much improved bandwidth. Perhaps some adaptation of the lumped constants could make multi-banding possible.

Design

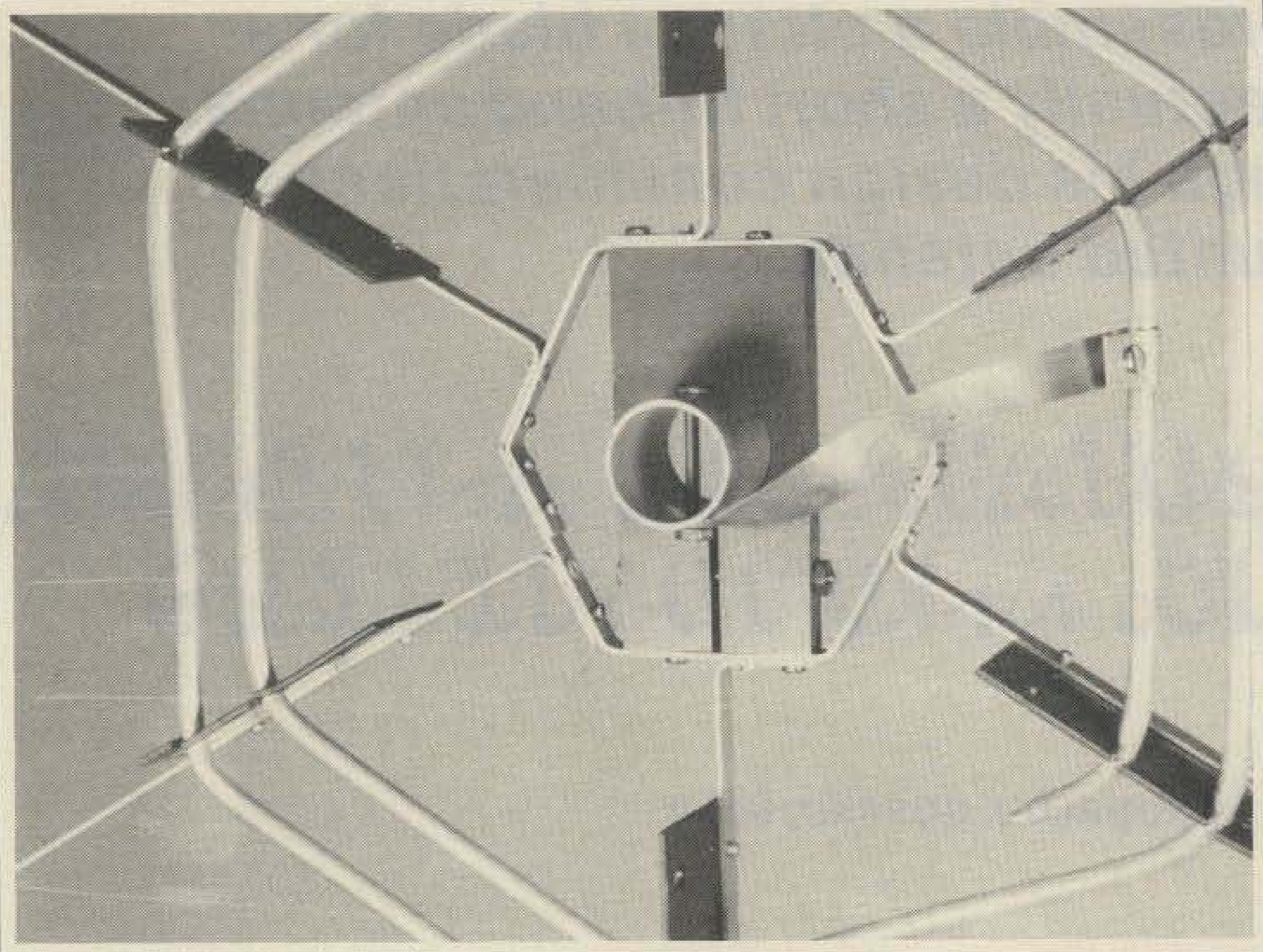
Design criteria were set as follows:

1. 12 foot length;
2. 20/15/10 meter operation;
3. Light enough so that TV-type masting could be used for support;
4. Sufficiently broad-banded so that v.s.w.r. would not exceed 2:1 over entire bands covered;
5. Use simple broad-band matching to 50 ohms.

*2330 West National Ave., Milwaukee, WI 53204

[1]*Ronald J. Gorski, W9KYZ, "Efficient Short Radiators,"* QST, *April 1977, p. 37.*

Fig. 1– Close-up of the resonator's center hub.



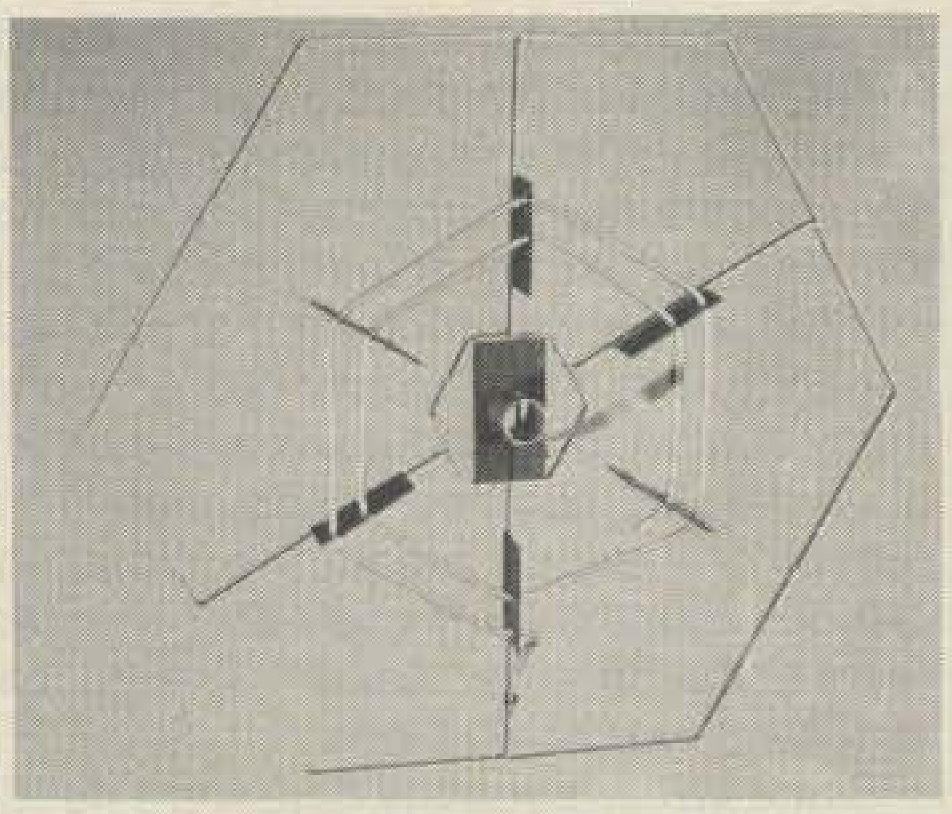


Fig. 2– The 15 meter resonator. The outside hex is 12 inches on a side. The hex-spiral coil consists of 1⅚ turns, the outer turn being 6 inches on a side and the inner turn being 5 inches on a side. The 10 meter dimensions are the same except that the coil has 1⅙ turns.

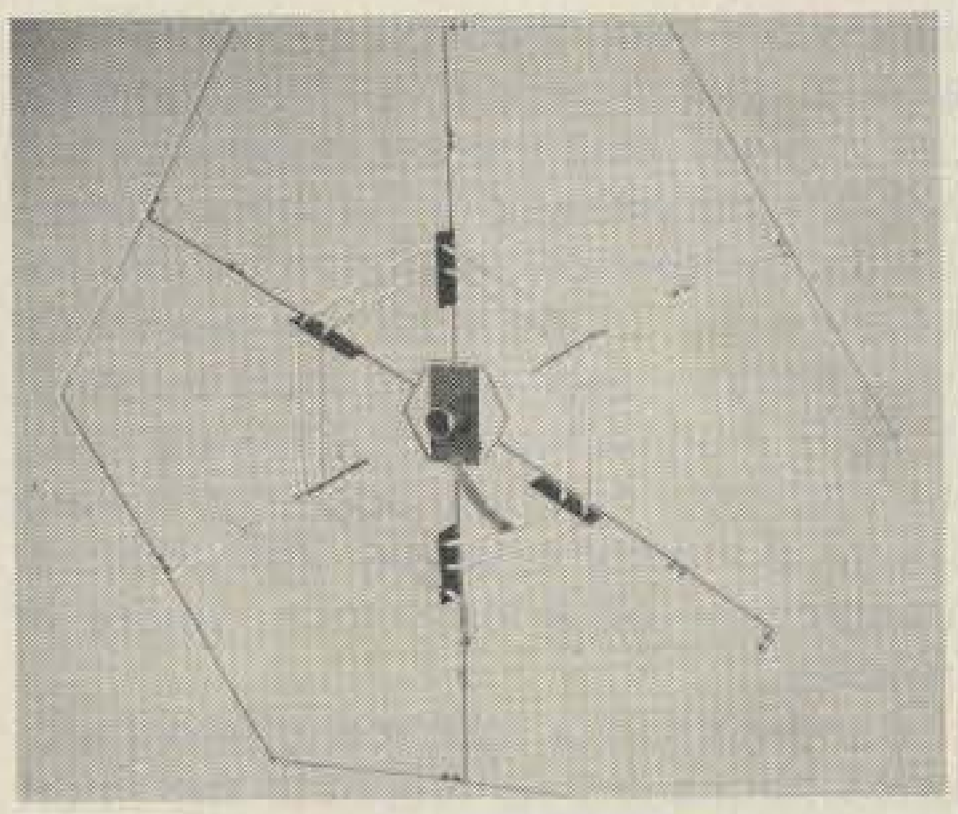


Fig. 3– The 20 meter resonator. The outside hex is 18 inches on a side. The hex-spiral coil consists of 2⅙ turns, the outermost turn being 7 inches on a side, the middle turn 6 inches on a side, and the inner turn 5 inches on a side.

A 12 foot long dipole was constructed using hex-shaped capacity hats, 18 inches on a side. That hats were insulated from the element. The 12 foot length was used because if a constant current distribution could be had, this length would yield a 25 ohm radiation resistance, which would be high enough to negate any coil losses and also high enough so that the dipole could be used for the driven element of a yagi. Also, 12 foot lengths of aluminum tubing are commercially available, and there would be no material waste.

At each capacity hat, a coil was connected between the insulated hat and the element. The inductance was adjusted for antenna resonance at 14.175 MHz using a dip meter. An "antenna-scope"[2] connected directly to the element center indicated a 25 ohm impedance. The height of the antenna was 35 feet.

Next, an attempt was made to secure resonance on 21 MHz using additional resonators. The 12 inch/side, hex-shaped, insulated capacity hats were installed at positions 4 feet either side of element center. As with the 20 meter resonators, coils were connected between the hat and the element. It was thought that since this coil inductance was much larger than the 4 foot element section, perhaps this lumped coil/capacity hat combination would effectively decouple the outer 2 foot element sections and the 20 meter resonators. The coils were adjusted for resonance at 21.2 MHz. Feed-point impedance was 25 ohms (same as 20 meters). The antenna-scope showed that indeed the 20 meter resonators had virtually no effect on 15 meter resonance. The initial theory, in fact, was proven: that a capacity hat/coil resonator can be placed on an element *(without breaking the element with an insulator)* and effectively decouple the remaining outside tip of the element.

This is the breakthrough that was being sought in multi-banding a short antenna. It is merely necessary to place a set of resonators, tuned to the appropriate frequency, at the proper position on an element for each band you want to operate. Positioning of resonators is determined by the length reduction desired and must be followed for each band. If a half-size antenna is built for 20 meters (16 feet), and 10 meter resonators are desired later, they must be placed 4 feet either side of center (8 feet overall) for proper operation. If this relationship is not adhered to, the feed-point impedance will be different on each band.

Construction

The element consists of two 6 foot lengths of 1⅛ O.D. × 0.058 inch 6061-T6 aluminum tubing, center spliced with a 9 inch length of 1 inch diameter fiberglass rod. The rod is inserted 3 inches into each tube and secured with 8-32 × 1¾ inch stainless hardware. Using 2 u-bolts, the rod is attached to a 2¼ × 4 × ¼ inch aluminum plate, which serves as an element-to-mast clamp.

The resonators consist of hex-shaped capacity hat-frames made from ⅜ × 0.063 inch 6061-T6 aluminum strips. The 10 and 15 meter hats are 12 inches on a side and the 20 meter hats are 18 inches on a side. A 2 × 4 × ⅜ inch gray PVC block supports a small inside hex, which in turn supports the larger outside hex through six spokes. A 1¼ inch hole is bored in the PVC block, and a saw-cut is made from this hole to one end. A 1¾ inch long piece of 1¼ O.D. × 0.058 inch aluminum tube is inserted into the plastic block, and the tube is secured with an 8-32 × 2¼ machine screw through a hole drilled edge-wise into the plastic block. Tightening this screw clamps the block onto the tube.

The plastic block is secured to the small hex with four #6 self-taping stainless screws (fig. 1). The outside hex and supporting spokes are made from six ⅜ inch wide strips which have been appropriately formed (see figs. 2 and 3). All joints are lapped 1 inch and are secured with two blind-rivets (aluminum). Prior to fastening the joints, each strip should be coated with some alum/alum anti-oxidizing compound.

The coil consists of hex spiral turns of ¼ inch aluminum tubing mounted to the spokes using pieces of black polypropylene sheet stock. Black poly is necessary, as it is least susceptible to damage from the sun's ultraviolet rays. Three ¼ inch

[2]*William I. Orr, W6SAI,* Radio Handbook, *21st ed., Editors and Engineers, Indianapolis, IN, p. 31.18.*

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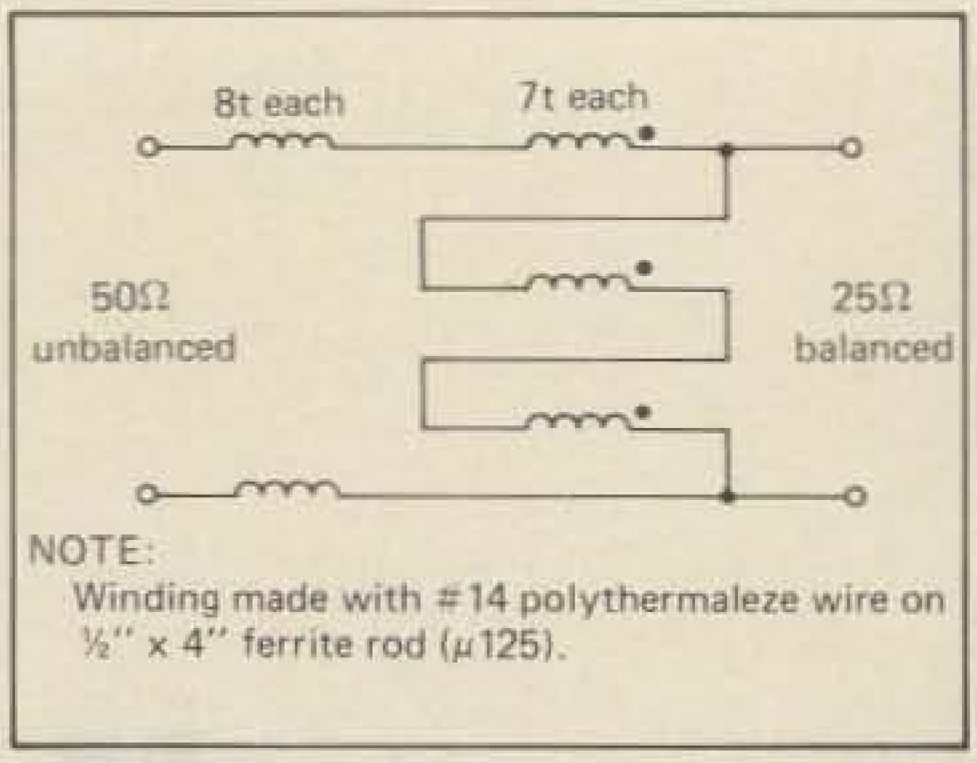


Fig. 4– The wiring diagram for the combination balun/2:1 transformer. Ferrite u = 125.

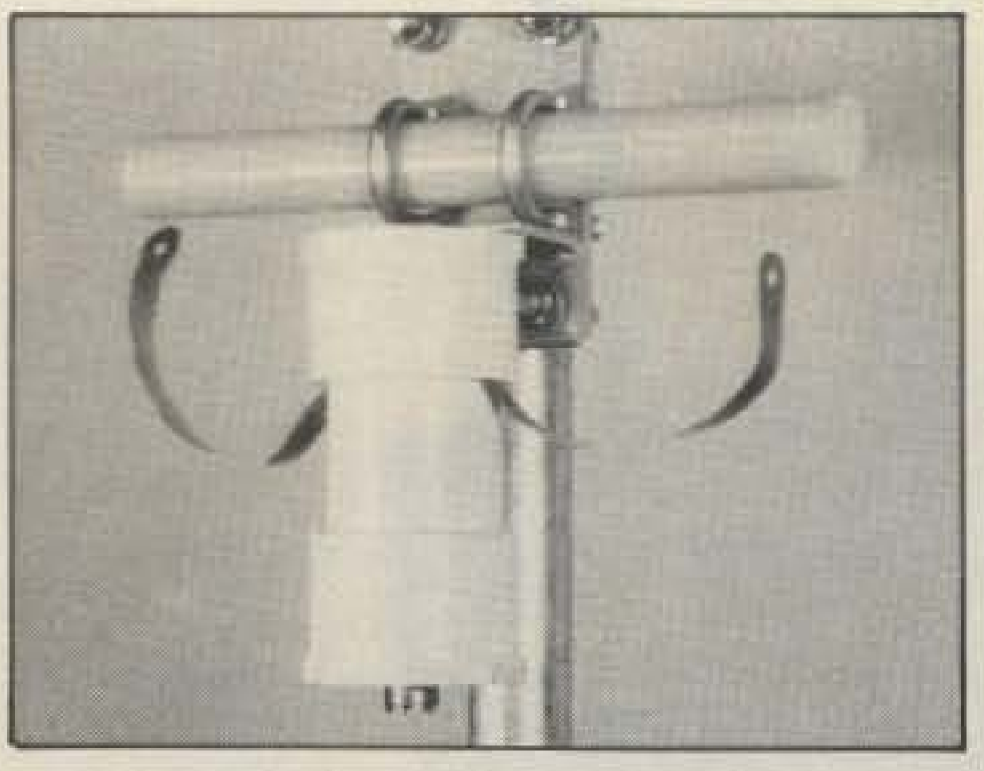


Fig. 5– The balun/2:1 transformer and center insulator as mounted on the element-to-mast clamp.

Fig. 6– The antenna is installed on a TV push-up mast mounted in a 10 foot tripod. the top of the tripod has been modified with a bearing and the entire mast rotates. The rotor is at roof-top level.

holes, spaced 1 inch apart, are punched in the plastic, and from each hole to the near edge the plastic is slit. The plastic spacers are riveted to the spokes. At each bend of the hex spiral coil, the ¼ inch aluminum tubing is inserted into these slit holes.

When completed, the assembly is rigid and lightweight. An adjustable strap connects between the coil and the inside 1¼ inch tube. The starting end of the coil (outside end) fastens to the adjacent spoke with 8-32 stainless hardware. The completed resonators are slipped over the 1⅛ inch O.D. element; the 10 meter resonators are positioned so that the outside edge of the center PVC block is 37½ inches from the center of the element. Drill a hole through the resonator's 1¼ inch tube and the element. Pass an 8-32 × 1½ inch stainless machine screw through the hole. Place the loose end of the coil strap over the screw and secure with a lock washer and nut. Likewise, mount the 15 meter resonators at 49½ inches from the center of the element and the 20 meter resonators so that the outside edge of the PVC block is flush with the end of the element.

The 25 ohm feedpoint impedance is matched to 50 ohms with a combination balun/2:1 transmission line transformer. This matching device is wound on a ½ × 4 inch ferrite rod (u = 125). The balun portion consists of eight bi-filar turns, close-spaced, and the 2:1 transformer consists of seven tri-filar turns, close spaced, all interconnected per fig. 4. The balun/transformer is housed in 1½ inch PVC tubing, and the completed model, together with the center insulator and element-to-mast plate, is shown in fig. 5. As a note of interest, two such transformers were connected in series, back to back, between a power amp and a 50 ohm dummy load. Efficiency was measured at 98%, and only a slight warming of the core was noticed after 5 minutes of 1200 watts RMS being applied at 28 MHz.

Tuning

While tuning of the resonators is best done with the dipole mounted in its final position, a good compromise can be had with it mounted at garage-roof level as long as the resonators are clear of power lines (important at all times), aluminum siding, etc. To initially adjust the resonators, it is best to couple a dip meter to a small coil across the center of the element with the transformer disconnected. Adjust the resonators for mid-band. Reconnect the transformer, feed a small amount of power to the antenna, and plot an s.w.r./frequency curve for each band. If resonance points need to be changed, move the appropriate coil tap strap—less coil to raise frequency and more coil to lower frequency. A strap movement of 1 inch is about equal to 100 kHz change in frequency. Mount the antenna in its final position and replot the s.w.r. If initially you kept clear of metal objects, the resonant frequencies should be very nearly the same, and the s.w.r. should be very close to 1:1. If the resonance points have changed much, the tuning will have to be repeated.

Installation

As I said in the introduction, it's not what you've got, but where you've got it. If the antenna is mounted close to house wiring, gutters, siding, etc., performance will be marginal. Every effort should be made to get this lightweight antenna up in the air where it will do some good. A typical installation is shown in fig. 6, where the dipole is mounted on a 30 foot TV push-up mast which has been lowered into a 10 foot tripod. The top of the tripod has been modified with a 1¾ inch bearing, and the entire mast rotates with the rotor being inside the tripod just above the roof. The mast is extended to 12 feet above the top of the tripod, and providing the tripod legs are *solidly* bolted into the roof, this installation should require no guy wires. Should you desire to mount the antenna in a different manner, stay away from metal guy lines.

Performance

With the 3 band dipole mounted 22 feet above roof-top level, performance has been excellent. The s.w.r. curves are plotted in fig. 7. Side nulls are in excess of 20 dB and front-rear lobes are broad, making only 180 degree rotation necessary. Virtually anything heard (pile-ups included) can be worked with 100 watts or less. The installation in fig. 6 has gone through 65 m.p.h. winds with no ill effects.

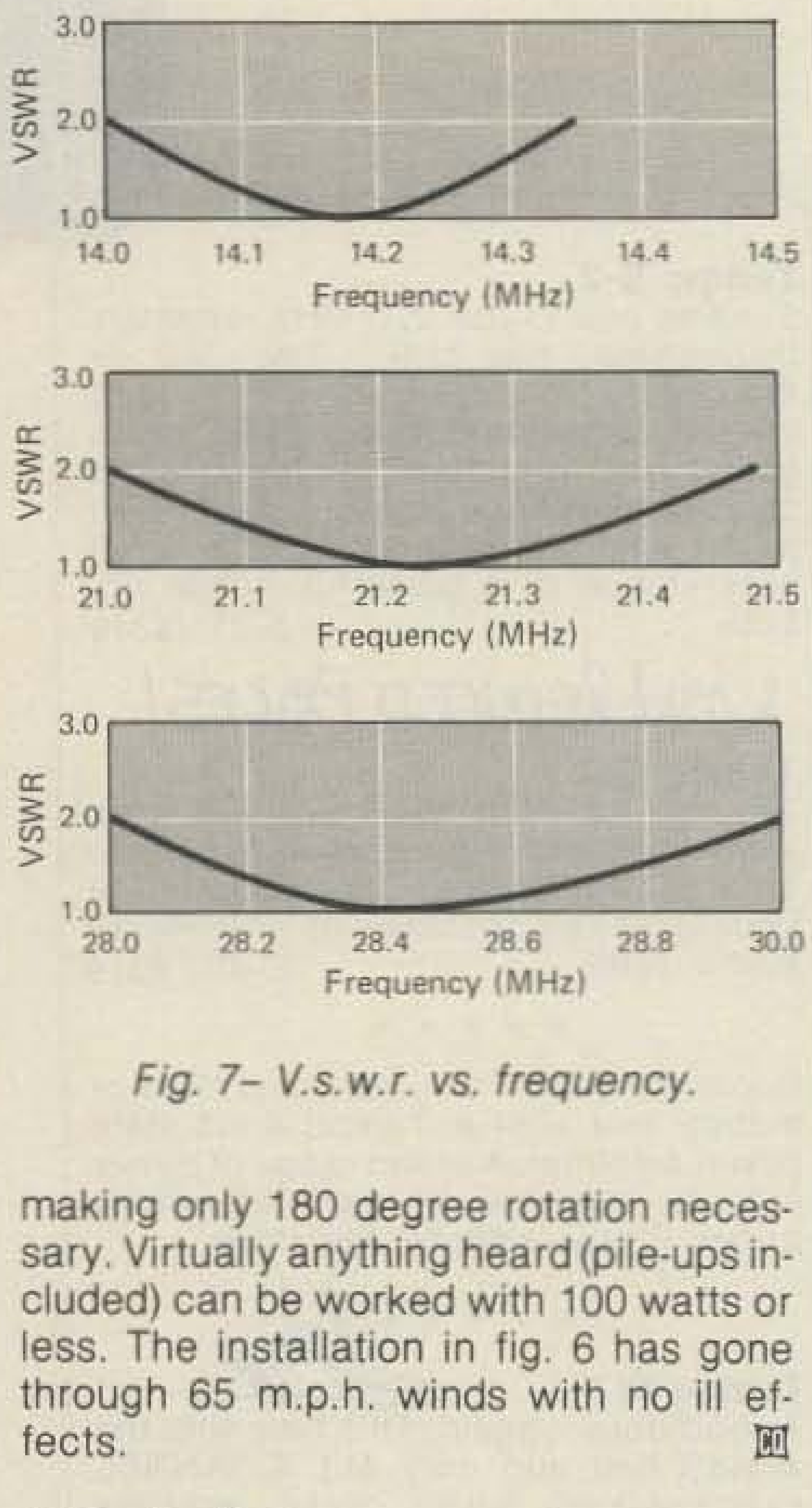


Fig. 7– V.s.w.r. vs. frequency.

Editor's Note

I met Ron Gorski, N9AU, at Radio Expo in Mundelein, Illinois, this past September where he was showing this antenna. I know he wasn't adverse to selling them, which he did. I was intrigued by the construction techniques and Ron's pitch *ergo* the article. If you want any more information you'll have to write to Ron.

—K2EEK

You can roll your own HV supply with surplus components. Put some of these components on your list when you check out your local club fleamarket.

Kilo-volts For Deci-bucks

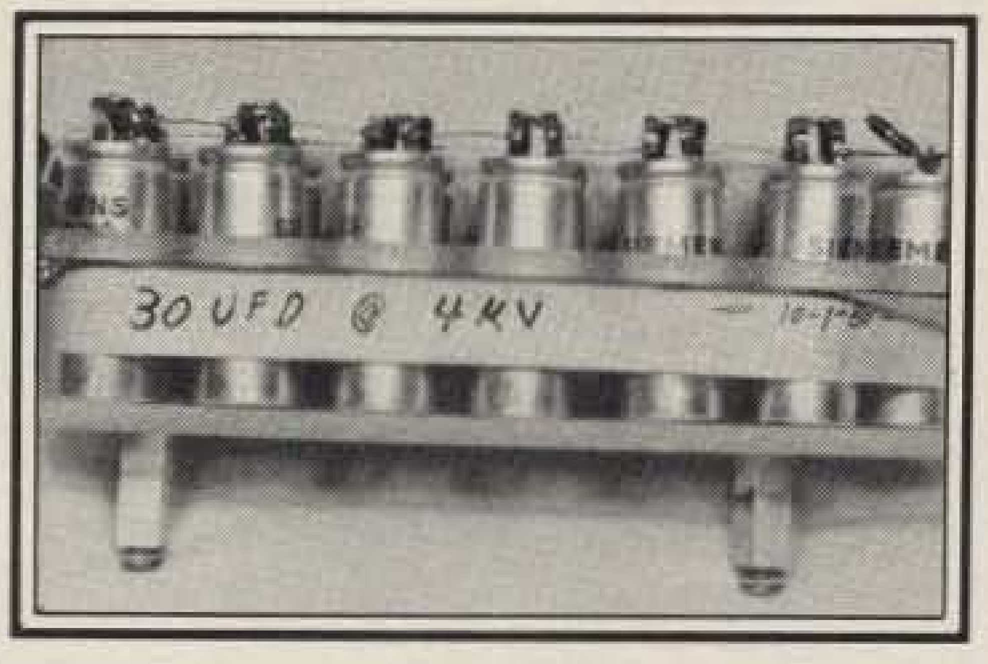
How To Save Money Building High Voltage Power Supplies

BY LEW McCOY*, W1ICP, AND DEAN BATTISHILL†, W5LAJ

When it really gets down to the nitty gritty, there aren't many ways an amateur can save a buck these days when it comes to building his own gear. This is mostly true if you think in terms of receivers, transmitters, and transceivers. However, test gear, antennas, and power amplifiers are areas where the amateur can come out a winner in beating the high costs of hamming. And power amplifiers, or rather power supplies for high-power amplifiers, is our specific case in this article. There are still buys in power transformers, capacitors, etc., to be found in surplus and at hamfests. And, a transformer doesn't have to be a high-voltage type to be used. It isn't too difficult, for example, to come across transformers of about 800 volts at 300 to 400 ma. These can be used in voltage-doubler circuits to provide about 2500 volts or so. Likewise, it isn't unusual to see some real monsters of, say, 6000 volts center-tapped that can be had for the weight of the iron. These are passed up because the average amateur thinks that such a transformer can't be used since he can't get the final voltage down to the "popular" 2500 v.d.c. range. In this article, we'll pass on a few "tricks" that will make you think twice when designing and building that high power supply.

Electrolytic Filters

One of the real surprises in saving a buck is the use of photoflash or strobe electrolytic capacitors. Several surplus houses[1] deal in these electrolytics, and the price is only about $1.00 per capacitor. The capacitor bank shown in the photographs consists of 13 capacitors. Each one is rated at 350 uF at 330 volts. When connected in series, this adds up to 27 uF at 4550 volts! These capacitors are only ¾ inches in diameter and 2¼ inches high. The entire bank of capacitors mounted in two polystyrene strips, as



The capacitor bank from a side view.

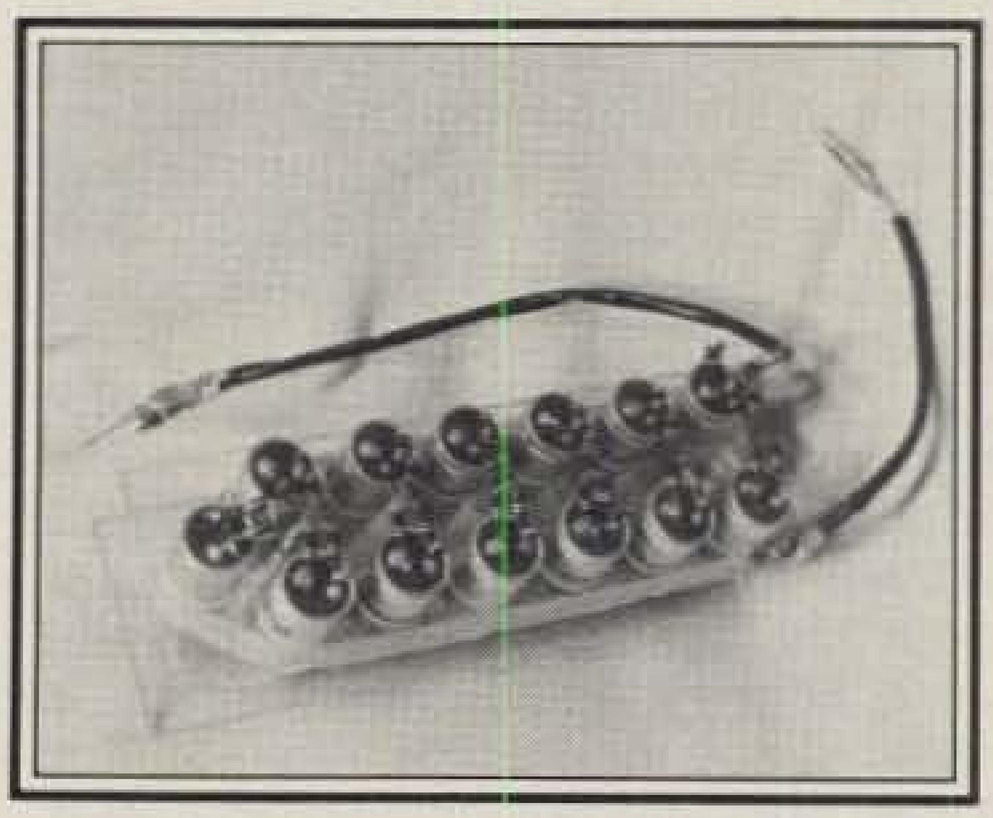
shown in the pictures, measures about 3 × 8 inches!

Some wiseacres out there are going to say, "Fine, but I can't see using such small capacitors in a big supply." Well, the proof of the pudding, etc., has been proven with use in this case. Observe the close-up photo of the running time meter of the power supply. That 207 hours is not heater time, but actual key-down operating time. (Since the photo was taken, we now have over 400 hours on line.)

Let's explain a few facts and let's use ten 300 volt, 300 uF capacitors for an example, as shown in fig. 1. At the top of the string we would have 3000 volts d.c. between the top of the string and ground. However, between each capacitor we would have only 300 volts. If we checked between the top capacitor and ground, we would find 3000 volts, and from capacitor No. 2 and ground, 2700 volts, dropping 300 volts as we moved down the string to ground. **IMPORTANT!** In actual practice we wouldn't make our capacitor string to be right at our maximum voltage, but instead we would build in a safety factor of at least 10 percent. In other words, for our 3000 volt d.c. we would use at least 3300 or 3600 volts of capacitors. At this price, it is reasonable and cheap to have some overkill in our circuit.

Getting back to our description, keep in mind that between the top capacitor and ground we would have 3000 volts d.c. And, our capacitor case, insulation, etc., are not *likely* to be insulated for that kind of voltage! There is an easy cure for this problem, though: simply insulate the capacitor cases from each other and ground with some sheet polystyrene as shown in the photos. In our supply, we mounted the capacitors in and on poly and then mounted the entire assembly on some Isolantite standoffs we obtained from the junk box. It may be overkill, but that 200 hours-plus operating time indicates that the system is working.

There is one other precaution that should be followed with any electrolytic capacitor that hasn't been used for a number of years or has been on a shelf for a long time. The capacitor must be "re-formed" before applying a full load to it. *(Don't ask where the expression came from; we don't know.)* Using Ohms Law to determine the value, use a resistor in series with the capacitor that will provide a maximum of 20 mA; in fact, any current between 10 and 20 mA is good enough. For example, a 300 volt electrolytic would require (I = E/R) 20,000 ohms for 15 mA. Therefore, a 5 watt resistor of 20,000 ohms could be used, and the capacitor and resistor should be connected across any d.c. supply from 100 to 300 volts for a minute or so to be *re-formed.* It is important that this procedure be followed, because if full voltage is applied without re-forming a capacitor, it can make a nasty explosion. Also, don't forget that an electrolytic can hold a charge for a considerable period of time, so be sure to discharge those re-formed electrolytics after applying voltage. In other words, **make sure they have been discharged before handling them.** When re-forming the capacitor, a good one can be determined when it draws one



Looking down on the capacitor bank. As we mentioned elsewhere, this bank has 13 capacitors. In a voltage-doubler circuit, an equal number would be required and divided equally across the transformer secondary.

*200 Idaho St., Silver City, NM 88061
†7 Chest Way, Silver City, NM 88061

[1]Chaney Electronics, P.O. Box 27038, Denver, CO 80227, has a good supply of capacitors of various values.

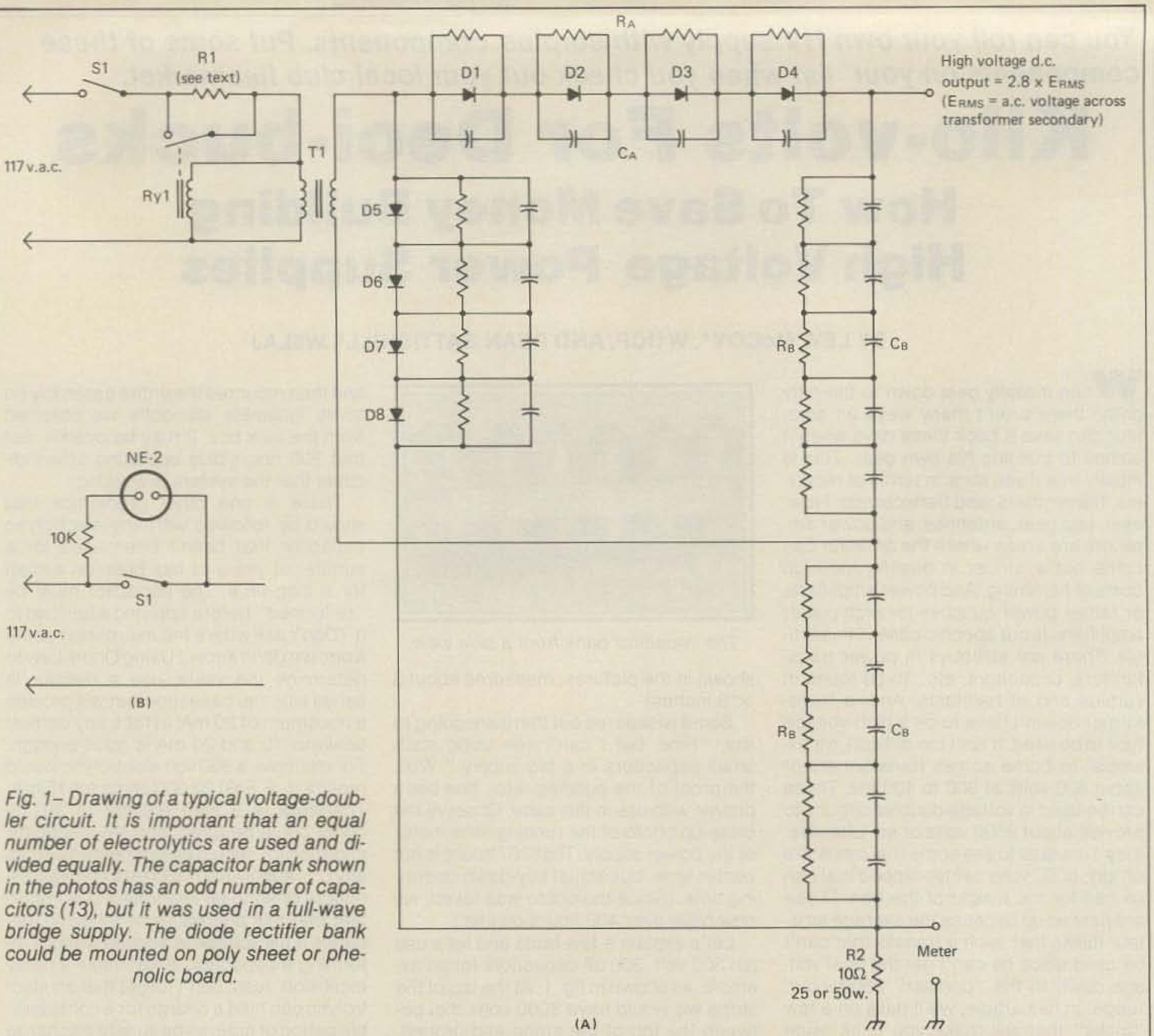


Fig. 1– Drawing of a typical voltage-doubler circuit. It is important that an equal number of electrolytics are used and divided equally. The capacitor bank shown in the photos has an odd number of capacitors (13), but it was used in a full-wave bridge supply. The diode rectifier bank could be mounted on poly sheet or phenolic board.

milliampere or less after being re-formed, and when it doesn't get warm or hot to the touch.

When using a bank of capacitors as described here, it is also good practice to use equalizing resistors across each capacitor in the string. One watt resistors make a good choice for this purpose, and any value between 100,000 and 220,000 ohms can be used, but they must all be the same value.

In fig. 1, we have drawn the circuit of a high-voltage supply using a voltage doubler in order to use a typical transformer with a 700 to 800 volt secondary to obtain about 2500 volts d.c. or so. While this is not a construction drawing *per se*, it could be used for one. The supply shown is used in a capacitor-input configuration using a bank of capacitors as previously described. In any capacitor-input supply, when the a.c. is initially applied (S1 is closed), there is a tremendous amount of current that rushes through the transformer and the rectifier diodes to charge the capacitor bank. In some cases, this charge is so high that it could blow out the diodes. *(It has happened to us!)* The surge current exceeds the surge current ratings of the diodes.

Some power supply circuits you'll see show a resistor in series with the secondary of the transformer and the diode rectifiers. This is used to protect the diodes from the current surge. However, we don't think much of this circuit simply because it adds series resistance to the supply and can seriously degrade the output regulation (no load, to full load voltage).

Diode Protection

As we just mentioned, one problem encountered in using diode rectifiers (actually there are a few others in a high-voltage supply) is that the initial surge current can be so great that it will destroy the diodes. The amount of current is determined primarily by the resistance in the windings of the power transformer. With the extremely large values of capacitance that one uses in modern design, this load creates a large instantaneous load which translates to a large amount of current flowing through the diodes at the initial charge. If it appears we seem to be overstressing this point, it is because we don't want you going to the expense and trouble we have!

If you study many of the power-supply sections of various handbooks, you'll find a resistor used in series with the secondary to limit this current flow. However, this is really not good design, because any series resistance contributes to poor voltage regulation. In other words, a greater voltage drop from the supply will result as the supply is used. Some years ago we used a simple system devised by By Goodman, W1DX, that eliminated this problem. The resistor, R1, in fig. 1 is part of this circuit. It consists of installing a resistor of about 25 to 50 ohms in series with one side of the a.c. line to the trans-

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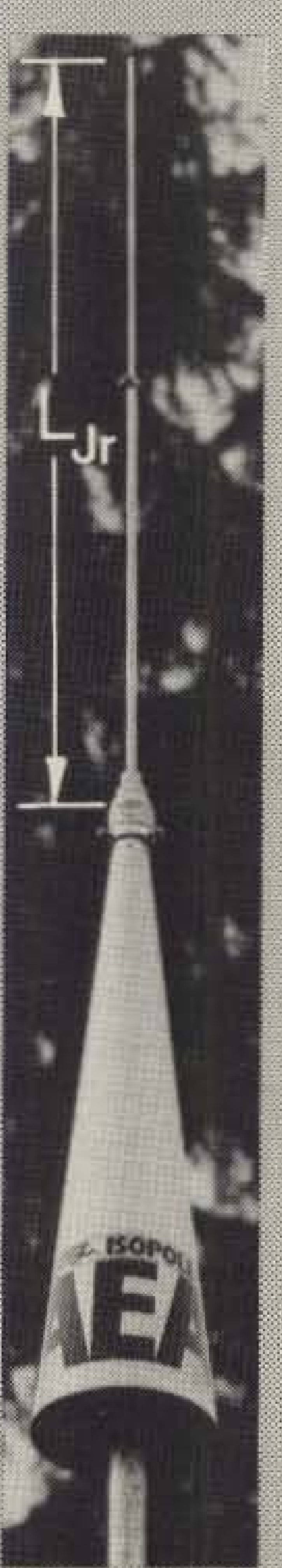

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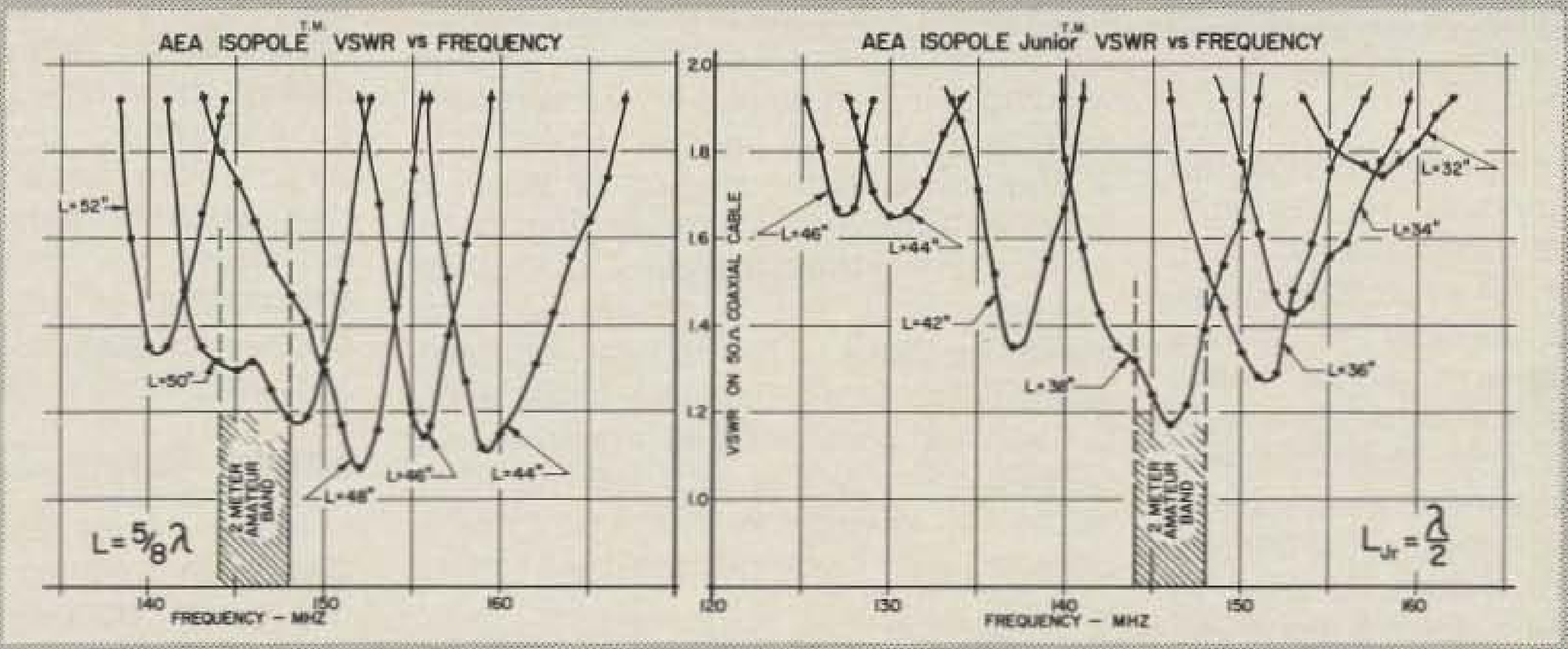

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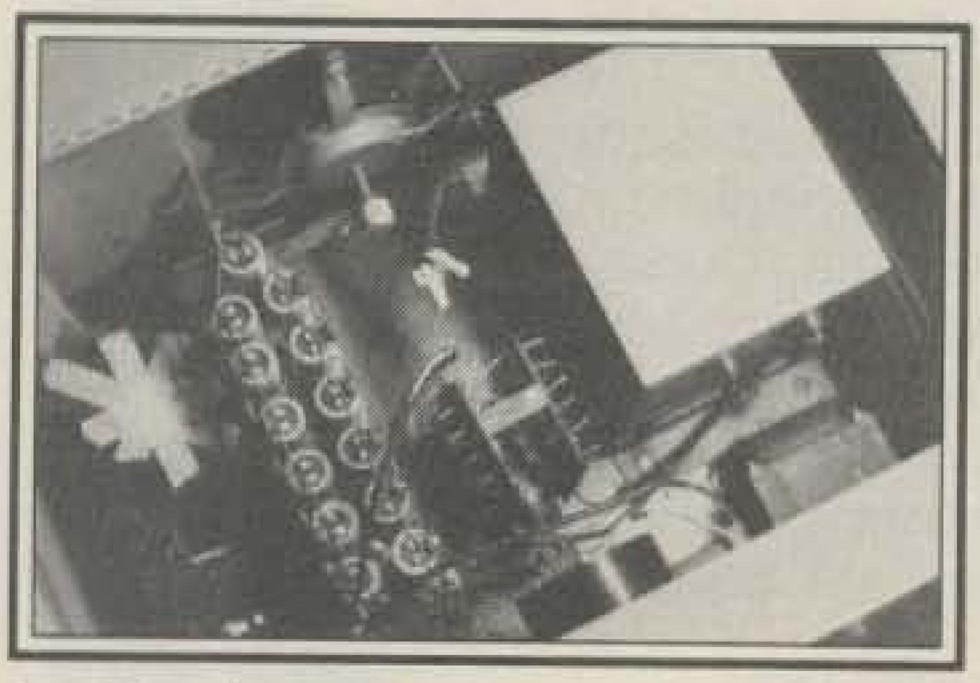
Here is that running time meter we mentioned in the text. Since then, there is a lot more time on the supply.



Looking down into the completed supply.

former primary. A relay is also connected across the primary with its contacts across the resistor. When the switch is closed, the resistor, for a fraction of a second, limits the current flow through the system, protecting the diodes while charging the capacitor bank. The relay closes and shorts out the resistor, thereby eliminating any series resistance in the circuit and still protecting the diodes. We have used this system for over 15 years and have never blown a diode yet. One could eliminate the relay and use a switch to cut out the resistor, but it would be easy to forget that the switch was closed when you turned on power. On the other hand, it would be simple to install an NE-2 neon lamp to alert you that the switch was closed. This idea is shown in fig. 1 at (B). If the switch is open, the NE-2 is lit. The only reason we mention a switch is that 117 volt relays are getting hard to find in surplus and new ones cost too doggone much.

We mentioned other problems in using diodes, and these are the standard ones of voltage spikes that can destroy the diodes. This is taken care of by using capacitors and resistors across each diode. When you are making a diode string, keep in mind that the same high voltage exists across the first diode and ground just as in the capacitor bank described earlier. Good high-voltage material should be used for mounting your diode bank. A 1 watt, 100,000 to 220,000 ohm resistor and a 0.01 to .001 disk capacitor are used across each diode *(all resistors and diodes should be the same value).*

Transformers—Making Do

We'll probably make somebody angry with these next remarks, but it can't be helped. At the present time, we know of only two commercial amateur sources for high-voltage transformers; both are amateurs and nice guys. One is Peter Dahl in El Paso, and the other is Fred Hammond of Hammond Manufacturing in Guelph, Ontario, Canada. They both make and sell power transformers of the types needed for big supplies. How about surplus and scrounging? Well, as we said earlier, there are many ways to get around the problem. As an example, the older tube-type TV sets used transformers in the 350 to 400 volt range and usually at 300-plus milliamperes. By not using the secondary center tap, the voltage across the winding is on the order of 700 to 800 volts. In a voltage-doubler circuit (as in our fig. 1) you could expect to get 2.8 times the a.c. secondary voltage, or in the case of an 800 volt unit, close to 2400 volts. With the large capacitance of the supply serving as a "storage" bank, it is easy to realize about a kilowatt of supply.

Another trick that many old timers know about is the use of another low-voltage transformer, or even a low-voltage winding on a high-power transformer, such as the one we just described.

The low-voltage winding is used to boost, or buck, the primary winding, thereby increasing the secondary voltage (or decreasing it). Fig. 2 shows some of these methods. The regular old-fashioned TV transformer usually had a heavy 6.3 volt and 5 volt winding. These can be connected in series and then used to boost (or lower) the primary winding. Boosting a 117 volt primary by 11 or 12 volts (5 plus 6.3) will give about a 10 percent increase in the secondary or the final supply output voltage. One can quickly see that there are several ways of changing a transformer to fit a given set of needs—and save a tremendous amount of bucks in the doing. There are no real limits on how much one can buck or increase the primary voltage, except possibly the insulation capabilities between the primary and secondary windings or the windings to the transformer case. We think—underline "think"—that 25 percent increase in raising the secondary would be safe for most transformers. However, to be safe, mount the transformer on insulating material such as poly or standoffs. It certainly won't hurt, and it could help.

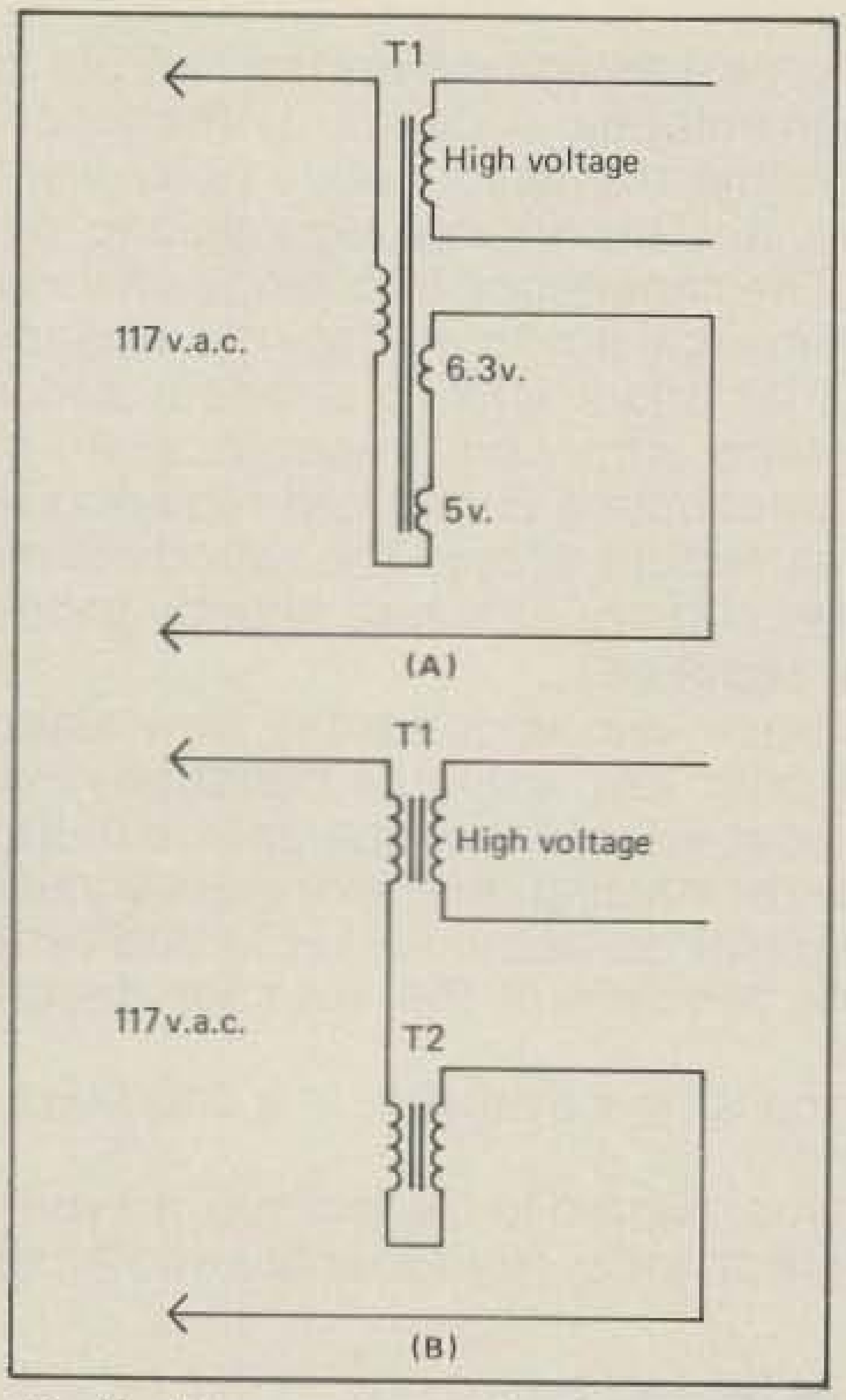


Fig. 2– Here are a couple of examples of using additional windings to buck or boost the primary in its relationship to the high-voltage secondary.

Here is the complete setup. The supply is used to power a Heath amplifier.

Safety, Safety, Safety

Many newer amateurs have never dealt with anything higher than 12 volts d.c. simply because most gear is solid state these days and that is usually the top voltage. It is very, very easy to get careless with electronic gear because one knows that 12 volts won't bite that much. Most old timers, including the authors of this article, have been badly bitten at one time or another by high voltage. Usually only once! A few hundred volts of d.c. or a.c. can quickly make a silent key out of you, so for gosh sakes *be careful.* We need your subscriptions at *CQ!* Joking aside, be sure that your supply is turned off from the a.c. line or actually unplugged and that the capacitors are shorted to ground using a shorting bar that has a well-insulated handle. In metering your supply, meter the current by installing your meter across a negative lead; R2 in fig. 1 is for this purpose. Although you probably won't find the information in any handbook, at least we don't think so, meter cases are usually rated at only 500 to 600 volts, so they cannot safely be put in 2500 or 3000 volt lines. Also, there are still some meters around that have a metal screw on the front of the case for zeroing the needle. That screw can be hot with voltage, so check it! High-voltage supplies shouldn't frighten an amateur, but on the other hand, have a lot of respect for them. *They can kill you* quickly and unpleasantly.

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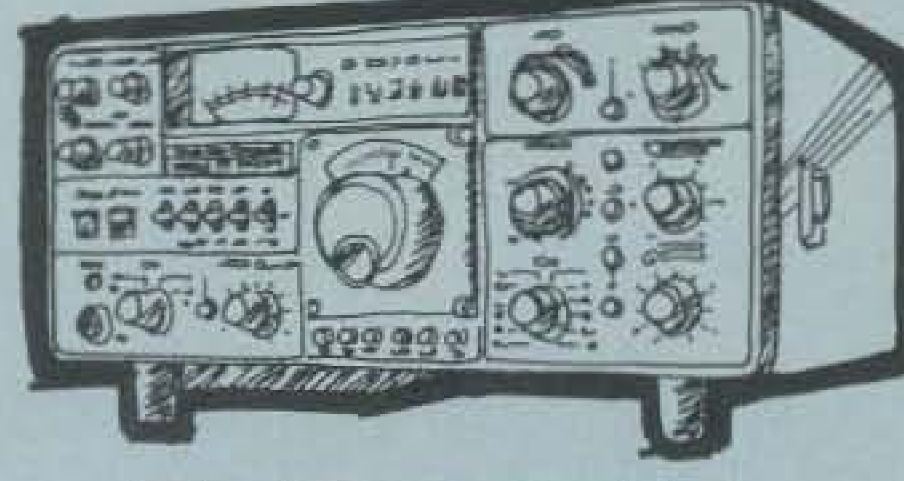

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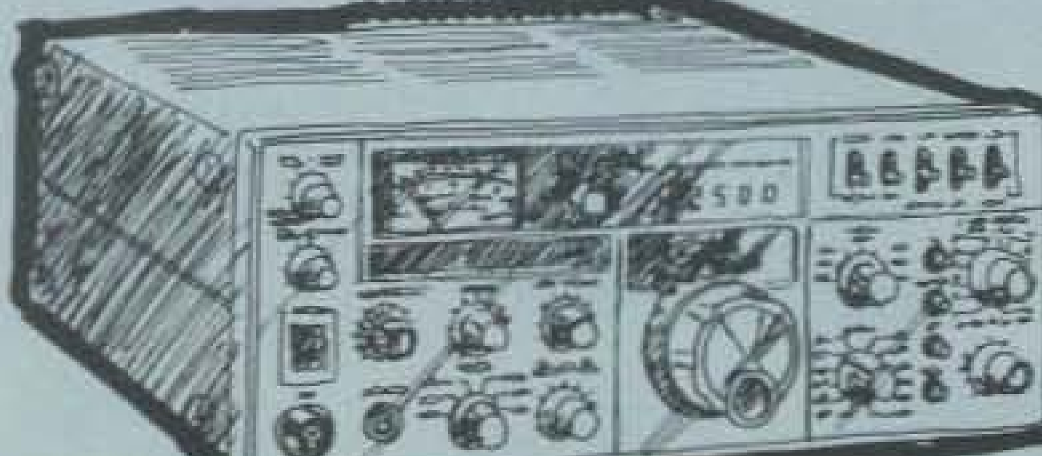

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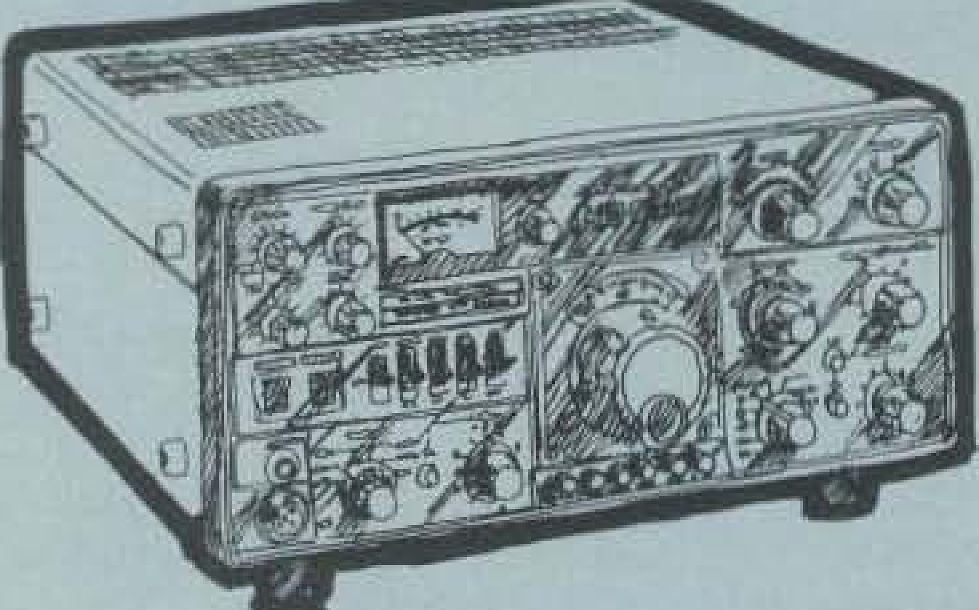

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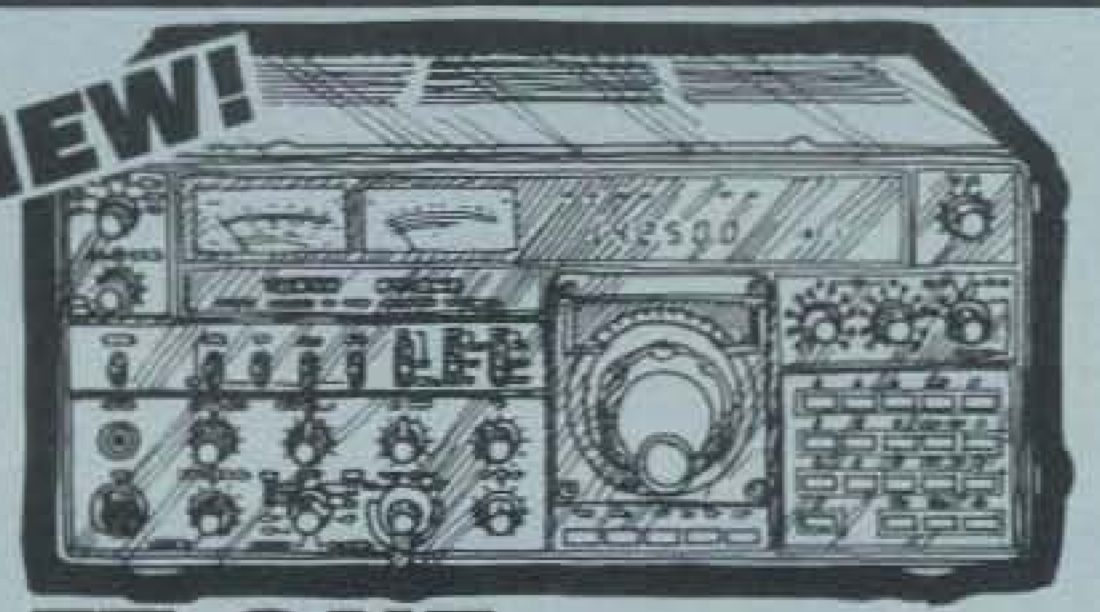

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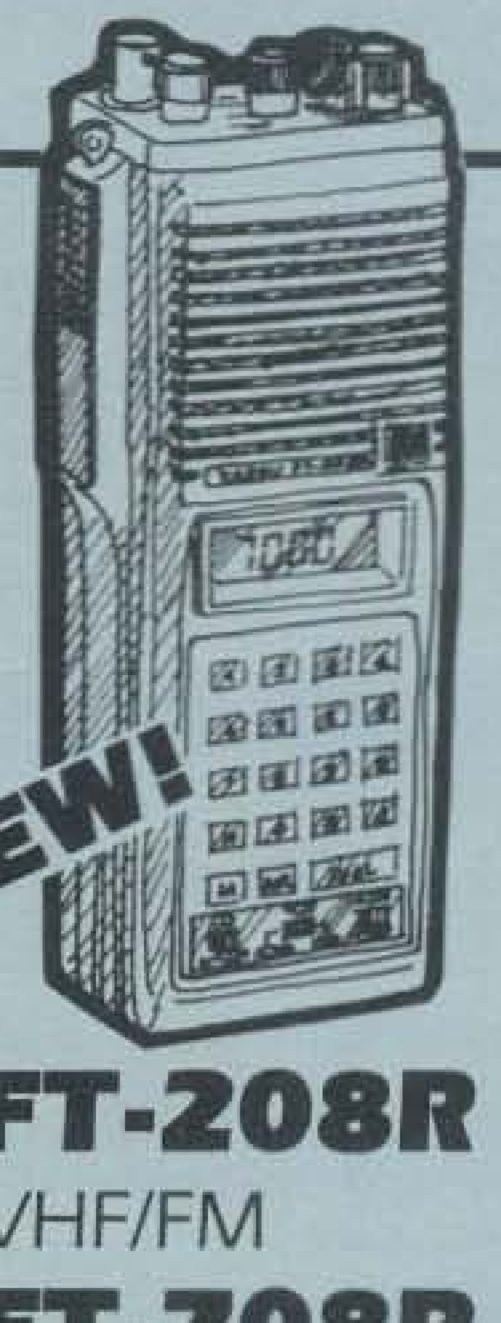

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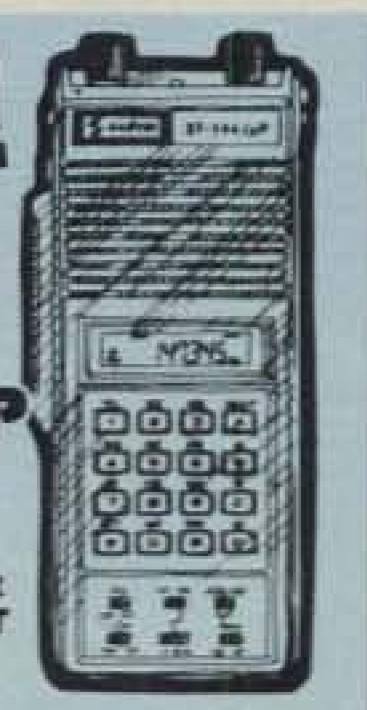

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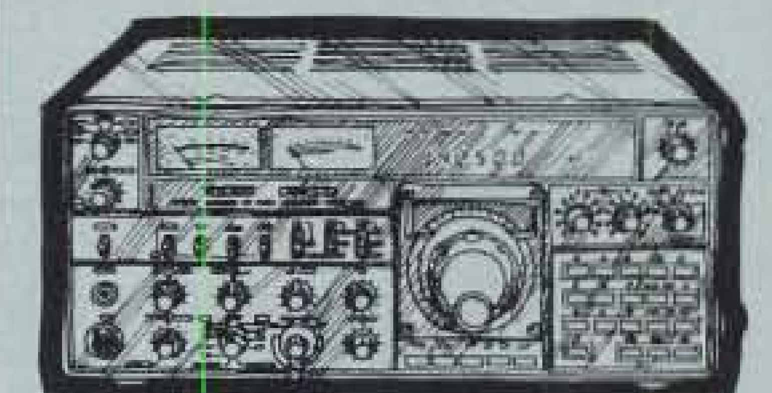

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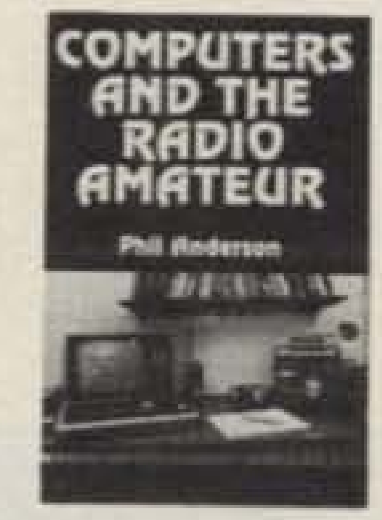

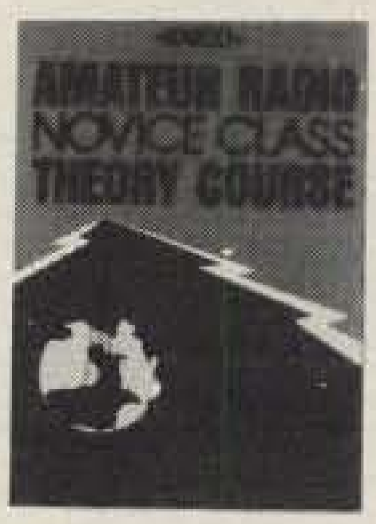

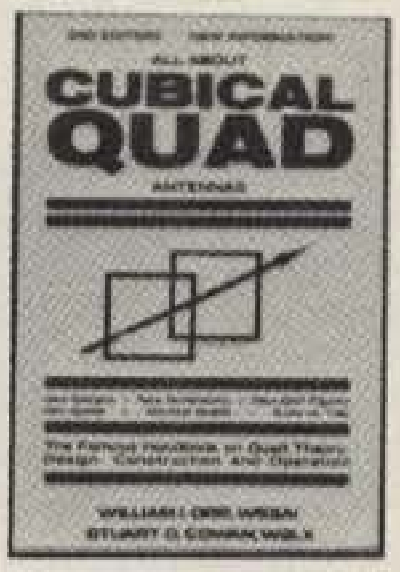

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UNDERGROUND CABLES ARE NOT FOR THE BIRDS

BY CHARLES J. ELLIS*, WØYBV

One problem caused by running coax from an antenna to a house is engendered by perching birds. It's not a major problem, true, but it can be obviated nicely.

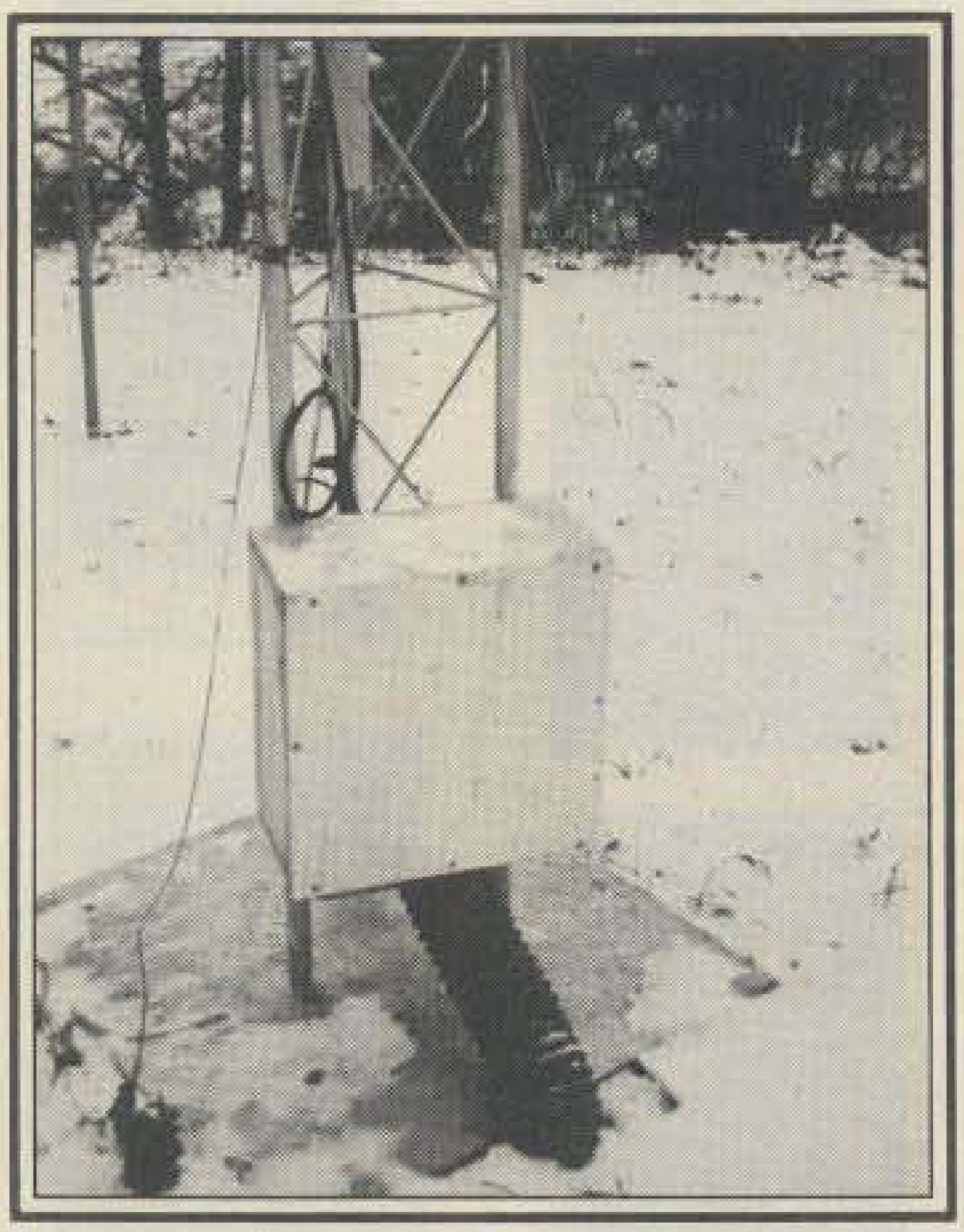
Not only can perching birds be kept off one's feedline, but lightning strikes, large trucks, and the neighbor's threat to hang clothes on it are relegated to limbo by a system I shall describe. It's not a new one, but materials used might be interesting.

My antenna is mounted on a 75 foot tower standing 100 feet away from our home. This distance was selected because the property at this site is ideal for this usage and if the tower should collapse in one of Iowa's infamous tornadoes, it would miss the house. The trade-off for these features was long lengths of feeder and rotator cables. These could have been stretched directly to the house from about halfway up the tower, but several considerations changed my mind against this method.

First, aesthetics of draped cables did not appeal to me, my spouse, nor, I was sure, our neighbors. Secondly, the span giving birds so large a perch was not approved! Lightning strikes might have been considerable, so another negative reason for draping wires existed. A fourth deterrent to the idea occurred to me in planning this installation, that of a cable break and the need to repair it. So, all in all, above-ground cable distribution did not receive high marks.

But what else to do? Short posts could have been used to carry the cables as is done in commercial installations. This idea had the obvious disadvantage of blocking the mower man (me!), cluttering the yard, and again, providing a perch for birds (and squirrels, raccoons, and little people from next door). This idea was abandoned as another came to mind.

*Rural Box 8873, Cambridge, IA 50046



Tower end of underground tube.

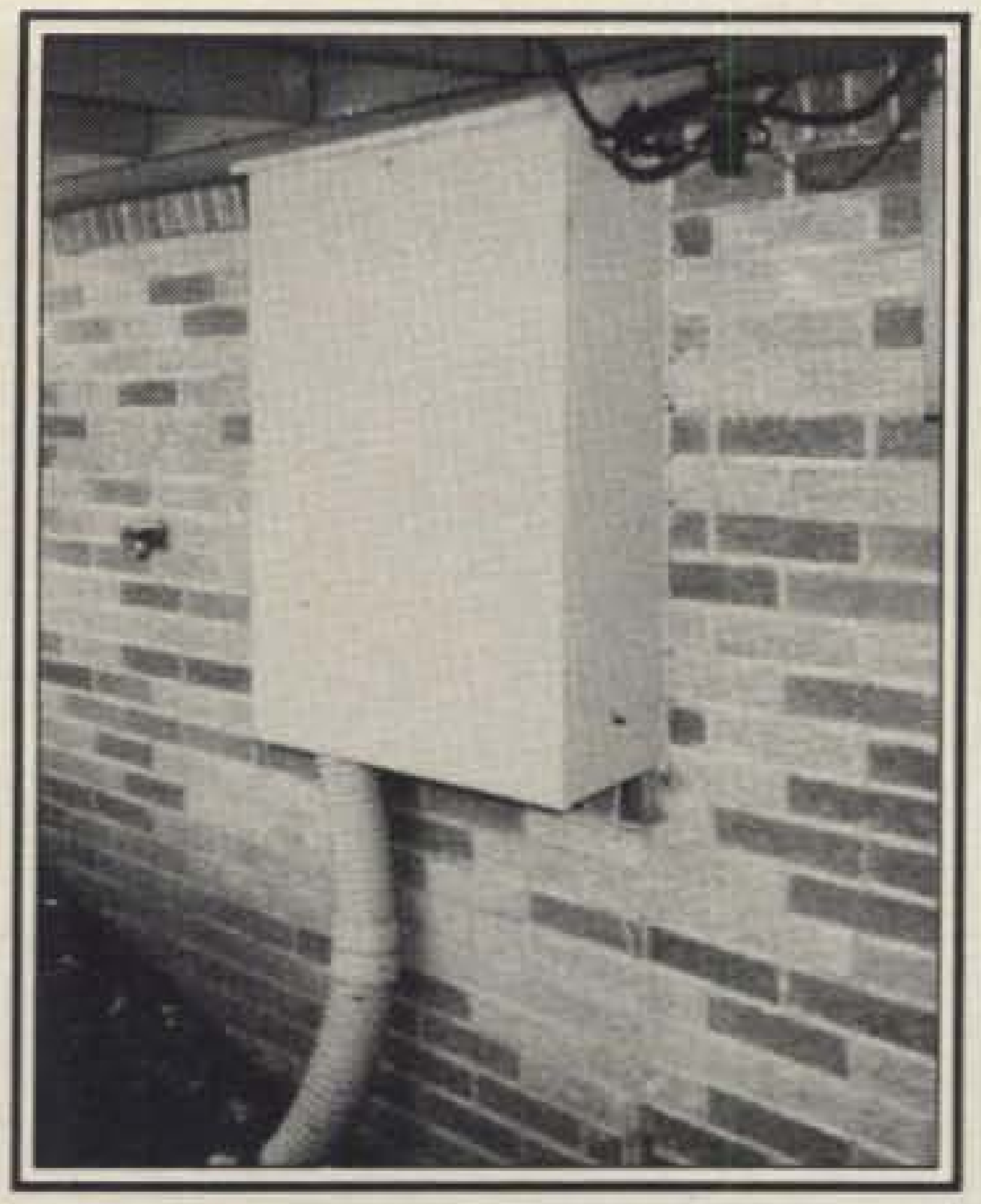
Underground! This seemed to have the disadvantage of water seepage, to say nothing of pipe cost. Clay pipe was not considered because of the mechanics of butting pieces together in a watertight fashion, plus the cost of pipe for the 100 foot run. PVC pipe was discussed, but it, too, seemed a bit expensive, even though it could be waterproof. Once features of "flexible" corrugated pipe used for septic tank outflow were discovered, it immediately became the pipe of choice. It *is* flexible (if you are not too fussy about your definition!); it is large enough so that many cables could be included therein without overcrowding; complete lengths are available so that joints do not have to be made with consequent risk of breakage and underground leaks; pieces for joining ends and for terminating are available; the maximum bend this pipe is capable of following is just about the same as for RG8U cable! So, this tubing (6 inch version) was selected.

Now, how to bury it and at what depth? These factors could be argued, but having learned of the high cost of a Ditch Witch, I decided I would bury this by hand (thanks to my neighbor) at the most convenient depth possible—the length of the spade. Voila!

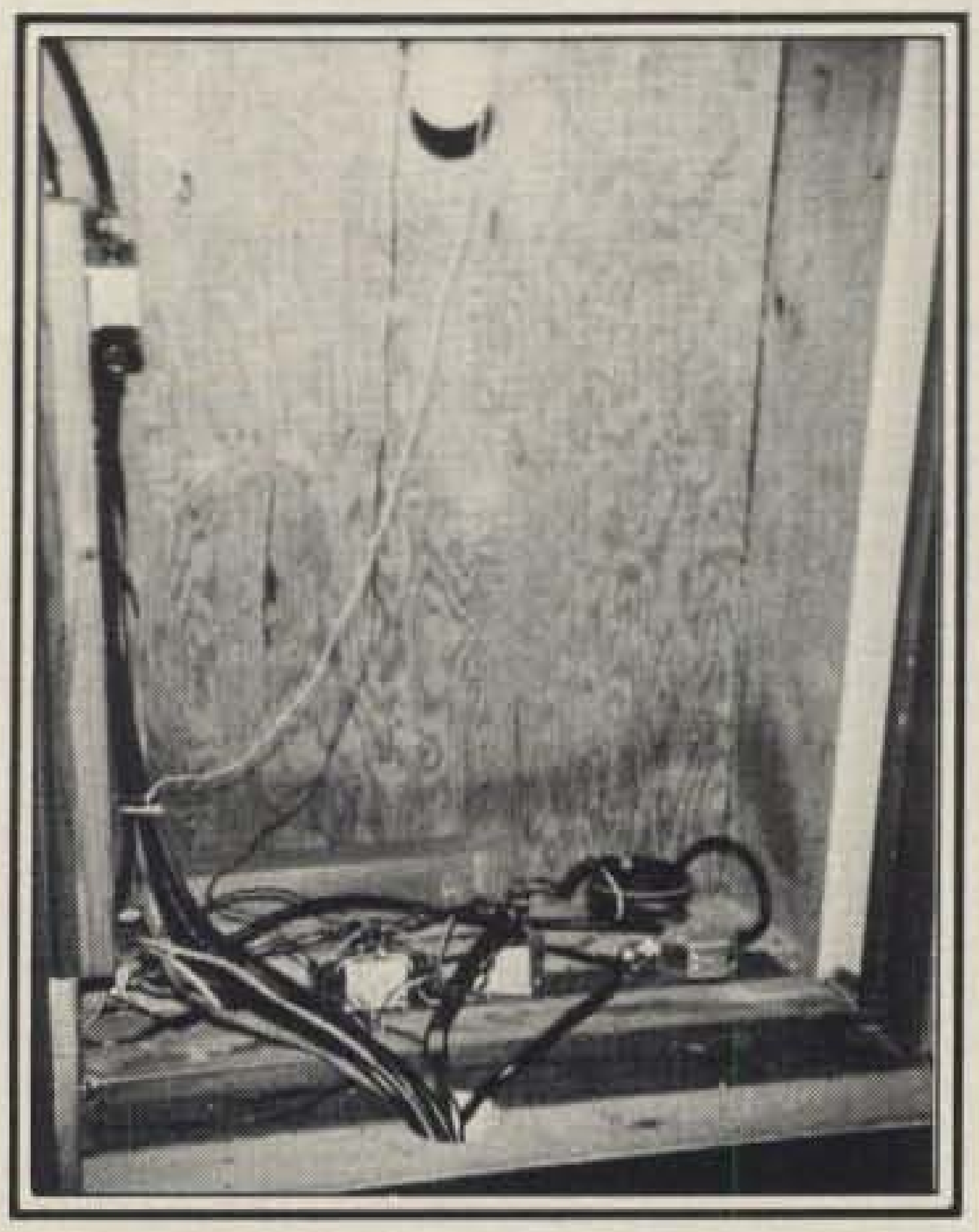
Once buried, how to get the cables through the pipe without tying them to a trained squirrel's tail? I passed a thin nylon rope through the cable *before* burying it, making certain both rope ends could not be pulled accidentally into the pipe after burial. It was a simple matter to tie a coax to one end of the rope and pull both through the pipe. But, you may ask, how does one get the rope back into the pipe to pull a second or third cable? Actually, the rope is at least twice the length of the buried pipe. When it is pulled through for one length of buried pipe, a second length of rope remains available. This requires coiling the rope at one end, awaiting the time when another cable is to be pulled through.

The antenna end of the underground tube is terminated about 3 feet up the tower in a wooden box made especially for the purpose. Cables come through the tube and out the wooden box to antennas through holes drilled in the box. This procedure keeps the tower end of the tube free of water and furry animals who might wander into that underground abyss.

The other end of the tube terminates in a wooden window replacement. I removed the window from the radio shack in the walk-out basement location. In its place is a large wooden cover overlapping the window opening. Inasmuch as it projects away from the house wall about one foot,



Window replacement box. Underground tube enters bottom left of box, and earth ground cable enters bottom right. Other coax feeders enter top of box.



Interior of window replacement box. End of underground tubing in lower right showing coax and ladderline entering the tube. Other coax is in upper left along with grounding relay. Dummy antenna shows at bottom rear. Three other relays show in front for grounding Yagi coax, ladderline, and control cable. All cables enter large hole in foreground behind panel door.

there is room for the tube to rise out of the ground and enter that unit. This end of the tube, consequently, is also free of water and provides no access for furry animals (except maybe house mice!). In this same window replacement are the terminations of other antennas. All of them are grounded automatically by relays. These are energized only when I throw the proper switch; otherwise, they ground all antennas. This arrangement affords me peace during a thunder storm. Antennas are not only grounded, but the path to the earth ground is barely more than 4 feet in a very straight line. Furthermore, the earth line is *outside* the house.

Ladderline (for a 160 meter dipole) is also fed into the buried tube and passed underground to the shack. According this feedline this treatment made me wonder. I was sure there would be some negative reaction between feedline and coax also in the tube. However, to date I have seen no signs of any detriment caused by this crowding. In fact, the ladderline is bundled along with coax and rotator cables into a massive line leading from the window replacement box to the operating table. And, we worked the 160 Meter C.W. Contest with no apparent ill effects. The next idea is to run ladderline through a pipe under a nearby country road to have access to an antenna run of at least two miles!

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Here's a great little project that can be built literally on the kitchen table. The SPC in the title can also stand for Super Plexiglass Construction.

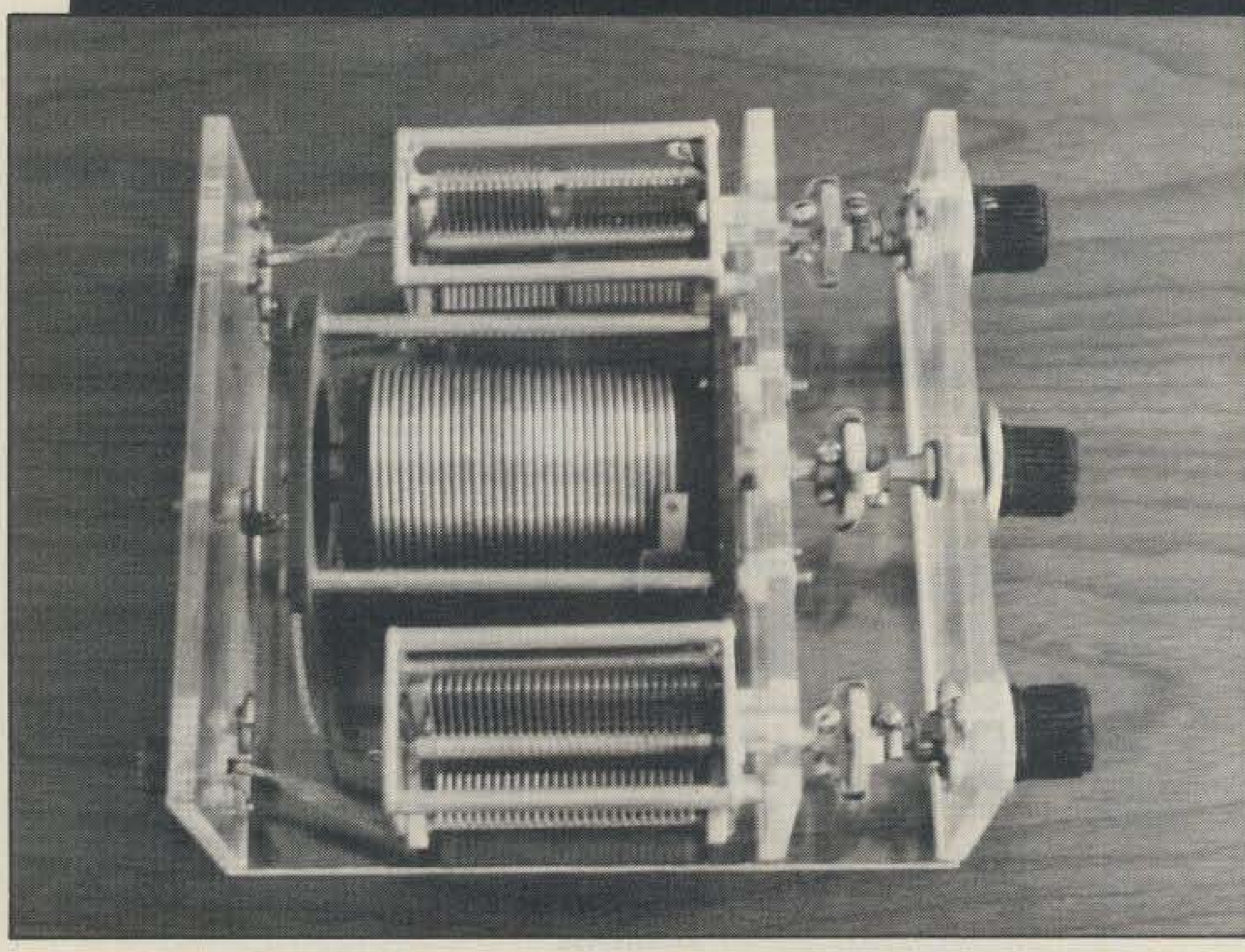
BUILD A CHEAP AND EASY SPC ANTENNA TUNER

SERIES PARALLEL CAPACITY

BY JOHN GRAY*, VE3AEH

Antenna couplers or tuners do not necessarily have to be housed in a big, black, expensive metal cabinet for t.v.i. or r.f.i. purposes. This unit is built completely with ¼-inch plexiglass 7 inches wide, 8 inches deep and 3¼ inches high. Any convenient dimensions could be used, provided the wiring is kept reasonably short. This particular size was dictated by the amount of plexiglass on hand. Plexiglass is available in the yellow pages of your telephone directory under residential windows or automotive window firms. For cementing plexiglass ask your supplier for specific instructions; the new exotic adhesives just do not work.

This tuner is an adaptation of W1FB's article in the 1981 *Handbook* and is a bare-bones unit without switches, baluns, and dummy load. All parts are readily available from Fair Radio Sales, 1016 E. Eureka Street, Lima, Ohio 45802. The rotary inductor part number is ACC55471. The two variable capacitors are C-1003/T195. As the "Q" of this tuner is fairly high (good harmonic suppression), vernier drives are a must for C1, C2, and C3. The verniers shown were purchased from Heathkit several years ago and may not now be available. An alternative again would be Fair Radio Sales, part number #TU-10VD.



The completed tuner is a marvel of simplicity and a very inviting construction project.

Construction is quite simple. This unit was built on the kitchen table at the apartment QTH. The use of insulated couplings may seem redundant at first glance, but the prototype model was prone to "hand capacity" effects, a term fondly remembered by us old timers tuning regenerative detector receivers. These couplings again are available from Fair Radio Sales, part #COUN006. The dual 200 pf capacitor is made by sawing the plates of the stator in half with a hacksaw. The rotor shaft is placed in a vise and the two middle plates are removed with a sharp tap with a small screwdriver and hammer. Do not remove the rotor from the frame; these capacitors have ball bearings, which makes reassembly very difficult.

The shield braid from a piece of 50 ohm cable is used for the simple wiring. In lieu of having an extra connection on the rear panel for a random wire antenna, a banana jack is plugged into the antenna connector.

This tuner will easily handle the output of the popular 200 watt p.e.p. rigs, and to put the icing on the cake, eyeball observation of the tap on the inductor and capacitor settings can readily be seen and are not hidden behind that big, black, expensive metal cabinet.

For those who wish to go bolt for bolt, the total cost is under $40.

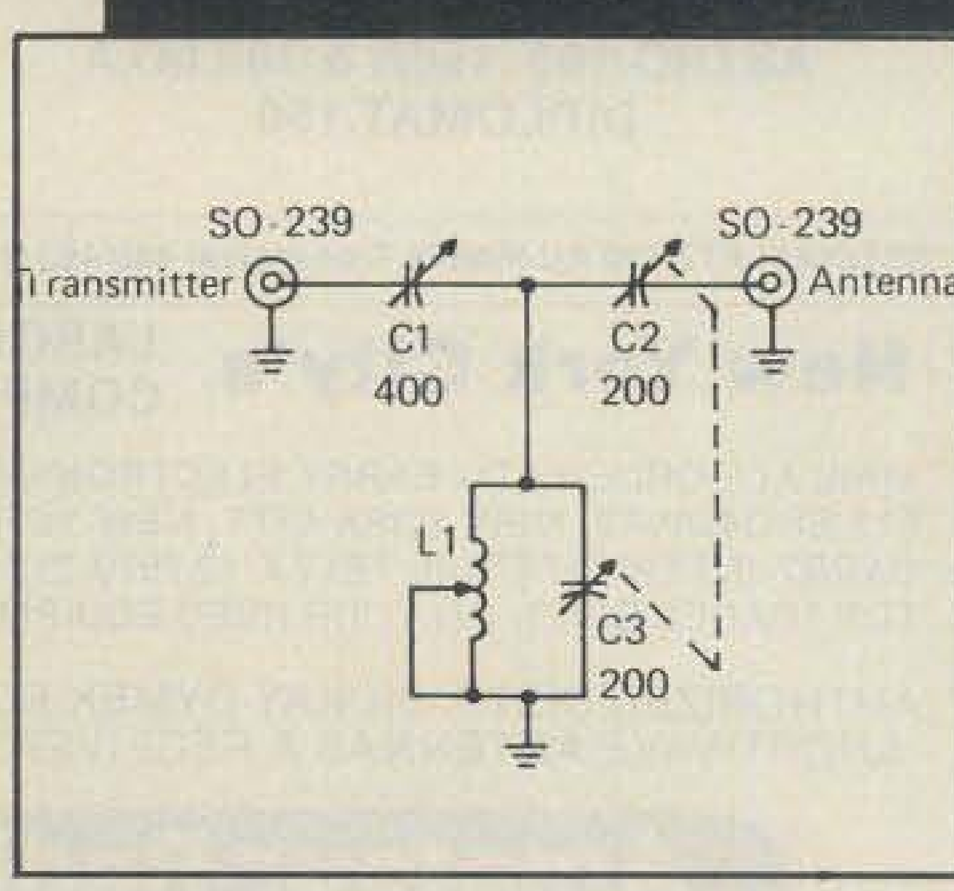
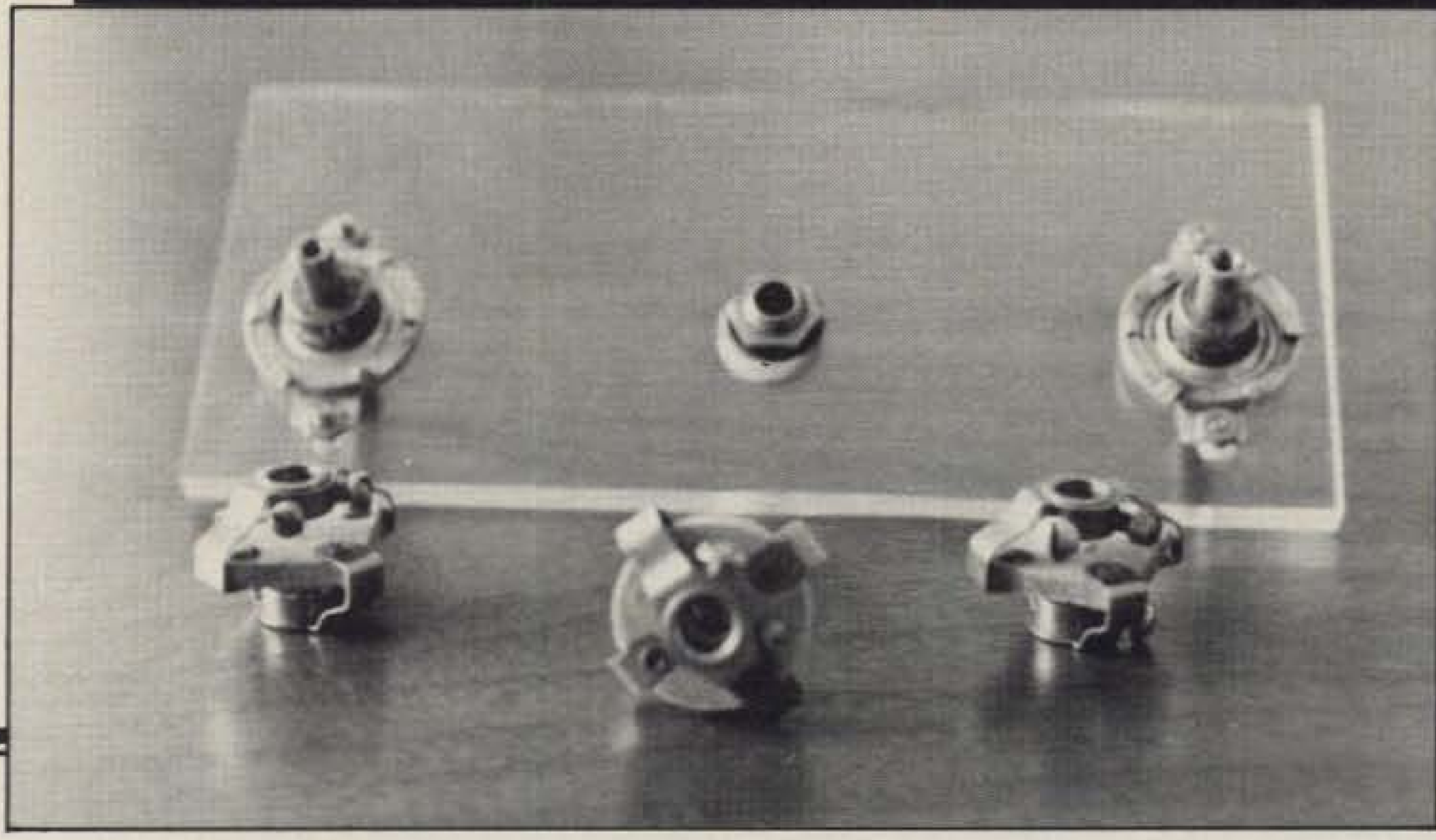
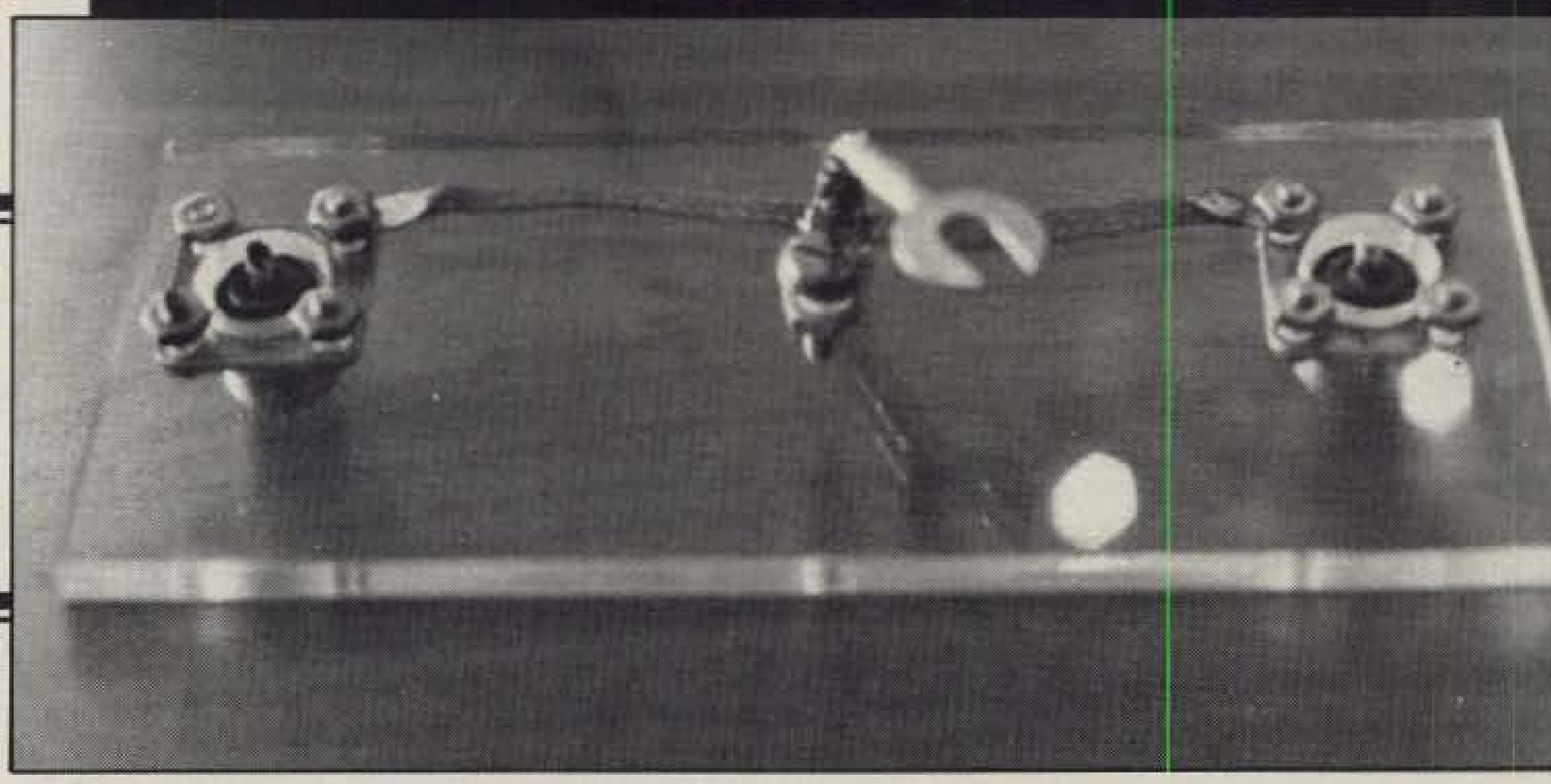


Fig. 1– The simple circuit for the SPC antenna tuner.

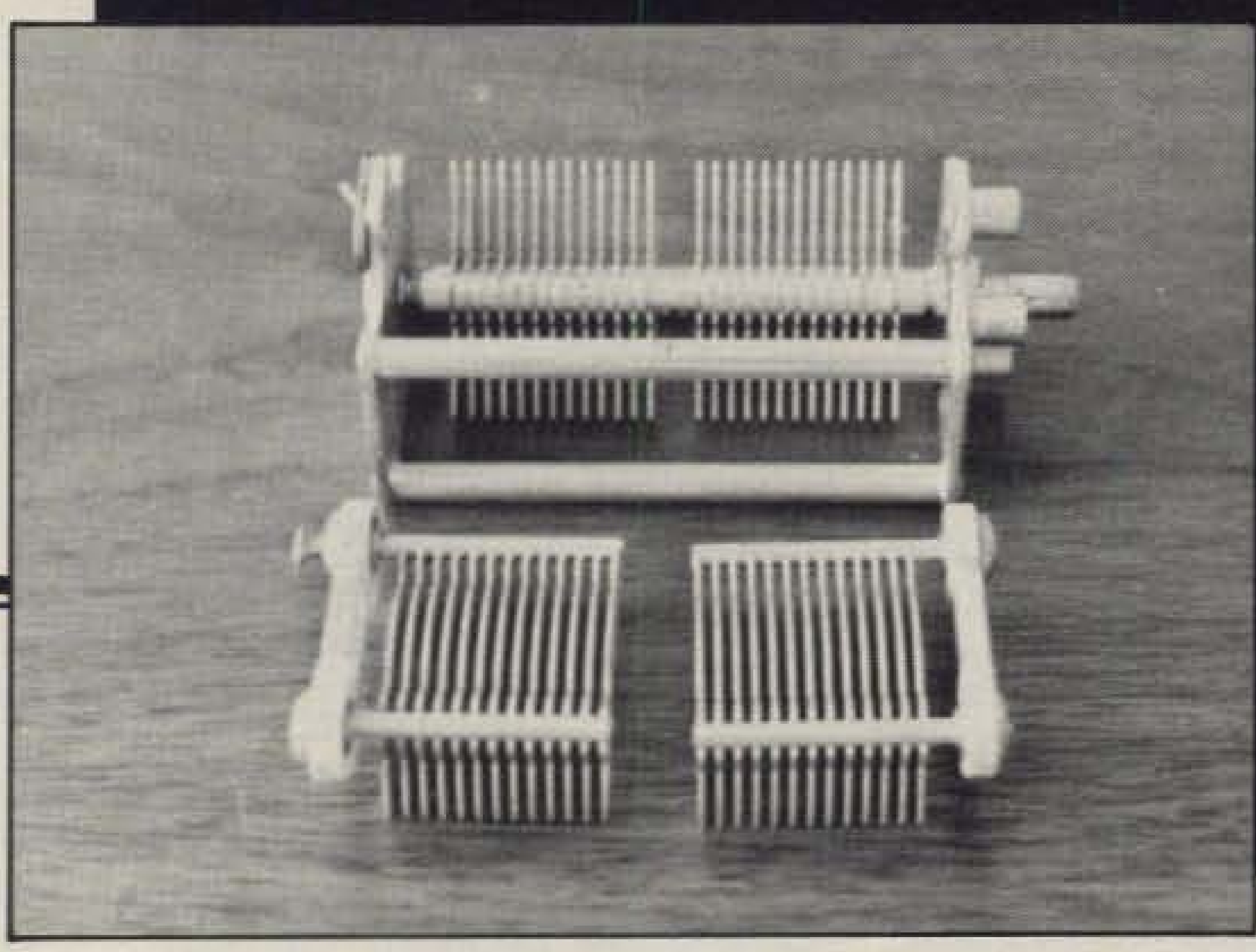
*5166 Lakeshore Road, Apt. 1003, Burlington, Ontario, Canada L7L 1C3



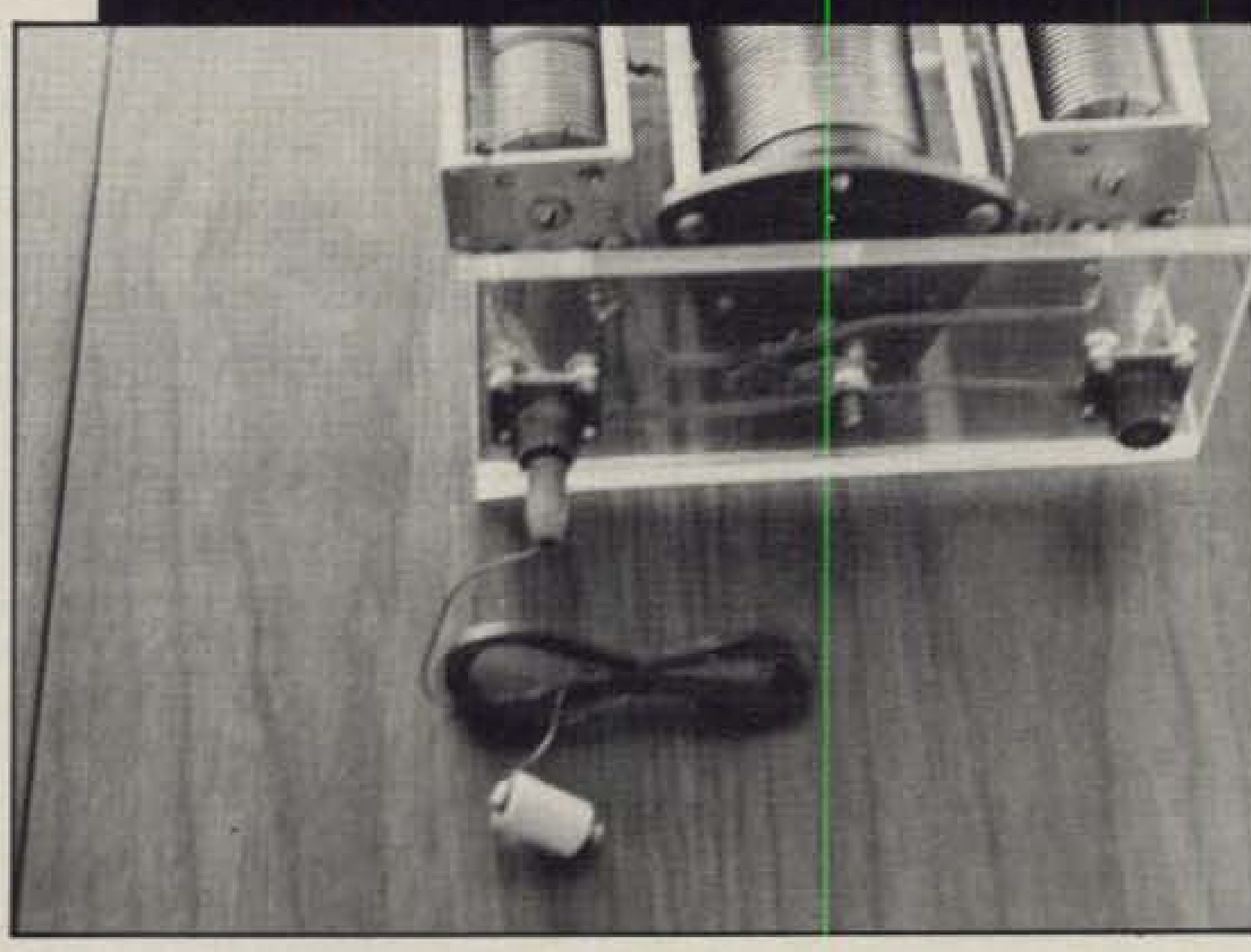
The front panel showing the two vernier drives and the ¼" bearing for the shaft of L1. The three insulated shaft couplings are in the foreground.



The rear panel view shows the ground assembly. The braid goes from connector to connector, with a center junction for L1/C3. A bolt at this point goes through the panel for external ground connection.



The dual 200 pf capacitor (made from a single unit) prior to installation.



To use this tuner with a random wire antenna, simply plug a banana jack into the antenna connector.

In our concluding installment we get to the nuts and bolts section where feeding, tuning, and using a Quad are discussed.

A PRIMER: THE CUBICAL QUAD ANTENNA

PART III—CONCLUSION

BY KARL T. THURBER, JR.*, W8FX

In this three-part series we've tried to give an overview of the quad antenna. In this last section W8FX enhances this by virtue of first-hand experience in using quads. The comparisons and subtle choices, as well as a hefty bibliography for future readings, are offered to the reader.—K2EEK

Feeding The Multiband Array

Like the basic Yagi, the quad is essentially a single-band affair: it's designed for optimum operation on a single band and is intended to be fed with a single feedline. The Yagi lends itself to multiband operation via a single feedline by means of trap coils inserted at strategic points in the driven element, reflector, and directors to electrically simulate half-wave element operation and to effectively present a low feedpoint impedance. With a reasonably uniform impedance on all bands, a simple balun transformer or gamma match effects efficient r.f. transfer from feedline to antenna.

Top-quality materials are required if the quad is to "stay up once put up." Shown in this photo is the db + Enterprises quad boom-to-mast mounting plate. The ½-inch thick 6061-T6 aluminum alloy plates are available with hardware to fit any boom to mast combination. (Photo courtesy db + Enterprises)

Multiband quads don't use traps, but they have separate wire frames for each band—normally three, in the common triband design. This presents a special problem, in that the transmission line must be connected to the frames, individually or as a group, in such a way as to effect a good impedance match and maintain system balance conditions, yet not introduce excessive interaction between the various driven elements.

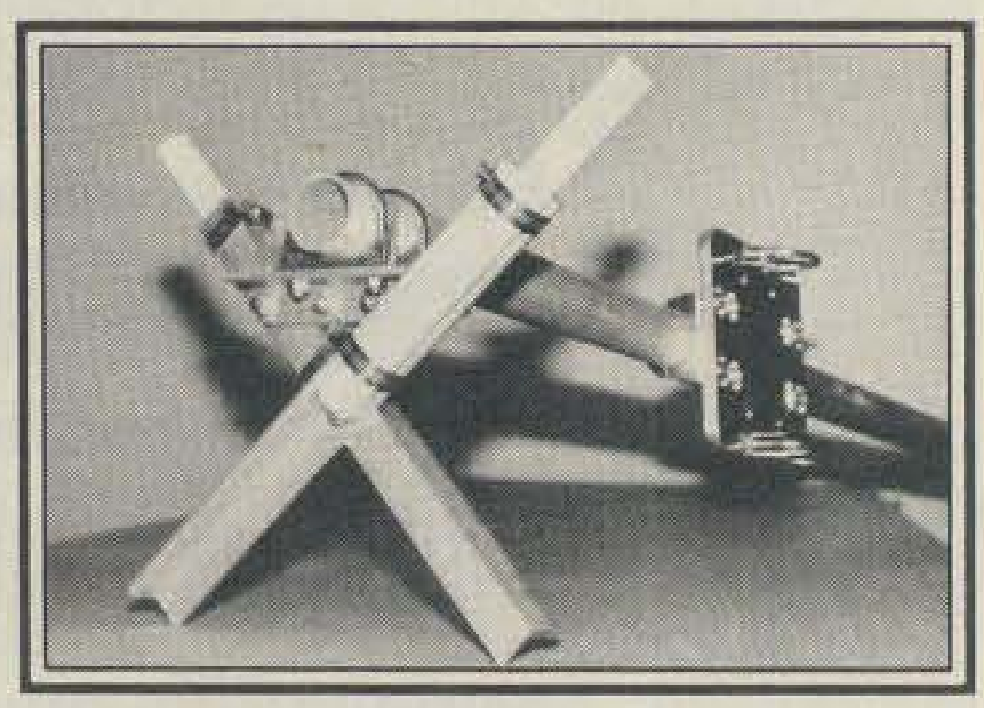
Doing all this is easier said than done. A number of approaches to feeding the multiband quad have been developed. Let's outline some of them:

(1) Using separate feedlines. This is the basic, no-nonsense method of feeding the multiband quad. Separate RG-8/U or RG-11/U cables are run to the antenna, or a remotely controlled antenna switch is used to allow individual, one-at-a-time connection to the driven element on the band on which operation is desired. This arrangement avoids some of the feeding problems introduced by electrically paralleling the frames for feeding with a single transmission line.

Separately feeding the individual wire frames minimizes possible feeding problems, but there are some matching considerations that must be observed. Feedpoint impedance will be different on each band, since with concentrically-arranged, single-plane elements, element spacing in terms of wavelength is radically different from band-to-band. For example, with a frame spacing of 8 feet (0.12-wavelength) at 20 meters, the triband quad might, for example, show a feedpoint impedance of 50 ohms on 20 meters, 80 ohms on 15 meters, and 130 ohms on 10 meters. This would indicate the use of RG-8/U (52-ohm) coax to feed the 20-meter frame, RG-11/U (75 ohms) coax to feed the 15-meter frame, and possibly a series coax matching section to feed the 10-meter frame. Alternately, expensive and difficult-to-find high-impedance coax could be used to feed the 10-meter frame.

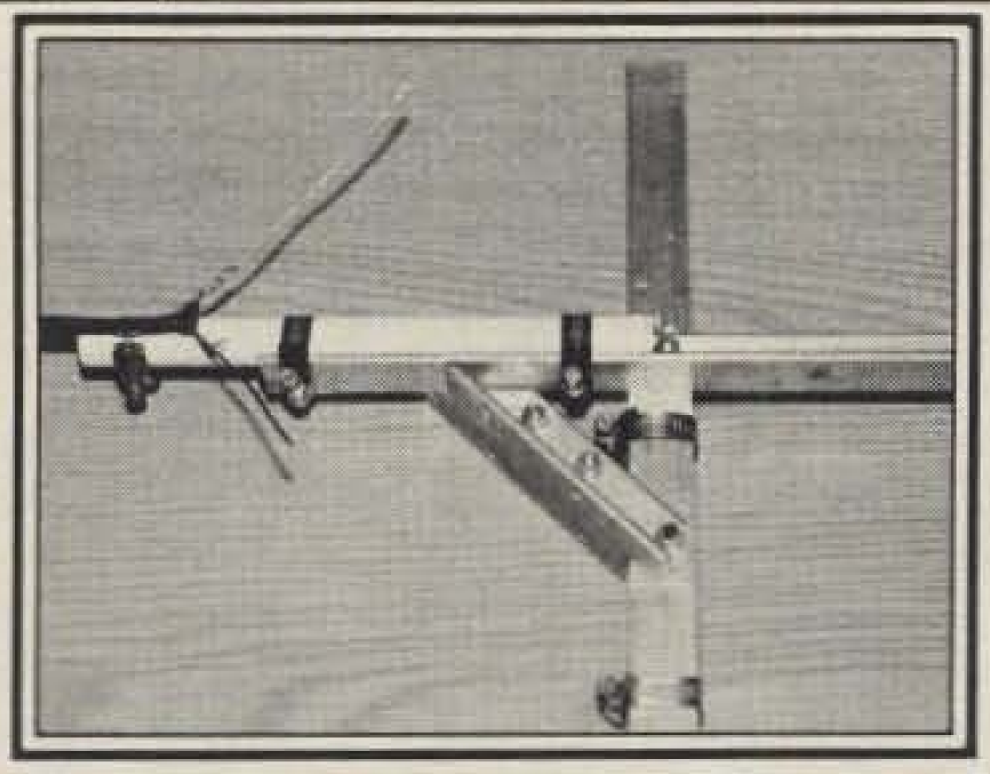
Even when separate feedlines are used, a balun should be used to maintain system balance. The balun is probably best omitted on 10 meters, however, since a 1:1 or 4:1 balun would not provide the proper impedance transformation to the driven element's high impedance. A gamma match would be a better choice on this band, or separate gamma matches for each band could be used for added flexibility in making precise adjustments.

(2) Using a multiple gamma match. As we have suggested, it's a "no-no" to simply parallel the triband quad's driven elements and direct-feed them with coax.



Heart of any quad: aluminum alloy spider with steel clamps, boom section, and boom-to-mast plate. db + Enterprises spiders are available for both 2- and 3-inch booms. (Photo courtesy db + Enterprises)

*317 Poplar Drive, Millbrook, AL 36054



Close-up view of the method of connecting the db + Enterprises quad spreaders to the spider. The spider and all aluminum members are constructed of extruded *aluminum, and the fiberglass spreaders have a special reinforcing core. (Photo courtesy dB + Enterprises)*

The problem is not so much the fact that the two unused antennas remain on-line when operating on a given band, but the fact that the in-use element may show a poor match and symmetry may be destroyed.

A practical solution to the difficulties involved in feeding the tribander with a single feedline lies in the use of a multiple gamma match. In this arrangement, the loop centers are paralleled and grounded to the boom. Separate, individual gamma matches are connected to each driven frame, and are interconnected to the center conductor of the coax. Thus, while the frames are fed in parallel, each is fed *separately* to effect a close impedance match and to allow maintenance of antenna symmetry. Some interaction between the three gamma match sections can be expected, but it should not be so severe as to preclude adjustment, provided the array is adjusted in an orderly fashion.

Multiple gamma match construction and adjustment details are spelled out in Bill Orr's authoritative handbook, *All About Cubical Quad Antennas.*

(3) Ring transformers. Skylane uses what it calls a ring transformer to match the varying impedances of the three driven elements. The firm strongly promotes its use to eliminate switching relays. It features an isolation circuit to reduce interaction between the individual quads. Contact the manufacturer for further information on this approach.

(4) Using a boomless quad. One way to minimize feedpoint impedance variations from band-to-band is to angle the frame arms, placing the parasitic element wire frames at proportional close-to-optimum distances so that a reasonably stable feedpoint impedance is maintained on each band. Though criticized by its detractors because of its mechanical complexity and occasional propensity to sag and distort arm and frame angles, the boomless quad does offer the appealing prospect of maintaining uniform gain and feedpoint impedance across several bands, much more difficult to achieve in the more common single-plane version.

While the boomless approach simplifies feeding arrangements, it doesn't completely eliminate them from consideration. The frames must still be either fed with separate feedlines or paralleled for single feedline use, and a balun must be used to maintain system balance.

The best-known commercial boomless quad is that made by Gem-Quad Products Ltd., of Transcona, Manitoba. The firm's basic triband offering is a two-element fiberglass model that is designed for near-optimum spacing on all three bands, and which requires but a single coaxial feedline with no switching required in changing bands. The Gem-Quad uses a single 1:1 toroidal balun, a practical approach since the feedpoint impedances are approximately the same from band-to-band; at no point on any of the three bands is s.w.r. objectionable, according to curves provided by the manufacturer. The antenna is expandable to three or four elements, although optimum director spacings are compromised slightly so that band-to-band match may vary slightly on the larger arrays.

Assuming that every reasonable precaution has been taken to ensure that feedpoint impedances are matched and system balance has been maintained, it may be that a slightly higher-than-desired s.w.r. may exist on one or more bands. Assuming the use of high-quality, low-loss coaxial cable and a reasonably short run, there is nothing wrong in "fooling" the transmitter by helping it to see the proper impedance for which it was designed. This can be done by pruning the feedline length—adding about a 10-foot length of line and cutting back in increments of 4 inches at a time until a satisfactory s.w.r. is achieved. Alternately, a coax-to-coax antenna coupler can be used to smooth out any transmitter loading problems that may exist on a particular band or at band edges.

Tuning

Tuning the quad is usually not too big a problem, with the possible exception of three- or four-element, triband arrays in which there may be some interaction and a number of adjustment steps to go through. Generally speaking, the quad is a broadband affair and requires less critical tuneup than does the Yagi.

The first requirement is that the driven element frame be resonant. Resonance can be checked using one or a combination of test instruments such as a grid dip oscillator (GDO) or an antenna noise bridge (ANB). These checks can usually be successfully carried out with the antenna installed on a short, temporary mast. Very little change in resonant frequency should occur when the quad is raised from its checking and testing height to its actual operating position.

Antenna type	dB gain over half-wave dipole	dB gain over isotropic source
Isotropic radiator	+ 2.1	N/A
Quarter-wave ground plane	− 1.8	+ 0.3
Half-wave dipole	N/A	+ 2.1
Quad loop	+ 2.0	+ 4.1
2-el Yagi	+ 5.0	+ 7.1
Expanded quad loop	+ 5.0	+ 7.1
2-el quad	+ 7.0	+ 9.1
3-el Yagi	+ 8.0	+ 10.1
2-el expanded quad	+ 9.5	+ 11.6
4-el Yagi	+ 10.0	+ 12.1
3-el quad	+ 10.0	+ 12.1
7-el Yagi	+ 11.0	+ 13.1
3-el expanded quad	+ 12.0	+ 14.1
4-el quad	+ 12.0	+ 14.1
5-el quad	+ 13.0	+ 15.1

Table I– A comparative gain table. The table shows relative power gain, expressed in decibels (dBs), of several popular antennas relative to isotropic and dipole sources. The gain figures are "typical"; expect to see slightly different figures quoted by different manufacturers and in various antenna texts. Element configurations and spacing also play a role, as does tuning. In evaluating antenna specs, be sure you know against which standard of reference (isotropic source or half-wave dipole) the antenna is being compared. Consider front-to-back (F/B) ratios, as well.

Particularly in the case of commercial quad kits, the driven element can be considered to be pretuned, provided dimensional assembly instructions are followed closely. Resonance can be rechecked later on, after final installation, using the antenna noise bridge in-shack, as long as the effects of the intervening transmission line are taken into account.

Reflector and director tuning aren't critical. You will probably derive satisfactory results by simply constructing the reflectors and directors as closed loops according to formula. In any case, slight misadjustment of the reflectors and directors will have little effect on forward gain. Rather, the effect of any dimensional errors will lie mainly in terms of a deterioration of F/B ratio. If it's important to obtain the maximum F/B ratio, the reflectors and directors can be tuned using several systems, the most popular being by means of tuned or shorted stubs. A system of calibrated coils may also be used, in which the parasitic elements are cut to the same dimensions as the driven element, with known-value coil assemblies inserted to alter resonance.

A simple way to adjust a two-element quad is suggested by the Gem-Quad folks. In this procedure, the array is directed *away from* a local station transmitting a signal on the desired frequency; in the case of the Gem-Quad, this would be on 14.200, 21.200, or 28.500 MHz. The stub on each reflector is shorted out on the band of interest (using alligator clips on a 2-inch lead) until the receiver's S-meter shows minimum signal. This adjustment should result in the best F/B ratio, although the best forward gain will occur at a slightly *higher* frequency. The procedure is repeated on all three bands, with a final check made on the first band adjusted to ensure that there has been no interaction; there should be little. When tuning the director stubs on three- and four-element arrays, the array is directed *toward* the local signal, and the directors are tuned for the *maximum* signal on the S-meter. If a more sophisticated approach is desired, a mock dipole can be set up several hundred feet distant from the quad, with the dipole being connected to a field strength meter. The reflector and director stubs are adjusted for maximum or minimum readings, as required, using low level r.f. fed to the driven frame. Table I shows comparative gain figures that may be realized.

Making all adjustments at a low height is usually adequate. But if optimum performance is desired, and if you can *safely* climb the tower and conveniently make adjustments to the parasitic elements (often impossible), by all means do so. But bear in mind that the quad's tuning is less critical and more forgiving than that of the Yagi.

Quads on V.H.F. and U.H.F.

While mainly thought of an an h.f. antenna, the quad can be used to good effect on much higher frequencies. The antenna's relative bulkiness is of little consequence. Standard quads, scaled down to hi-band dimensions, have been especially popular in portable, backpacking, mountaintopping, and boating applications. A novel, collapsible 2-meter quad antenna was described by R.J. Decesari, WA9GDZ/6, in Sept. 1980 *QST*. In this compact, highly portable two-element design, suggested as an alternative to a conventional four-element Yagi, 6 dB of forward gain results in a configuration that produces 45 degree *diagonal* polarization, which enables compatible f.m. and s.s.b./c.w. operation with a single antenna.

The Swiss Quad. A European design pioneered by Rudolf Baumgartner, HB9CV, the so-called Swiss Quad is an all-driven array with a radiation pattern similar to that of the conventional quad. The antenna retains the electrical advantages of the quad, but adds durability and mechanical strength in an all-metal configuration constructed exclusively of aluminum tubing and copper wire, as opposed to wire and bamboo or fiberglass.

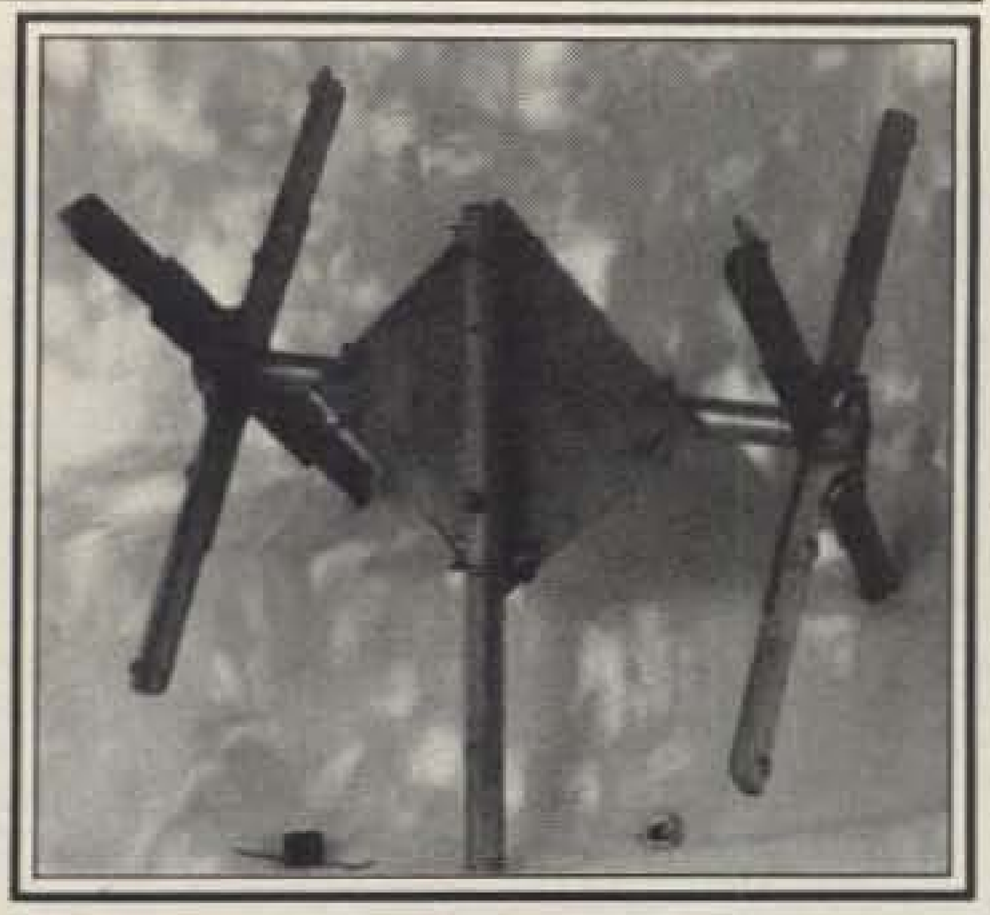
In the Swiss Quad, the centers of the horizontal members of the two elements are pushed in until they touch, where they are joined, electrically and mechanically, to the supporting mast. Since the horizontal members are made of aluminum tubing, the structure is self-supporting without the usual quad-like framework. The antenna is fed using a T-match feed system; it may be fed directly using open-wire line or TV-type twinlead, or indirectly through a balun transformer and coaxial cable.

Gain of the horizontally-polarized Swiss Quad is better than 6 dB over the dipole. Front-to-back and front-to-side ratios up to 35 dB have been reported; characteristic of antennas where all elements are driven, a deep null exists off the back. With its horizontal polarization, it's a solid, low-cost performer for s.s.b. and c.w. DX, especially on the low end of 2 meters. Several Japanese versions of the Swiss Quad are imported by TET, USA, Inc.

Super quad arrays. Since physical dimensions become more reasonable at the higher frequencies, it's feasible to stack both standard (one-wavelength) and expanded (two-wavelength) quads in a variety of configurations to produce truly impressive gain figures. Quad-stacking proponents claim that doing so is more effective than stacking Yagis, going back to the fact that a quad loop has a slight gain over a Yagi dipole element.

The Kirk Electronics quad instruction manual, available separately from the company for $2.75, contains a wealth of technical reference material and specific v.h.f. super quad antenna suggestions. I suggest this booklet for anyone contemplating designing or building a large v.h.f. or u.h.f. quad array. As the Kirk manual points out, 6- and 2-meter super quads, installed singly or interlaced for 6- and 2-meter operation, offer all the best qualities of their h.f. cousins; expanded quad stacked arrays offer additional gain possibilities. Any number of quad elements can be used, the limiting factors being primarily mechanical ones.

Various stacking arrangements can be used. Kirk recommends an interlaced array consisting of four elements on 6 meters and eight elements on 2 meters on a 12-foot boom; the arrays can be stacked one above the other, providing the spacing between the stacked arrays is a minimum of 5/8 wavelength. A matching harness made of coaxial cable is used to match the two- and four-bay arrays. A four-element diamond or square expanded quad can also be constructed for either 6- or 2-meter use. Yielding an approximate 200-ohm feedpoint impe-



View of the center plate and castings used on the Skylane quad. Boom lengths are about 8 feet for a 2-element, 12 feet for a 3-element, and 20 feet for a 4-element quad. (Photo courtesy Skylane Products)

dance, a 4:1 linear balun (made from coax) can be used to secure feedline match on 2 meters, or a 4:1 ferrite core balun can be used on 6.

I am not aware of large quad array work on the higher v.h.f. and u.h.f bands, but there is no reason why large quad stacks can't produce superior results at the higher frequencies. However, there has been considerable work done as high as 432 MHz with a quad-like antenna, the Quagi.

The Quagi. The Quagi resulted from h.f. experiments to combine the best features of the Yagi-Uda array with those of the cubical quad. The outcome is one of the most interesting hybrid antenna designs of recent years.

The Quagi comes close to being an "ideal" antenna design at v.h.f. and u.h.f. frequencies, if such is possible. The antenna uses the familiar one-wavelength quad driven element and reflector but Yagi-like (dipole) director elements. This results in generally noncritical construction and simplified feedline matching, combined with high antenna gain. The quad loop driven element is used without a gamma match, which becomes increasingly ineffective at higher v.h.f. and at u.h.f. frequencies. Quagi adherents assert that little tuning or special handling is required, and that direct coaxial feed can be used using RG-8/U or RG-11/U. Technically, a balun should be used, although at the higher frequencies the balun may introduce more loss than is compensated for by correcting for any feedline imbalance. Running the feedline at right angles to the antenna and/or tightly coiling several turns of coax near the feedpoint can help to decouple the line.

In one popular *QST* design, a 15-element Quagi for 432 MHz yields a 15 dB gain on an 11½-foot boom.* As with conventional Yagis and quads, Quagis can be stacked for additional gain. Up to sixteen 15-element long-boom arrays have been stacked for meteor scatter, tropo, and moonbounce efforts. On 432 MHz, really awesome arrays are practical: sixteen stacked 15-element long-boom Quagis could deliver dB gains in the "mid-twenties." There are practical mechanical limits, of course. This is especially true of moonbounce systems, where all bays must track with sufficient precision so that they're all pointing at the moon at the same time.

A small point, but one to consider: most Quagis are horizontally polarized, standard for weak-signal DX work. But vertical polarization is used in f.m. and repeater operation; if the Quagi is to be used on f.m., it will have to be constructed with the directors vertical and with the quad loop fed on one side rather than at the bottom. If this isn't done, results will be quite unimpressive.

Despite some limitations, the Quagi poses real competition to the Yagi at v.h.f. and u.h.f., since it readily lends itself to homebrew construction at a fraction of the cost of an equivalent-performing, commercially-manufactured Yagi.

Summing Up

In these pages, we've shown why the quad is so popular an antenna. We've looked at quads from a historical stand-

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**See bibliography.*

Although the Quad requires a minimum of adjustment, a precision instrument such as the antenna noise bridge (ANB) can be useful in pruning the wire elements on a homebrew quad to the proper resonant frequencies. For example, with the noise bridge connected to the driven element, nulls will be found at the resonant frequencies of the reflector and director because of the close coupling. The correct frequencies depend upon the exact design of the beam; their proper dimensions directly affect beam gain and front-to-back ratio. These parameters can be found in the ARRL Antenna Book *and other reference sources. (Photo courtesy Palomar Engineers)*

point, reviewed simple loop and two-element versions as well as multi-element and specialized quads, looked at matching and tuning considerations, and highlighted some practical v.h.f. and u.h.f. applications. Most importantly, we have shown that the quad antenna isn't a fluke: it really *works*.

Quads have been around for a long time. Maybe it's time one found its way into *your* backyard!

For Further Reading

In this article we have attempted to survey the field from A to Z. Thus, we've not delved into the nitty-gritty details of specific dimensions and measurements; there is much more construction and installation information available than we could possible present. This bibliography provides a good takeoff point for further reading and ultimate selection of a quad to fit *your* needs.

Belcher, D.K., WA4JVE, and P.W. Casper, K4HKX. "Loops vs. Dipole—Analysis and Discussion," *QST*, August 1976.

Decesari, R. J., WA9GDZ/6. "A Portable Quad for 2 Meters," *QST*, September 1980.

Glover, Paul, K5NE. "The Mono-Loop Delta Antenna," *QST*, September 1979.

Gray, Jim, W1XU. "A Pair of Loops for Fun and Gain," *Ham Radio Horizons*, September 1978.

Haviland, Robert P., W4MB. "Which Antenna is Best?", *Ham Radio Horizons*, June 1980.

Landskov, Hardy, W7KAR. "Evolution of a Quad Array," *QST*, March 1977.

Leeming, Harry, G3LLL. "The Delta-Loop Antenna Rides Again," *Ham Radio Horizons*, June 1979.

Lindsay, J.E., Jr., WØHTH. "Quads and Yagis," *QST*, May 1968.

Orr, William S., W6SAI, and Stuart Cowan, W2LX. *All About Cubical Quad Antennas*, Radio Publications, Box 149, Wilton, CT 06897.

Orr, William S., W6SAI, And Stuart Cowan, W2LX. *Beam Antenna Handbook*, Radio Publications, Inc., Box 149, Wilton, CT 06897.

Orr, William S., W6SAI. Antennas Column, *CQ Magazine*, November 1977.

Brier, Herbert S., W9EGQ/W9AD. "Build a 144-MC. Swiss Quad Antenna," *Electronic Experimenter's Handbook*, Spring 1966 edition.

Orr, William S., W6SAI. "Ham Radio Techniques" column, *Ham Radio Horizons*, November 1980.

Overbeck, Wayne, K6YNB/N6NB. "The VHF Quagi," *QST*, April 1977.

Overbeck, Wayne, K6YNB/N6NB. "The Long-Boom Quagi," *QST*, February 1978.

Sparks, Roger, W7WKB. "Build This C-T Quad Beam for Reduced Size," *QST*, April 1977.

Self, Aaron C., W8FYR. Booklet, "Instruction Manual, Kirk Super-Quads," Kirk Electronics Div., Viking Instruments, Inc. 1968.

Tyskewicz, John, W1HXU. "The Simplex Wire Beam," *Ham Radio Horizons*, November 1978.

Thurber, Karl T., Jr., W8FX. "Antennas Column," *CQ Magazine*, March and April 1980.

Volpe, Ralph, J., WB8VCS. "A Hybrid 20-Meter Quad," *QST*, January 1977.

Selected Quad Manufacturers

Avanti Research, 340 Stewart Ave., Addison, IL 60101.

Cubex Company, P.O. Box 732, Altadena, CA 91001.

Cushcraft Corp., 48 Perimeter Rd., P.O. Box 4680, Manchester, NH 03108.

db + Enterprises, Pine Valley, NY 14872.

Gem-Quad Products, Ltd., P.O. Box 53, Transcona, Manitoba, Canada R2C 2Z5.

Gotham Antennas, P.O. Box 776, 422 W. Bay Drive, Largo, FL 33540.

HI-RELI, Inc., 1738 N. Greenville Ave., Richardson, TX 75081.

Hy-Gain div. of Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, MN 55420.

Kirk Electronics, 73 Ferry Rd., Chester, CT 06412.

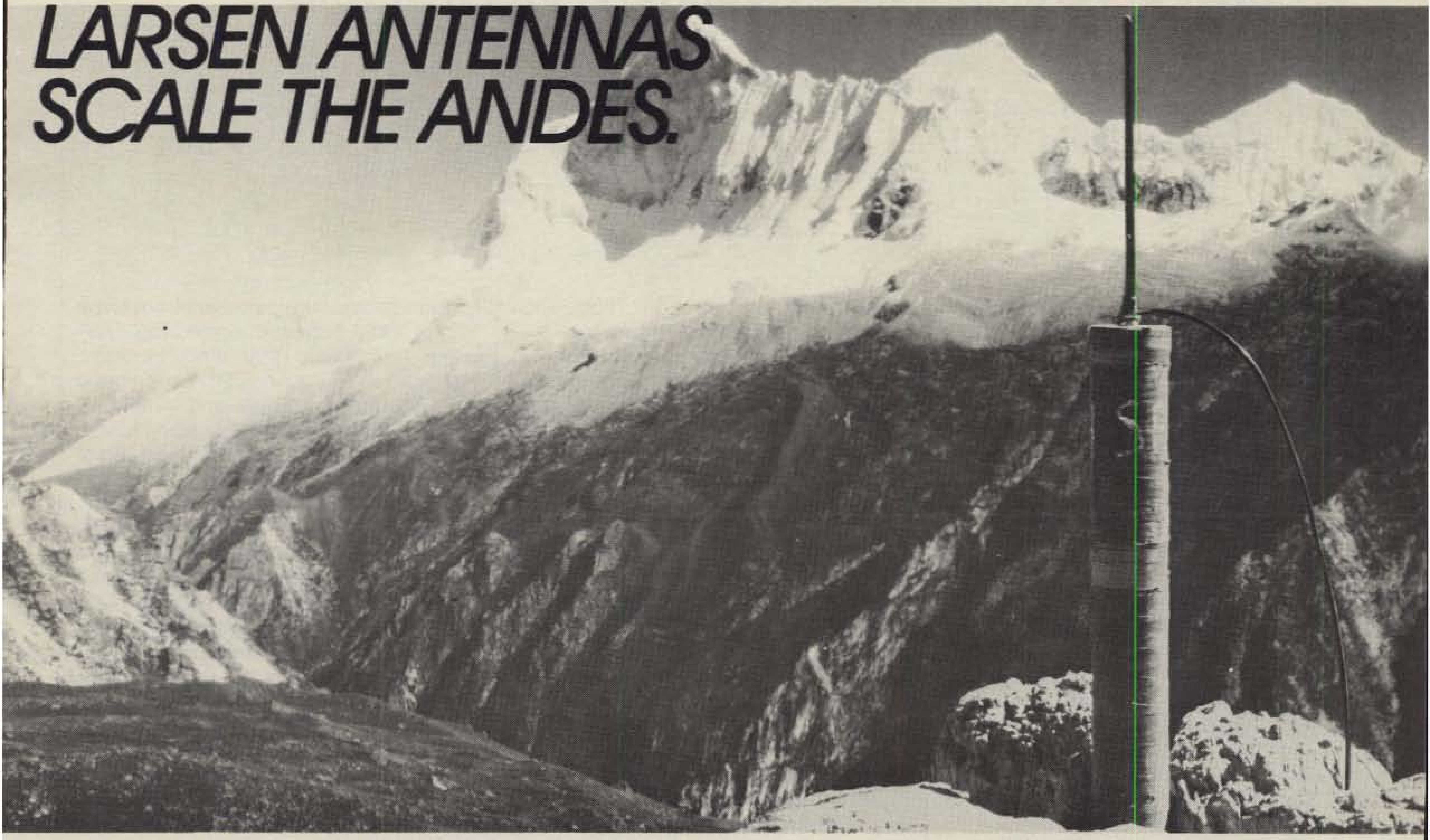
Mini-Products, Inc., 1001 W. 18th St., Erie, PA 16502.

Palomar Engineers, 1924-F West Mission Rd., Escondido, CA 92025.

Skylane Products, 406 Bon Aire Ave., Temple Terrace, FL 36617.

TET U.S.A., Inc., 425 Highland Parkway, Norman, OK 73069.

Unadilla/Reyco, Div. Microwave Filter Co., Inc., E. Syracuse, NY 13057 (Quad Parts).



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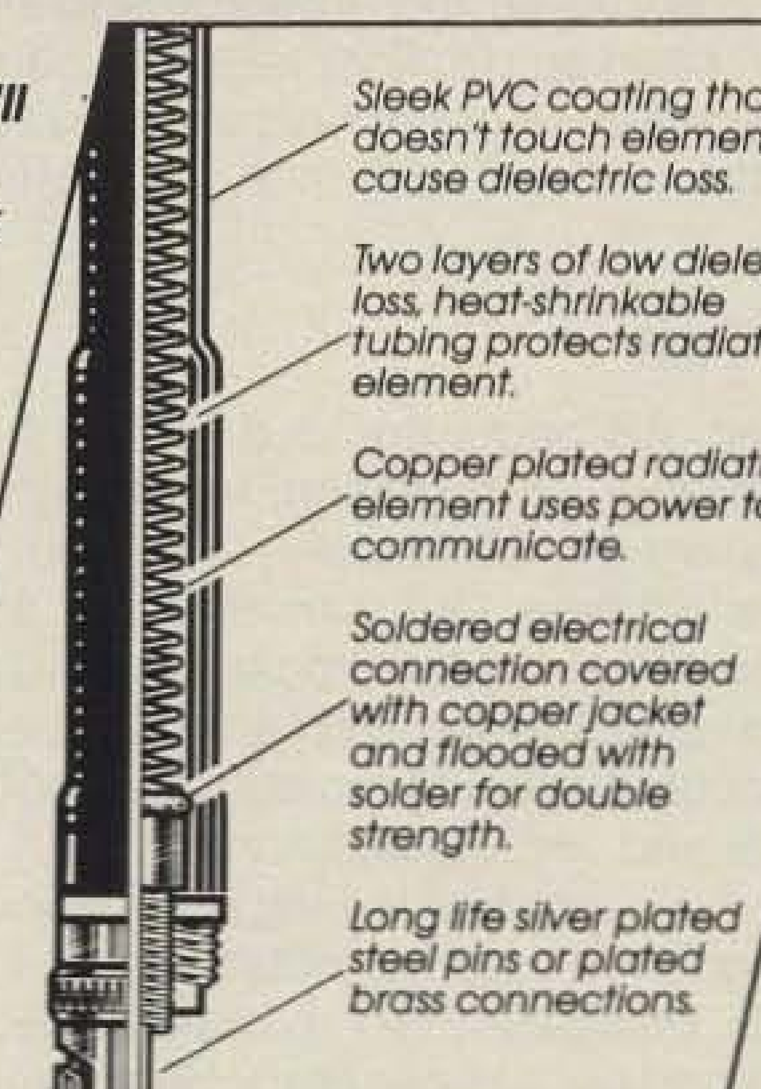

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Somewhere out there, perhaps one of you has the answer to this perplexing problem. All of our resident experts are urged to put on their thinking caps, dust off their programmable calculators, and help the author out.

Polarization Modulation

BY S. SMITH*

Arnold's Theme

"Art, I've been thinking about a new project for us. You recall Arnold's comments at lunch last year?"

"You mean about the satellite receiver changes?"

"No, no. I'm hung up on his funny story about modulating the polarization of an antenna!"

"Oh yeah! I remember that. We had a really good laugh about it, didn't we?"

"Yep. But did you ever stop to think, he may have been giving us a straight story, doctored up as a joke? Maybe he wanted to see if anybody was on his toes."

Well, friend, that discussion between Art and myself got us to untying a real bag of troubles. Not that the engineering hurdles were that steep, but the legal mess we got into sometimes makes a fella wonder if research is really worth it all!

Let me back up a bit. Art and I both worked for Arnold some time ago. And Arnold was quite the researcher. He was the chief of our outfit's Research Division, working directly for the Chief Engineer, until his retirement. He used to take all us young squirt engineers—and all the engineers who would join him—and go to lunch every doggone day. Discussions were always interesting, usually technical, but very light. Those lunches were actually quite a treat to just about everyone.

Well, as things happened, Arnold got around to talking about modulation theory one lunch. As we all know, every type of modulation is *either* amplitude modulation, angle modulation, or a combination of these two. For example, we're all familiar with amplitude modulation. And we all think we know that frequency modulation is a technique of varying the instantaneous phase angle of the carrier—hence the term "angle modulation." Phase modulation, you recall, is essentially the same thing as f.m. All modulation schemes—s s.b., PPM, PAM, PCM, etc.—are really just combinations of these two basic types of modulation. S.s.b., in particular, is well-known to be such a combination. What else about a carrier can you vary besides its amplitude and instantaneous phase?

But Arnold, true to form, brought up a novel idea. Why couldn't you set up a transmitter and receiver some distance apart, both with dipole antennas. If the dipoles are horizontal and rotated properly, the receiver will get a maximum signal from the transmitter. If we rotate the transmitting dipole to a vertical position, theory says that the receiver signal will drop.

Now the plot thickened. Arnold suggested rotating the dipole between horizontal and vertical positions, producing a varying voltage at the receiver. He said, "Put a servo on the antenna, and key it with a hand pump. That way, you can set up a fine Morse communications system, and the transmitter is not modulated at all!"

The Test

Well, Art and I decided to see if this would work, so we set out to put together a system on 20 meters to try out the whole scheme. Our transmitter antenna was a center-loaded dipole about 10 feet end-to-end. We put it on a rotating hinge so it could be swung rapidly between horizontal and vertical positions.

At Art's location we set up a standard horizontal dipole, oriented toward my shack. Using 2 meter f.m. simplex, we coordinated our experiments. Sure enough, Art could easily discern between horizontal and vertical orientation, provided propagation conditions were not too severe. We decided to go the next step. By ginning up some really high solenoids with mechanical linkages, we managed to put together a system that could take Morse at about 5 w.p.m. and get it across!

The technical difficulties started to erupt at this time. To get the speed up, we acquired some surplus servos from some kind of NASA project or something. They could really whip that dipole around. That's when we found out that even good 6061-T6 tubing will flex and eventually fail. During a nice session sending Morse at about 15 w.p.m., danged if one end of that dipole didn't manage to put itself through the windshield of the XYL's car. Needless to say, she wasn't too happy about the whole incident. But, being a really good sport (who else is the *world* would feed your field day crew with the finest French cuisine, including chocolate mousse, out in the woods?), she saw that it was all in the interest of science. She had already grown used to the house swaying and vibrating, with those servos grunting, before this happened.

Refinements

About this time Art and I decided something must be done to prevent a divorce. The XYL is such a tremendous asset at contest time that we put top priority on retaining her at all costs. Besides, she had long since turned us into mousse junkies; I think it's the cognac she puts into it. If not, then it must be the copious drenchings of good spirits used on just about all dishes served up. It's enough to corrupt a good Methodist, I tell you. The search was on for a better way of swinging the antenna around.

What emerged from this skull session, but an electronic power switch. It consisted of four 833A's arranged so that two of them in push-pull would be "on" while the other two would be "off." Mind you, the tubes were operated only as r.f. switches, driven by the keying signals. They had zero power gain for our purposes. The antenna was totally rebuilt. We put up two full-size dipoles, one horizontally polarized and one vertical. The power switch was used to excite one or the other of these dipoles. Now we were in business! By golly, Art could copy that Morse as fast as I could send it, and we rapidly went to machine code at up to 100 w.p.m. Everything seemed to be going great guns!

*c/o Smithe Engineering, P.O. Box 273, Bonifay, FL 32425-0273

Some more skull scratching, and Art said, "Why don't we drive the power switch with audio instead of binary data, and see if polarization modulation could transmit reasonable voice info?" Now that was such a bolt, I tell you, that I immediately pooh-poohed his idea. You know, that's the kind of idea that I was destined to come up with, not him! However distasteful it was, I eventually had to admit that the idea had enough merit—just enough, you understand—that maybe we should think about trying it. So I called him and mentioned, in passing, that the idea might be worth a try sometime.

Well, Art showed up the very next day with a whole electronics box, ready to attach to the power switch, to put voice onto the system. He had worked out the whole circuit while I was smarting about not having thought up the scheme! The system was not without fault. As anyone who has ever tried crossed dipoles already knows, we discovered that the vertical component was much stronger than the horizontal component. This gave a really funny sounding effect on voice—sort of like trying to talk with a mouthful of 3AG fuses, some of 'em carrying HV.

The cure was as simple as the problem. We decided to adjust the power switch to get about equal signal levels on both horizontal and vertical dipoles, as measured by a 45 degree sloping dipole at the receiver. By gosh, it worked!

The Club

We got into some discussion with local club members who had heard about the great windshield incident from Herb, our auto-shop man who just happens to live on the 2 meter repeater! Sure enough, someone asked, with the crass ignorance of inexperience in such matters, what bandwidth the system had. Why, it was obvious that the answer was zero! Keep in mind, the transmitter is unmodulated! I was amazed anyone would think otherwise, but the world is full of naive individuals.

Pundits persisted. Some other wise guy said, "The power switches constituted zero gain, but grid modulated, amplifier stages." We countered on the spur of the moment, remarking that since they were zero gain, they were not amplifiers at all, and certainly not modulated ones! However, one of the guys with lots of education gave a pretty plausible argument, saying, "One can produce amplitude modulation with variable attenuators, as your 'power switches' so constitute." That was a real kicker, I must admit, and one we couldn't counter right away.

At the next meeting, being pressed into giving some kind of formal presentation before the club, Art opined that the system works with simple servos to rotate the antenna, so the whole power switch/modulated attenuator argument was killed. In a stunning display of prestidigitation involving the chalkboard and a copious helping of genius, he went on to confirm that his calculations indicated a zero bandwidth to the *transmitted* signal, as the information is only converted to amplitude variations in the receiver coax!! Ah, the value of a good showman in an emergency! It left the gang speechless, and that was a relief.

What's The Bandwidth?

Now the whole question of occupied bandwidth, transmitter bandwidth, etc., seemed to explode. Art and I remained adamant that *transmitted* bandwidth remained absolutely zero, even though information is transmitted.

You ask, how does this reconcile with Claude Shannon's work? Hah, I say! The road through history is paved with the ground-up bits of disintegrated theories that, popular at the moment, have crumbled from innate weakness on exposure to the searing light of truth. Our system is quite obviously and simply one more fine example of that. Does anyone yet believe the earth to be flat?

Arguments raged. Some fellas got fancy, and listened to my PolM (as it got to be named) signals, put a spectrum analyzer on their receiver i.f., and confirmed that the signals were indeed simply amplitude modulated. The pressure on us mounted, as is always the case when anyone challenges long-established theory.

The Rescue

Quite by accident, an unusual development occurred. Isn't it odd that most major contributions to our understanding of nature, including challenges to erroneous theory, occur by accident? One of the military installations not far from us got wind of our zero-bandwidth communications system. They decided to monitor our transmissions, and wrote a nice classified report on their findings.

It didn't take us long to hear of it. Although security wraps remained on the total report, some probing through our Congressman's office got us an unclassified abstract of the report. As it happened, this required us to become a sort of no-pay contractor to DOD, which was done with the blessing of five of the FCC Commissioners, so I'm told. Part 97 of the FCC rules demands that we accept no remuneration for our work; that didn't trouble us at all, at least at the moment. After all, amateur radio is always regarded by the FCC as being an important tool in exploring radio communications theory, and they looked on our now-published work as a fine case in point. This did nothing to dissuade us from our quest. If anything, the whole incident oiled the path. Imagine! Becoming the subject of an FCC meeting!

Surprise!

Well, now the report showed that the DOD crew did almost exactly what had been done earlier. They monitored the signal, and looked at its spectrum at the receiver i.f. But they didn't report amplitude modulation characteristics, as had been done earlier. In fact, they reported that the signal was a good bit broader than that. They said it was essentially angle modulated. Angle modulated? That threw us! But everyone knows that the signal should be amplitude modulated at the receiver antenna's coax. What was going on?

Our new-found position as a contractor of sorts got us a very interesting and privileged visit to the prestigious military monitoring station where the measurements were done. We got to meet the OIC, NCOIC, and the actual crew who took the data. They certainly were well-trained people, and their equipment would impress Marconi, if not God Himself. It seems they used a fancy military antenna, which was circularly polarized! How about that? This setup caused the receiver input voltage to remain constant with modulation, but our PolM seemed to produce advancing and receding wavefronts at the receiver antenna, which translated into a sort of narrow bandwidth phase modulation!

Well, sir, we did some more work on the DOD contract. We found another interesting surprise, too. By rotating our horizontal dipole at my shack, we could change the received signal from a pure phase modulated one (when the dipole was broadside to them) to a pure amplitude modulated form (with the dipole end-on toward the DOD post). This should have been guessed in advance: we were simply changing the amplitude of the horizontal component into that circularly polarized receiving antenna.

Storm Clouds Gather

Now the controversy raged even further. Was our PolM really occupying bandwidth? If so, was it angle modulation or amplitude modulation? Our position remained firm. Sometimes, in the midst of confusion, you gotta put your foot down just to keep from being swept away by the ever-changing tides.

Well, that wasn't enough. The military couldn't answer the question of modulation type or bandwidth. No one at the club could do it, either. So someone got the bright idea of calling the FCC and asking their opinion.

In due time a monitoring wagon from the FCC arrived. They couldn't exactly establish the type of modulation either. They went back to the FCC's lab at Laurel, Maryland, and got one of their modulation experts to come down. This guy has degrees from a couple of places, including Princeton. How do you argue with that? They did some more testing and measuring. The Princeton fella had them measure with both linearly and circularly polarized antennas. In the end, they decided that the signal had amplitude modulation characteristics on one antenna, and angle modulation characteristics on the other. I don't think they ever decided the actual bandwidth issue.

The Bomb

Now things got sticky. Shortly after the FCC crew wrote their report, I got an official violation notice from the FCC. It seems I had been violating part 97.73 of the rules, in that I had *both* angle and amplitude modulation going at the same time!

Recall my earlier observation. To date, I have no reason to believe that the signal was either amplitude or angle modulated, so neither Art nor I was willing to accept that it was both! We stuck to our guns, and argued that the *transmitted* signal was really unmodulated as far as bandwidth was concerned. The bandwidth occupied was occupied only after interception by a receiving antenna, and on the receiver transmission line, which the Commission does not control.

Unfortunately, the FCC stuck to their guns, too. In due course I received official notification, a show-cause order, asking why my license should not be revoked for willful and repeated violation of the rules! In a way, there seems to be a parallel here between the situation of Galileo and the Church concerning his findings on dropping a small shot, and a cannonball, from the leaning tower. Despite the fact that (as we now accept) both reached the ground at the same time when dropped at the same time, the learned Church insisted that the heavier object must fall faster, so Galileo was practically put to death for preaching such heresy!

More trouble developed in connection with our patent application on the matter. We have received a first rejection from the patent examiner on the basis that the system described represents no significant advance in the state of the art. How about that? A zero-bandwidth communications system represents no significant advance! I wonder if the discovery of fire was treated likewise in its time?

Help!

Now, here I am, stuck in a real mess. My license is about to be revoked. In my opinion I have done nothing wrong. So I ask you, the reader, to give me a hand. What is your opinion on these issues, and why do you have such an opinion?

1. Is the system amplitude modulated or not?

2. Is it angle modulated?

3. Does the system occupy bandwidth in the *ether*, as opposed to the receiver's transmission line?

4. Is the patent office's position correct?

5. Should an amateur be penalized for applying amateur radio to advancement of the state of the art?

6. Is the FCC being reasonable?

7. Is Shannon's theory put in jeopardy by our findings?

8. Are we about to embark on gaining new insight into the relationship between bandwidth and rate of information flow?

Advice On Answering The Above

To decide if the system occupies bandwidth, it is necessary to say how much bandwidth for a given kind of information signal. To do this, you must first decide if the system is amplitude modulated, with only a first order set of sidebands, or angle modulated, with sets of sidebands of all orders.

Should you decide, as we have, that the system actually occupies *zero* (or nearly zero) bandwidth *in the ether*, then you may think the patent office position is erroneous.

A decision that the system occupies no bandwidth (or very little bandwidth) in the ether is a decision against Shannon's findings.

If you care to cast your vote, and join the now raging storm, please do so. Let us know your feelings by writing to: Smithe, Bonifay, FL 32425-0273, Attn.: POLM. NO PHONE CALLS, please!

Art and I regret that we cannot answer all letters or inquiries, but plan to publish the findings presented by you, our readers, particularly those which finally put this conundrum to rest. We want to rest, too, but find it impossible nowadays. ▣

a monthly feature by
DAVE INGRAM, K4TWJ

The World of Video

A LOOK AT THE WORLD AROUND US

As you may have heard, the Federal Communications Commission recently modified its rules to permit SSTV communications on all General Class licensed s.s.b. frequencies in the 80, 40, 20, and 15 meter bands. That progressive resolution opens numerous communication possibilities and benefits, particularly during times of emergencies or special events. The projected number of affected amateurs can provide a communications window for amateurs at sea, a chance to finally put a face with a familiar voice (often quite an experience), a means of replacing phone patches with "video visit" equivalents, and much, much more. The key to this video acceptance, however, lies in successful use of SSTV as a communications tool rather than as a mere "fad" for exchanging mugshots and cartoons. Think about that. Many of us are involved in unique professions, located in special-interest areas, or possess unusual knowledge, all of which can be shared with others via the medium of Slow Scan TV. This is a chance to open new doors and experience new communications heretofore unknown. Enjoy, enjoy!

The new provisions for increased SSTV operations should create many opportunities for commercially manufactured amateur gear and related items. We project many specialized companies will realize their new and receptive audience, resulting in a variety of competitive gear ranging from basic SSTV units to special-feature and color Slow Scan equipment of various types. How about, for example, a simultaneous audio/video unit which extracts milliseconds from the SSTV picture to create an audio channel, or an internally programmed unit which automatically adds one's call onto bottom gray-scale lines. Here, also, is a chance for larger amateur equipment manufacturers to integrate SSTV gear into their line of matching equipment accessories. Such video gear would surely

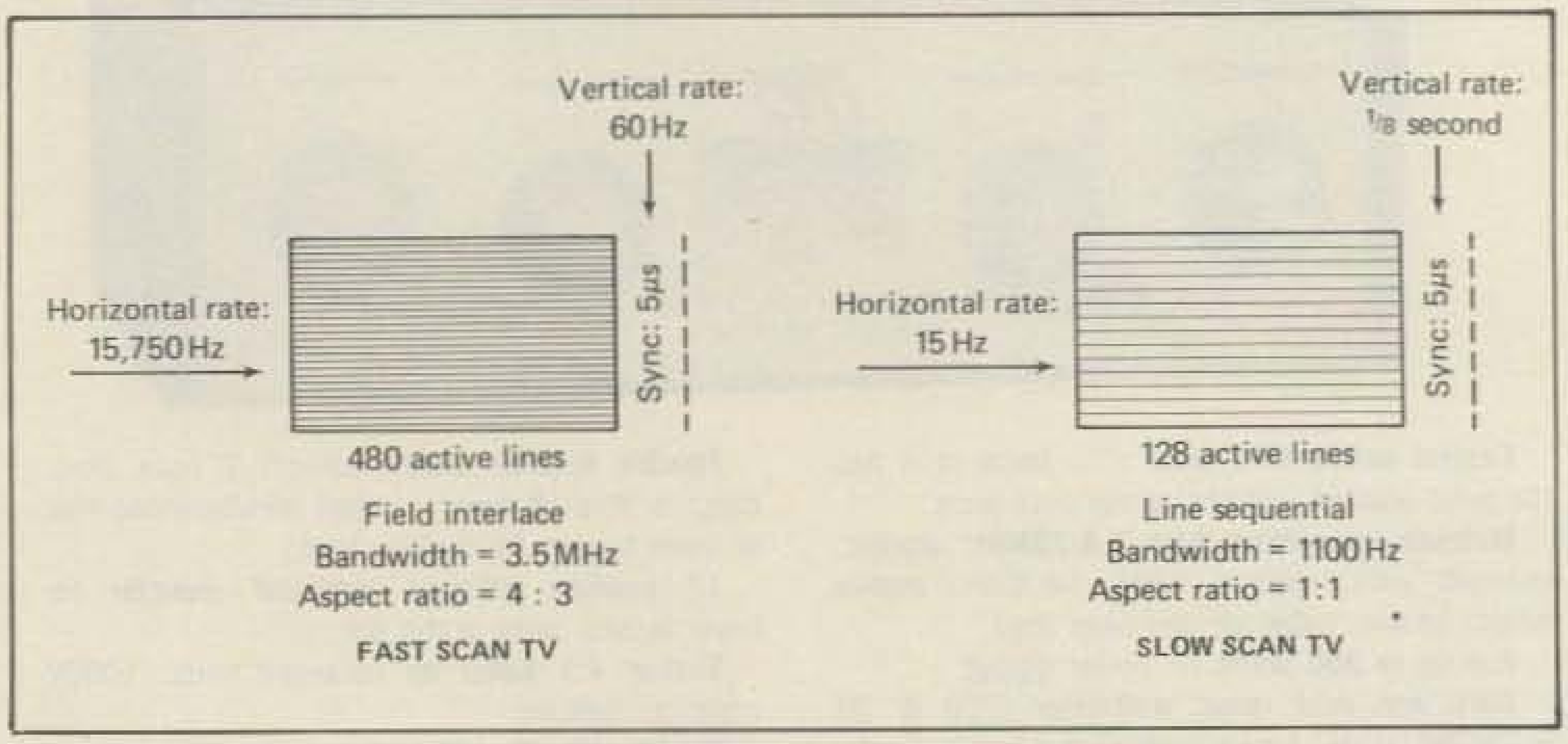


Fig. 1– Comparison of Fast Scan TV and Slow Scan TV operational parameters.

The color SSTV system of VE3EGO includes all preassembled circuitry, v.h.f. oscillator for radiating the output signal into antenna terminals of unmodified color TV, servo unit for camera filter selection, and a new "top" Robot cabinet.

outsell oscilloscopes, panoramic adapters, etc. A word to the wise. . .

A prime consideration for General Class SSTV activity involves the judicious and considerate designation of new "upper band" calling/gathering frequencies. This should create few problems on 80, 40, and 15 meters; however, General Class frequencies on 20 meters may be a different matter. Overviewing recent happenings in that spectrum, it appears to be a prime "stomping ground" (no pun intended!) for everything from DXing to phone patching and rig destruction testing. Statistics again show many a.m. diehards, and the majority of license-losing deliberate QRMers have also frequented this range. "Aged" SSTVers have been studying this situation and comparing notes during the Saturday SSTV Net (14,230 kHz at 1800 GMT). As this column is being written, the present concensus suggests adopting 14,280 or 14,330 kHz for General Class SSTV. The worldwide-established SSTV frequency of 14,230 kHz has been used for 20 years. The multiple efforts involved in that settlement are now respected and observed. The 14,230 kHz frequency will thus remain the prime frequency for SSTV activities.

There may be nets operating on the previously mentioned General Class frequencies (are there any non-adopted frequencies in this range?), but a time-sharing gentlemen's agreement could surely prove mutually beneficial for passing messages to friends, etc., in an "on-the-air mailbox" fashion. We want to hear your opinions on this, and soon. The annual Dayton Convention, which happens during the latter part of this month (April), is the yearly gathering of amateur television enthusiasts. Most of the prime innovations and future developments evolve from these gatherings. Among the many planned activities for this year's FSTV/

*Eastwood Village No. 1201 So., Rt. 11 Box 499, Birmingham, AL 35210

Here's W6ORG's video "returning" through his crossband FSTV machine described in column. The "93" in right top is repeater's a.g.c. level superimposed on video. Below that is Time Display also superimposed. Repeater ID is at bottom.

SSTV forum are an airing of thoughts and resolution/adoption of General Class SSTV calling frequencies. Time is of the essence, so please let your thoughts be known to either myself or any of the Dayton SSTV forum group (Dr. Don Miller, W9NTP, Chairman) within the next couple of weeks. Better yet, join us at the SSTV booth, the Friday night informal gathering, or the Saturday forum. We'll also be on the Saturday SSTV Net each weekend except Dayton's. During that time, Slow Scanners rally around the *large* booth for personal discussions and design evaluations. (This is not the Robot or A5 booth, but either of those exhibitors can direct you to our booth. It's usually near our forum room.)

ISSS

A considerable amount of interest has been expressed concerning reactivation of the International Slow Scan Society (ISSS) which we proposed/initiated a few years ago. The time is right and the need is obvious, but mass support will be vital for success. The proposed ISSS plan is somewhat similar to the role of AMSAT for OSCAR: A voicing body and assisting foundation with officers, board of directors, etc., working for the mode's worldwide advancement and betterment for all. An associated monthly column, tentatively dubbed "Amateur Video," has also been proposed. This opportunity to unify Slow Scanners worldwide could truly mushroom into unlimited possibilities. Would an International Slow Scan Society be accepted and supported on a widespread basis at this time? You tell us. We're running an ISSS poll this month; it will conclude with Dayton '82. If several hundred supporters are tangibly indicated, we'll proceed. Send a QSL or letter to me, or sign your name to the "ISSS List" at Dayton. We'll announce results in this column and at the Dayton Convention. The request for written response is meaningful: the effort of writing one's support, investing in postage, and mailing a letter indicates efforts which reflect sincerity. Are you sincere or passive in this project?

Another Color SSTV System

Although strictly unintentional, our discussion of color SSTV systems in last month's column overlooked the superb unit available from Sid Horne, VE3EGO. This system is a conversion kit for a Robot 400. It consists of an assembled and tested conversion board, an expanded Robot 400 cabinet, all required additional conversion parts, and a servo filter control unit which is mounted in front of the black-and-white camera's lens for automatic selection of proper red, green, and blue filters. The video input accepts conventional NTSC-compatible camera outputs (1 volt peak to peak) while either raw video or TV channel 2 or 3-converted output is available for connection to the color monitor or receiver. Estimated installation time of the VE3EGO "Color Scan 403" is 10 hours, and the complete system is $550 U.S. The system sounds easy to install, and it works with almost any color TV receiver and black-and-white camera.

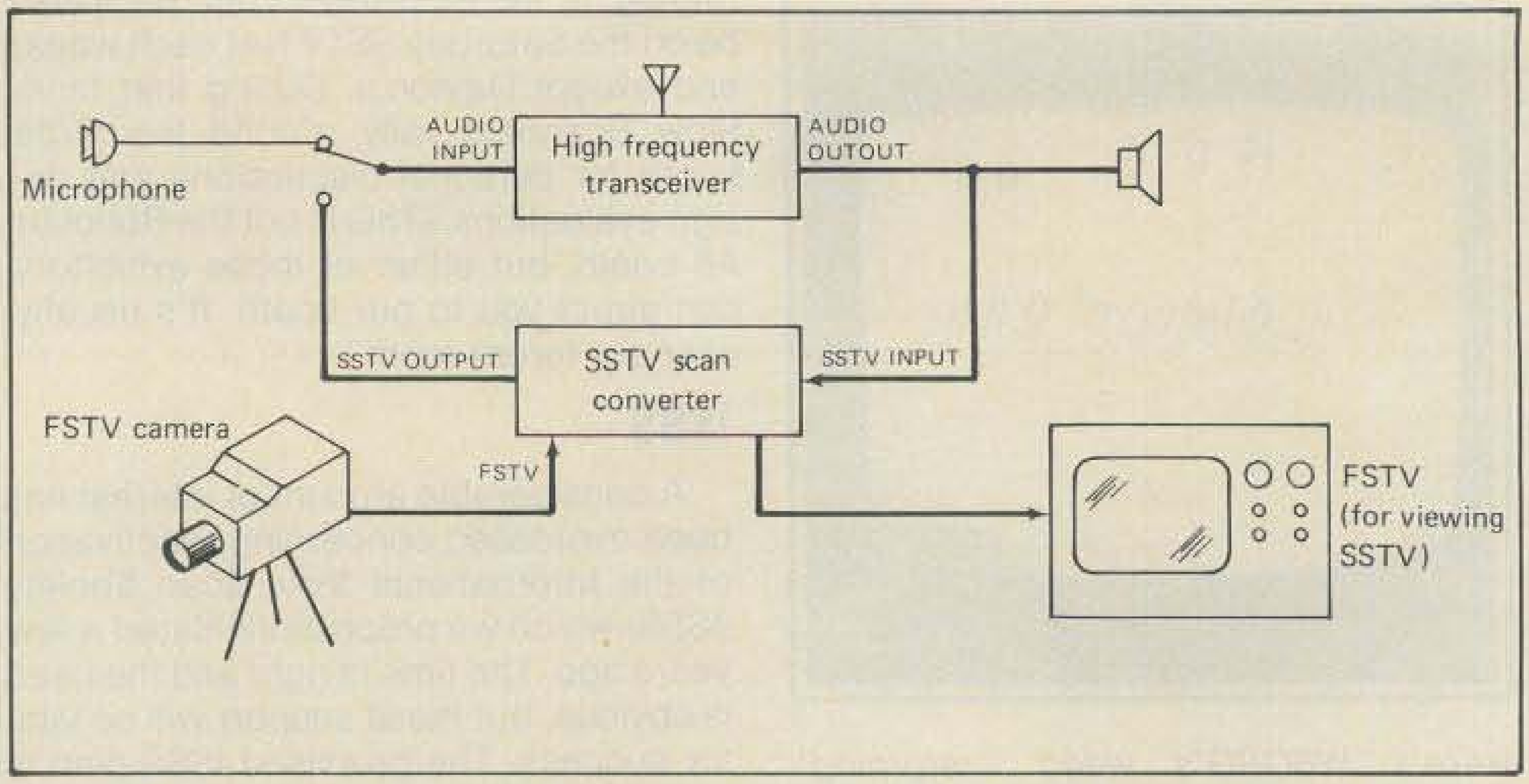


Fig. 2– Basic SSTV setup. Monitor or scan converter parallels speaker for converting tones into video signals while camera's output is SSTV-converted and fed to mike input of rig.

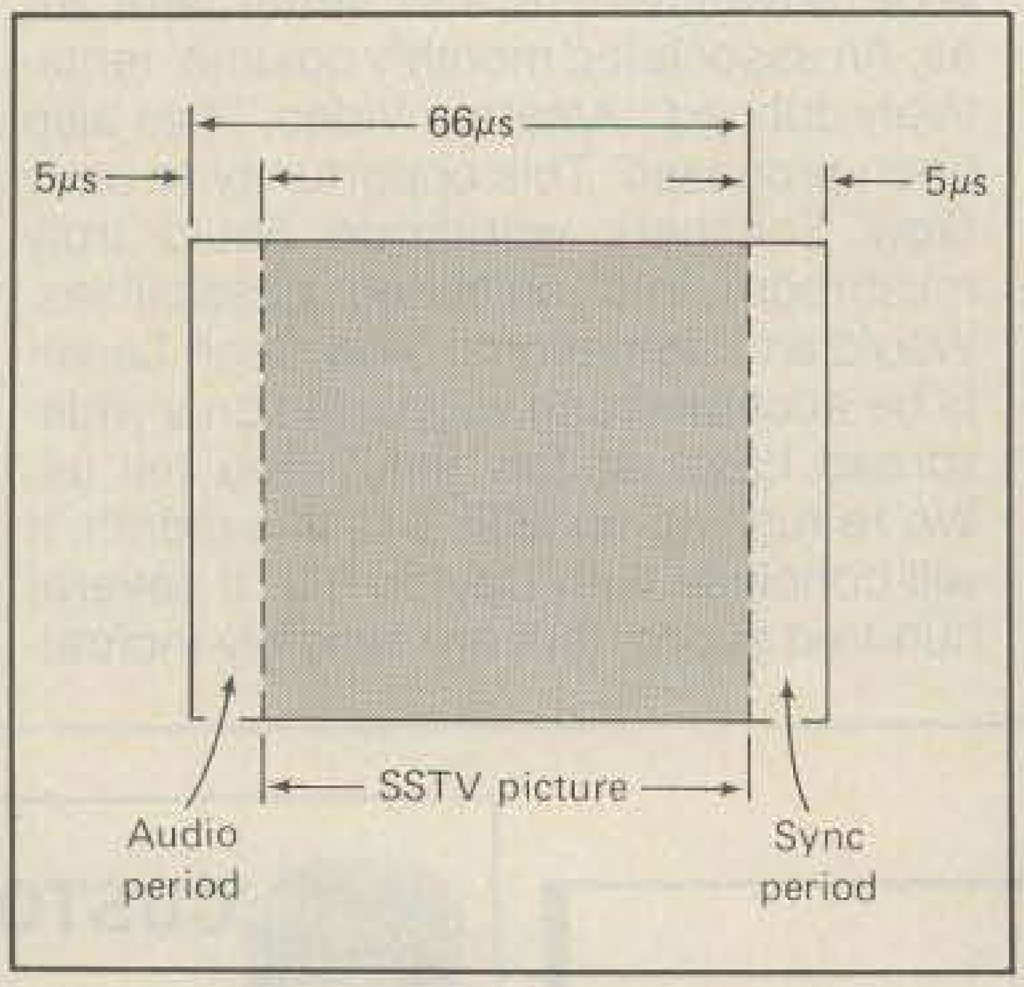
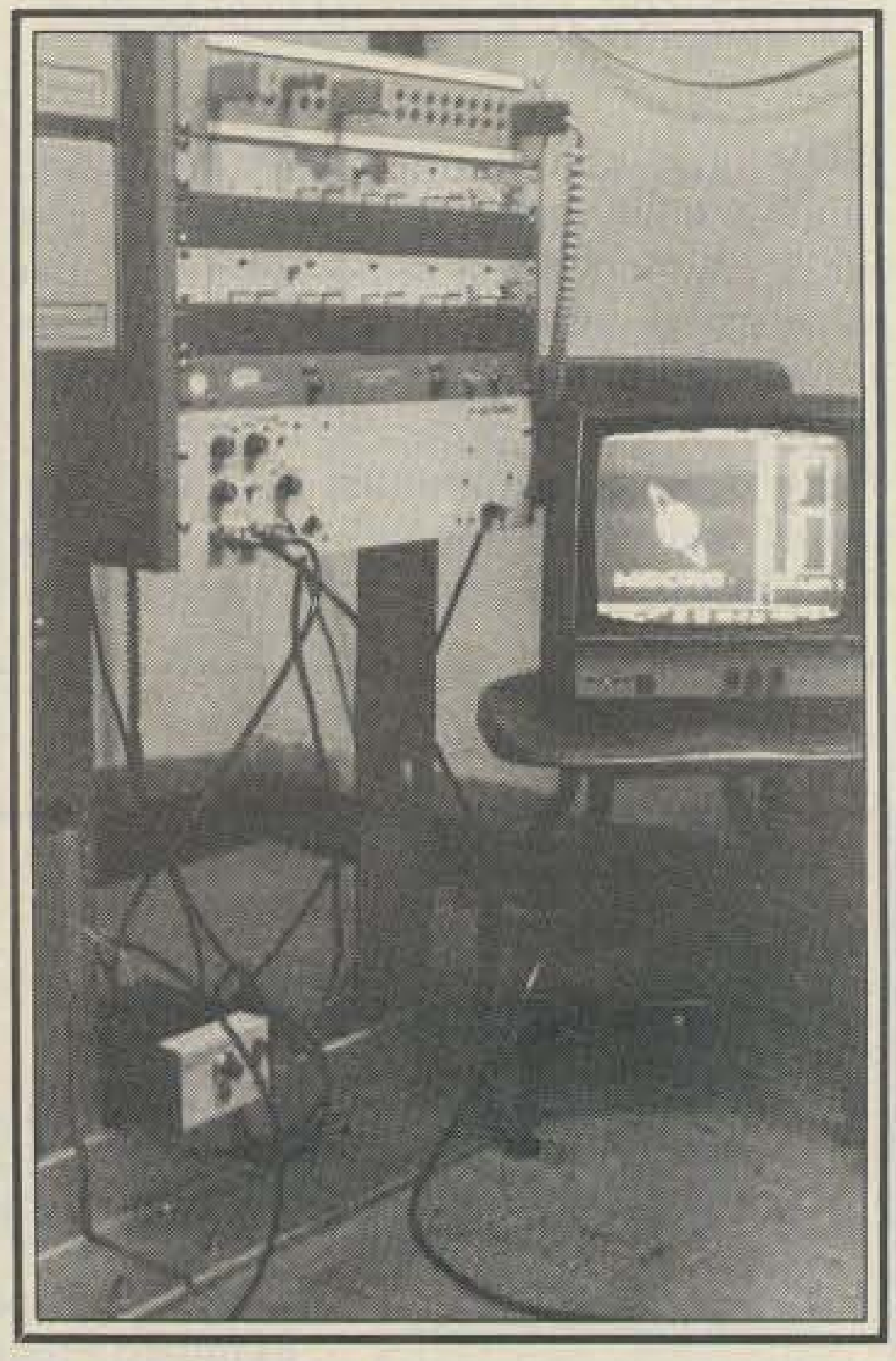


Fig. 3– Concept of adding a time-keyed audio channel into SSTV pictures as discussed. Approximately 5 milliseconds are switched from picture's left side and used to convey bursts of voice information.



This is the head end of 1288 MHz ATV system used by W6ORG and W6VIO at JPL. Equipment includes circuit for superimposing call letters (W6ORG/W6VIO sequentially) on video from Voyager 2. Box on rack bottom is power supply and control unit for remote transmitter. Rest of rack gear is microwave and video distribution for JPL's TV system.

FSTV Activities

Amateur Fast Scan TV activities continue to flourish in many areas of the United States, with new ATV repeaters sprouting in a very encouraging manner. The west coast gang doesn't seem to do a lot of "horn blowing," but they're a very active group. One of the best known and most active ATV repeaters in the California area is the crossband machine of Tom O'Hara, W6ORG. This machine, which has been in continuous operation for nearly 3 years, runs 25 watts PEP output on 1265 MHz with an input on 434.0 MHz. The unit is full color with subcarrier sound which may be simultaneous with 434.0 MHz video or mixed from a 146.43 MHz f.m. input. The repeater's call letters, time of day, and a relative a.g.c. number between 10 and 99 corresponding to received video signal strength are superimposed on the repeater's video output. A grid with this superimposed video information is transmitted for approximately one minute after a station drops its 434 MHz video, permitting self-adjustments and evaluations of gear, antennas, etc., via the repeater itself (an interactive, or "talk back" repeater!).

One of the appealing features of crossband ATV repeaters is that no special filtering is necessary to view repeated video signals, a definite plus for ATV "upstarts" and for simplifying FSTV setups. Future plans for the W6ORG repeater include adding an on-site camera mounted in a weatherproof enclosure. The camera will be used for monitoring activities at the repeater's mountaintop site, and possibly for viewing forest fires which might happen in that area (one recently destroyed many acres around the repeater site). Tone control of that camera is planned. Hopefully, we've whetted your interest in FSTV. Think about it, and we'll present some FSTV repeater suggestions in a future column.

TV Special To Feature SSTV

Another television network special including views of amateur radio is being prepared for broadcast during the summer months, and this one will feature SSTV operations. The movie is a three-part television production of Alan Toffler's best seller *The Third Wave*, and actual on the air SSTV activities are featured between K6AEP of Silicon Valley, U.S.A., and JAØBZC of Silicon Valley, Japan (yes, that country has one also, and it's cranking out some unbelievable items destined to have a tremendous impact on the electronics field during the near future). The movie reflects waves of man's evolution (first wave—from caves, second wave—the industrial revolution, and the third wave—the electronic revolution). The amateur/SSTV portion's length is presently undetermined, but approximately 3 hours of filming time were involved during simultaneous coverage of K6AEP by CBC Canadian TV and JAØBZC by NHK Japanese TV. Watch for it between now and June. You'll even get a view of K6AEP's new hardcopy, 16 shades of gray SSTV printer in action. We'll have some info on that printer in the next column. Incidentally, we have some corrections to K6AEP's TRS-80C SSTV packages mentioned in last month's column. The black-and-white SSTV package is a 128 by 128 by 4 shades of gray arrangement, while the color SSTV package is a 128 by 128 by 4 color arrangement. Output signals from the TRS-80C's r.f. output port (not the RS232 port) are directed to the TV monitor.

Wrap Up

That's all the space for this month's column, gang, so we'll continue discussions next time. Among the topics planned for future coverage are OSCAR 9 facts and parameters (England is still experimenting with its digitalized video format. Hopefully, things will soon stabilize.), basics of rigging an FSTV repeater, thoughts on an SSTV weather radar system, a discussion of Holographic video (could this be the next significant step after television?), and much, much more. A true technological revolution is on the horizon. We'll probably feel the leading edge of this during late '82. Stay with us, and we'll keep you informed and ready for all the exciting action. Amateur Radio's best years are yet to come!

73, Dave, K4TWJ

CQ SHOWCASE

Kenwood 2 Meter FM Mobile Transceiver

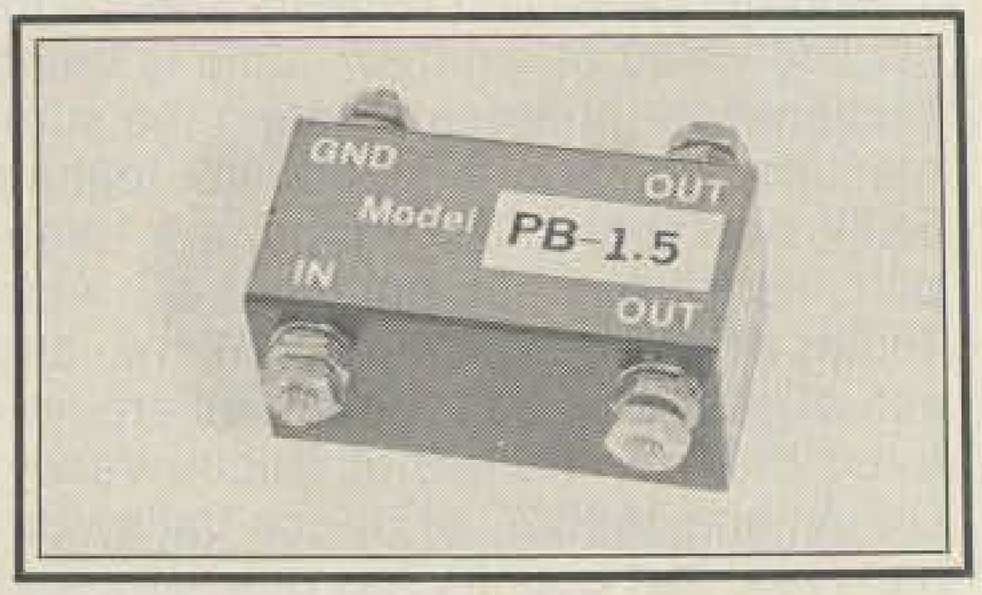
The Trio-Kenwood Model TR-7730 2 meter f.m. mobile transceiver is compact in design, has an r.f. output of 25 watts, and comes with hi/lo power switch, 5 memories, memory scan, automatic band scan, up/down manual scan on the microphone, 4 digit LED frequency display, S/RF bar meter, ±600 kHz offset switch, and LED indicators for "busy," "on-air," and "repeater." Optional accessories include the MC-46 16-button autopatch microphone, SP-40 remote speaker, and KPS-7 power supply for fixed station operation.

ICOM IC-290A 2 Meter Mobile

The IC-290A 2 meter mobile v.h.f. transceiver includes the following features: 5 memories plus 2 v.f.o.'s; priority channel; programmable offsets; 5 kHz or 1 kHz tuning; full scanning capability; and f.m./u.s.b./l.s.b./c.w. capabilities. The compact size of the unit is 6$^{11}/_{16}$"W × 2½"H × 8⅝"D. The unit is priced at $549, including the HM8 touch-tone mic as standard. For more information, contact ICOM America, Inc., 2112 116th Ave. N.E., Bellevue, WA 98004, or circle number 102 on the reader service card.

Palomar Engineers Antenna Baluns

A new series of antenna baluns, the Model PB, feature low cost, small size, and a number of available matching ratios. The balun series will match 50 ohm coaxial cable to 50, 75, 100, 150, 200, 250, 300, 375, 450, 600, or 800 ohm balanced antennas. They can also be used as matching transformers for various purposes.



The PB series work at power levels to 350 watts p.e.p. and are only 1½" × ¾" × ¾". They operate from 1.7 to 30 MHz, are fully encapsulated to keep out moisture, and have stainless steel hardware for use in any environment. The series sells for $14.95. For more information, contact Palomar Engineers, 1924-F W. Mission Rd., Escondido, CA 92025, or circle number 104 on the reader service card.

Our Sky (wire) King answers head-scratching questions like: which way do I put the line through the pulley?

A Primer Of Rigging And Erecting For Antenna And Mast Builders

BY T.E. WHITE*, K3WBH

Nothing takes the joy out of hamming as much as the aerial that won't go up or the halyard that won't come down. For those who don't own their own fleet of cranes or command the services of members of the local heavy haulers union, here is a brief course in blocking and tackling (no, Virginia, not the gridiron variety), and other secrets of the rigger's art.

We will cover lifting, guying, anchoring, reeving pulleys and blocks, winches, and other arcana of putting the laws of mechanical advantage to work for the ham who may hold an advanced ticket, but who is a novice in hanging skywire from skyhooks. There are tricks of the trade which enable one or two people, or four at the most, to accomplish easily and safely what at first glance may seem to require a whole crew of power company linemen or circus roustabouts.

*36 Lake Ave, Fair Haven, NJ 07701

Say we need to raise a typical tubular mast which will support one end of a wire antenna. What is axion number one? Answer: measure, cut, and preassemble *everything* in the shop or in the yard first. This means every turnbuckle, guy length, swivel, guy ring, pulley, lifting line, etc. (and oil the pulleys).

This article is written not for permanent broadcast-station-quality installations as much as it is for field-day and semi-permanent backyard work. But still, quality pays. Use plastic-coated guy wire; it's easy to work with and will support almost any mast you'll ever raise. For turnbuckles, rings, thimbles, and clamps use marine-grade hardware, not chain or franchise electronic store varieties. Spend a dollar and be safe and happy. Wilcox Crittenden of Middletown, Connecticut, makes excellent hardware. For nuts and bolts get the cadmium-plated or

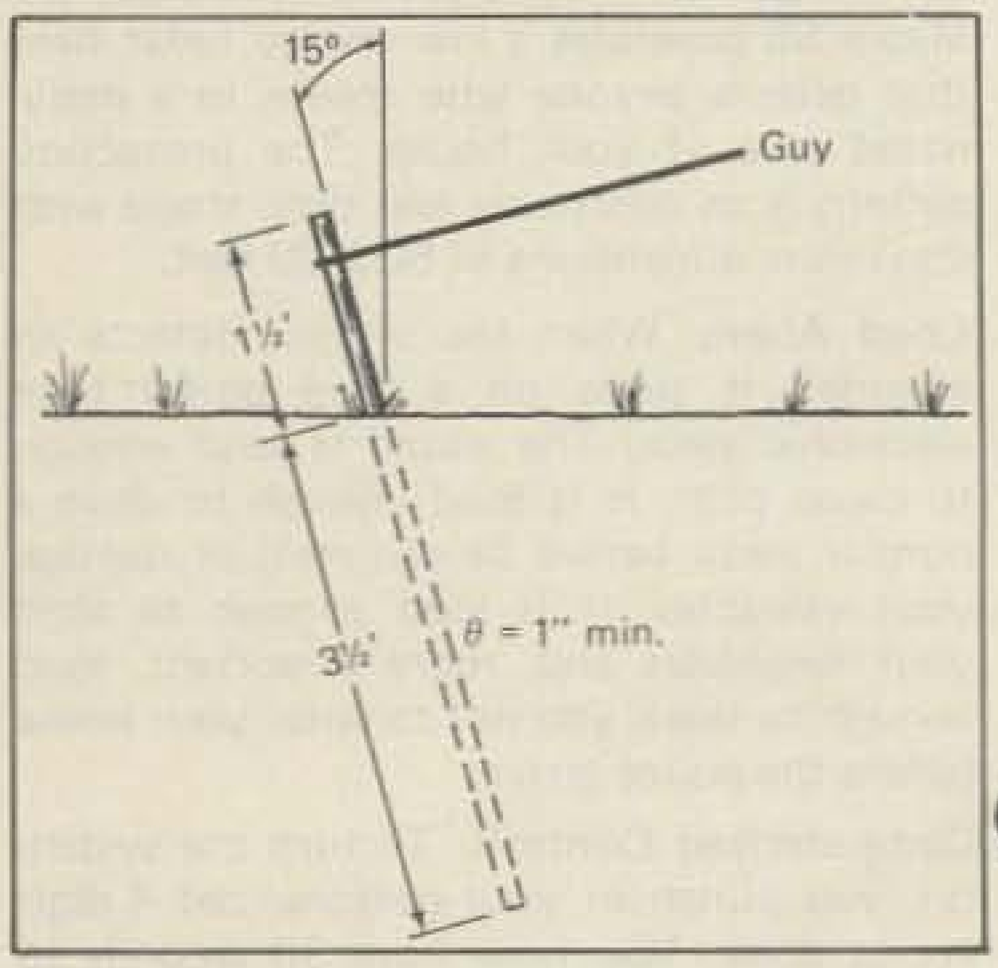


Fig. 1– Guy anchors.

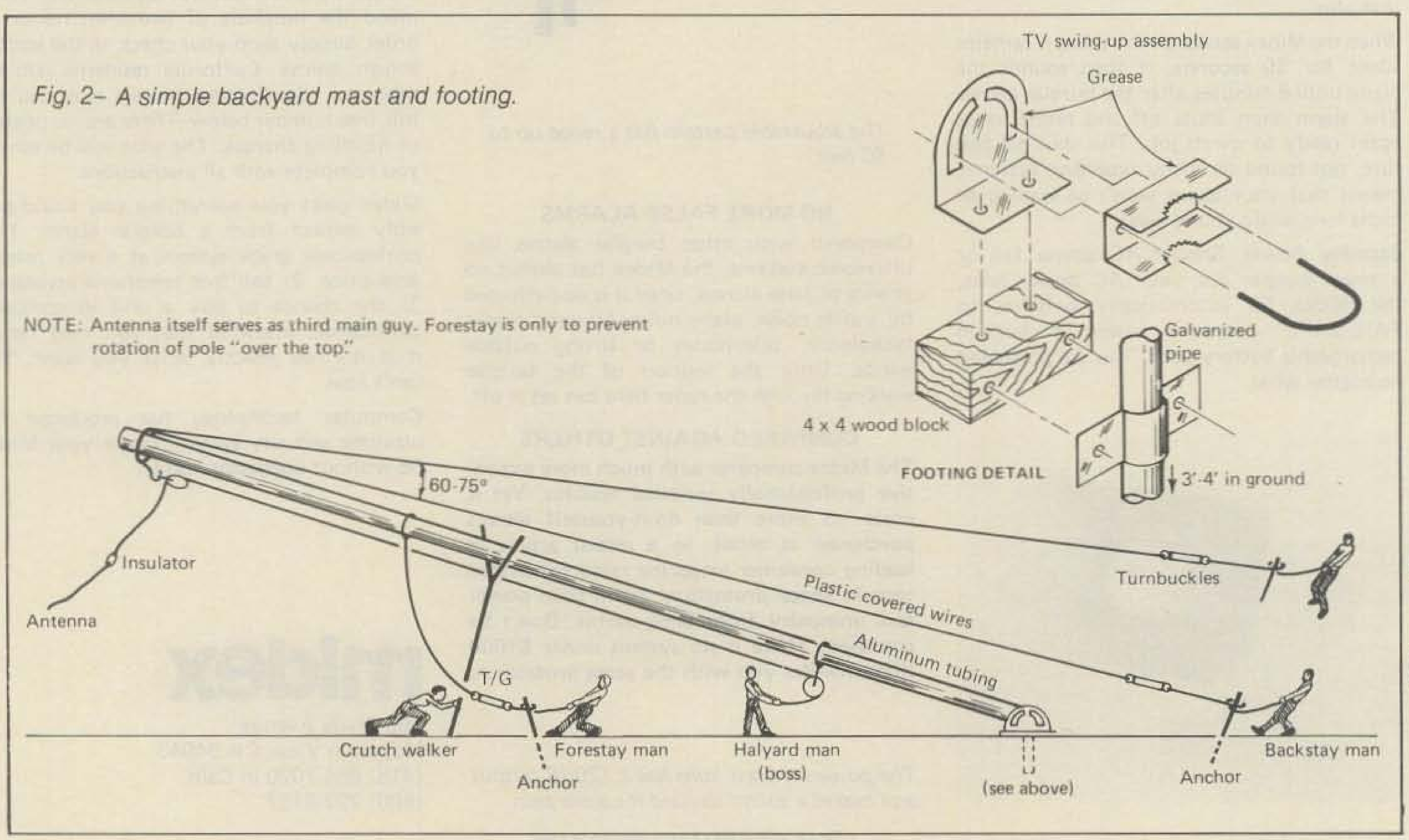


Fig. 2– A simple backyard mast and footing.

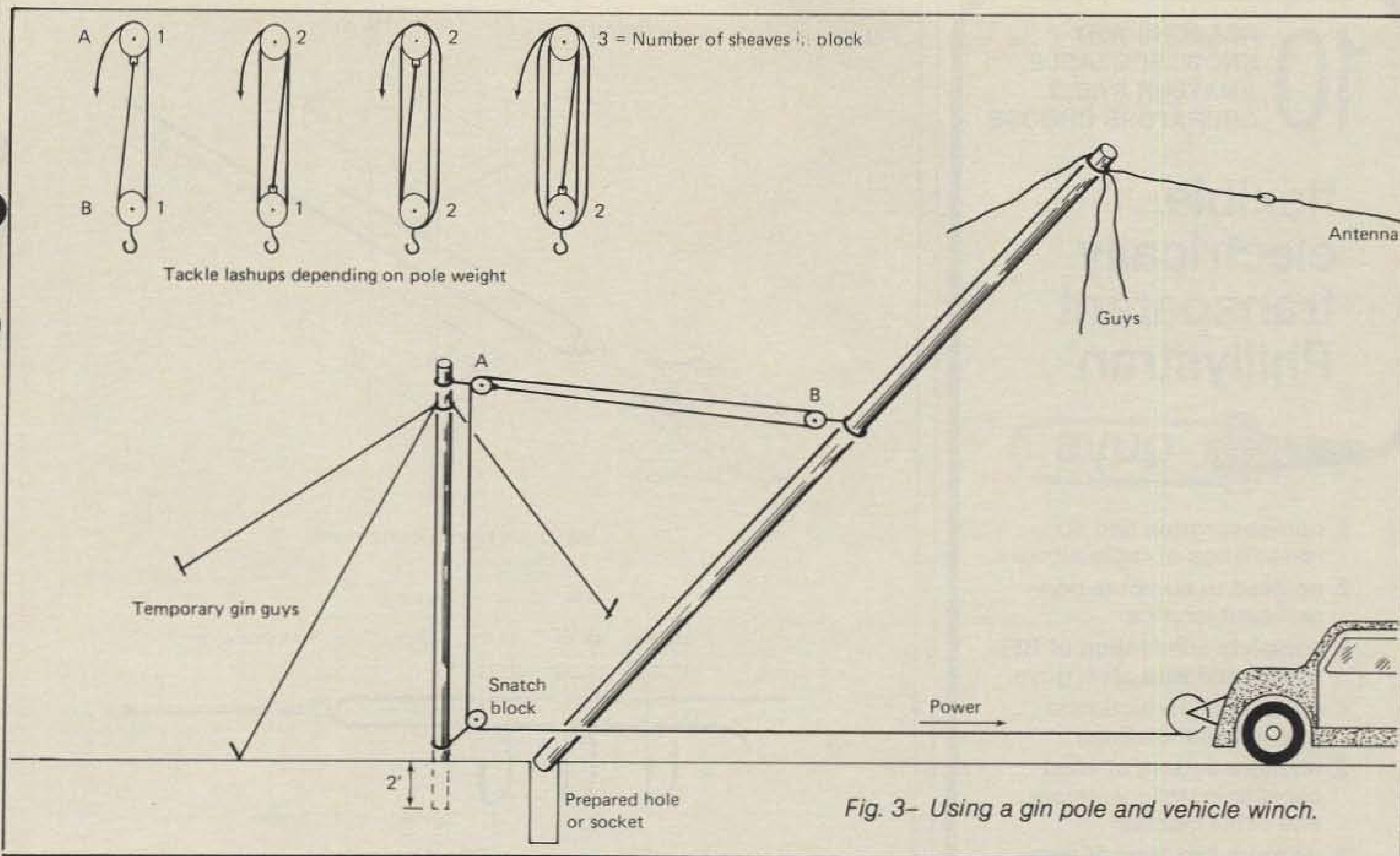


Fig. 3– Using a gin pole and vehicle winch.

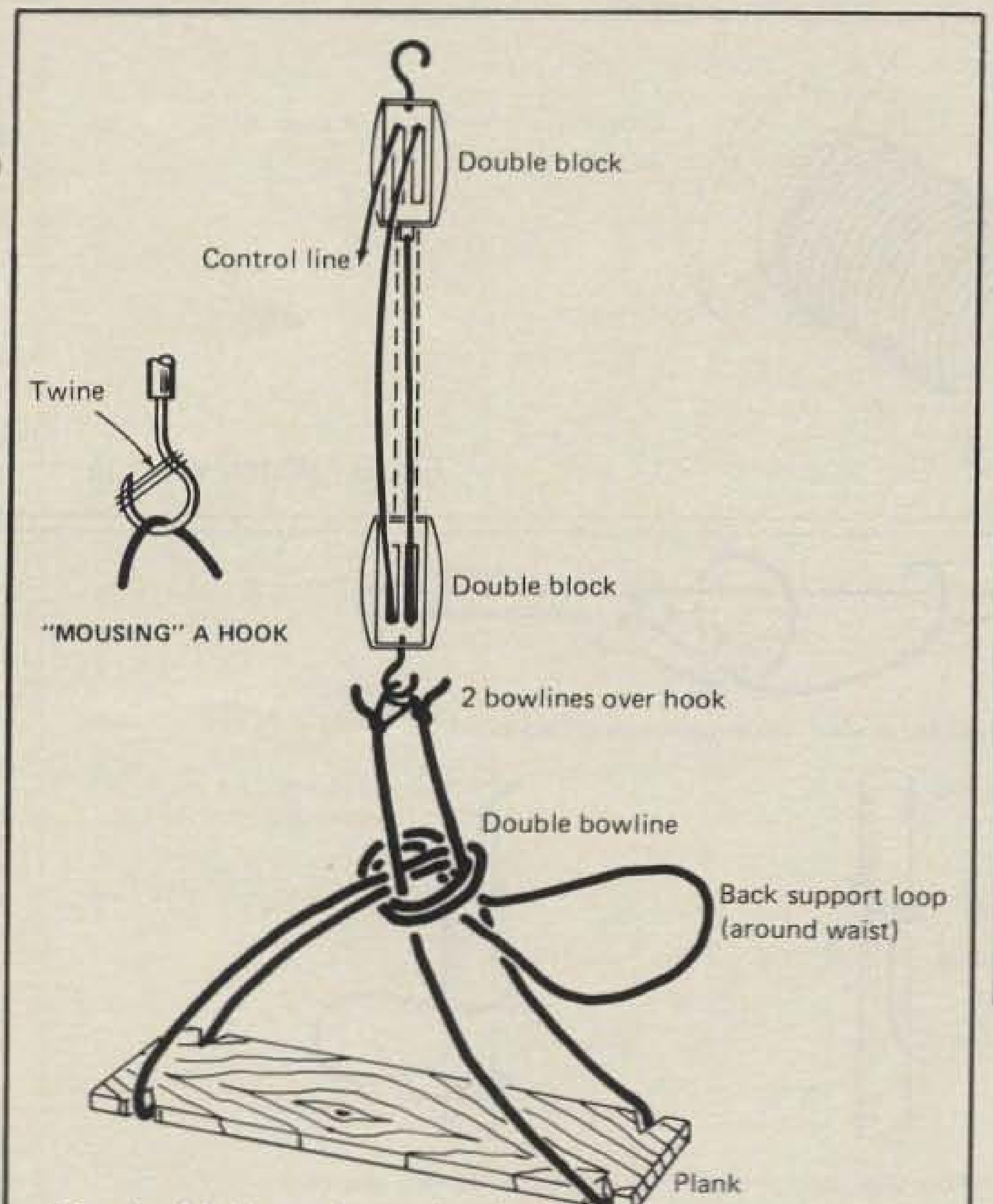


Fig. 4– Making a bosun's chair.

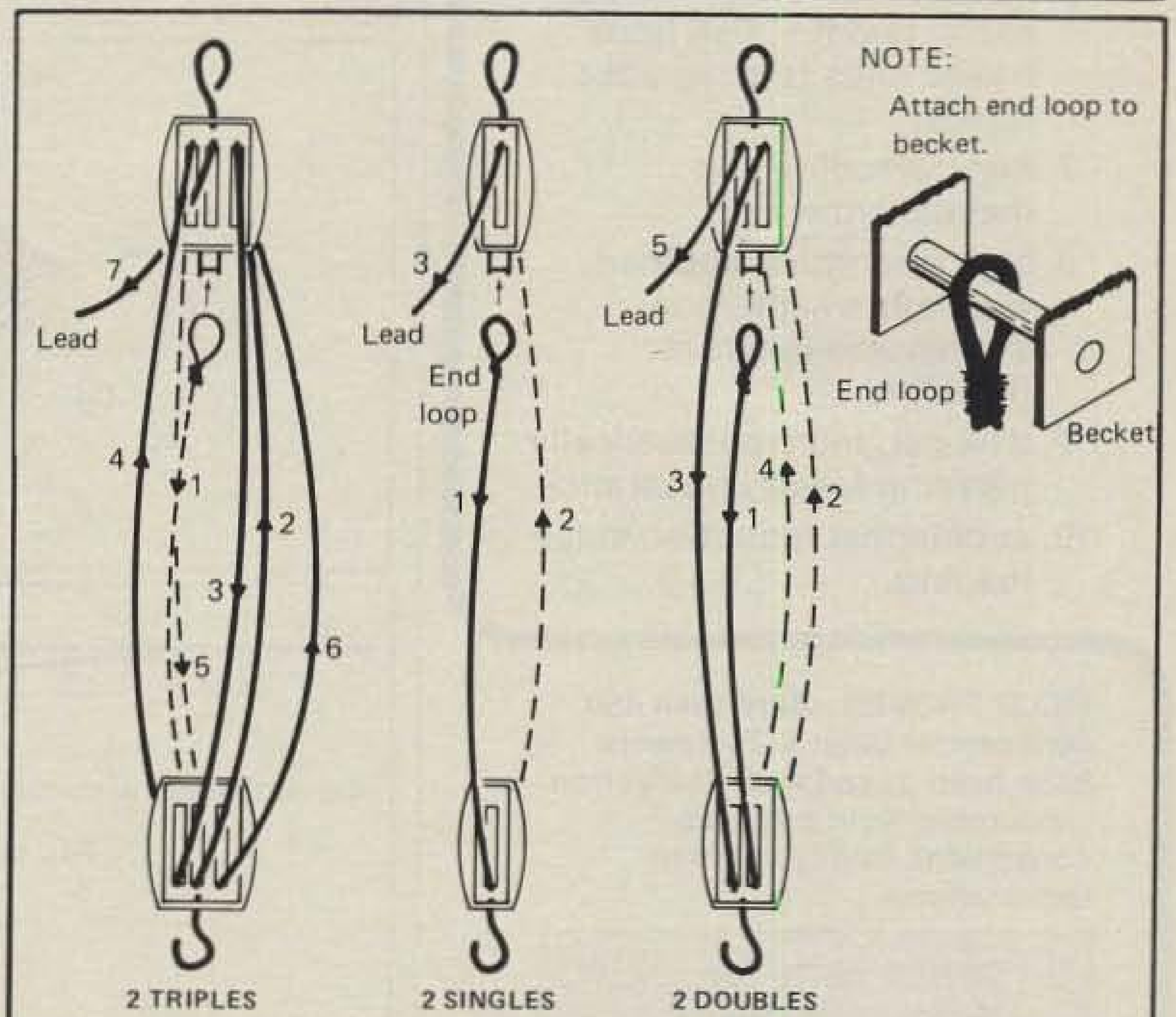


Fig. 5– Reeving blocks.

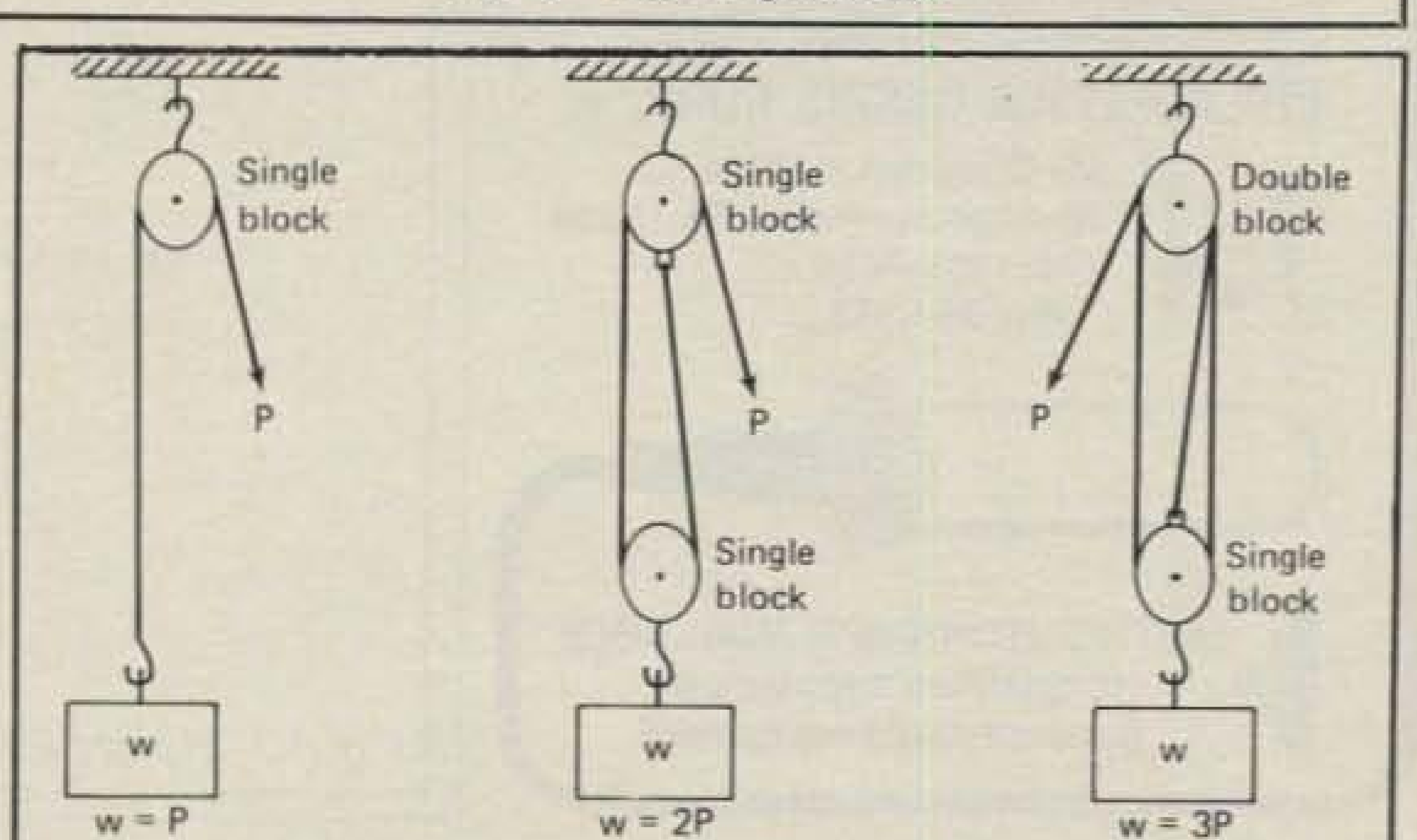


Fig. 7– Mechanical advantages.

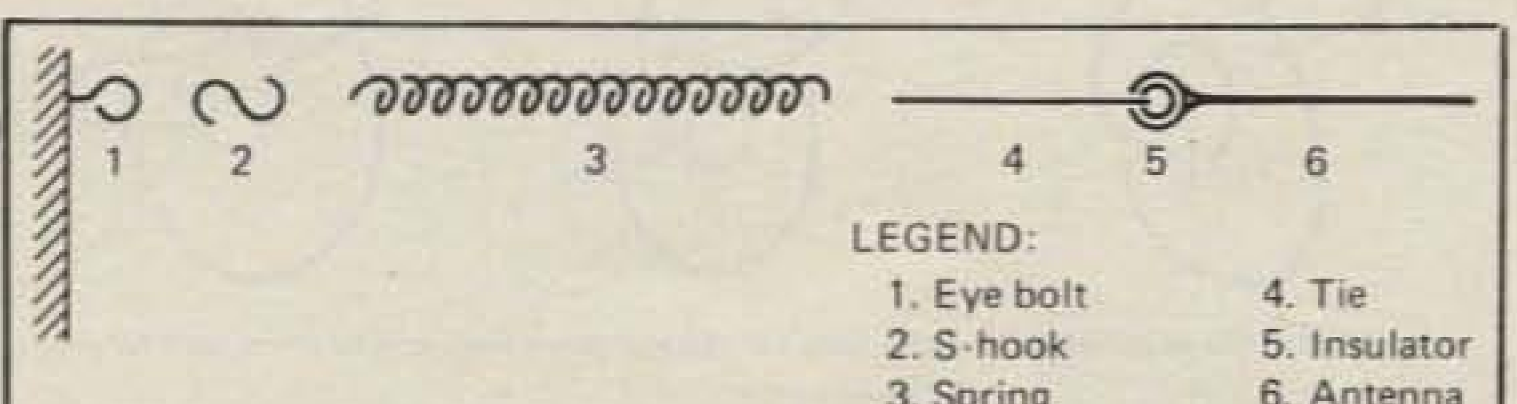
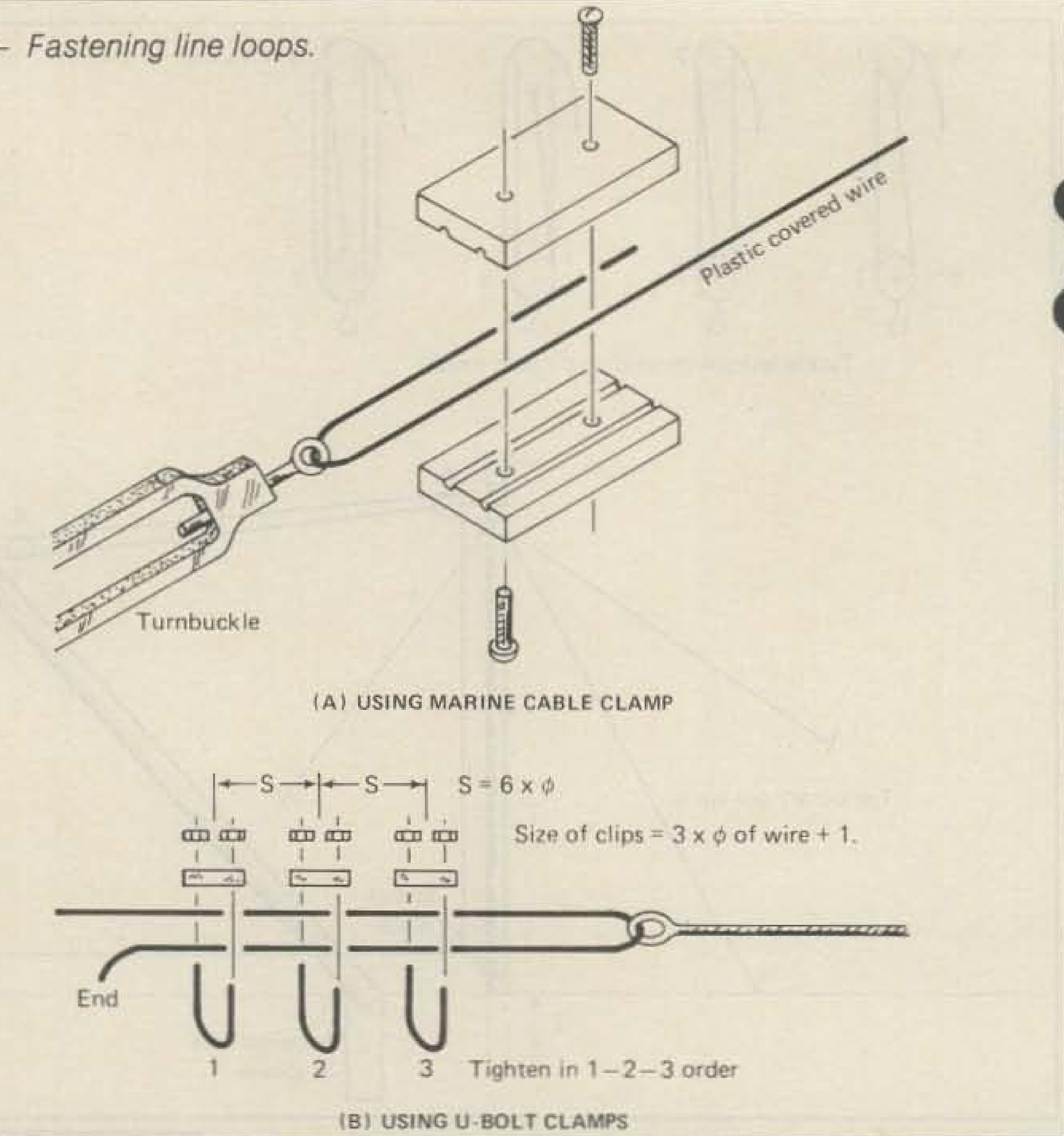


Fig. 6– Components of shack end of antenna anchorage.

Fig. 8– Fastening line loops.



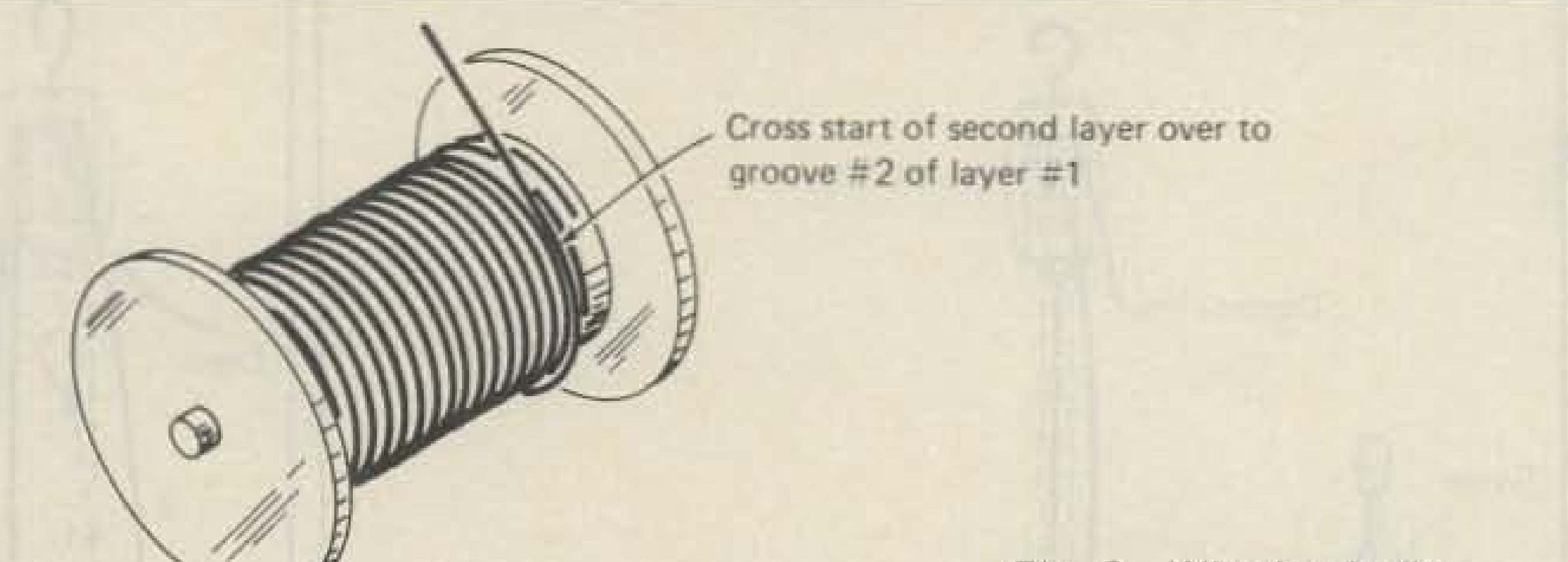


Fig. 9– Winch winding.

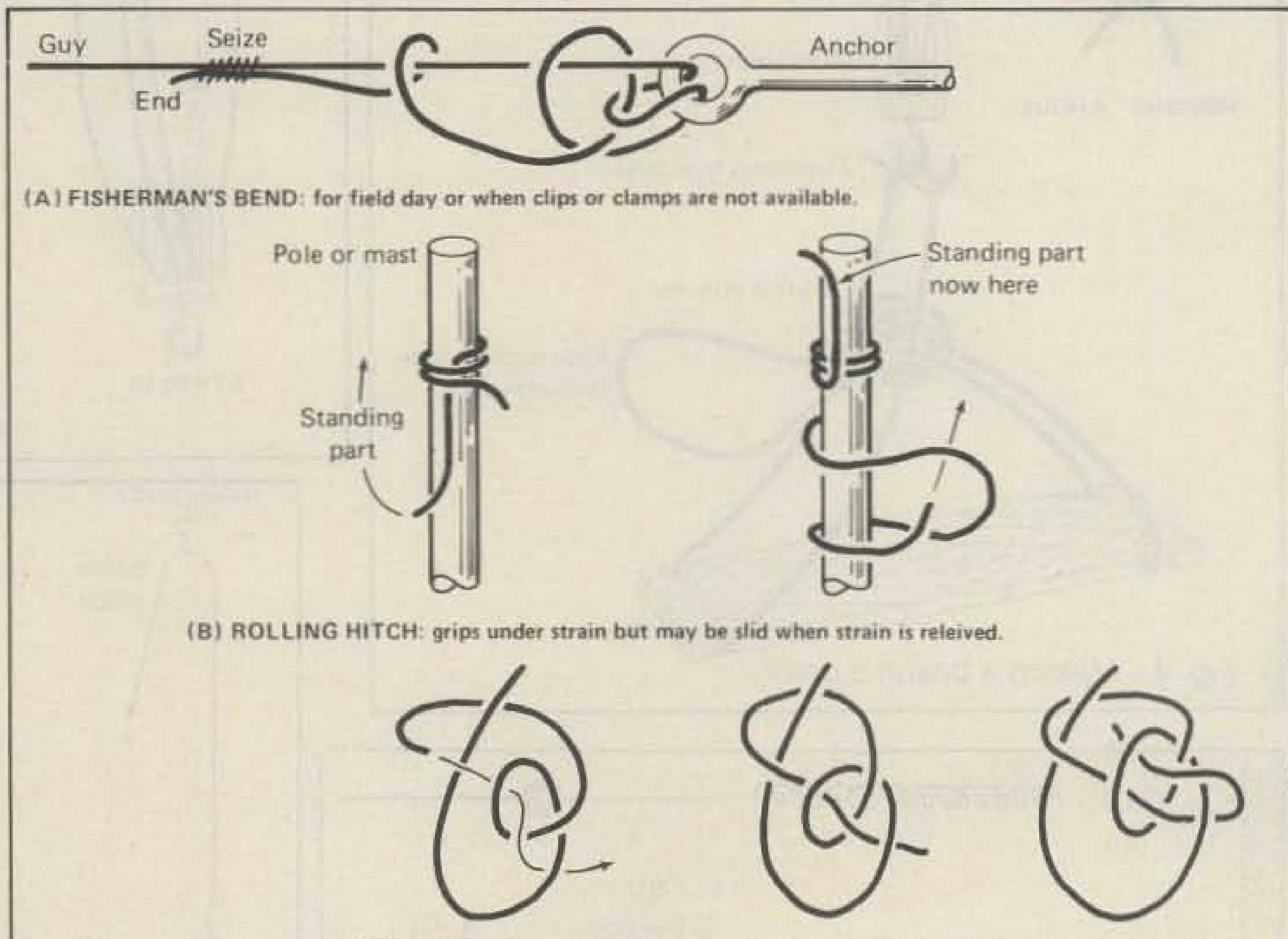


Fig. 10– Handy knots.

iridite finish types. For lines and halyards use marine nylon (not dacron or polypropyline, and certainly not "clothesline"). Insulators should be ceramic, and not glass. Aerial wire should be solid, not stranded.

There are only two ends to a line—the live end and the dead end—no matter how many blocks it reeves through.

Pre-raise the mast in a dress rehearsal without the antenna attached. Rough-cut the guys so your backstay man or men will need only to attach them to the deadmen when the real raise takes place. For masts over 40 feet a temporary gin pole is a help (see illustrations).

Winches

The rating of a winch is taken with only the first layer of cable wound on. Each successive layer wound on reduces the capacity. Turns of line or cable should not overlap, but should wrap in smooth layers. Start the line against one flange and wind under tension. Wind the second layer with the line in the grooves of the first. Each turn of the second layer should cross over two turns of the first layer.

Drawings are worth thousands of words, so spend some time on the ones with this article. You may survive the next northeaster.

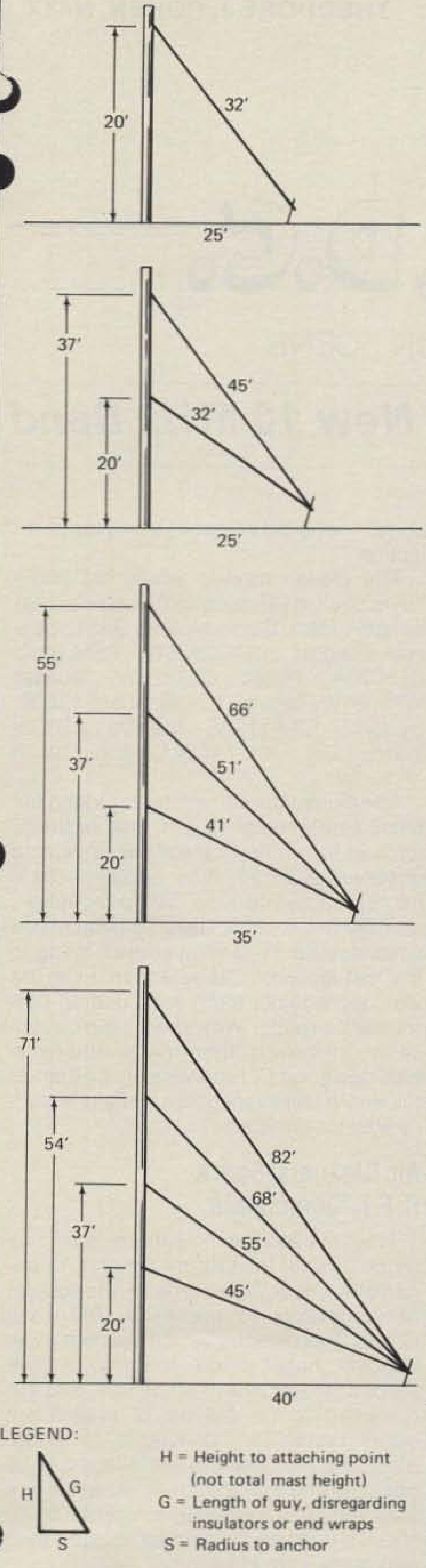


Fig. 11– Representative guy lengths versus mast heights for three guys of guy sets at 120° interval.

a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

League Proposes Immediate Access To New 10 MHz Band

In their mid-December 1981 meeting with FCC officials, ARRL representatives proposed that U.S. amateurs be allowed access to the new 10 MHz band on 1 January 1982. Under the proposed move, U.S. amateurs would have been granted permission to operate in the band on a "secondary" basis.

Unfortunately, it was not within the Commission's powers to grant such access. This was so for a number of reasons:

1. The new 10 MHz amateur band was created at WARC-79. To date, however, the U.S. has taken no explicit actions with respect to WARC-79 pending Senate ratification of the new ITU Treaty.

2. To take unilateral action of the type proposed by the ARRL would have violated the U.S. Administrative Procedures Act since there would have been no opportunity for notice and comment.

3. There are now about 40 common carrier and government users in the 10 MHz band; in addition to soliciting their views on new allocations, a reaccommodation plan for existing users must be developed.

It should also be noted that if the FCC had taken immediate action on the League's proposal, it could have set a precedent which would later come back to haunt the amateur service. What, for example, would prevent users in other services from seeking "secondary" allocations in bands allocated to amateurs, and to do so through requests which circumvent the opportunity for notice and comment?!

At this writing, early action on the ARRL's 10 MHz proposal is unlikely. Further, when the matter is addressed, it will be handled through the Notice of Proposed Rule Making (NPRM) process.

8603 Conover Place, Alexandria, VA 22308

ARRL Toughens Stand On R.F.I.

With activity heating up on Capitol Hill over the r.f.i. provisions of Senate Bill S.929 and House of Representatives Bill HR.5008, the League is making a concerted effort to educate lawmakers on the real causes behind most consumer r.f.i. complaints.

Writing in *Amateuradio* (the League's newsletter for public information use) for December 1981, the ARRL noted:

"The . . . [Consumer Electronics Group of the Electronics Industries Association] . . . says that the interference problem has been exaggerated, that there aren't enough consumer complaints to justify legislation. Yet, a recent FCC study (on television interference only) revealed that only one in eight problems with interference was actually reported. Last year, there were more than 80,000 known incidences of RFI, which translates into at least 560,000 [more] consumers with *defective* electronics products [emphasis added]. FCC estimates put this figure in the millions."

Concludes the League: "For the past thirty years, the problem of RFI has been left to the marketplace to be resolved, with little apparent success. Isn't that time enough?"

"Consumer Reports" Rates Color TV's On Susceptibility To CB Signals

Consumer Reports, in January 1982, reported that of eighteen small-screen color television receivers tested, none scored higher than "average" in its ability to reject signals from a nearby CB transmitter. The tests, performed by Consumers Union (a nonprofit organization established to provide information and counsel on consumer goods and services), employed the use of a "perfect" CB transmitter . . . one, presumably, free of harmonic radiation and other unwanted signals. According to *Consumer Reports:* "none did an outstanding job of rejection . . ."

The eleven models which did score "average" in CB rejection were (in alphabetical order): Curtis Mathes G381, General Electric 13AC2506W, Panasonic CT3020A, Philco C2322PW, Quasar WT3931W, Sanyo 31C40A, Sharp 13E35, Sylvania CAA113W, Toshiba CB335, Wards Cat. No. 40341, and Zenith N1320W.

The Consumers Union tests judged the small-screen color TV's on their performance in seventeen categories (including observed picture quality, adjacent-channel rejection, interlace, fringe reception, and serviceability). Thus, in selecting a small-screen TV, an "average" rating in the category of CB rejection must be weighed against each set's overall performance rating. We cannot help but observe, however, that many otherwise well-designed TV receivers on the market today are still susceptible to signals from nearby transmitters.

Air Cleaners Spark R.F.I. Complaints

Negative-ion air cleaners such as those offered for sale by a major American oil company are currently the subject of complaints to the ARRL RFI Task Group. The devices, which use four independent negative-ion emitters, are intended for home and office use, and are designed to rid the air of unpleasant odors, smoke, and pollutants. Unfortunately, the air cleaners are alleged to be polluting the r.f. spectrum. At least one amateur has reported interference on 80 meters from an air cleaner located over two miles from his station!

The matter has been reported to the Field Operations Bureau of the FCC. Presumably, the Commission will require that the manufacturer of the air cleaner bring his device into compliance with the standards for incidental radiation set forth in Part 15 of the Commission's

Rules. Amateurs experiencing r.f.i. problems with negative-ion air cleaners and other electrical devices are urged to file complaints with the FCC: Federal Communications Commission, Attn: Chief, Field Operations Bureau, 1919 M Street NW, Washington, DC 20554.

AMRAD Addresses Self-Policing Of Spread Spectrum Transmissions

Writing in the January 1982 issue of *AMRAD Newsletter* (the journal of the Amateur Radio Research and Development Corporation), Hal Feinstein, WA3KDU noted that "both spread spectrum and packet are examples of non-traditional amateur communications modes which are not 'decodable' on a conventional receiver system." Given this situation, it would be an understatement to say that the self-policing of transmissions employing nonconventional modulation schemes faces unique challenges in the 1980s.

Feinstein noted that to monitor a spread spectrum signal requires that the third party have knowledge of the signal encoding characteristics. The reason for this is that in systems employing spread-spectrum modulation schemes, the modulation signal is convolved with a spreading function which literally spreads the composit signal over a selected portion of the r.f. spectrum. Without a knowledge of the spreading function's characteristics, decoding of a spread-spectrum signal is quite complex, and it requires both special equipment and training.

To address the problem of decoding a spread-spectrum signal without a prior knowledge of the signal's spreading function, Feinstein, together with other AMRAD members, is now considering techniques which could be used to decode a frequency-hopped signal of unknown characteristics. One solution, albeit expensive, is to use a computer-based system to reconstruct the pseudo-random "noise" (PN) spreading sequence from captured signal samples.

A second approach under consideration involves the use of a so-called "wide-band compressive receiver" which focuses the frequency hopping signal around a signal frequency.

Readers interested in spread-spectrum modulation techniques and their use in amateur communications are urged to contact Feinstein: Mr. Hal Feinstein, WB3KDU, 1410 Rhodes St. North, Arlington, VA 22209.

FCC Proposes Reinstatement Of Previously Held Club-Station Licenses

As we go to press, Private Radio Bureau (PRB) Chief James McKinney has proposed that previously held club and military recreation station licenses which expired between 11 March 1977 and a late-January 1982(?) order-adoption date be reinstated.

Readers will recall that in 1977, the Commission, in an NPRM, proposed to eliminate all station licenses other than those having a "primary" destination. According to John Johnston, Chief, Personal Radio Branch, PRB, this NPRM was apparently misinterpreted by a number of club station trustees who subsequently allowed their club station licenses to expire. As a result of the NPRM proceedings, however, it is now the Commission's intent to "grandfather" club and military recreation station licenses which are currently in existence, though no new club or military recreation station licenses will be issued.

Under the new rules, trustees of club and military recreation stations whose licenses expired would ordinarily not be able to secure another station license. To rectify this situation, trustees of such stations for which the station license expired during the period over which the NPRM was being considered will have until 1 June 1982 to apply for reinstatement of their licenses.

IEEE Questions Engineering Manpower Shortage

As reported in the January 1982 issue of *The Institute* (a news supplement to *IEEE Spectrum*), IEEE leaders are concerned that forecasts of an engineering manpower shortage could fuel an engineering manpower glut. This, in turn, could result in massive layoffs reminiscent of those which were experienced by U.S. engineers on several occasions during the last ten years. To support their argument, institute spokesmen point to the recessionary climate now being experienced in the semiconductor, automotive, and electrical manufacturing industries.

The views expressed above are in direct conflict with published reports that the U.S. faces a severe engineering shortage over the next decade. Thus, the IEEE, at its Conference on Engineering Manpower Supply and Demand (November 1981), asked the following question: "Are there or aren't there shortages today?"

Responding to the question were six different speakers from the engineering community. Some believed that shortages do exist in certain geographical areas and in certain engineering specialties. They noted, for example, that the Department of Defense is unable to fill many openings. Other participants responded, however, that DOD's problems in engineering and scientific manpower are similar to those found in academia . . . "poor salaries, lack of adequate facilities, and so on."

Regardless of their views on the manpower shortage, Conference participants and attendees did agree on one thing: the state of engineering education in this country is "in some distress and in need of attention." To this end, IEEE President-Elect James B. Owens suggested that "the IEEE reevaluate its continuing education programs from the viewpoint of how they might be used to improve the utilization of engineers."

World Communications Year

In late 1981, the United Nations General Assembly proclaimed 1983 as World Communications Year: Development of Communication Infrastructures. The proclamation of WCY 83 concludes four years of negotiations on the intergovernmental level after it was suggested that such a year be celebrated to seek ways to use the tremendous achievements in communications technology to promote the harmonious development—economic, social, and cultural—of mankind as a whole.

In recent years, politicians and economists of all countries have become increasingly aware that one of the biggest obstacles for economic and social progress is inadequate communications infrastructures. In most countries, for example, telephone density is extremely low and telecommunications have not yet penetrated rural areas.

World Communications Year will provide the opportunity for all nations to undertake an in-depth review and analysis of the policies on communications development and to stimulate the development of communications infrastructures. In this regard, special attention will be given to the communications needs of developing countries.

For further information on WCY 83, contact International Telecommunication Union, WCY 83 Secretariat, CH-1211, Geneva 20, Switzerland.

Announcing

• **Foundation for Amateur Radio Scholarships** - The Foundation for Amateur Radio, Inc. plans to award nine scholarships for the academic year 1982–83. Radio amateurs holding at least a General Class license or the equivalent may compete for one or more of the scholarships if they plan to pursue a full-time course of study beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. The scholarships range from $300 to $900. Additional information and an application form can be requested by a letter or QSL/postcard, postmarked prior to May 31, 1982, from Hugh A. Turnbull, W3ABC, 6903 Rhode Island Ave., College Park, MD 20740.

•**Annual VS6 Activity Days** - As many VS6's as possible will be active from 0001Z April 3 to 1700Z April 4 with the sole purpose of giving as many QSO's as possible to other amateurs world-wide. This activity is not meant to be a contest, but rather a weekend set aside to give DXers and award chasers a chance to work the relatively rare Hong Kong. Suggested frequencies are: s.s.b.—3770, 7070, 14170, 14220, 21270, 21320, 28470, 28520; c.w.—3502, 7002, 14025, 21025, 28025. Exchange: VS6's—signal report plus 3-digit QSO number; rest of the world—signal report plus CQ zone. For information on awards given, send an s.a.s.e. to Steve Hawley, VS6JR, Hong Kong Amateur Radio Transmitting Society, P.O. Box 541, Hong Kong.

• **CQ High School and College Club Stations** - McKinley High School Amateur Radio Station KH6NF is trying to make contact with teenagers and young adults around the world. The club station, located in Honolulu, Hawaii, is making a special effort to contact other club stations and younger members of the amateur community to make this an outstanding year for the youth in amateur radio. Hours of operation will be from 1730Z to 1815Z; 0045Z to 0115Z Monday through Friday; 2000Z to 2130Z Monday, Wednesday, and Friday. At present they operate 10 meters, 28.520 MHz, ± QRM. If 10 meters closes up, they will operate 21.420 MHz or 14.320 MHz. If you are unable to contact them because of poor band conditions, write to them to set up a schedule at McKinley High School Radio Station, 1039 S. King St., Honolulu, HI 96814.

• **Quad Cities ARC Special Events Station** -W9YCR, the Quad Cities ARC, Rock Island, Illinois, will operate a Special Events Station in commemoration of the first bridge across the Mississippi River. W9YCR will be on the air from 1800 UCT (noon CST) Saturday, April 17 through 1800 UCT Sunday, April 18 on the 80 through 10 meter bands on the following frequencies: in the middle of the Novice c.w. portion of each Novice class band, as low as possible in the general c.w. portion of each band, and 30 kHz up from the lower edge of the general s.s.b. portion of each band. QSL via Denny Spurgeon, N9BKY, 413 23rd Ave., Moline, IL 61265 and enclose a business-size s.a.s.e. for a certificate.

• **Novice Bands from Novice, Texas** - Beginning April 17 at 1800Z and continuing until 1800Z April 18, the North Texas High Frequency Assoc. will operate the Novice bands from Novice, Texas. Look for the mini-expedition about the center of the Novice bands signing KC5YN. Operators will be working your calling speed. A commemorative QSL will be issued to all stations worked and who send a legal-sized s.a.s.e. For more information, or the QSL, contact Fred Keen, KC5YN, Box 77815, The Colony, TX 75056.

• **The following hamfests and fleamarkets are slated for April:**

April 3, **Rochester Area Hamfest,** Rochester, MN. Contact RARC, c/o WBØYEE, 2253 Nordic Court NW, Rochester, MN 55901.

April 3-4, **Fourth Annual Oak Ridge Hamfest,** Oak Ridge, TN. Contact ORARC Hamfest, P.O. Box 291, Oak Ridge, TN 37830 (Att: Jim McNair, N4EXG).

April 3-4, **1982 Missouri State ARRL Convention,** Kansas City, MO. Contact PHD ARA, Inc., P.O. Box 11, Liberty, MO 64068-0011, or phone 816-781-7313 or 816-452-9321.

April 4, **Framingham ARA Spring Fleamarket,** Framingham, MA. Contact Ron Egalka, K1YHM, 3 Driscoll Dr., Framingham, MA 01701, telephone 617-877-4520.

April 4, **Tenth Annual Madison Swapfest,** Madison, WI. Contact M.A.R.A., P.O. Box 3403, Madison, WI 53704.

April 17, **Great Bay Radio Assoc. Hamfest-Fleamarket,** Somersworth, NH. Contact Great Bay Radio Assoc., Rt. 16, Dover, NH 03820, or call Dick Sedgewick, N1EX, at 603-742-3703.

April 17-18, **ARRL Mississippi State Convention,** Jackson, MS. Contact Don Elder, KC5VD, 2806 N. Mill St., Jackson, MS 39216, telephone 601-362-0336.

April 23, **Dayton Hamvention BASH,** Convention Center, Dayton, OH. Contact Miami Valley FM Assoc., P.O. Box 263, Dayton, OH 45401.

April 24, **Bemidji ARC Swapfest,** Bemidji, MN. Contact Bill Williams, WAØABX, Route 1 Box 369J-3, Bemidji, MN 56601, or call 218-751-9070.

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Tidbits

Microphones And Headphones

Novice operating privileges do not include voice emissions, but many Novices have an interest in mikes because they use them in other radio services. Also, Novices need to know basic facts about mikes to help them pass upgrading FCC examinations. One of the best brochures I have seen on this subject is Telex Form AP2460, *Clean and Clear.* This 16-page, free pamphlet can be requested from Telex Communications, Inc., 8601 N. E. Highway 6, Lincoln, Nebraska 68505. It includes brief but useful basic descriptions of how balanced armature, carbon, dynamic, electret, and magnetic microphones function. A table is used to show relative ratings of these types of microphones with regard to cost, **E**lectro**M**agnet**i**c **I**nterference (EMI) immunity, element size, frequency response, intelligibility, noise cancelling, primary advantage, shock resistance, and weight. Microphone subjects covered by this booklet include distortion, electrical interference, frequency response, noise cancelling, noise interference, and rising frequency response theory. Headphone factors such as basic considerations, comfort, noise attenuation, and response are detailed in this brochure, plus a brief discussion about the advantages of using headsets (combined headphones and microphone). This brochure is specifically written for pilots, but most of the material in it is also useful to amateurs.

The **F**ederal **A**viation **A**dministration (FAA) issues **T**echnical **S**tandards **O**rders (TSOs) for a variety of aviation equipment. FAA TSO *C-57* covers headphones and TSO *C-58* details microphone requirements. Both of these TSOs refer to documents published by the **R**adio **T**echnical **C**ommission for **A**eronautics (RTCA) for specific requirements. RTCA *100-54/DO-60*, as amended by RTCA *256-58/EC-366*, outlines environmental test procedures for headphones, microphones, and speakers. RTCA *257-58/DO-90* details requirements for aircraft headphones and speakers. RTCA *258-58/DO-91* states requirements for aircraft microphones. It should be possible to obtain copies of these RTCA documents by sending your written request to RTCA at 1717 H Street N.W., Washington, D.C. 20006. The RTCA telephone number is 202-296-0484. The FAA TSOs may be available from the FAA office listed in your local telephone directory; if not, you could write to FAA, Washington, D.C. 20591. This additional information is included in the item to enable those who want more details to obtain them easily and quickly. The FAA TSOs are expected to be updated by the time this item is printed.

Woody Hester, WD9IFF, conducts a continuous amateur radio forum to help Novices upgrade to higher licenses. This Novice column is required reading each month by his students in Springfield, Illinois. Mike Klever, KA9DCZ, and Rich Westenberger, KA9KTQ, were operating in the 1981 ARRL Field Day Contest when this picture was taken. Both are members of the Sangamon Valley Radio Club, and they were in Woody's group.

A transducer is a device that changes one form of energy into another form of energy. Since headphones and microphones interchange electrical and acoustic energies, they are electroacoustic transducers. When we speak, we create areas of high pressures (compactions) and low pressures (rarefactions). When these acoustic compression waves are impressed on a microphone diaphragm, essentially equivalent electrical voltage changes are produced, and they are applied to the associated electronic equipment, where they are amplified and otherwise processed as necessary. A headphone simply reverses the microphone function; it converts electrical impulses into acoustic compression waves (sound) as the electrical signal causes the headphone diaphragm to mechanically vibrate. Older terms for a headphone include phone and head receiver. Since a pair of these devices is commonly used to impart sound to both of the operator's ears, reference is normally made to headphones. The term headset was accepted for decades to mean a pair of headphones, but it now more commonly denotes a combination device including a boom microphone and one or two headphones mounted on the same frame.

Queen Mary Amateur Radio Station

The March 1981 Novice column includes coverage of the operation of amateur radio station W6RO aboard the Queen Mary, which is permanently berthed in Long Beach, California, as a convention center, hotel, and tourist attraction. Several of my friends operate W6RO on a regular basis, and most of their operation is in the Novice bands. The station is active between 9 a.m. and 5 p.m. local (California) time seven days per week, plus 5 to 7 p.m. Tuesday evenings. Code operation is emphasized from 5 to 7 p.m. Tuesdays, plus 1 to 5 p.m. (California time) on the second Friday and Saturday of each month. W6RO is active on one or more of the Novice bands from 9 a.m. to 5 p.m. on the second Monday, 1 to 5 p.m. on the second Wednesday, and 9 a.m. to 1 p.m. on the third Saturday of each month. Operation is usually on more than one band at the same time, since several rigs and antennas are used.

W6RO is manned by 115 volunteers who each donate at least four hours time per month. Some of these volunteers travel more than 100 miles (round trip) to operate W6RO. Hundreds of guest operators have made contacts from the Queen Mary. Each visiting amateur is limited to 30 minutes operating time, and you must present your valid and appropriate (American or reciprocal) license to operate W6RO. This Queen Mary operation provides some introduction to amateur radio for many visitors to this attraction. Since all W6RO operation is on emergency power, this station is always available

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Stability:	Within 50Hz/one hour
Power requirements:	AC 100/117/220/240V, 50/60Hz, 50VA
Dimensions and Weight:	340mm(W)×140mm(H)×300mm(D); Approx. 7.5kg
Preset memory (Option):	24ch.
Frequency stability:	Less than 50Hz per hour after warming up.
Image rejection ratio:	70dB or more
IF rejection ratio:	70dB or more
Input impedance:	50 to 75 ohms, unbalanced
AF outputs:	
Speaker output:	1W or more (4 ohms)
Record/line output:	1mW or more (600 ohms)

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NRD-515

Best for 59

Transmitter, NSD-515

SPECIFICATIONS

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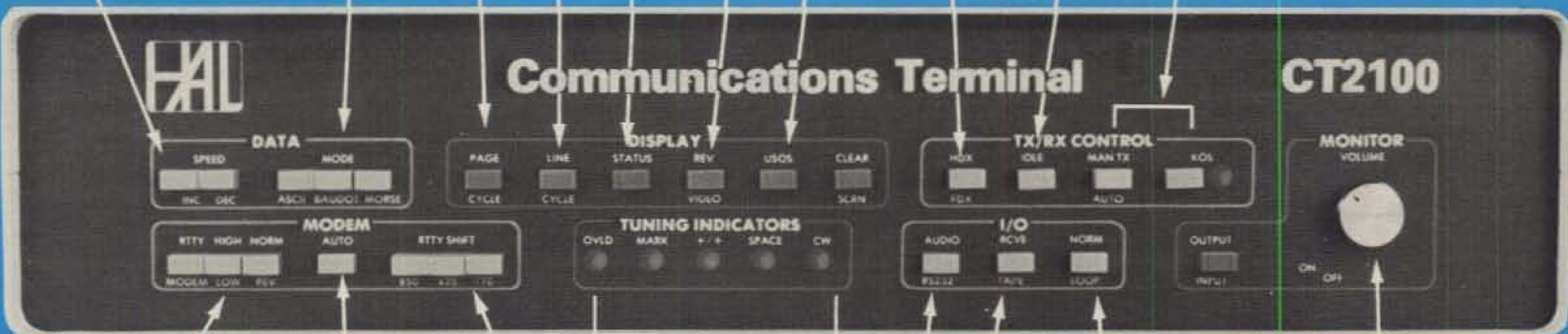

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CIRCLE 10 ON READER SERVICE CARD

to handle communications during emergencies.

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I wish you luck in contacting W6RO, and you are invited to visit the radio shack whenever you visit the Queen Mary.

A Private Field Day

Terry Scarbrough, KA9GZH, told me about his first field day experience while he was a Novice. It is unusual and interesting enough to be included in this column.

Terry and his cousin David Adcock, KA9EQG, planned to join the 1980 ARRL Field Day (FD) activities of the Galesburg, Illinois Amateur Radio Club. However, they got mixed up on the date and did not participate in the club's FD activity. Undaunted, they decided to hold their own mini-FD. They gathered the radio gear, tent, tables, chairs, antennas, lights, coaxial cable, tools, logging material, food, and all the rest of the material they thought would be needed to conduct a private FD exercise. Dave talked his mother into printing special QSL cards at no cost to them for their FD use. Ed Neel, WB9GQW, loaned them a 1500-watt gas-driven ac generator, plus a 150-foot-long heavy-duty power cord. Dave's future in-laws gave them permission to operate from a remote part of a farm located between Abingdon and Galesburg, Illinois. Their FD site had a lot of trees that could be used to support antennas.

Terry and Dave loaded all the items into Dave's old Buick and drove to their FD location at about 9 a.m. on their chosen Saturday morning. They could not completely disassemble the vertical antenna, so Terry held a 12-foot section of it above the roof of the car as they rode the 6 miles. Terry said he felt like a Knight of the Round Table carrying his rusty spear aloft as he rode a yellow mount into battle.

They arrived at the field day site without incident, and the station setup was much faster and easier than anticipated. These two new amateurs did a remarkably good job of preparing for their event. They erected a ground-mounted vertical

Here is Mel Best, KA9IXM, who operates from Albany, Wisconsin. He is a 31-year-old dairy farmer. He obtained his Novice ticket in July 1980 with the help of Scott Feldt, WD9DYH. Mel has worked all states and more than 40 countries. His station includes a Ten-Tec Omni-D transceiver, a 10-meter dipole, and a trap dipole for 15, 40, and 80 meters. Mel has the RCC (Rag Chewer's Certificate) and an ARRL 10 w.p.m. code proficiency certificate. I am one of Mel's recent contacts. Mel is a CQ subscriber, and he advises that he particularly enjoys this column. His major operating interests are rag chewing (chatting) and working DX (foreign stations).

for use on 10, 15, and 40 meters with Dave's Kenwood TS-520-SE transceiver. They then assembled an 80-meter dipole from a 50-foot length of old RG-8/U coax, 14-gage wire, and plexiglass insulators that were fabricated at the FD site. They suspended this dipole between two huge oak trees for use with Terry's Ten-Tec 570 transceiver. A quick check disclosed that the antennas were functioning satisfactorily on all four Novice bands.

Setup and checkout was completed in time to let them start operating at noon. Ten meters was very poor and 15 was not much better, so Dave started on the 40-meter band, which was fairly active. Terry was hearing very few signals on 80 meters, and the amateurs he did hear did not respond to his calls. Also, the s.w.r. had skyrocketed to full-scale reading, so he knew he had antenna trouble. As he was moving around to check the installation, he tripped over the coax transmission line and heard the band come alive on his receiver section. Investigation disclosed that a faulty solder job in the coax connector had separated, causing the center conductor connection to be lost. This problem was quickly repaired, and 80-meter operating results became good.

Their private FD operation ran smoothly for a while, but then Dave noticed that the transmitter section of his TS-520-SE was going bad (even a Rolls-Royce can get a flat tire). He left it in the receive (only) mode while trying to spot the trouble, and he soon noticed delicate puffs of white smoke coming out of his rig. The smoke was laced with streaks of blue smoke; it was pretty smoke, but it signalled the end of that rig's usefulness in their FD. Terry talked Dave out of committing suicide over his rig's demise, and the two of them took one-hour-long turns operating the 570 until the 24 hours were gone. Their lights attracted bugs from several nearby counties, and they finally resorted to leaving the lights off except when writing contact entries in the log.

Terry and Dave learned a lot from their exercise in setting up and operating an amateur radio station under emergency conditions. They had a good time and they made a lot of contacts. Both of them urge you to participate in real ARRL Field Day contests on the last weekend of each June. They also strongly recommend two (or more) local amateurs pooling their talents, resources, and efforts to check out their emergency communications capability. Try it and you will like it. Terry is still waiting for the tiny red bugs that ride on the fiduciary (pointer) of his 570's frequency scale to find some other home.

Participation in such emergency communication exercises provides invaluable experience that can enable you to be useful in your community when a real disaster strikes. Many amateurs maintain a handy list of the items needed in such situations and keep them on hand. Pre-assembled dipoles (complete with feedlines, connectors, and suspension cords) are often useful in emergencies. Light and highly portable gas-driven generators provide enough power for emergency amateur radio stations. Solar cell panels and wind-driven generators can be used when no commercial power is available. One of the most important contributions amateurs can provide is dependable radio communication during emergencies. As I used to tell the boys when I was a Scoutmaster, "Be prepared."

Photographs Wanted

Black-and-white photographs of Novices in their shacks are frequently included in this column. The size of the submitted photograph is unimportant but it must have reasonably good definition, contrast, and subject matter. Color pictures can be used, but black-and-white photographs are preferred. A brief summary of operating activities and achievements, plus a personal self-introduction, are needed with each picture. Photographs are not returned unless they are accompanied by a request for their return, plus a self-addressed and stamped envelope. A free one-year *CQ* renewal or new subscription (please state which) is awarded to the amateur who sends the picture I select as the winner for the month. One award is made each month, no matter how many photographs are printed.

73, Bill, W6DDB

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Here is the April "Story of The Month" as told by Roy:

Roy V. Glasscock, KØDJC All Counties #261, 12-14-79

"I was born in Bono, Arkansas on August 19, 1906. When I was 2 years old, we moved to Beggs, Oklahoma where my father and grandfather ran a sawmill. In 1910, my grandfather died and we moved to St. Louis, Missouri, where my father entered medical school. I was educated in the public school system in St. Louis.

"When I was 16, in 1922, I began building crystal sets, winding coils on Quaker Oats boxes. When tubes became popular, I tinkered with them for a few years. Then I gave it all up until 1931 when I was working at City Hospital and met a doctor who was working on an amateur transmitter and needed some help. That brought me back into the amateur radio hobby for awhile.

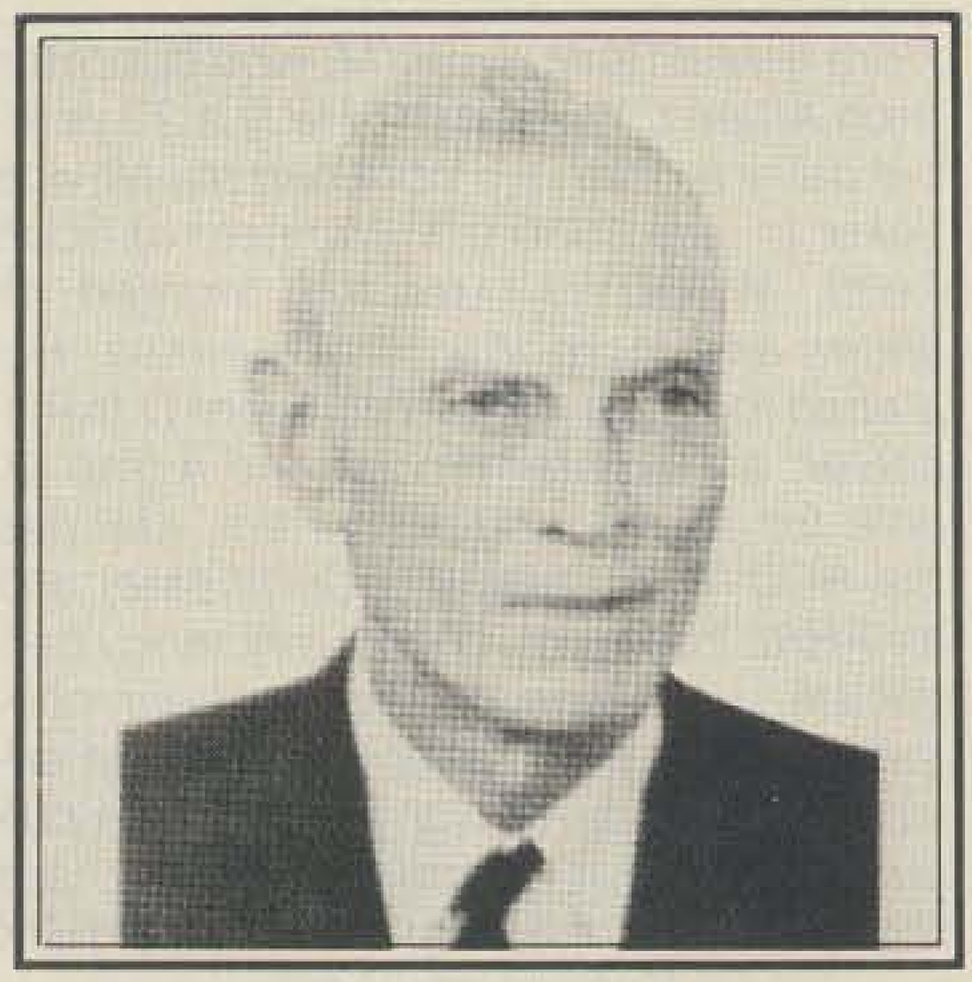
"In 1933, I met my wife, who was a nurse at the hospital, and we were married that year. We had three sons born in the next few years, Jim in 1934, Roy in 1936, and Lloyd in 1938.

"During the depression years my time was devoted to earning a living, and radio was not in my plans at that time. The depression ended in World War II, and I spent those years working for a small company making airplanes and parts. After the war I left McDonnell Aircraft to work in another field.

"In 1938, while moving into my present home, the moving company broke my refrigerator, and I had to purchase a new one. The salesman was H.M. Lewis, WØQLR. Lew and I became good friends, and during the war we kept in touch and shared our ideas. Lew was hurt during the war, and after his discharge we began to build an amateur station for him in my basement. Through his persistence, I finally began to study for my license.

"On December 12, 1955 my Novice license came and I was finally on my way. My two oldest boys were away in the Navy at the time, and the youngest, Lloyd, was still at home. He got his Novice ticket at about the same time (KØGEN) and there were two of us on the air from here.

P.O. Box 73, Rochelle Park, NJ 07662



Roy V. Glasscock, KØDJC, All Counties #261, 12-14-79.

"In 1958, Jim, WØFF (KØRTH), came home from the Navy with a new wife. A few months later, Roy, Jr., KØOQI, followed.

"Between Lew and myself, we managed to get them and the XYL, Evelyn, all started, and in the fall of 1958 the following licenses were all issued at 3418 Manhattan Avenue, St. Louis: Myself, KØDJC; Evelyn (XYL), KØRHF; Jim, KØRTH (WØFF); Roy, Jr., KØOQI; Lloyd, KØGEN; Deloris, KØRRO (XYL of Jim); and then Lloyd's wife, Pam, rounded it out when she became KØOTN.

"With seven hams in the family and only one transmitter, it became a race to the rig everyday. The seat at the operating desk never cooled off. All manner of deceptive practices were used to get to the rig; many wrestling matches were held at the door to the basement leading to the shack.

"Lloyd, KØGEN, and Pam, KØOTN, were a Navy family and left St. Louis for many bases in the next 20 years. Their home is now in Coos Bay, Oregon.

"Roy, Jr., KØOQI, lives in South St. Louis, where his second oldest son has his Novice license, KAØHFE.

"Jim, WØFF, lives next door. He and Deloris, KØRRO, have one more addition to the ham family; two years ago their youngest daughter, Sandra (Sam), WBØUDS, hit the air.

"Evelyn, KØRHF, became a silent key on December 1, 1969."

"Jim and Deloris brought County Hunting into the house, and in 1964 started me hunting counties on the old 40 meter net. Things got in the way, and a couple of years went by and my old gear went kaput. One day Jim brought a Kenwood TS 520 and an L4B amplifier into the house, and we went back to hunting counties.

"Art, WØBK, was a continuing help with my efforts. He made a trip to Monomie County, Michigan, just to give me my last county. How do you ever thank a friend like that?

"Many hours of pleasure and aggravation were derived from the net, and many fine friends were made, which is the most important thing in the long run. It's a hard habit to break, but I am not planning a second go-around. I'm very proud that I have made All Counties #261 and want to thank *everyone* out there who actually made an almost impossible task obtainable and enjoyable."

USA-CA Honor Roll

3000		2000		500	
N4CTH	382	N4CTH	500	K9WZ	1678
				JA2BJW	1679
		1500		N4CTH	1680
2500		N4CTH	562	OE8MOK	1681
KA1SF	442				
W1JR	443	**1000**			
N4CTH	444	N4CTH	693		

Awards Issued

Vic Ballerini, N4CTH (ex-K1VKY), waited until he had them All and sent for USA-CA-500 through All Counties, endorsed All S.S.B.

Jim Elwell, W1VJ, added to his fine collection All Counties endorsed Mixed.

Clem Lambert, KA1SF (ex-WB1DQA), keeps plugging away and obtained USA-CA-2500 endorsed All S.S.B., All 14.

Joe Reisert, W1JR (ex-W2HQL, WA6TGY, W6FZJ, W1JAA), gave me his paper work for USA-CA-2500 endorsed Mixed.

USA-CA-500 certificates, endorsed Mixed, went to:

Dr. Hobart E. Freeman, K9WZ.

Junpei "Jun" Okamura, JA2BJW.

Max Orasch, OE8MOK, applied for USA-CA-500 endorsed All S.S.B. (this #7 to Austria and #1 to OE8).

Special Honor Roll
All Counties

#355 Victor Ballerini, N4CTH 12-23-81.
#356 James Elwell, Sr.,W1VJ 12-28-81.

Awards

Arbor Day Commemorative Certificate: A Special Events Station will be operated from the Nebraska State Arbor Lodge, former home of J. Sterling Morton, founder of Arbor Day, in Nebraska City, Nebraska, Tree City USA, during the annual Arbor Day Celebration. This station, in addition to other club member stations, will be operating in the General portion of the phone and c.w. bands on 80 through 10 meters from 2400 UTC April 23 to 0600 UTC April 26. All amateurs contacting this station or any other club member station during this time will be eligible to receive an Arbor Day Commemorative Certificate from the Nebraska City Amateur Radio Club. Please send one dollar and a business-size self-addressed envelope to: John A. Royal, WØGRB, P.O. Box 146, Nehawka, Nebraska 68413.

The San Cristobal DX Radio Club Awards (Venezuela):

1. *San Cristobal Award:* DX stations need to contact 2 San Cristobal amateurs (YV2).

2. *All YV Award:* Contacts with all YV districts (1 through 0), the YVØ (Aves Island), can be substituted for any other district.

3. *100–200–300 YV Award:* Contacts with 100–200–300 YV amateurs. Contacts with YV2AJ, the local radio club, 20 points; contacts with YVØ, 10 points; contacts with San Cristobal amateurs, 5 points; any other YV, 1 point.

4. *The Islands Award:* Contacts with 30 islands, YVØ (Aves Island), 5 points; others 1 point.

5. *The Caribbean Award:* 20 contacts with stations in the Caribbean area, YV included.

6. *DXpeditions Award:* Work 20 DXpeditions including YVØ (Aves Island).

7. *The South American Award:* Work all South American Countries (13): YV, HK, HC, CP, OA, CE, LU, CX, PY, ZP, 8R, FY, PZ.

8. *50–100 South American Award:* 50 or 100 contacts with South American amateurs, YV included.

Rules: The Awards will be issued to any amateur or listener on payment of a fee of 8 IRCs or $2.00. Endorsements will be added on request. Each claim must be accompanied by a list showing data of the contacts achieved for the Award concerned, and each list must be accompanied by documentary proof in the form of letters or cards or certification by two amateurs that the necessary cards have been checked. All correspondence must be sent to: Awards Manager, YV2BYT, Alberto Guarino, P.O. Box 494, San Cristobal 5001 A, Venezuela, South America.

73 DX Country Award.

73 DX Country Club Award: The editors of *73 Magazine* have instituted a fine Awards program, and here are the rules for this Award:

1. The Award is available to licensed amateurs throughout the world.

2. To be valid, all contacts claimed must be made in a *single calendar year* (January 1 through December 31) beginning January 1, 1979.

3. This Award is issued for All Phone, All C.W., and Mixed Modes. Should you wish to recognize a single-band or mixed-band accomplishment, merely state your request when submitting your application.

4. To qualify for any of the *73* DX Country Club Awards, a minimum of 73 DX countries must be worked and confirmed from the *73 Magazine* Work The World DX List. Remember, all contacts must be made in the same calendar year for which the application is made.

5. Annual endorsement stickers are available for each succeeding year in which application is made and showing a minimum of 73 countries worked.

6. To apply, prepare a list of claimed contacts in prefix order, include each station's callsign, date, and time in GMT, mode, and band of operation.

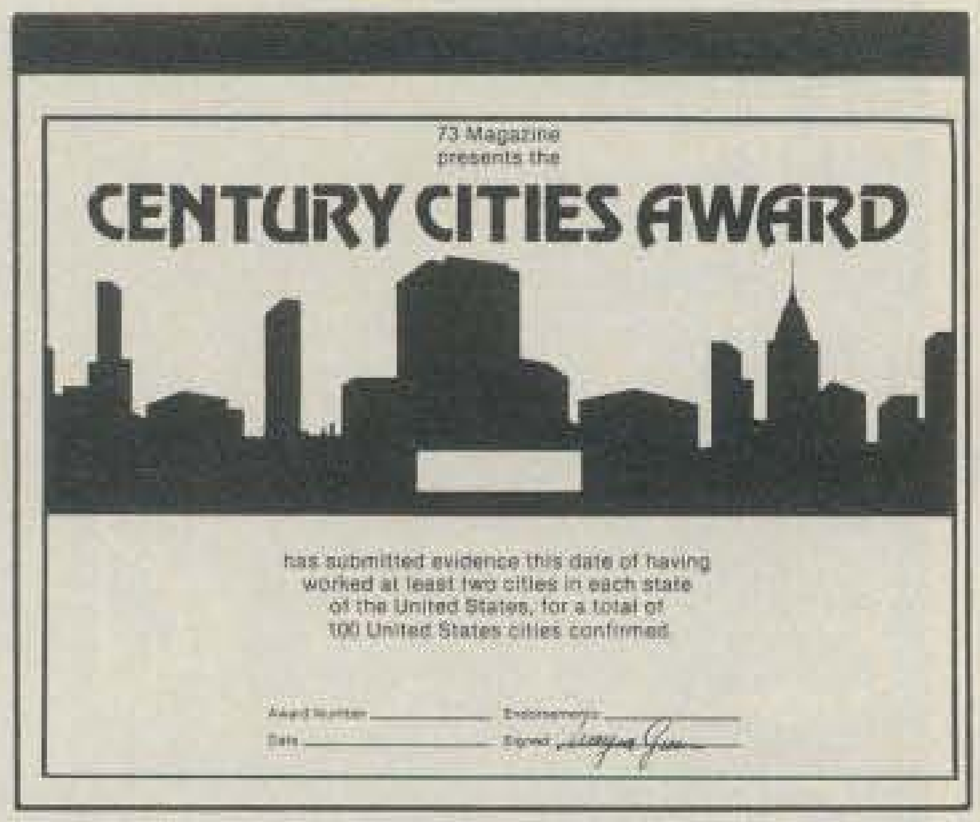
7. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local club secretary, or a notary public.

8. Award fee is $4.00, or 12 IRCs, for each award. Endorsements are granted for a fee of $2.00, or 6 IRCs.

9. For all *73* Award applications, enclose your verified list and award fee/fees to: Bill Gosney, KE7C, *73* Awards Editor, 2665 North Busby Road, Oak Harbor, Whidbey Island, Washington 98277 USA.

Century Cities Award: Also sponsored by *73 Magazine*, and all contacts must be made on or after January 1, 1979 to be valid.

1. The applicant must work and con-



73 Century Cities Award.

firm a minimum of two cities or towns in each of the 50 US states, for a total of 100.

2. To apply, prepare a list of claimed contacts in alphabetical order by state. Include the full callsign of the station worked, the date, the band, and the city. Beginning with Alabama, your list will look something like this: Alabama, W4ZZZ, March 31, 1979, 14 MHz; Decatur, N4XXY, February 1, 1979, 21 MHz, Mobile; and so on.

3. Do not send QSL cards! Have your list of claimed contacts verified by two amateurs, a radio club secretary, or a notary public.

4. Enclose your list, a fee of $4.00, or 12 IRCs, and send to Bill, KE7C.

The 88 Certificate.

The 88 Certificate: The Dutch-YL-Club was started on 9 May 1981 and is affiliated with VERON, and they are the sponsors of this award. Rules are as follows. H.f.: Eu-DYLC members count 8 points; non-members of DYLC, but still Netherlands YLs, count 4 points. DX: All Netherlands YLs plus the members of DYLC, 11 points. V.h.f.: All DYLC members 4 points; non-DYLC members but still Netherlands YL, 2 points. Sponsored YLs do not count for the certificate.

Submit proof of having established two-way radio contacts with Dutch YLs or members of DYLC. Each contact is awarded with a number of points and applicant must earn a minimum of 88 points. (Same rules apply for s.w.l.'s.) Only QSOs from 9th May 1981 on are valid. Have list certified by two other amateurs, club officer, or notary public. Cost is 8 IRCs. Apply to: Awards Manager, M. Wolf-Wildeboer, Polotenweg 14-b, 8303 EJ Emmeloord, The Netherlands.

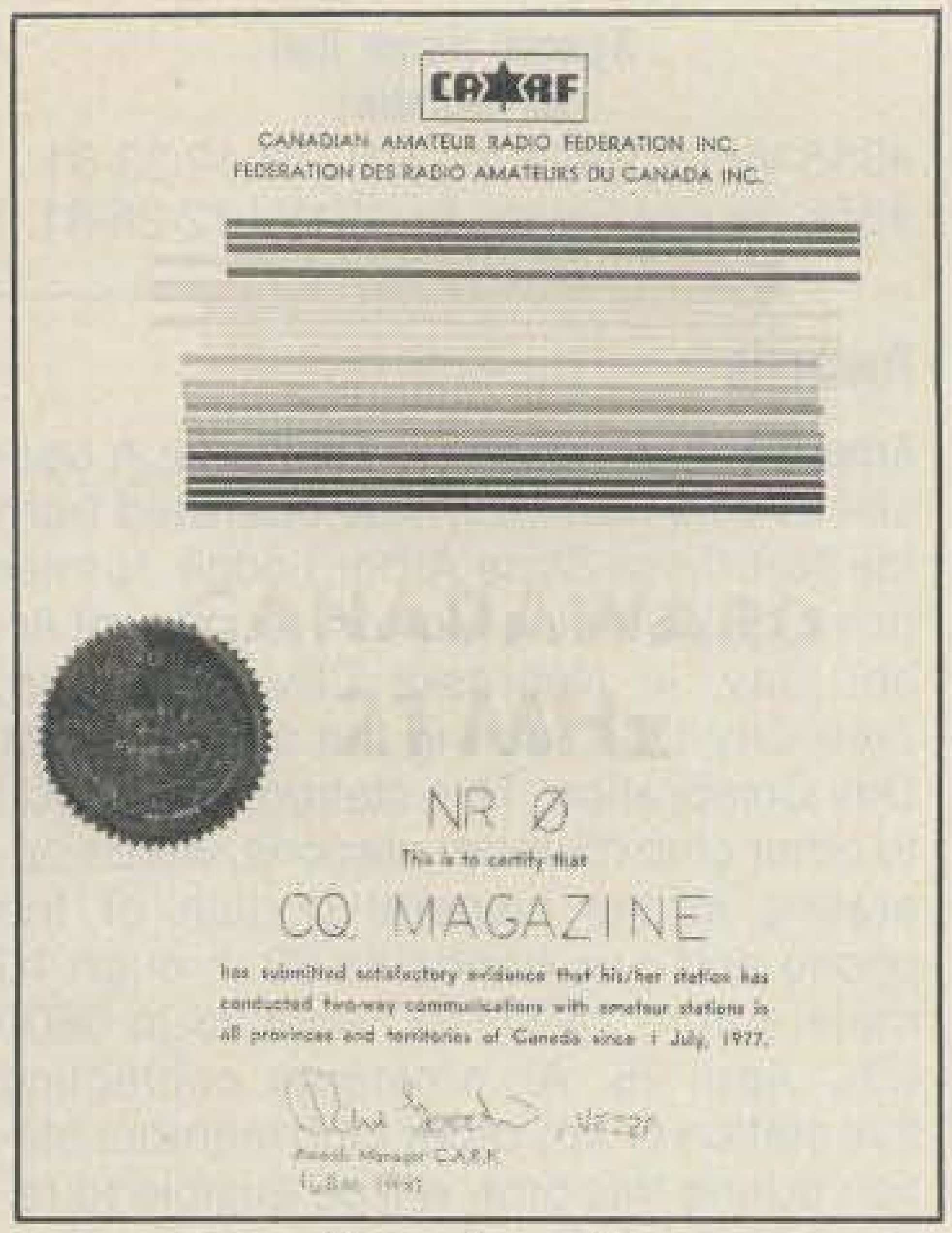
Shogun Award.

Shogun Award: Sponsored by the Crazy Awards Hunters Club to all licensed radio amateurs and s.w.l.'s for confirmation of QSOs with stations whose first letter of their prefix forms the letters **S H O G U N**, such as **S**M, **S**P, **S**T, etc.; **H**K, **H**L, **H**P, etc.; **O**A, **O**K, **O**R, etc.; **G**, **G**M, **G**W, etc.; **U**A, **U**K, **U**B, etc.; **N**, **N**P, **N**H, etc. Send full log data, certified by two other amateurs, club officer, or a notary public and 10 IRCs to: Awards Manager, Tahihei "Yasu" Myogan, JI1SPX, 2506 Chogo, Fujisawa, 252 Japan.

Canadawards: The Canadian Amateur Radio Federation is pleased to announce the following awards available to all radio amateurs worldwide.

Canadaward: A colorful certificate will be issued to any amateur who confirms two-way QSOs with all Canadian Provinces and Territories. All QSOs must be on one band only. Separate awards are issued for each band on which the applicant qualifies (12 cards per band). A mode endorsement is available if all QSOs are made on the same mode (c.w., s.s.b., RTTY, SSTV). Contacts made after July 1, 1977 *only* will count for this award. Submit the 12 cards with two dollars ($2.00) Canadian or U.S. funds or 10 IRCs plus sufficient funds for return postage.

5 Band Canadaward: A special plaque is available to any amateur who confirms two-way QSOs with all Canadian Provinces and Territories on each of five separate bands (total of 60 cards, 12 cards per band). Contacts made after July 1, 1977 *only* will count for this award. Submit the 60 cards with $25.00 Canadian or U.S. funds plus sufficient funds for return postage.



Canadaward.

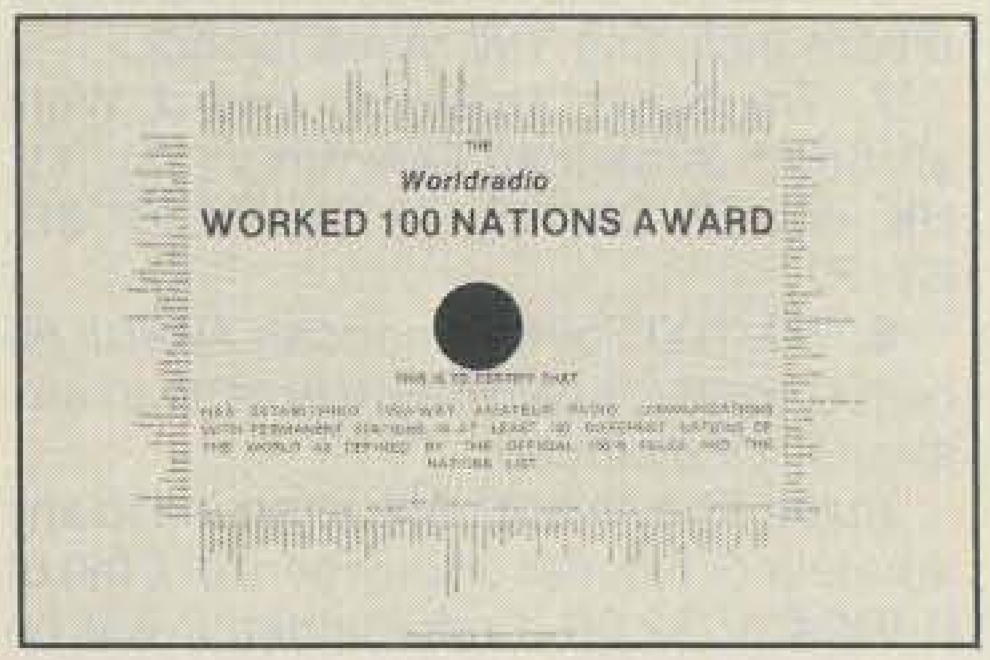
Canadian Provinces & Territories

VO1/VO2 Newfoundland/Labrador
VE1 Prince Edward Island
VE1 Nova Scotia
VE1 New Brunswick
VE2 Quebec
VE3 Ontario
VE4 Manitoba
VE5 Saskatchewan
VE6 Alberta
VE7 British Columbia
VE8 Northwest Territories
VY1 Yukon Territory

Note: VO2, Labrador, is part of the Province of Newfoundland and counts for Newfoundland.

All amateur bands may be used. Each distinct satellite mode (432 in/144 out, 144 in/29 out, 144 in/432 out, etc.) will count as a separate band.

Mail applications for Canadawards to: P.O. Box 2172, Station D, Ottawa, Ontario, Canada K1P 5W4. (Thanks to Dave, VE2ZP, for this data.)



The Worldradio 100 Nations Award (Details March CQ or via s.a.s.e. to N6JM).

Notes

A reminder that as of 1 January 1982 applications for All Counties must list/include Cibola County, New Mexico. This was split from Valencia County June 20, 1981, but I did not require it for All Counties until 1 January '82.

I'm unhappy to report that although Molly, WD4IUY, claims to have up-graded from Novice to General in October, the FCC tells me (in writing) that she is still listed as a Novice. Until I see a copy of her General license, do *not* use her QSOs for USA-CA.

Although WB2HTX did upgrade from Novice in November 1981, due to the fact that he did operate on the 14336 Net while still a Novice, do *not* use QSOs with him for USA-CA.

Sad to report the loss of another friend/County Hunter, Patricia L. Smith, WA7GMX, All Counties #144, story March 1977.

To those who do not already know how to save money on postage while County Hunting, write to Dave, W6CCM, with an s.a.s.e. to get complete data on his Mobile QSL Bureau. Also for data on Mobile QSL cards and many other helpful booklets for County Hunting, write (with s.a.s.e.) to WØOWY.

Now that I've had a chance to peruse the *Directory of Certificates and Awards* sold by KB7SB, I no longer feel that the price plus postage is out of line.

As this is being written the first week in January, I'd like to thank all for their Christmas cards, and I repeat that I wish I had several secretaries (not necessarily blonds) so I could send each and every one of you a nice letter and card.

73, Ed, W2GT

a monthly feature by
HUGH CASSIDY, WA6AUD

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

They spoke, I think, of cycles past.
They spoke, I think, of DX at last.
But one thing I remember:
Spring came on forever. . . .

Now that it is April and the days are warm again, we were thinking of working on the beam. But before we got too far into work and away from DXing, we were saved by one of the local types who came trotting up the hill. When a DXer comes trotting, you can be sure that he has something on his mind. We were not long in waiting to find out what it was.

"You know something," this Deserving DX type said as soon as he got within range, "I've been thinking. It seems to me that DX is a multifaceted endeavor and the cogencies of human experience in the quest for DX often remain elusive. Don't you think so?"

Should you think that this one had us cornered, even for a brief moment, you are possibly not yet a true-blue DXer, for true-blue DXers always have strong opinions on everything, the keenest of insight into the most obstruse concepts, and a programmed response for almost every eventuality. One learns as a DXer that there are many sides to any question, and a quick shift can align one on the side of the absolutes. Before this local QRP type was firmly seated in his chair, his obviously suppressed anticipation indicating that he hoped to have us in a bind, we were off on a tangent. First we had to appear thoughtful; then we spoke.

"You know something," we said, "you are probably right. Why it even reminds us of something that Albert would often say in the long hours of the night." And before he could start to even get a word in, we seized a sheet of paper and wrote:

$$E = DX^2$$

"There!" we said, working hard to keep the flourish out of our voices, "there is what Albert would say about the subject. And while you may have heard of some of this other quantums, this is the foundation one for DXers. This one ranks with the Eternal Enigmas and the Mysteries of the Ages. Maybe even more so!"

77 Coleman Dr., San Rafael, CA 94901

Philip Greentree, VK2DPN, perched atop his operating position from which he worked the first ever WAZ Mobile. Philip first got a Novice license in February 1980, with full privileges later that year. By mid-1981 he had the WAZ Mobile worked. With Single Band WAZ almost in hand for 10/15/20 meters and a good start for 40/80 meters, it can be expected that there will be a 5B WAZ Mobile showing shortly. The antenna on the rear bumper—those are resonators for 15 and 80 meters. He changes the 80 meter resonator for one on 40 as needed. A helical whip does for 10 meters and a whip for 20. What else helps? If you were to see that necktie in full glowing colors, you'd know what it takes to get attention.

We were figuring that perhaps we had him, for he was fumbling with his glasses, tilting his head back to get the tri-focals aimed. For a bit it was quiet, only the contemplative "Mmmmmmm" being heard. Finally he spoke. "Just what is that supposed to mean?"

We tried hard to conceal our delight. A questioning DXer is a confused DXer, for true-blue DXers always know everything. That's why they are true-blue. But if he was thinking we were going to give a prompt and direct answer, he was wrong. This one would have to wait.

"It's like this everlasting list argument," we said, and realized then from the quick attentive jerk of his head that we had touched his cogencies of human endeavor. "When you mention lists, you get an immediate reaction when a DXer is involved. And generally he is right. All you have to do is listen to the arguments, and you will know on what side are logic, purity, and righteousness." We leaned close to the QRP type so he could not escape us. "You understand all of this?" we said, and there was a quick nod of acknowledgement.

"You are right on track," he broke in to advise us. "Why down at the HRO luncheon just last week we old timers were talking about the same thing and the curse of lists. But . . ."

We held up our hands to stop him, for what he was going to say might not have been what we wanted to hear. As you well know, most DXers have ears carefully attuned to hearing the things they want to hear. So we continued.

There are those who would forfeit any DXCC credit for any country worked on a list operation. And there would be a ban as illegal and forsworn forevermore, the bearer of the bar sinister, any amateur station, domestic or foreign, who works from a list. Right?"

We weren't quite sure as to what was going on, but this local type was on his feet, capering around the room as though he had taken leave of his senses. His arms waved, his eyes rolled, and he was having difficulty speaking. It was obvious that we had to do something. We were quick in speaking: "And they will cancel the DXCC of anyone who is suspected of ever having worked a DX station on a list—all the way back to 1947. A clean sweep of all tainted QSLs, right?"

The capering and arm waving came to an abrupt halt. It was startling to see. Suddenly we were looking at a stranger, the eyes blank with shock, a regained voice guttural with animal rage. "Not my DXCC, you don't" he roared, "and whose side are you on anyhow?"

Gone was the serenity of logic; gone was the purity of thought. But not gone was the righteousness. So we made the needed quick shift and asked, "But what do you think about the quantum theory of DXing that Albert would often talk about. Rather interesting, yes?"

The WPX Program

Mixed

966	CT1ZR	970	JA2NDQ
967	KP4V	971	JA7MLG
968	AJ6O	972	VE3LNW
969	SM5BMB		

S.S.B.

1457	WA2VJL	1462	KB2ZQ
1458	I0SGF	1463	K0REF
1459	WB6GFJ	1464	SM5BMB
1460	N2AWM	1465	JA2NDQ
1461	I6DQE		

C. W.

2117	SM7DWY	2120	JA2NDQ
2118	SM5BMB	2121	JR7KND
2119	JH8IVO	2122	GM4GIF

Endorsements

Mixed: 450 KP4V, W5UR, AJ6O, SM5BMB, JA2NDQ, JA7MLG, VE3LNW. 500 KP4V, W5UR, AJ6O, SM5BMB, JA2NDQ, VE3LNW. 550 YU4HA, KP4V, W5UR, AJ6O, SM5BMB, JA2NDQ, VE3LNW, 600 K9TI, YU4HA, KP4V, W5UR, AJ6O, SM5BMB, JA2NDQ. 650 YU4HA, W5UR, AJ6O, SM5BMB. 700 YU4HA, W5UR, AJ6O, SM5BMB, WD9IIC. 750 AF7M, YU4HA, W5UR, AJ6O, SM5BMB. 800 YU4HA, W5UR, SM5BMB. 850 YU4HA, W5UR, SM5BMB, K9UQN. 900 YU4HA, W5UR, LA7JO. 950 YU4HA, W5UR. 1000 YU4HA, W5UR. 1050 W5UR. 1100 W5UR. 1150 W5UR. 1200 W5UR. 1900 W2NC.

S.S.B: 350 I0SGF, WB6GFJ, N2AWM, W5UR, SM5BMB, JA2NDQ. 400 I0SGF, WB6GFJ, N2AWM, W5UR, SM5BMB. 450 I0SGF, WB6GFJ, W5UR, SM5BMB, KA3A. 500 WB6GFJ, W5UR, SM5BMB. 550 WB6GFJ, W5UR, SM5BMB, JH4PRU. 600 WB6GFJ, W5UR, SM5BMB. 650 WB6GFJ, W5UR, SM5BMB. 700 WB6GFJ, W5UR, SM5BMB, DJ1YH. 750 WB6GFJ, W5UR, SM5BMB. 800 I5AFC, W5UR, KL7AF. 850 W5UR. 900 W5UR, TG4NX. 950 W2NC.

C.W.: 350 W5UR, GM3YTS, SM5BMB, JH8IVO, JA2NDQ. 400 W5UR, K8KPM, GM3YTS, SM5BMB, JH8IVO, JA2NDQ, JA3ARM. 450 W5UR, GM3YTS, SM5BMB, JH8IVO, JA2NDQ. 500 W5UR, GM3YTS, W2XQ. 550 W5UR. 600 W5UR. 650 W5UR. 700 W5UR, DJ1YH. 750 W5UR, WA1JMP. 800 W5UR, W1DMD. 850 W5UR. 1650 ON4QX.

10 meters:	W5UR, SM5BMB.
15 meters:	SM5BMB, WD9IIC.
20 meters:	W5UR, SM5BMB.
40 meters:	W5UR.
80 meters:	W5UR, AE1T.
160 meters:	W5UR.

Asia:	None.
Africa:	W5UR.
Europe:	W5UR, SM5BMB, JA2NDQ.
So. America:	W5UR.
Oceania:	AF7M, W5UR, JA2NDQ.

VPX: UB5-0683 937
Y2-5238H 500

WPX Award of Excellence Holders to Date: K6JG, W4WSF, W4CPW, WA5VDH, K6XP, WA2EAH, VE3GCO, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, K4IEX, WA2AUB, WB8CNL, W1JR, F9RM, W5UR.

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, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

We were relieved to see that we were moving to safe ground, for anger goes when confusion comes. Finally he spoke. "Yeah," he said, "that's an interesting thought. But what does it all mean?" We were able to breathe freely again.

"It's quite simple," we explained. "Long ago Albert would do a lot of heavy thinking, DX and other things, and while only some DXers know about this one, there is visible proof all around you. The years may have dimmed my memory on some of Albert's explanation, but it went something like this:

$$E\,(\text{plate power}) = DX^2$$

"Thus, if you increase your plate power, you square the DX worked. The more power, the more DX worked. Get it?"

If we were thinking that we would be thanked for taking this QRP type by the hand and leading him to the portals of enhanced DX knowledge, we were mistaken. Perhaps it might have been something we said about list operations.

"What's new about that?" he demanded. "Everyone knows that the more power you have, the more DX you work. And what has this to do with list operations anyhow?"

We had to shrug our shoulders and smile. We could not remember just what Albert had said about list operations, but we were sure that it would eventually come to us, for there are list operations which are ridiculous, and lists which are attention getters, as well as those lists which serve no purpose whatsoever.

There are instances in which a DX station would be impossible to work without the order enforced by a list operation, where language is a problem sometimes complicated by a marginal equipment situation. But we had someone on our hands who wanted a reply. "Tell me," this one demanded, "just what did your friend Albert have to say about lists? And it had better be good!"

We had to smile, for we were remembering. We quoted from the memory of the years:

> Only the seas and the stars,
> And DX lists,
> Are eternal!!

And that was it. Somehow we suspect that lists will be around as long as Albert predicted. And long ago we learned that it is easier to give than to take back. Avoid lists if they irritate you, ignore them even when they offer you a new country and remain the pure in heart, tolerate them when obviously specious. Lists will always be the hope of the low in power and the poor in DXCC counters. But then again, that's the way it has always been.

Ciskei

ZS2RM passed along the information to W1BFT that another of the South African homelands is being heard, this one being *Ciskei*, which became independent in December.

S42A was the first operation planned. As with the other homelands, there probably will be sporadic operations while discussions continue as to their validity for DXCC. As with Transkei and Bopthutaswana, these homelands may be around for awhile and eventually should be counters. All you need is the certified QSL and patience.

ZS2RM may be remembered for some Gough Islands efforts of a few years back. He still has the logs for ZD9BG and ZD9GA and reports that a lot of Gough QSLs have never been applied for. He waits.

The WAZ Program

10 Meter Phone

174	SM6LIF	177	VK2NTF
175	KB5RF	178	VE3IPR
176	N5BBO		

15 Meter Phone

112	JA8CDL	114	JR6GEJ
113	OH1AA	115	VE3IPR

20 Meter Phone

388	OH1AA	390	N6AFD
389	WA7JUJ	391	VK3DU

40 Meter Phone

13	JA9UX

80 Meter Phone

14	SM0AJU

10 Meter C.W.

27	SM0AJU	29	OH1AA
28	K1MEM		

15 Meter C.W.

58	K1MEM	60	OH1AA
59	W4WJ		

20 Meter C.W.

161	SM0AJU	162	OH1AA

All Band WAZ

S.S.B.

2343	I5VSW	2353	K5SSB
2344	G3RUR	2354	K0REF
2345	AB6R	2355	W6PN
2346	VE3LNW	2356	WB6GFJ
2347	VE3JPJ	2357	W5KC
2348	W3KBZ	2358	JA2CXK
2349	W4UW	2359	JA2NDQ
2350	N1AKX	2360	DA1MV
2351	VK2DXH	2361	K5IH
2352	N4EDT		

C.W. and Phone

5275	JA1JXR	5281	JG1IMM
5276	W4MPY	5282	KA2AA
5277	I3YEG	5283	F6FSQ
5278	N6VO	5284	W0UBT
5279	W1OCV	5285	KC9R
5280	K3TW		

All Phone

576	K1LJT

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

Kermedec

In early January, San Hutson, K5YY, and Ron Wright, ZL1AMO, were marking time on their plans for Kermedec. San noted that while they had been issued the callsign ZL0AEQ, they were unable to obtain landing permission from the New Zealand government agencies.

At this time neither San or Ron have forgotten Kermedec, but they are thinking that any action will be late this year when spring is returning to the Antipodes and boat travel has a few less problems there in the western South Pacific. Kermedec and Raoul Islands are north of New Zealand, being above-water bits of land on a long ridge that runs all the way from New Zealand to the Tongas. East of Kermedec the ocean floor plunges down to over 10,000 feet in the Kermedec Trench.

Visalia DX International

Back at the Holiday Inn again this year, this big annual meeting of DXers will be the weekend following Easter Sunday, or over the weekend of April 17–18th.

Actually, DXers start to gather on Friday, April 16th, not being able to get enough of a good thing. The Southern California DX Club will be the host club this year, and the plans are for more of everything plus a few innovations.

Reservations should be made early, as they often run out of space close to the big weekend.

KF1O/CEØX

Back in October there was supposed to be an operation from San Felix with the KF1O/CEØX callsign. The Radio Club de Chile has written the ARRL raising questions on this operation.

Rogelio Gomez Fernandez, CE3GF, and Patricio Fernandez H., CE3GN, signed the letter to the ARRL noting the following points:

1. The holder of the KF1O callsign never set foot on San Felix Island.
2. The only Chilean license issued to Mr. Read was WB1GDQ/CE3, and this license only authorized operation from the Chilean mainland. This license was subsequently cancelled.
3. There was no contract with the Chilean Naval authorities to perform electronic survey work on San Felix.
4. The supposed operation must have taken place with a portable rig somewhere between Valparaiso and Santiago. Such a location would make it almost impossible for U.S. amateurs to determine whether the signal was from the mainland or from San Felix.

The officers of the Radio Club de Chile derided reports published after the trip, these being purported details of security clearances, clandestine operation, and other covert happenings. After using up two pages to lay the deadwood on the operation, the Radio Club de Chile was strongly asking for disciplinary action to be taken in this instance. Well, there's the Chilean section heard from. Though the language was proper and obviously restrained, there could be little doubt from reading their letter as to just how they were feeling. Incidentally, CE3GF and CE3GN signed the letter as President and Director, respectively, of the Radio Club de Chile.

5H3AP—Tanzania

Ian Miller used to hold this callsign when he was a resident in Morogoro. But Ian says that he turned in the license to the Tanzanian authorities back in 1975, then left the country in 1977. Thus, he has a strong inclination towards the belief that anyone who has worked 5H3AP since 1975 is not working the true-blue Ian, but East Africa Slim.

Iam notes that he has been receiving QSL cards for those who hunger for a 5H3 QSL, these being forwarded by the firm at which he used to work in Morogoro. This is not the first instance. One of the controllers at the Kilimanjaro Airport also tried the call for size but was nailed by the Kenya Radio Society.

Ian Miller now lives in Spain, at Alicante in the Valencia area. He appears to be a bit incensed over the use of his call, a bit more so when the QSLs start to roll in.

Some Notes, DX and Otherwise

S83H heard at times from Transkei is Father Harry Houlihan, there for a good bit and right out of the El homeland. While thinking of that homeland, the Irish Radio Transmitters Society has something they call "the monthly *draw*." They say is definitely is not an elite club for retired artists. We are not quite sure how it works; these things often confuse us. But apparently you put in one Irish pound each and every month when the Club Committee meets, and they declare a dividend or something. Being one of the purer types who never even thinks of working a DX list, we are not a fount of information on this one, but EI7CC is right in there with tickets between each finger on both hands. Peter is the one who knows about this. And apparently the IRTS pulls enough to help keep club dues down. All this shows what you can learn reading a DX column.

San Hutson, K5YY, has stepped down after two years as chairman of the ARRL DX Advisory Committee. (Elsewhere we mentioned his delay on the proposed Kermedec plans.) San is a doctor, and a couple of years back he took on a contract on an hourly basis so he could take off on long trips. However, San is now thinking of returning to a full-time medical practice and suspects that this may slow up his DXing trips. As San says, "... no more four and five week DX trips as the last four trips." It sure is tough to be young and a DXer, but we understand that some are working on an idea that might improve the problem—something like premature old age.

With the flux slipping down towards the 100 mark, you might find it in the next year or so going even lower. So what does the sharp-eyed, square-jawed, heavy-thinking DXer do? He thinks of antennas for the lower frequencies.

You can be sure that one of these days 10 meters will just about disappear, 15 meters will be a pale shadow, and even 20 meters will be a vexing frequency at times. But DX will live, and all you have to do is look at the other end of the spectrum. Maybe you might even think of 80 and 160 meters. These always provide a lot of action at the bottom of the cycle.

Still the ARRL continues to warn that while new amateur bands are coming but are not yet here, there can be some thought of what it will be like when those good days of more bands for the Deserving DXer are at hand. W1BB continues to publish his *One-Sixty Bulletin* and will supply you with a free copy if you supply him with s.a.s.e. envelopes. For years some of the local DX types have been trumpeting the words of that Hero of Mafeking, Lord Baden-Powell: "Be prepared!!" If you prepare now, you will know the joy.

QCWA activity in the Los Angeles area seems to have a distinct DX tinge. Don Wallace, W6AM, is the president of the local group, while Art Munzig, W6PYV, is the secretary. Everyone knows about Don Wallace and how he was President Wilson's telegrapher in 1919 on the way to the peace conference on the USS

George Washington. We always remember that very well, as Don and we went to Europe on the same ship. We also remember Art Munzig; his sailing vessel caught fire on a return trip from Catalina a few years back, and Art and his XYL did a quick exit over the side to be picked up by a passing fishing boat.

Anyhow, if you have 25 years in the trenches and might want to see what the years have done to some noble DXers, try the QCWA gathering when you are in or around Los Angeles. It's better than racing up and down the freeways.

Jay Belfort, VQ9JB, will be on Diego Garcia until late this year, and he is active and has a QSL manager. Shari Runyan, 477 Mose Drive, Biloxi, Mississippi 39532 is handling the QSLs. Her call is WD5BHP, but she says she is only in the last couple of callbooks. Send her a QSL with s.a.s.e. and if you are in the VQ9JB log, you'll definitely be surprised.

DF4FX was handling the QSLs for 5B4JE, but unfortunately DF4FX became a Silent Key in June of last year. Aris Kaponides, 5B4JE, asks that anyone needing his QSL go direct to him: P.O. Box 1723, Limassol, Cyprus. He promises a QSL, but the loss of DF4FX has put the block on some which were sent that route.

Once in awhile we come across one of the Deserving DXers with a QSL in hand and a blank look on his face. You don't have to ask more than once to know that the QSL is not ringing out with the solid chimes that are hoped for. But how does one tell? We'd like to know that ourselves, but there are some signs which may start the caution flag up the mast.

It is rather unusual for any effort to show from an extremely rare spot without a bit, or even a whole lot, of advance publicity. Most everyone going on a DXpedition wants to wring the utmost out of the effort and bathe in publicity—all he can get. Try it yourself and you will learn to savor the moment. So if someone opens up from Peter I Island, Ernest Legouve Reef, the Milwaukee Seamount, or even the legendary Maria Theresa Reef, it might be best to keep your DX heart in your hip pocket rather than to wear it on your sleeve. If they just dropped in on the spot from an oceanographic survey, or maybe even a world cruise on their yacht, some will hint of the necessity not to tell much of anything at all about their being there. Covert operations? Well, we can't talk about things right now. Whatever the cover, and whatever your need for this rare one, toss in a good measure of skepticism, but don't try to unveil them over the air. It's hardly worth the trouble.

So what does one do? Work them first, worry later! Once you learn that, you are well on your way to understanding one of the mysteries of the ages: things are not always just what you expect them to be. Trust nothing that does not ring true-blue, especially if it is on c.w. But work everything; never pass up the opportunity.

Peter Watson, ZL3GQ, winner of 5B WAZ #17 at the operating position that brought him this award, 5B DXCC, 5B WAS, and a 6B WPX. An electrical engineer, Peter has followed amateur radio since his early school days and still finds it everlastingly intriguing. He will be in the states with his family this month, planning to attend the Dayton Hamvention and going on to the FOC Meeting at Danbury, Conn.

It hardly seems so long ago, back when Jordan was on the banned list, that one day on the bands came this deep voice signing JY1 and advising that the handle was "Huessin." Those who worked him first hardly had to worry at all later.

One final note. Rod Linkous, W7OM, who has worked in this DX vineyard for these many years, back to 1975, is stepping down for a bit, the pressure of other commitments providing him with more work than there often is time for.

Rod works for Boeing Aircraft and is often away from home on company business. He is also a Colonel in the U.S. Air Force Reserve and this take a lot of his time. Some may think that as one grows older, things grow easier, but that is not always so. Therefore, the March DX Column marks the end for awhile, although he hopes to return again in the future.

One does learn that time changes most everything, especially people, and there is little that goes on forever. The work of W7OM over the years has been recognized and appreciated, and it is with regret that we have to see him go. Best wishes to one of the true-blue DX types.

5B WAZ #17

Peter Watson, ZL3GQ, at Christchurch in New Zealand, is the winner of 5B WAZ #17. Considering the number of years that this award has been offered and the good conditions of Cycle 21, gaining 5B WAZ must be regarded as one of the toughest achievements in amateur radio.

Peter was first licensed back in 1947 while still in the lower school grades, moving up to a Grade I license the following year. In the late 1950s university studies brought an Electrical Engineering degree. Peter also acquired an XYL and a daughter, now 16 years old, and a son 14 years old. He was in London in 1970–1971 taking advanced courses, and he came back to New Zealand with a Master of Science degree with Distinction.

Peter acquired the first 5B DXCC for Oceania and the Southern Hemisphere, this being 5B DXCC #34. He also picked up 5B WAS and a 6-Band WPX. And there was the NZART's 5X5 Award for working 100 countries on 5 bands using contacts with the same station within each country. Currently he is on the verge of a double 5B DXCC.

Peter has used the Drake Twins, R4B/T4XB, adding a 75A4 and recently swapping the R4B for an R4C. He has 3/4/5 quad elements on 14/21/28 MHz plus two 160 meter dipoles about 100 feet high. In other years it has been mostly c.w. work, membership being held in the FOC, but of late there has been more emphasis on s.s.b. trying to pick up some of the needed zones.

How did he get them? Some came from contest operation. Only one 15 meter contact can be identified as a net operation. All the rest came from casual operations. Peter also gives some time to

5 Band WAZ

Standings as of January 1, 1982

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. WØSD, Edward Gray (U.S.A.)
13. KØZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SMØAJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)

The top 12 contenders for 5 Band WAZ:

1. K5UR, 199
2. CT1FL, 198
3. DL3RK, 198
4. LA5YJ, 197
5. K1MEM, 196
6. W8GT, 195
7. G3MCS, 194
8. N4RR, 192
9. LA9GV, 191
10. N6DX, 191
11. F6DZU, 191

127 Stations have attained the 150 zone level

CQ DX Awards Program

S.S.B.

1079	WA4VSL	1085	G3PSM
1080	WB3DNA	1086	G3BLS
1081	I6DQE	1087	KF4S
1082	I2KKL	1088	K9VIQ
1083	VE3LNW	1089	KA5BML
1084	KD4KU	1090	FO8DP

C.W.

515	SM6DEC	517	GM3YTS
516	KP4EQF		

S.S.B. Endorsements

310	K2FL/319	275	IØMBX/295
310	W9DWQ/318	275	WB1DQC/202
310	DJ9ZB/316	275	I3OBO/291
310	N4MM/312	275	KP4EQF/280
310	K6XP/310	275	WB3DNA/277
300	G4CHP/304	275	WØKU/276
300	N5FG/302	28 MHz	K9RF
275	IV3YRN/298		

C.W. Endorsements

310	ON4QX/317	200	KP4EQF/207
310	W9DWQ/316	200	GM3YTS/206
275	N4MM/298	150	N5FG/162
275	N5DX/280	150	W2XQ/151
275	I3OBO/276		

With the addition of SMOM, the total number of active countries is now 319. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply.

the NZ Defensive Driving Council and is a member of Rotary International.

This year he will be in the states, planning to make the Dayton Hamvention in late April and then on to the FOC meeting at Danbury, Conn.

Peter is quick to admit that he got a lot of help in his quest for WAZ counters. There was a lot of schedule keeping and a lot of encouragement and assistance from VO2CW, OX3ZM, N2KK, ZS5WT, ZS5BK, and others.

There it is. Anyone with 5B WAZ has worked for it. They always have to.

WAZ Mobile

This being the age of miracles and near-miracles, it probably was inevitable that someone would work WAZ while mobile. However, it is always a wonder when it actually happens. Philip Greentree, VK2DPN, in New South Wales did it on s.s.b.

John Attaway, K4IIF, confirms that this is the first WAZ ever awarded for all mobile contacts. It grows a bit more startling to learn that Philip just got his first Novice license, VK2VUQ, in February 1980, and all of this was done in the short time since. He did not receive his full call privileges until late 1980, and by August 1981 he had been advised by W4KA that his WAZ Mobile was indeed #1.

VK2DPN is obviously on the road a lot. He racks up in excess of 40,000 miles each year in New South Wales, and the

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 into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2227	YU2DX	1637	N6CW	1269	PA2TMS	951	KL7AF	775	WB8YQX
2154	F9RM	1634	K5UR	1240	K6ZDL	921	YU2CBK	757	AJ6O
2000	K6XP	1622	W9DWQ	1238	K5DB	918	LA7JO	750	W6YMH
1945	W2NC	1584	DJ7CX	1230	WØSFU	901	I2MQP	707	WØJIE
1942	K6JG	1575	W2NUT	1205	DL1MD	893	JA1KRU	700	I1ZQD
1938	K2VV	1542	N6JV	1180	WA1JMP	865	KA2DC	700	NN4Q
1912	VE3GCO	1504	N9AF	1175	IN3ANE	864	G4CHP	662	KO8T
1790	N4MM	1475	N2AC	1170	SM3EVR	826	K2QF	643	WD9IIC
1762	YU7BCD	1415	AA4A/8	1127	K9BG	820	K7AGJ	633	K7CU
1723	W3PVZ	1368	YU1ODS	1076	W7CB	819	N4IB	618	JA9FAI
1713	N4UU	1325	N6AV	1050	K8LJG	807	WB8ZRL	600	OE1KJW
1695	W4BQY	1301	I6SF	1001	N6JM	793	DK2BL	600	KJ7N
1673	W7LLC	1282	N6FX	1001	YU3APR				

S.S.B.

2066	F9RM	1408	I4ZSQ	1127	YU7ODS	996	JH1VRQ	810	I6NOA
1868	IØAMU	1387	K5UR	1121	DJ6VM	954	ZP5RS	802	I4LCK
1833	IØZV	1331	IØMBX	1114	WA4QMQ	944	W2NC	752	KL7AF
1759	K6XP	1285	W9DWQ	1105	WB2NYM	912	KF2O	743	WB8YQX
1682	K2POA	1276	OZ5EV	1100	WD8MGQ	901	I2MQP	716	EA3KW
1672	K6JG	1262	N4UU	1072	DL1MD	852	CT1UA	702	WB8ZRL
1607	K2VV	1254	WØYDB	1060	DJ7CX	851	I8KCI	700	AC2J
1594	N4MM	1234	PA2TMS	1040	I6ZJC	850	N2AC	641	N4IB
1552	ZL3NS	1201	AA4A/8	1035	W2CC	833	TG9GI	629	YU3APR
1510	I8KDB	1189	HP1JC	1014	N6FX	828	IØRIZ	619	VK3NDY
1421	YU7BCD	1150	N2SS	1001	W4BQY	820	WA2FKF	606	VK6YL

C.W.

1721	W2NC	1443	K2VV	1273	K5UR	1069	LZ1XL	799	JH1VRQ
1680	W8KPL	1420	YU7BCD	1259	N4MM	1066	YU7ODS	750	N4YB
1599	ON4QX	1415	N4UU	1225	DJ7CX	1058	I6SF	735	DL1MD
1543	WA2HZR	1344	W3ARK	1205	VO1AW	1056	N6FX	731	AA4A/8
1502	N6JV	1342	G2GM	1127	W1WLW	1000	VE7CNE	701	KL7AF
1471	K6JG	1317	W4BQY	1108	VK2SS	965	JE1JKL	682	JA5MG
1467	DL1QT	1316	N2AC	1077	K6ZDL	802	DJ3LR	615	KA3A
1460	K6XP								

long hours on the road were lightened a bit by the quest for WAZ.

There probably are by now more WAZ's gained on single bands. Last Fall he was within a hands breadth of WAZ on 10 and 15 meters, 20 needing just a few more. He has a good start on 40 and 80 meters. His DXCC is now close to the 250 mark.

All of this proves that planning and persistence can do most anything. This achievement of Philip Greentree, VK2DPN, certainly is noteworthy. It took a lot of something.

WB3AKI advises that he is not the QSL Manager for FM7WO. He does handle FM7CF, the other side of the family, but FM7WO goes direct. KA3ARF is available for anyone needing a stateside QSL Manager. Joel Levine, WA4HNL, is not the QSL route for 3D6BA, except for that two day operation on September 25–26 back in 1978. This was an operation by ZS6JR. He still has the logs, for those two days only, and can help, but he is no help at all for other 3D6BA activity.

73, Cass, WA6AUD

QSL Information

C5AEG to N6BFM
CN8CX to K4CEB
CN8CY to G3GJQ
ON2AS/CT3 to ON2SX
EA6FS to EA6GP
FM7CF to WB3AKI
FOØKP to W6SZN
FØGOP to KA1GC
FOØJTP to KA1GC
FPØGNS to VE3CXL
HK3A to HK3AFD
SMØGMG/HBØ to SMØDJZ
OHØAL to OH2AL
K3SA/PJ3 to K3SA
KF1V/PJ7 to WB1HJF
W3BTX/PJ7 to W3BTX
WA6VEF/PJ7 to WA6VEF
SU1AA to OH2MM
(Nov 27–Dec 1981 only)
T3ØAT to G3XZF
TJ1GH to DJ6SI
TG9NX to WA4RZL
TU2JQ to TU2CI
VP2MFM to WB8OBW
VP2MFZ to AK8W
VP2MEV to AJ6V
VP2MHK to AK8W
VP2MM to AB1U
VP2MNC to WB8OBW
VQ9JB to WD5BHP
N7DF/YV1 to US QSL Service
KØHGW/VY1 to US QSL Service
YUØITU to YU1EXY
YZ9HDE to YU2HDE
ZC4KC to G4ICC
4A2Q to XE2AQ
4X6FY to WB2MCB
5Z4CS to JI1VLV
3B7CF to 3B8CF
3V8AA to ISØLYN
6W8JU to F6CGS
8P6MI to VE3FCU
8R1Y to 8R1B
9U5WR to SP6FER
C6AFR to Box F996, Freeport, Bahamas
CT2YG to POB 5, Lagoa 9560, St. Miguel, Azores
EA9KS to POB 100, Mellila, Spanish North Africa
FM7WO to Laurent Morduan, POB 287, 97203 Fort de France Cedex, Martinique
HC8MD to Box 665, Cuenca, Ecuador
HI8AMP to POB 100, Salcedo, Dominican Republic
J3ACJ to Box 223, St. Georges, Grenada, West Indies
NF4B to POB 21065, Kennedy Space Center, Florida 32815
K3SA/PJ3 to Steve/Patty Affens, 3305 Llewellyn Field Rd, Olney, Maryland 20832
S81WJJ to POB 821, Yumtato, Republic of Transkei
SV1NA/5 to POB 40, New Ionia, Athens, Greece
TJ1AA to POB 73, Pascarosse, 40600 France
VP2VGF to Gary Mitchell, POB 1003, Fairfield, Conn 06430
VP5GCM to Gary Mitchell, POB 1003, Fairfield, Conn 06430
VP2MEV to Edward Radio, AJ6V, 897 Newell Rd, Palo Alto, CA 94303
VP2MM to Rick Casey, AB1U, 85 Hacienda Circle, Plantsville, Conn 06479
VQ9JB to Shari Runyan, WD5BHP, 477 Mose Dr., Biloxi, Mississippi 39532
WP2ABZ to Gary Mitchell, POB 1003, Fairfield, Conn 06430
4X6FY to POB 191, Oakland, New Jersey 07436
5B4JE to Aris, POB 1723, Limassol, Cyprus

a monthly feature by
GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Excellent skip propagation, both long and short, is forecast for all amateur bands between *10* and *160* meters during the month of April. The effects of *equinoctial* propagation, which was discussed in last month's column, should continue to be noticeable during most of the month. This should result in improved DX propagation conditions on paths between the USA and the southern hemisphere.

As thunderstorm centers move further north, a seasonal increase in the atmospheric noise or static level is expected during April. This should be most noticeable on the *40, 80,* and *160* meter bands, but may also be bothersome at times on other bands.

Ten, 15, and *20* meters are expected to produce abundant DX to most areas of the world during the daylight hours. All three bands should open shortly after sunrise—*20* meters first, followed in approximately a half hour by *15* meters, and then by *10* meters approximately a half hour later. Openings on these bands should follow the sun. Signals should peak before noon in the quadrant extending from the northeast to the southeast. Openings towards the north and the south should maximize during the afternoon hours, and signals towards the sector from the southwest to the northwest should peak during the late afternoon and sunset periods. Expect the *10* meter band to close shortly after sunset, but *15* meters should remain open to almost midnight, and *20* meters should be useful for DX almost around-the-clock.

Forty, 80, and *160* meters should be strictly nighttime DX bands during April. As mentioned previously, also check for nighttime DX on *15* meters until midnight, and on *20* meters throughout the period. Openings on these bands will follow the day-night terminator. Expect openings after sundown towards the sector northeast to southeast. Signals in a northerly or southerly direction should peak just before midnight, while openings in the quadrant southwest to northwest should maximize just after sunrise. Another rule to remember for *40, 80,* and *160* meters is that signals will peak when it is daybreak at the *eastern* end of a specific path. Signal levels should be strongest on *40* meters, with worldwide openings expected on most nights. Static levels will be higher on *80* meters, signals will often seem weaker, and openings somewhat fewer, compared to *40* meters. DX propagation on *160* meters may often be marred by high static levels and weak signals.

For short-skip openings up to approximately 250 miles, try *40* and *80* meters during the day and *80* and *160* meters at night. For distances between 250 and 750 miles, *40* meters should be best during the day, and *80* and *160* meters at night. Try *20* meters for daytime openings between 750 and 1300 miles, and *40* and *80* meters at night. Beyond 1300 miles, *20* and *15* meters should be best during the day, with some good openings also possible on *10* meters. During the hours of darkness, check *40* and *80* meters for openings beyond 1300 miles, with some good ones also possible on *20* meters.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between *6* and *160* meters for the period April 15 to June 15, 1982. Beginning this month and continuing through the summer and fall months, the times shown in the Charts will be given in local *daylight* time (EDT, CDT, MDT, and PDT). For detailed predictions of short-skip openings between distances of 50 and 2300 miles, see the Short-Skip Propagation Charts which appeared in last month's column.

*11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1982

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 10, 24	A	A	B	C
High Normal: 4, 6, 9, 11-12, 14, 23, 25-26	A	B	C	C-D
Low Normal: 3, 8, 13, 15-18, 22, 27-28	A-B	B-C	C-D	D-E
Below Normal: 1-2, 7, 19, 21, 29-30	B-C	C-D	D-E	E
Disturbed: 20	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 any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on April 1st and 2nd, good-to-fair (B-C) on the 3rd, good (B) on the 4th, excellent (A) on the 5th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

Solar Cycle Activity

The *Royal Observatory of Belgium* reports that December 1981 was a month of variable solar conditions. A sunspot number high of 271 was observed on December 10, but ten days later the count dropped to a low of 57. The mean for the month was 147. This results in a *smoothed sunspot number* of 141 centered on June 1981. This is a drop of two points in the solar cycle, and may indicate that solar activity is again declining at a slow pace. A smoothed sunspot number of between 115 and 120 is predicted for April 1982.

V.H.F. Ionospheric Conditions

April should be a good month for v.h.f. ionospheric openings, with 6 meter F-2 and sporadic-E openings possible, trans-equatorial propagation at a seasonal peak, and good chances for auroral and meteor-scatter-type openings.

Solar activity is expected to be high enough during April to support some 6 meter DX openings. Chances are best for openings towards Africa, the Caribbean, and South America from an hour or so before noon to several hours after noon. During the late afternoon hours look for possible openings towards the Pacific area and Australia and New Zealand. Openings are more likely to occur when conditions are expected to be High Normal or better.

Trans-equatorial propagation between the USA and South America is expected to peak during April. Best time to check for openings on 6 meters is between 8 and 11 p.m. local time. An occasional opening may also be possible on 2 meters. TE openings favor the southern tier states, but some openings may be possible for locations further to the north.

Sporadic-E produced short-skip openings begin to increase during April, although this mode of propagation usually peaks during June and July. Some openings should be possible on 6 meters during April over distances ranging between approximately 750 and 1300 miles. When the skip is near maximum on 6 meters, check for sporadic-E openings on 2 meters. An occasional 2 meter opening should be possible during the month.

April is a month in which widespread auroral displays often occur. These can produce intensely ionized regions which can reflect 6 and 2 meter signals over distances up to approximately 1300 miles. Check for possible auroral activity on those days shown as Below Normal or Disturbed in the Last Minute Forecast at the beginning of this column.

A major meteor shower, the Lyrids, is scheduled to intersect the earth's atmosphere between April 20–22. A maximum of 15 large-sized meteors may enter the earth's atmosphere hourly during this shower. This should produce sufficient ionization for typical meteor-scatter type openings on both 6 and 2 meters for distances up to approximately 1300 miles.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location, The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

April 15 - June 15, 1982
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe & North Africa	10-13 (1) 13-17 (2) 17-18 (1)	07-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-01 (3) 01-04 (2) 04-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	10-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 22-00 (1)	06-09 (2) 09-13 (1) 13-16 (2) 16-20 (3) 20-22 (4) 22-02 (3) 02-03 (2) 03-06 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediterranean & Middle East	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	12-16 (1) 16-18 (2) 18-21 (3) 21-00 (4) 00-02 (3) 02-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Western Africa	10-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1) 10-13 (1)**	07-08 (2) 08-10 (3) 10-13 (2) 13-16 (3) 16-20 (4) 20-23 (3) 23-04 (2) 04-07 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-02 (4) 02-05 (3) 05-07 (2)	20-22 (1) 22-02 (2) 02-03 (1) 22-02 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-21 (1)	08-12 (1) 12-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-01 (3) 01-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	21-01 (1) 22-00 (1)*

April - 1982

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

Time Zones: CDT & MDT (24-Hour Time) CENTRAL USA TO:

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

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

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

*Indicates best times to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a Propagation Index of (2), or higher.

**Indicates best times to listen for F-2 layer openings on 6 Meters.

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Recent rumors via the "grapevine" out of the USSR give the impression that we have been negligent in supplying them with the latest information about our World Wide DX Contest, and that they were not aware of recent changes in the rules. As a matter of fact, there have been no changes in the rules for the past several years. The one item they were referring to was the multi-operator, single transmitter category, which reads as follows:

"Par. III, Item 2a. Multi-operator, single transmitter (all band operation only). Only one transmitter and one band permitted during the same time period (defined as 10 minutes). Exception: One—and only one—other band may be used during the same time period if—and only if—the station is a new multiplier. Logs found in violation of the 10 minute rule will be automatically reclassified as multi-multi to reflect their actual status."

This rule has been in effect for some years, and the vast majority of entries in this category from the USSR have observed this restriction. Therefore, it must be a well known fact over there.

A limited few who tried to get around it to gain a couple of extra multipliers were reclassified as multi-multi entries. The gripes are no doubt coming from this very small group.

There was also a rumor that *CQ* contest awards are not being received in the USSR. Again I must disagree. Certificates and plaques have been hand delivered to the Soviet Embassy in Washington, D.C. They in turn were forwarded via diplomatic pouch to Box 88, Moscow.

I myself have delivered several and found the Press Representative at the Embassy very cooperative and interested in our program, so I have no reason to believe that they were not forwarded to the Central Radio Club in Moscow.

Bob Cox, K3EST, has also made several trips to the Embassy. And Bill Schneider, K2TT, and George Jacobs, W3ASK, have personally taken plaques to Moscow. George made it to the Central Radio Club headquarters. Bill, however, did not make it; a representative from the Club picked up the plaques at his hotel. Evidently headquarters is off limits unless elaborate preparations are made in advance.

I just want to set the record straight in case you hear some of this unjustified criticism.

It would be helpful if the officials at Box 88 would keep us as well informed about their activities.

Incidentally, deadline for material for the July issue is April 15th, and May 15th for the August issue.

73 for now, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

* Apr.	3-4	Polish C.W. Contest
* Apr.	3-4	ARRL Open CD Phone Party
Apr.	7-8	DX YL to N.A. YL C.W.
Apr.	10-11	CARF Commonwealth Phone
Apr.	14-15	DX YL to N.A. YL Phone
* Apr.	17-18	Polish Phone Contest
* Apr.	17-18	ARRL Open CD C.W. Party
Apr.	17-18	EME Contest (Part 1)
Apr.	17-18	ARCI QRP SSB Contest
Apr.	24-25	Swiss "H-26" Contest
† Apr.	24-25	King of Spain Contest
* Apr.	24-25	YL ISSB Phone QSO Party
May	1-2	County Hunters SSB Contest
May	1-3	Georgia QSO Party
May	8-9	USSR "CQ M" Contest
May	8-9	World Telecomm. Phone
May	15-16	World Telecomm. C.W.
May	15-16	EME Contest (Part 2)
May	15-17	Michigan QSO Party
May	22-23	Rocky Mountain QSO Party
May	**29-30**	**CQ WW WPX C.W. Contest**
June	12-13	ARRL VHF Contest
June	12-13	South America C.W. Contest
June	19-20	All Asian Phone Contest

* Covered last month.

At the time of this writing, the middle of January, all amateur radio activity in Poland is still suspended, so we have no idea whether or not the SP Contest will be on. Hopefully, the situation over there will improve and things will be back to normal by the time you read this.

Luis Caamano, HI8LC, and his generous display of CQ and other world-wide awards. HI8LC has been handing out Dominican QSO's for the past 20 years and can always be found in the weekend contest pileups. Nice looking layout, Luis.

DX YL to N.A. YL Contest

C.W.: April 7–8 S.S.B.: April 14–15
Starts: 1800Z Wednesday
Ends: 1800Z Thursday

This is strictly a YL affair in which DX YL's will be contacting YL's on the North American continent. (KH6 & KL7 are considered DX.)

All bands may be used, but cross-band contacts are not permitted. Contacts with OM's do not count. The same station may be worked on each band for QSO credit. Avoid contacts on Net frequencies.

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

Exchange: QSO no., RS(T), and state; province or country.

Scoring: One point per contact. Your multiplier is determined by the number of states, VE provinces, and DX countries worked, counted once only, *not* once on each band.

There is a power multiplier of 1.25 for stations using 150 watts or less on c.w., 300 watts p.e.p. on s.s.b.

Final Score: Total QSO points × (states + provinces + countries) × power multiplier if any.

There is a penalty of three (3) additional and equal contacts for each duplicate contact removed from the log by the Contest Committee.

Awards: Cups to the 1st place winners: DX and N.A. phone, and DX and N.A. c.w. Plaques to the highest combined c.w./phone scores for both DX and N.A. Certificates to the 2nd and 3rd place DX and N.A. winners.

Submit separate logs for each contest. Include a summary sheet showing the scoring, transmitter power, and other information. The usual signed declaration is also requested.

Entries must be postmarked no later than April 29th and received no later than May 24th.

This year they go to: Sandra Heyn, WA6WZN, 962 Cheyenne St., Costa Mesa, CA 92626.

CARF Commonwealth SSB Contest

Starts: 1200Z Saturday, April 10
Ends: 1200Z Sunday, April 11

This one is organized by the Canadian Amateur Radio Federation and is not to be confused with the RSGB Commonwealth, a c.w. contest held in March.

Eligibility is limited to amateurs licensed to operate within the Commonwealth and British Mandate Territories on s.s.b. only.

The same station may be worked once per band. Contacts between stations in own call area are not permitted. (All of the U.K. is considered the same area.)

Exchange: RS plus a 3 figure serial number starting with 001.

Scoring: Each completed QSO is worth 5 points. In addition, a bonus of 20 points may be claimed for the 1st, 2nd, and 3rd contact with each Commonwealth call area on each band. Add total points from each band for your final multi-band score (no multiplier).

Entries may be single or multi-band, single operator only. Multi-band entries are not eligible for single band awards, but you may request that one single band be judged for competition. Use a separate log for each band.

Frequencies: Plus or minus 20 kHz of 3600, 3780, 7080, 14180, 21200, and 28480.

Awards: Certificates to the top scoring entry in each Commonwealth area in each category. The CARF Commonwealth Trophy goes to the overall winner in the multi-band class.

Penalty points may be deducted for taking credit for duplicate contacts or bonus points. Include a summary sheet, dupe sheet, and the usual signed declaration with your entry. Logs must be received before June 1st.

Mail to: CARF Contest Committee, P.O. Box 2172, Station D, Ottawa, Ontario K1P 5W4, Canada.

ARRL International EME Contest

April 17–18 May 15–16
Full 48-hour UTC each weekend

In case you don't know, EME is the abbreviation for earth-moon-earth, commonly known as moon bounce contacts made on u.h.f. amateur frequencies.

It's a rather specialized and complicated field, and unless you are knowledgeable about what it's all about, it would be advisable to get in touch with someone who participated in last year's contest. (See the '80 results in Sept. '81 *QST*.) You'll need more than an average u.h.f. antenna, that's for sure. (See front cover Sept. '81 *QST*.)

710 - 99 - 100

The March issue of *QST* should have all the basic information on what to do if you do get involved.

ARCI QRP SSB Contest

Starts: 1200Z Saturday, April 17
Ends: 2400Z Sunday, April 18

This is the Spring edition of this QRP activity sponsored by the QRP Amateur Radio Club International. It is open to both members and non-members. Participation is limited to a maximum of 24 hours out of the 36 hour contest period. The same station may be worked on each band for QSO and multiplier credit.

Exchange: RS, state, province, or country. Members also include their QRP number, non-members their power output.

Scoring: Contacts with a member, 5 points. With a W/VE non-member, 2 points. Stations other than a W/VE, 4 points.

There is also a power multiplier as follows:

8 to 10 watts p.e.p.	×2
6 to 8 watts p.e.p.	×4
4 to 6 watts p.e.p.	×6
2 to 4 watts p.e.p.	×8
Less than 2 watts p.e.p.	×10
Over 10 watts	Used as check log

There is an additional bonus multiplier. Stations using solar or wind power, ×2. Those using battery power, ×1.5.

Final Score: Total QSO points × (states + province + countries, worked on each band) × power multiplier × bonus multiplier if any.

Frequencies: 1810, 3985, 7285, 14285, 21385, 28885, 50385 kHz. No repeater contacts.

Awards: Certificates to the highest scoring stations in each state, province, and country with two or more entires. Scores in this contest will also be credited for the annual "Triple Crown" award.

Logs must be received by May 20th and go to: QRP ARCI Contest Chairman, William W. Dickerson, WA2JOC, 352 Crampton Drive, Monroe, MI 48161. Include a large s.a.s.e. for copy of results.

Swiss Helvetia Contest

Starts: 1500Z Saturday, April 24
Ends: 1500Z Sunday, April 25

This activity offers an excellent opportunity to work some of the rare Swiss Cantons and to build up your total for the new attractive Helvetia Award. Confirmation of all 26 Cantons is required. Only contacts made after January 1st are valid.

Contacts may be made on all bands, 10 through 160, phone or c.w. The same station may be worked on each band for QSO and multiplier credit, but only on one mode, either phone or c.w.

Exchange: RS(T) plus a three figure contact number starting with 001. Swiss stations will also include two letters indicating their Canton. There are 26 Cantons: AG, AI, AR, BE, BL, BS, FR, GE, GL, GR, JU, LU, NE, NW, OW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each HB QSO is worth 3 points. The sum of Cantons worked on each band is your multiplier (a possible multiplier of 26 on each band).

Final Score: Total QSO points multiplied by the sum of Cantons worked on each band.

Awards: Certificates to the top scorers in each country and each W/K and VE/VO call area.

Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicate contacts, and include a summary sheet showing the scoring and your name and address in block letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, G. Stalder, HB9ZY, Tellenhof, 6045 Meggen, Switzerland.

Applications, in the form of QSL cards, for the Helvetia Award go to: Walter Blattner, HB9ALF, P.O. Box 450, Locarno 6601, Switzerland.

Helvetia 1981 Contest North America Results

*	AK1A	12,006
	K1EM	11,205
	WA1UZH	10,260
	W1CNU	2,916
	W1OPJ	462
	N1BDB	144
*	N2QT	9,576
	N2UN	4,224
	W2XQ	2,100
	K2NU	1,314
	KA2DYB	1,275
*	W3ARK	3,915
*	W4KO	4,158
	K4DDB	1,296
	K4KMS	1,242
	W4YN	585
*	W6UA	2,208
*	W8DA	9,804
*	W9OA	10,965
	K9BG	10,857
	WD9IIC	5,860
	AE9X	189
*	KB0C	168
*	VE2FGL	3,045
	VE2WA	2,325
*	VE3BR	684
	VE3MUV	168
*	VO1AW	12,480
*	XE1AAG	75

**Certificate winners.*

King of Spain Contest

Starts: 2000Z Saturday, April 24
Ends: 2000Z Sunday, April 25

I have not received any announcement for this year's contest, so I will repeat last year's rules in case you hear some EA contest activity and want to get involved.

The top award makes this a very attractive activity. The winner will receive an expense-paid invitation to visit Calella for a period of 8 days to receive his Trophy.

You can use all bands, 10 through 160, and also the three u.h.f. bands, both on c.w. and s.s.b. Operation must continue on the same band for at least 15 minutes. There is a 4 hour compulsory rest period in the 24 hour contest period. The same EA station may be worked on each band and each mode for QSO point credit.

Exchange: RS(T) plus a 3 figure QSO number starting with 001. EA stations will also include 2 letters identifying their province (maximum of 53 provinces on each band).

Scoring: One point per QSO. Multiply total EA contacts by the number of EA provinces worked on each band for your final score. (Contacts with Calella stations count as an extra multiplier.)

Awards: Besides the Top Trophy, there are also trophies for 2nd and 3rd place, and awards for the top continental and s.w.l. scores. Certificates will be awarded to all stations making 75 or more contacts and s.w.l.'s logging at least 150 QSO's.

Logs must be mailed no later than June 1st to: Agrupacio Radioaficionate Calella, Apartado 181, Calella (Barcelona) Spain.

County Hunters SSB Contest

Three Periods GMT
0001 to 0800 Sat. May 1
1200 Sat. May 1 to 0800 Sun. May 2
1200 to 2400 Sun. May 2

This is the 11th annual contest sponsored by the Mobile Amateur Radio Awards Club to increase activity for the County Awards program.

Emphasis is on mobile operation. Fixed stations may work other fixed stations, but once only regardless of the band. Mobiles may be worked from each county or band change. Mobiles contacted on a county line count as one QSO but two multipliers. Net frequency contacts are not permitted.

Exchange: Signal report, county and state, and country for DX stations. (Mixed mode contacts are permitted providing one station is on s.s.b.)

Points: Contacts with a fixed W/K or VE count 1 point, 5 points if it's a DX station (KH6 and KL7 are DX). Mobile contacts, 15 points.

Multiplier: Each U.S. county and each VE station worked.

Lunar introduces a Linearized Amp for handheld 220 MHz transceivers Model 1.3M4-30P

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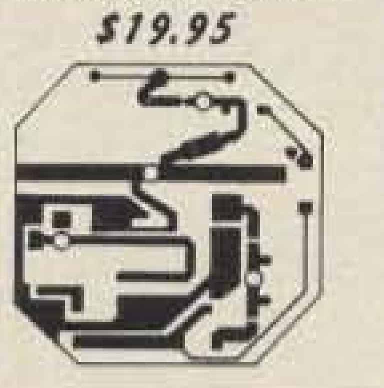	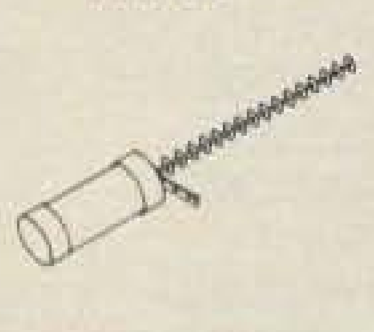	
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CIRCLE 122 ON READER SERVICE CARD

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

Frequencies: Plus or minus 10 kHz, 3930, 7230, 14285, 21385, 28635. There will be a "Mobile Window" 5 kHz each side of 3930, 7230, and 14285. Mobiles try DX on 28636.

Awards: Certificates to the top 10 fixed and top 10 mobile stations in the U.S. and Canada, and to the top scoring station in each DX country. There are four plaques: Overall U.S. or Canadian winner, DX station, and 1st and 2nd place mobiles. Only single operator stations are eligible.

It is suggested that you write to WØQWS for detailed rules and log forms and summary sheets. Include a large s.a.s.e. with your request.

All entries must be received by June 15th and go to: John Fergusen, WØQWS, 3820 Stonewall Ct., Independence, MO 64055.

Georgia QSO Party

Starts: 1600Z Saturday, May 1
Ends: 0200Z Monday, May 3

There was no Georgia Party last year, but evidentally the Atlanta Radio Club has picked it up and hopefully will continue to sponsor this activity.

There are three classes of entries: single operator, multi-operator single transmitter, and Georgia mobile/portable operating outside of own county.

The same station may be contacted on each band for QSO credit, but a multiplier is counted only once.

Georgia to Georgia contacts are permitted for QSO point credit, and mobiles in each county change.

Exchange: QSO no. and QTH. County for Georgia; state, province, or country for others.

Scoring: Georgia stations multiply total QSO's by number of states, VE provinces, and DX countries worked.

Others multiply total Georgia QSO's by the number of Georgia counties worked (maximum of 159).

Frequencies: C.W.—1805 and 60 kHz up from the bottom of each band. S.S.B.—3900, 3975, 7245, 14290, 21360, 28600. Novice/Tech—3718, 7125, 21110, 28110.

Try 160 at 0300Z, 10 on the hour, and 15 on the half hour from 1300 to 2300Z.

Awards: Certificates to the top scorers in each state, province, DX country, and each Georgia county. Second and third place awards where activity warrants. There are three plaques to the overall winner in Georgia, out-of-state, and Georgia mobile/portable.

Include a summary sheet and a check sheet for those making over 200 contacts.

Logs must be received before June 15th and go to: Atlanta Radio Club, Att: Dave Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092.

All Asian Contest Results 1981 Phone

U.S.A.		
*N6RO	3.5	1,548
*K7SS	"	780
*K6NA	7	18,308
AI6V	"	15,075
*K4PI	14	11,850
*W6OK	"	8,080
AA6DX	"	5,587
*K7NW	"	2,992
WA4QMQ	"	2,590
N4IJ	"	2,139
*K3TW	"	1,479
*KB2MK	"	1,450
KB7HG	"	943
WB4UBD	"	600
W4KMS	"	221
KJ7I	"	200
AK4T	"	1
*N6RZ	21	177,287
*K6RU	"	135,654
*KM5R	"	90,805
WA6EJL	"	76,545
*WB7RFC	"	53,395
*W1NG	"	22,816
*KØRWL	"	18,154
*W2FG	"	13,640
WB5DDI	"	8,096
KBØC	"	3,420
KBØU	"	2,788
*NI4Y	"	2,688
WB2TYD	"	1,824
W5IYR	"	1,368
W6SZN	"	1,125
AA6EE	"	1,032
N4MM	"	437
W4PTT	"	187
*KE7V	28	1,524
*K6HNZ	AB	522,276
*KB5FU	"	40,866
*K3ZO	"	27,550
*ABØI	"	22,570
*LU3YL/W4	"	7,750
N4UH	"	6,579
*W7PQE	"	4,356
*K1MEM	"	3,157
W3ICM	"	1,944
*W2IFK	"	1,890
WB2QEU	"	748
KA2BBZ	"	456
W2FGY	"	374
W5EIJ	"	340
WB7FGC	"	282
N2ATT	"	150
N1BDB	"	24
*KØUK	M-Opr.	225,852
*KB2NU	"	540
*WB4AFP	"	9
U.N.		
*4U1UN	M-Opr.	9,063
Alaska		
*KL7JAI	21	432
*NL7P	AB	17,138
Canada		
*VE2RV	AB	31,108
VE1AI	"	14,280
Dom. Rep.		
*HI8LC	14	130
*HI8GB	AB	3,404

*Certificate winner

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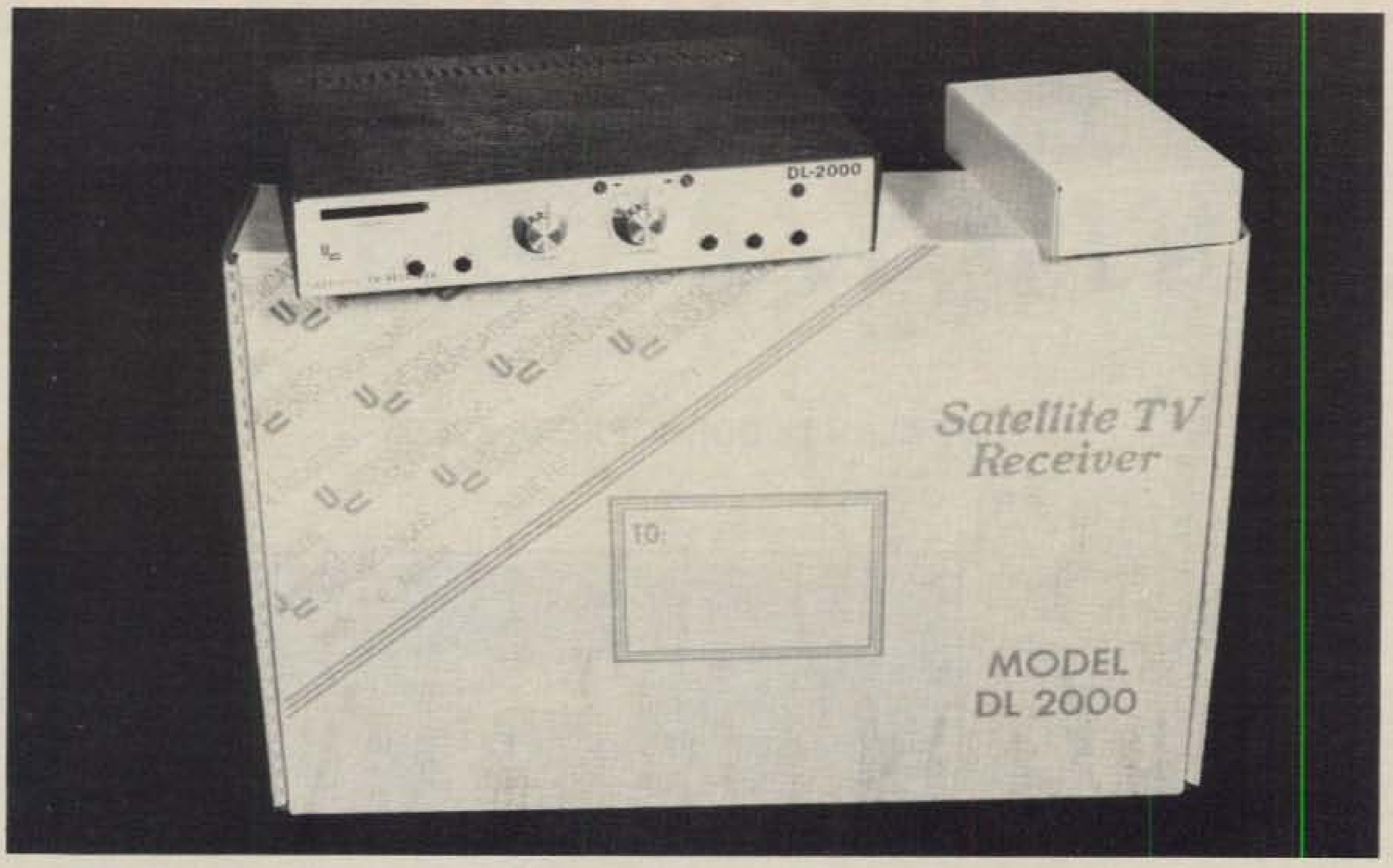

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CQ Reviews:

THE MFJ-308 WORLD EXPLORER II SHORTWAVE CONVERTER

BY ALAN M. DORHOFFER*, K2EEK

Did you ever have one of those days when you're stuck in traffic on the Expressway, the batteries poop out on your HT (the dog buried your quick-charger in the garden somewhere), and your car radio just seems to get top-40 stations which all play the same songs by weird-sounding groups you've never heard of? Kinda makes you lose your temper, doesn't it?

Well, cheer up, because now you can tune in the world and see what's happening in traffic jams from here to Timbuktu. MFJ has introduced their MFJ-308 Explorer II eight-band shortwave converter which will take the doldrums out of morning traffic. If you're showing withdrawal symptoms from trying to punch up a dead HT, and you've got to get a quick amateur radio fix, rest easy; you can also tune in 40 meters and eavesdrop on some random QSOs or even try to get some quick code practice in.

The MFJ-308 measures 6¼" × 1¼" × 5" and can mount practically anywhere. If you're afraid of getting it ripped off, think about putting it in your glove compartment. Otherwise, you can mount it under the dash with the two "L" brackets which are supplied. Connections are very simple; the normal car antenna plugs into the converter, and a cable from the converter plugs into the car radio. A single red wire goes to any +12 v.d.c. point, and that's it—you're ready to go. When the converter is switched "off," the antenna feeds straight through to the car radio. Switching the converter "on" puts the antenna in the line.

Test bench setup for checking the MFJ-308. Even in a high-noise area, many foreign broadcasts could be heard quite clearly throughout the day. The converter is to the left of the Radio Shack auto radio, and as you can see it is significantly smaller.

Frequency Coverage

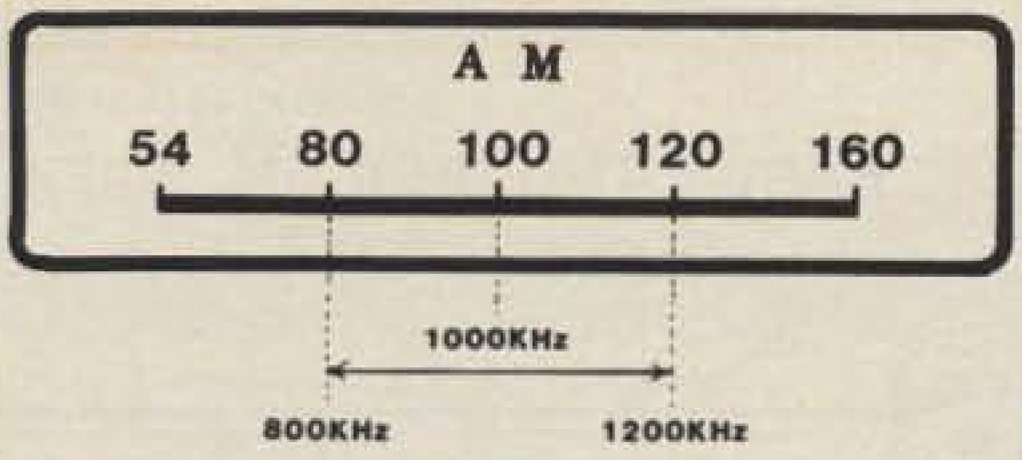
The converter consists of two 40673 dual-gate MOSFETS and covers 400 kHz segments of 8 bands. These 400 kHz segments divide 200 kHz above and 200 kHz below the 1000 kHz center frequency on an a.m. radio dial. This relationship is illustrated in fig. 1, which also has a frequency chart. You will note that in order to go up in frequency, you tune down the a.m. band. The 41 meter band obviously includes the 40 meter amateur band. Now obviously, the 308 is not about to replace the "Super Wizzbang" or whatever you may have in the way of a general coverage receiver. It wasn't designed to replace anything. What it does do and do admirably is give the trapped motorist or casual driver a real taste of and for shortwave listening.

What's On

What's on the shortwave bands to listen to (even with a car radio antenna) could fill a book. Unlike the amateur bands, these stations stay where they are and maintain a schedule. Just about every country is represented, and as would be expected, there are foreign language (to us) broadcasts. As with amateur radio, shortwave listening is tied in to propagation conditions, and you could safely use George Jacobs' Propagation Column to extrapolate what will be coming through.

For the novice at shortwave listening, there is a good book entitled the *World*

*Editor, CQ



S. W. BAND	FREQUENCY (MHz) FROM AM DIAL 1200KHz	TO AM DIAL 800KHz
13M	21.400	21.800
16M	17.600	18.000
19M	15.075	15.475
25M	11.638	12.038
31M	9.438	9.838
41M	7.000	7.400
49M	5.875	6.275
60M	4.705	5.105

Fig. 1– Frequency range of the MFJ-308. The auto radio dial is depicted to show band spread.

Radio TV Handbook, which lists all of the international radio and television stations. It tells you where everyone *is* plus information about the stations and a great deal about the world of shortwave listening. It is available through *CQ*'s Book Shop.

Operation

The MFJ-308 is simple to operate; all controls are pushbutton switches. It can be turned on by the on-off switch or by selecting a band and pushing that button. Bandswitching is done through an A or B switch which selects rank. In the A position, the converter's switches cover 13, 16, 19, and 25 meters. In the B position, 31, 41, 49, and 60 meters are covered. Just select the band you want to listen to, push the buttons, and tune your car radio.

Money Matters

While you're thinking about adding one of these little gems to your car, you might want to give a little thought to your next car. Now normally when you gather up your courage and figure out what you can afford in the way of a new car (if you can, that is), you generally think in terms of the whole car with all the goodies thrown in. Well, why not think in terms of leaving one option off—the radio. Why, you may ask, should I leave the radio off? Where am I going to hook up my MFJ converter? Fear not.

The average a.m./f.m./cassette-player stereo car radio as an option starts somewhere in the neighborhood of $250. The bottom of the line is just about one step up from a galena crystal set anyway, so you will probably go for a few bucks more. Why not indulge yourself; after all, it's not every day that you buy a new car. Well, let's just look at that $250 bottom line set and see what it really costs. Assuming that you're not paying cash for the car (and that's most of us), you will be financing this wheeled chariot for the next several years. If you take as an average 16% as a finance charge, then your $250 radio will actually cost $316.41 after three years, or $340.08 after a four-year loan. If you went for the super-duper radio, the number would be higher.

One alternative would be to buy your own car radio from a source other than your friendly auto dealer. It's sort of like buying your own phone from a company other than "Ma Bell," only with a lot less hassle. The radio used here is from Radio Shack. You can get a radio from them starting at about $70, up to about $180 for something exotic. The radio pictured is their 12-1896 (an in-dash, pushbutton a.m./f.m. stereo cassette job), which sells for $119.95. You can quickly see that you can save about $200 to $250 by doing it yourself. That $200 or so can pay for the converter plus enough gas to drive several thousand miles.

The 8 band MFJ-308 sells for $79.95 (plus shipping). They also have a 4 band version (19, 25, 31, and 49 meters) which sells for $59.95 plus shipping. While these converters won't replace amateur radio, there is the outside chance that one of those top-40 songs just might sound better in a dialect of Singhalese.

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

The H.F. Yagi: Part III—Construction Techniques

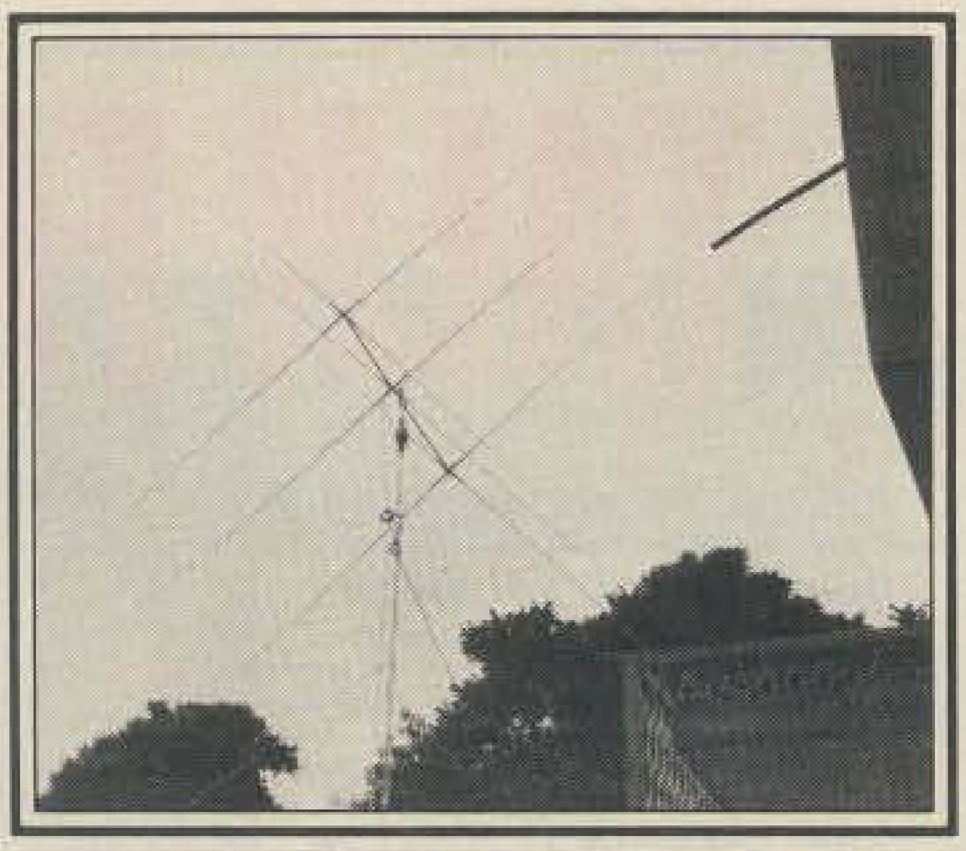
Author W8FX set the stage for discussion of the Yagi by taking us from the basic dipole to complex, multi-element, multi-band arrays. In this article, we start with the Yagi vs. quad controversy and get into general beam construction considerations.

Up front, let me state that anything I might say regarding the superiority of one antenna over another (especially for DX work) is fraught with risk. The subject of antenna performance is a favorite topic of many amateurs, and it provides an almost unlimited source of animated, if not downright heated, discussion. So at considerable risk, I will make a few comments on DX antenna choice and performance based on my own experience and readings: first, on the merits of fixed vs. rotatable arrays, then on Yagis vs. quads.

As far as fixed arrays are concerned, the bottom line is that they are *generally* unpopular in the amateur DX community, with the possible exception of the V-beam and rhombic for specialized applications. Although some fixed arrays may offer high potential gain, it's likely that this gain is rarely attained in practice since it's unusual for such arrays to be installed at heights comparable to the heights at which rotatable Yagi and quads are normally installed. Long single wires and extended double Zepps are also popular for the amateur who does not have the resources to erect a rotatable array, although these types have limited utility since more than one antenna is required for around-the-compass coverage.

Ground planes are inexpensive and popular. Many serious DXers like to use the ground plane's omnidirectional characteristics before switching over to beams in stalking DX, finding it a definite asset to be able to transmit and receive equally well in all directions, at least initially. This feeling is at the opposite end of the spectrum from that which says that an antenna must be rotatable to be really effective.

*317 Poplar Drive, Millbrook, AL 36054



A competition that probably will never be settled amicably is that between Yagi and quad enthusiasts. Element-for-element, the quad offers more gain and generally better overall performance, but the bulkiness and wind area of the latter make installation tricky and cumbersome. The three-element h.f. quad shown here offers about a 10 dBd gain. (Photo courtesy Skylane Quads)

Both the Yagi and the quad are highly efficient antennas that can provide considerable gain not available from the simple dipole and vertical, coupled with a quantum jump in flexibility over most fixed arrays. Also, the front-to-back (F/B) and front-to-side ratios of both types of antennas considerably reduce interference from undesired directions while concentrating the transmitted signal in the desired direction.

Of the two types, the Yagi is probably the more popular (particularly in the three-element monoband version), whereas the quad is slightly better than the Yagi for DX work, on an element-for-element basis. On one hand, the Yagi is mechanically strong and features a very tight unidirectional radiation pattern for DX work; on the other, it's difficult to homebrew a trap Yagi due to the mechanical complexities of constructing and inserting the traps in the elements. The quad is relatively easily built for either single- or multiband operation, but it's a tricky antenna to handle and get up in the air.

Here are a few observations regarding comparisons between the two antennas. I've tried not to "take sides," but rather just present the facts as I have gathered them. Consider the following:

(1) All beams work best high in the air, but the quad seems to be more forgiving of height deficiency than the Yagi, and also exhibits less ground effect and ground loss. Of course, a good natural QTH can offset individual antenna deficiencies quite easily.

(2) The quad is about equivalent in power gain to a Yagi having one additional element. The quad also exhibits more gain than the Yagi does for a given boom length, weight, size, and turning radius.

(3) The quad has a slightly lower radiation angle than the Yagi. This often results in one's signals being the "first in" and "last out" when using a quad.

(4) On receiving, the quad is a relatively quiet antenna, being less vulnerable to precipitation static on reception than its Yagi counterpart.

(5) The quad is more broadbanded than the Yagi, being a low-Q closed loop. This makes the quad less critical of on-the-nose tuning. End effects, prevalent with dipole-like open elements, are much reduced.

(6) The quad is less vulnerable to lightning strikes and static discharges than is the Yagi, as it has no sharp end points.

(7) The quad is easier to adjust for proper performance than the Yagi since there is less interaction between the elements, there is less critical element spacing, and there are no traps to tune. However, feeding schemes can become quite complex in the quad.

(8) The Yagi is more aesthetically pleasing than is the quad, at least in the public mind.

(9) The Yagi is less susceptible to damage from strong winds and ice storms.

(10) The quad is less popular than the Yagi, mainly because it requires added effort to install and maintain. A "boxy" antenna, the quad is bulky and fragile to handle and hoist into the operating position when compared with the Yagi.

(11) The quad is an inherently inexpensive antenna if made of bamboo, although it can become more expensive than the Yagi if specially fabricated fiberglass spreaders, aluminum spiders, and other custom fixtures are used in construction.

All factors considered, there is very little on-the-air difference between the two most common competing antennas—the three-element Yagi and the two-element cubical quad. The choice boils down to a personal one, and should be based at least partially on practical assembly, construction, installation, and tuneup considerations rather than narrow differences in expected performance statistics. Use of either type antenna will result in considerable DX improvement over the simple dipole or groundplane vertical, whether operated on a single- or multiple-band basis. Too, overshadowing the considerations we've mentioned, local factors such as man-made obstacles, geographical location, method of feeding, transmitter power output, and type of ground all enter the picture. In any case, the choice is clearly yours!

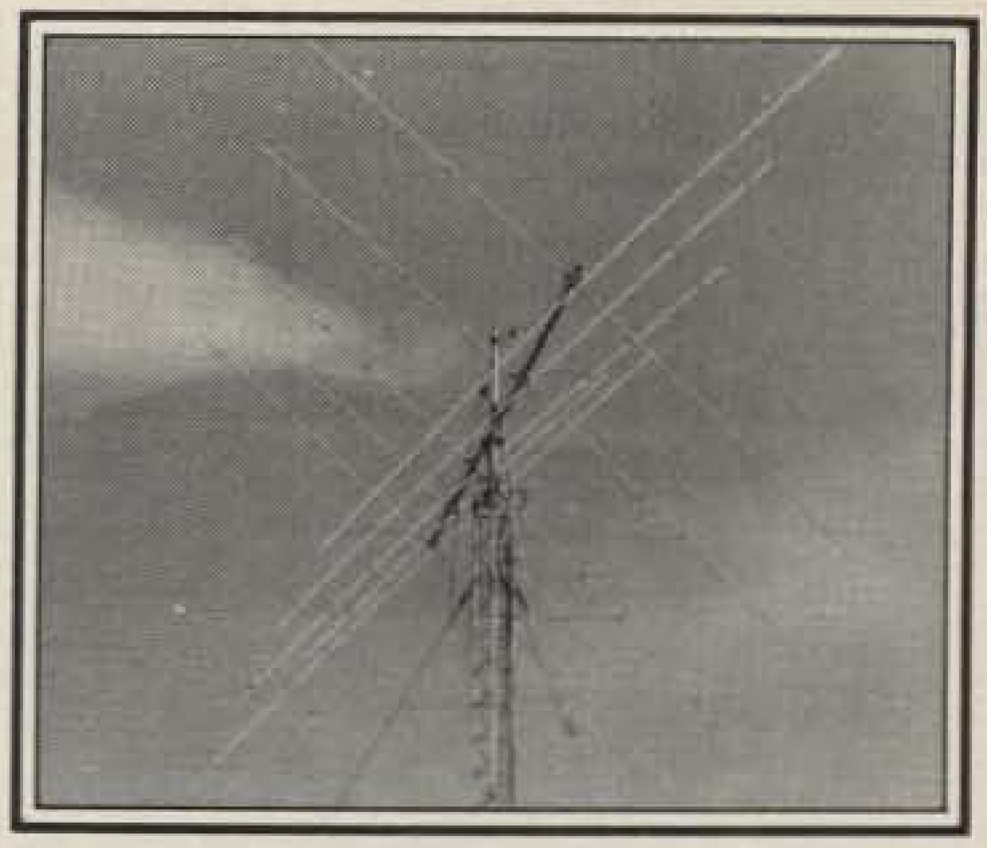
Construction and Installation

Our emphasis is on the "survey approach," so we won't go into intimate detail on construction techniques, although we will present some general beam construction guidelines you should find useful. The bibliography, found at the conclusion of this series, should prove helpful, particularly if the decision is to "roll one's own."

A basic question is, should you build or buy your beam? Antennas represent one of the last preserves of the do-it-yourself hobbyist; fairly impressive results can be achieved with a modest investment of time and dollars, and h.f. antennas are not so difficult to build that it is necessarily best to defer to a manufacturer's expertise. However, the cost of raw materials, such as aluminum tubing, has skyrocketed, and many builders have found tubing difficult to find and of limited selection. A sorry situation, perhaps, but a factual one; as a result, only the most persistent will construct their own h.f. "plumber's delight" today.

Our bibliography will lead you to some solid reference sources if it's your desire to buck the tide and scratch-build your array. Recognizing that most amateurs buy ready-made beams, our approach is to emphasize selection considerations, and to provide some tips on what follows: installation, feeding, matching, tuneup, and operation.

The rotary beam is an orchestrated collection of parts, conductors, insulators, supports, nuts, bolts, stubs, connectors, and the like. The "conductors" play a key part, and foremost among them—especially in the "plumber's delight" design—are the elements. While there are several ways to build a beam, this all-metal design is the most satisfactory. This design allows the array's center to be at ground potential for easy lightning protection. The array is weather resistant and strong; by way of comparison, insulating materials, such as wood, plastic, porcelain, or bakelite, may be broken by



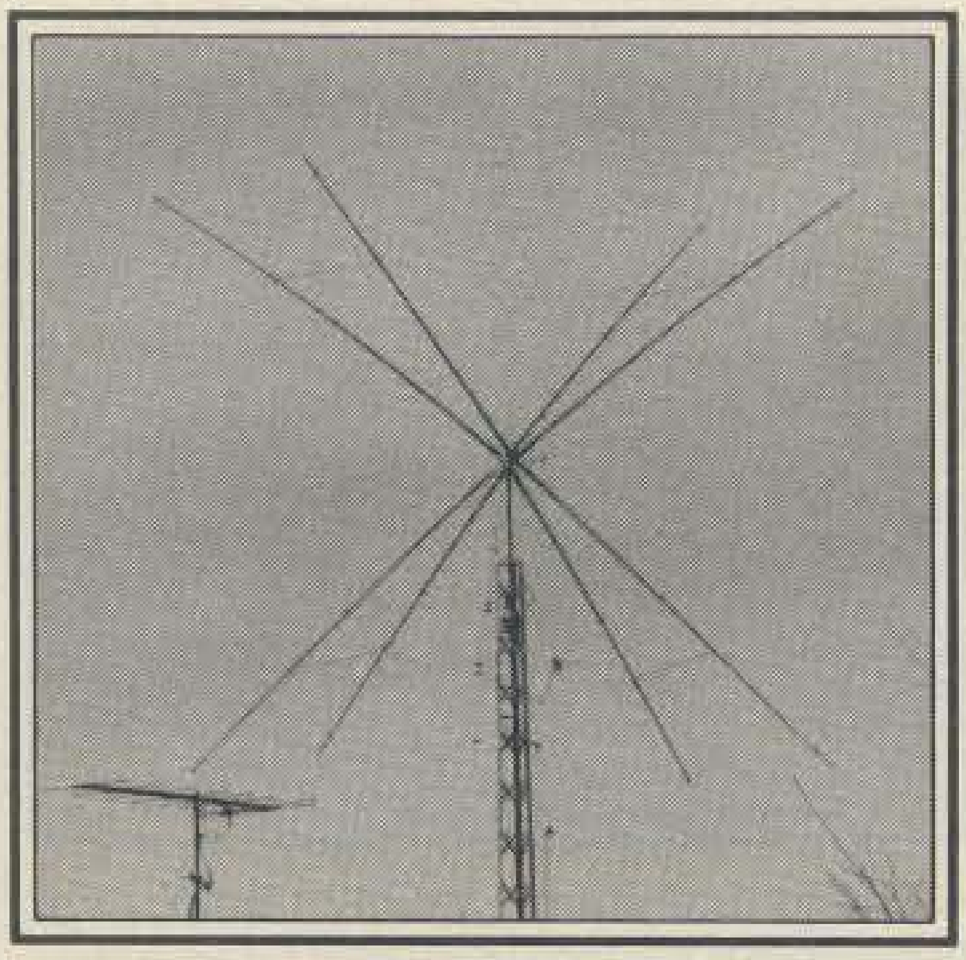
Although bulky and difficult to erect, large quads offer increasingly stiff competition to the Yagi; the quad is about equivalent in power gain to a Yagi having one additional element. Shown here is a five-element quad; such configurations offer as much as 13 dB gain over the half-wave dipole. (Photo courtesy dB + Enterprises)

wind stress or may deteriorate from continuous exposure to the weather.

Aluminum and steel tubing or pipe are generally employed for the elements and boom; usually, both are made of aluminum tubing, while the hardware is of steel (sometimes plated). Because of its strength and ease of working, 6061-T6 (61S-T6) round aluminum tubing is frequently used; it is generally sold in 12-foot lengths by the pound. The tubing generally stocked by suppliers runs from ¼ " OD to 4 " OD or greater, with wall thicknesses of from .049 " to .125 ". Obviously, the inner sections and the boom should be constructed of the heavier grades.

Keep a few points in mind. The 61S grade is probably best for h.f. beam elements; softer alloys may not be suitable. The telescoping elements should be arranged so that the center section is one continuous length for high strength. Large h.f. arrays require the use of a suitably rugged boom; 2–4 " diameters are frequently used, and are sometimes made of aluminum irrigation pipe. Tubing can be spliced together to form the boom, although special care must be taken to preserve mechanical integrity and electrical continuity.

It's fairly easy to evaluate an antenna from a mechanical standpoint, if one can see it up close or mounted atop a tower. Undersize or cheap construction is generally highly visible, especially when the array is in the air. It's a little less obvious when it comes to hardware. Suffice it to say that parts at load-bearing points should be rugged. Heavy hose pipe and muffler clamps, aluminum angle stock, pipehangers, cast aluminum fittings, and other hardware are commonly used for these tasks; these should "look the part" when it comes to providing visible support. A perennial problem is corrosion, which, over time, can reduce the best beam to rubble if unchecked. Any antenna hardware that is subjected to corrosion should be treated or protected. Plated nuts and bolts are a good investment, since most antenna hardware, even that found in commercially designed kits, is untreated. Several methods can be used to increase protection. These include spraying the hardware with some type of rust-preventative primer or paint, or coating surfaces with oil. An even better solution is to have all the hardware, including washers and nuts, cadmium-plated. This



The answer to the question, "which is best, quad or Yagi" is not easily forthcoming. Proponents of each design list numerous advantages. The real answer can, at best, be written in terms of "best for whom" using some of the considerations mentioned in the text. Shown here is the Canadian Gem-Quad 2-element "boomless" quad tribander.

involves taking the hardware to a job shop and having them run the parts through a plating bath. While a modest fee will be charged, the hardware will last a long, long time if so protected. Silicon sealing grease can be used to protect coaxial connectors.

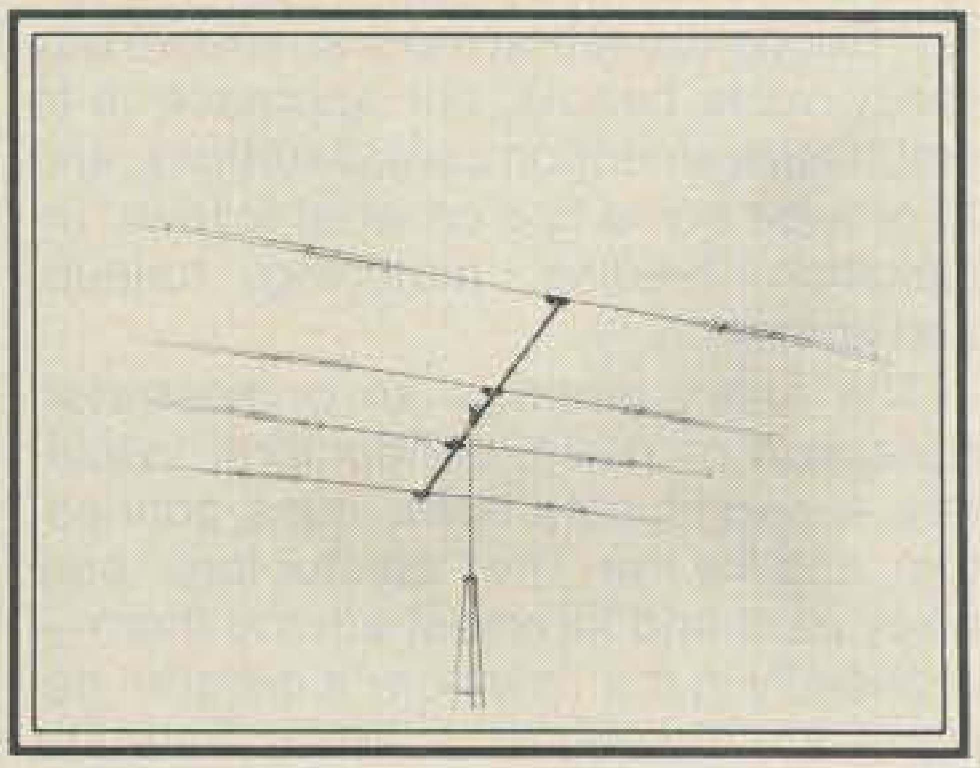
Antenna assembly can be the worst part of the whole operation; this requires patience. Assuming a commercial kit has been purchased, the first step is to open the package and place the parts in an "assembly area" that is off-limits to all but antenna party participants—both to avoid inadvertent loss of parts and to protect others from injury. The package should be carefully checked against the parts list, and some time should be devoted to reading the instructions. A little time taken at these points will be time well spent. Most well-designed kits contain concisely written instructions and most of the information needed to complete the antenna assembly. In many cases, all that is needed in the way of tools are a screwdriver and wrenches.

What about the tower? A tower or support of some type is, of course, needed to get your beam in the air. The higher the better, although most amateurs use a tower between 40 and 50 feet. Telescoping or tilt-over type towers are probably best so that the tower may be cranked down or cranked over when the need arises. This allows the tower to reduce its exposure when serious weather threatens and allows for work to be done on the tower or antenna. For strength, guys may be used, or the tower may be backed up against the house, using the structure as a support. Note that if the tower is placed against the house, it must be supported by a part of the house that can take the stress. Also, towers tend to creak and hum in even light winds; the noises may be disturbing to the household. A secure base and proper grounding are essential.

In selecting the tower, the square foot wind area of your beam (plus future additions) should be matched with the wind load the tower (and rotator) will safely take. You will find these figures expressed in square feet of wind load, usually at a wind velocity of 50 m.p.h. or more. Know the average wind velocity for your location. The cost of a tower is roughly proportional to the tower's strength, durability, and height. Aluminum is a favorite material in areas subject to high corrosion, such as from salt spray, although galvanizing or aluminum coating can reduce this problem with steel towers. Note that the tower should, if possible, be erected in a place where it would not touch electric wires should it fall.

A rotator that can handle an amateur-sized array is a "must." Practically all TV-type rotators fall far short of turning heavy 20-, 15-, and 10-meter beams, although these units can be suitable for rotating medium- and even large-sized v.h.f. and u.h.f. arrays. The rotator is usually placed in some sort of cradle or mounting assembly that will vary with each installation. The idea is to provide a rugged mount for the rotator, one that keeps the weight of the antenna off the rotator. One technique is to install the rotator 8–10 feet below the top of the tower, supporting the beam mast at the top of the tower with a thrust bearing. This will tend to keep the weight of the beam off the rotator and reduce the "bending load" on the rotator due to the wind. Rotator cables should be routed so as not to provide an easy path for lightning to enter the house.

There are dozens of ways to erect the antenna, and there is probably one best way for your particular installation. Time spent in analyzing the "lift" problem, preferably pooling the experience of several local amateurs, can yield good dividends when the time for installation of a big array comes. A little pre-planning is especially important, since chances are



Rotary beam installation really isn't completed when the antenna is erected and tuned up. Efficient, effective operation depends on proper orientation and a positive means of determining signal path headings. Several methods are described in the text. (Photo courtesy KLM Electronics)

that the antenna assembly instructions provide little or no guidance for raising and mounting the beam.

While there are many unique, specialized installation techniques, the most common makes use of a ground party, "tower man," gin pole, halyard, and pulley. The objective is to have the ground party do most of the work, and to let the tower man be free to guide the antenna into position. Using this popular technique, the array is placed in a clear area, arranged to point toward the tower. The halyard is secured to the boom. It is run through a pulley attached to the top of the gin pole about 2 feet above the top of the tower. The ground crew pulls the antenna up the tower using the halyard. As the antenna is lifted and approaches the top of the mast, the tower man guides it after the lifting rope has been untied from the front of the antenna. The antenna is pulled into a horizontal position by the ground crew, and the tower man secures the antenna to the rotator mast. These operations can be tricky, and safety is paramount. Special care must be taken not to allow anyone to stand near the base of the tower while the antenna is being raised to guard against tool-dropping casualties. And, anyone who climbs the tower must wear a safety belt—not only from a safety standpoint, but from the fact that it's near-impossible to work efficiently while hanging onto the tower with one hand.

As we have indicated, each installation is different, and as a result, no general set of instructions will exactly suit a particular installation. The key to successful installation is the step-by-step thinking-through of the process to include exactly what tools, materials, and manpower will be required at each point, *all done while the antenna is still on the ground.*

(To Be Continued)

Antenna Entrepreneur

The emphasis in our Antennas Columns is that of an instructional presentation of antenna theory and design, with most material presented on a non-technical or semi-technical plane. We also like to highlight new and unusual antennas through our "Antenna of the Month" feature. Occasionally, it's nice to give a small and unsung manufacturer a boost.

We've noticed that George Shira, WD4BUM, makes the flea market scene at many, if not most, of the hamfests in the southeast—at least, at most of those that we attend. George sells several kinds of unusual, custom-fabricated h.f. and v.h.f. mobile antennas, as well as a line of mobile mounts. He doesn't advertise, except by word-of-mouth, and he describes his operation as strictly a "mom and pop" enterprise. I finally had an eyeball QSO with this personable fellow at the Atlanta Hamfest, where he showed me an interesting line of continuously loaded fiberglass monoband mobile antennas for 80 through 10 meters; these are manufactured to his specifications by a local factory near George's QTH. According to George's tests, these whips are about equivalent in performance to standard center-loaded whips, but have much less wind resistance than the usual whip-and-coil combination. His whips are also much less expensive, running about $11 each. He has devised a unique triple mounting bracket for parallel (no band-switching) operation of three of these whips on a travel camper. George showed me some sturdy 10-, 6-, and 2-meter magnet mount antennas and a collinear for under $15.

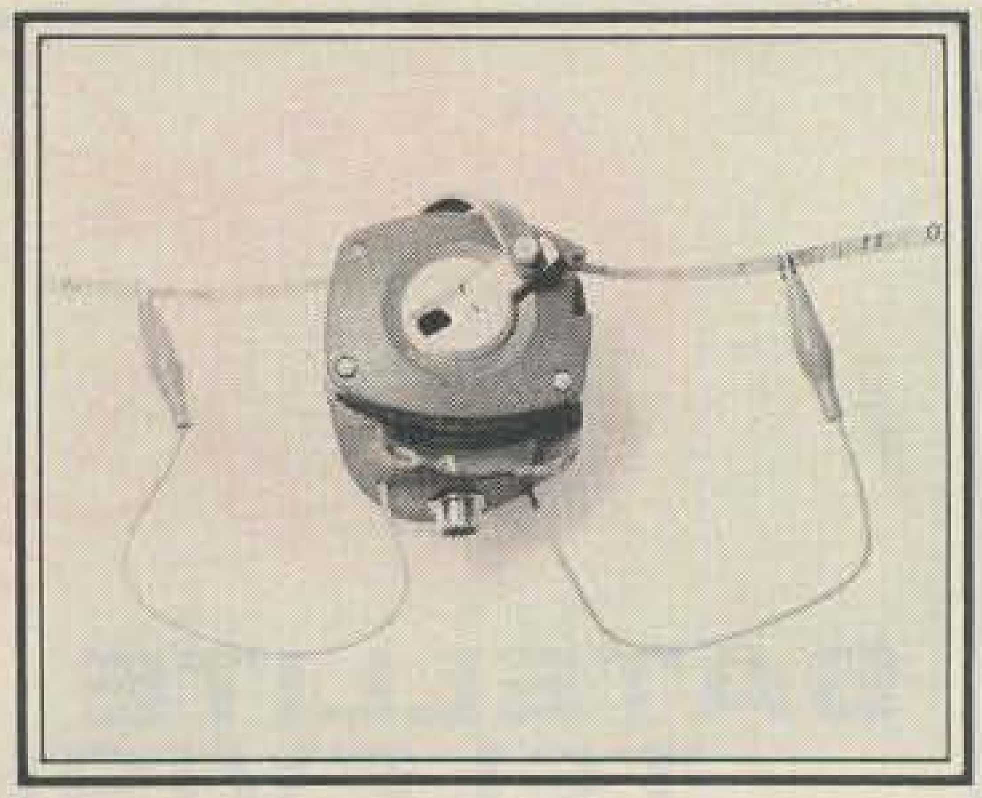
As I said, George doesn't advertise, but the modest line of inexpensive, unusual antennas and fittings deserves a plug. George's address is Rt. 7, Box 101-I, Anderson, SC 29624.

Summing Up

Next month we will take up and conclude our discussion of the Yagi antenna. We'll get into feeding, matching, and tuning the Yagi, as well as some practical tips on using a beam antenna. Finally, we will give a useful bibliography on selected readings for those of you who wish to delve deeper into Yagi-Uda arrays.

73, Karl, W8FX

Antenna Of The Month: Spencer Products "Tenna-Tape"



This interesting portable antenna manufactured by Spencer Products is intended for ham-band use from 10–40 meters, but it can be set to intermediate lengths for shortwave band monitoring.

The inexpensive antenna is made from two Stanley 50-foot steel tape measures coated with Mylar; the leather strap is attached to one handle and has a hole that fits over the other one, thus preventing the tapes from unrolling. Designed for indoor or outdoor use, traveling or camping, the tapes crank into a high-impact, compact housing for storage. The antenna can be used as a dipole, inverted-Vee, or sloper. Conceivably, the tape device could be set up as an off-center-fed Windom.

The Spencer Products "Tenna-Tape." (Photo courtesy Spencer Products, 18 Reynolds Avenue, Cortland, NY 13045)

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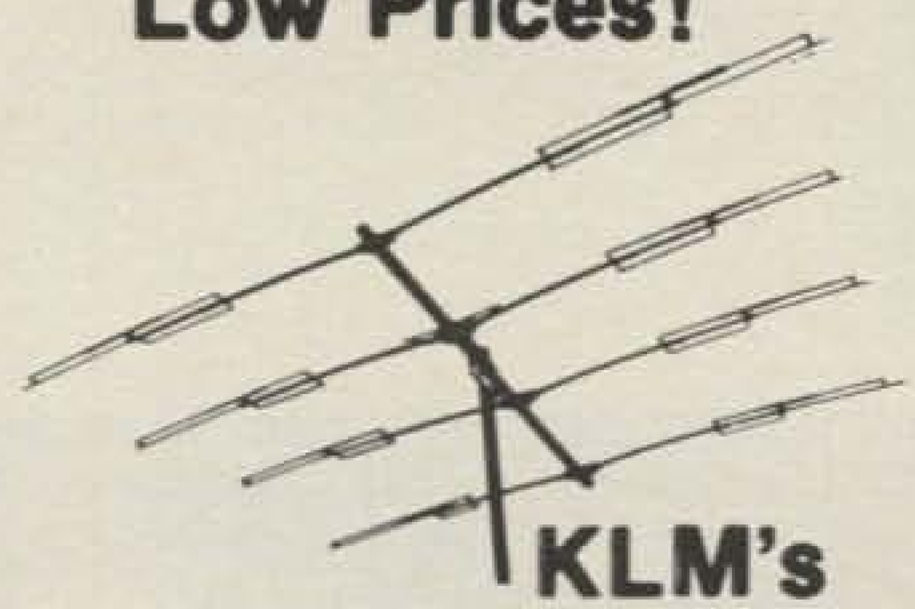

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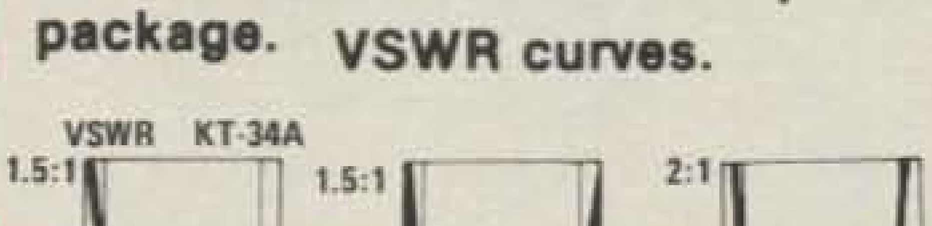

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A4	4-El. Triband Beam	$209
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R3	New Motor Tuned 20/15/10 mtr. Vertical	$229
AV5	80-10 mtr. Trap Vertical	$ 89
20-3CD	3-El. 20 mtr. Beam	$169
20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 89
15-4CD	4-El. 15 mtr. Beam	$ 99
10-3CD	3-El. 10 mtr. Beam	$ 69
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 59
617-6B	6-El. 6 mtr. "Boomer"	$169
214B	14-El. 2 mtr. "Boomer"	$ 66
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CIRCLE 90 ON READER SERVICE CARD

The precise regions of daylight and darkness are hard to locate mathematically. However, they can be found easily with just a globe, a clock, and some wire. Here's how.

Finding The Terminator

BY STAN GIBILISCO*, W1GV/4

It is often necessary for DXers to know the exact position of the terminator line—the boundary between daylight and darkness around the earth. Knowing where it is day, where it is night, and where this dividing line is helps you to get an idea of what parts of the world you are most likely to hear on a given band at a given time. Some bands are open only at night; some are better during the daylight hours.

Sometimes it is possible to work stations which lie on the terminator line when it is dawn or dusk at your QTH; you may be able to use any of several bands, and work either long or short path. It is a great help to know what the astronomical situation is. It's not very hard to figure it out.

The Solar Zenith Point

Finding the terminator is greatly simplified by the realization of one fact: Somewhere in the world, no matter what time it is, the sun is straight overhead. Once we locate this point, the terminator is easy to find; it is the great circle whose axis has a pole at the **Solar Zenith Point** (abbreviated SZP).

That sounds pretty complicated, perhaps! Let's take it one step at a time. Where is the SZP right now? Well, its latitude depends on the time of year, and its longitude depends on the time of day. Figs. 1 and 2 show the latitude and longitude variations of the SZP.

Latitude

Fig. 1 gives the latitude of the SZP as a function of the time of year. Just find the location of the date on the horizontal axis; interpolate by assuming that each month is exactly 30 days long. Read the value of the latitude from the function. (Be sure you note whether it's north latitude or south latitude.)

The SZP never strays more than 23.5 degrees north or south of the equator; twice during the year, it crosses the equator. Where is it now?

Longitude

The longitude of the SZP, as a function of the time of day, is shown by fig. 2. Read the time in Coordinated Universal Time (UTC) on the horizontal axis; the longitude may then be read off the vertical axis. For the first 12 hours of each day UTC, the SZP is in the eastern hemisphere; for the second 12 hours, it is in the western hemisphere. (Be sure to note whether the longitude is east or west!) The SZP crosses the Greenwich Meridian at 1200 UTC.

Of course, the SZP moves once around the world each day at the rate of 15 degrees of longitude per hour.

**P.O. Box 561652, Miami, FL 33156*

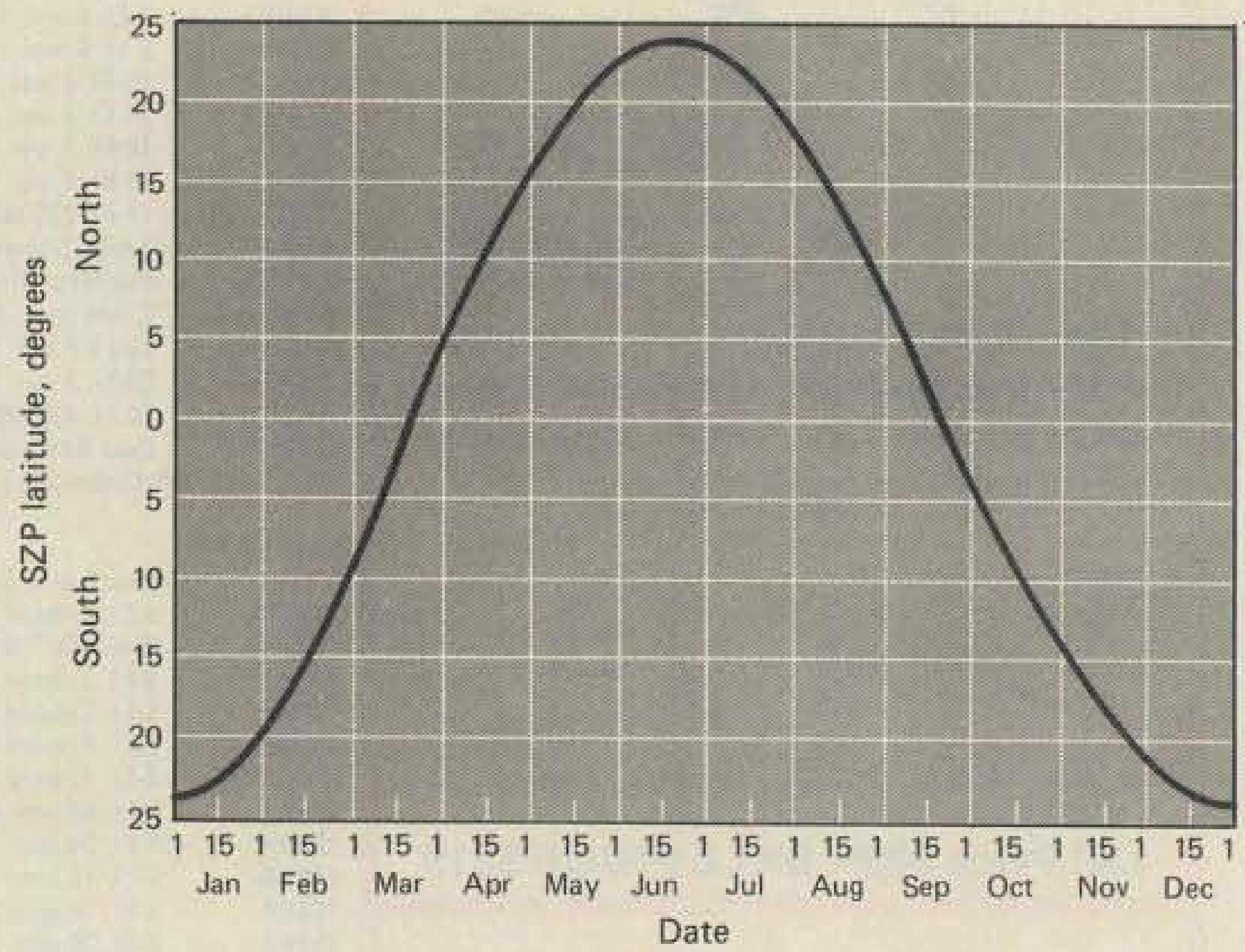

Fig. 1– Latitude of the solar zenith point (SZP) as a function of the time of year. Interpolate the date within the month on the horizontal axis; read the latitude on the vertical axis.

A Wire Around The World

Find a piece of stiff wire in your junk box. No. 10 or 12 soft-drawn copper wire is the best; the No. 8 aluminum stuff you find in TV or hardware stores is also acceptable.

Form the wire into a circle having the same diameter as your globe. Solder the ends together or use epoxy cement. Once this circle has been manufactured, be sure it is perfectly round and lies all in one plane. (Put it around the equator of your globe and adjust it so it coincides everywhere.)

Make two half-circles of wire by placing the wire on the globe and cutting them so they run from one pole to the other. Then adjust them in the same way you adjusted the full circle, to make them lie in a single geometric plane.

Attach the two half circles to the full circle in the manner shown by fig. 3. The half circles should be attached to the full circle at 90-degree points with solder or epoxy. At the apex point, where the two half circles cross, secure them together with a small piece of fine wire, so they can be moved slightly. The finished structure should fit nicely over half of the globe.

Some globes are mounted in such a way that the wire structure cannot be positioned flat against the globe. Try moving your wire creation around on the sphere; if the mounting interferes significantly, you will have to remove it.

Once your globe is free, place the wire structure on the globe so the full circle runs around the equator and the half circles lie in the northern hemisphere. Adjust the crossing point so it lies precisely at the north pole. Then secure the wires with

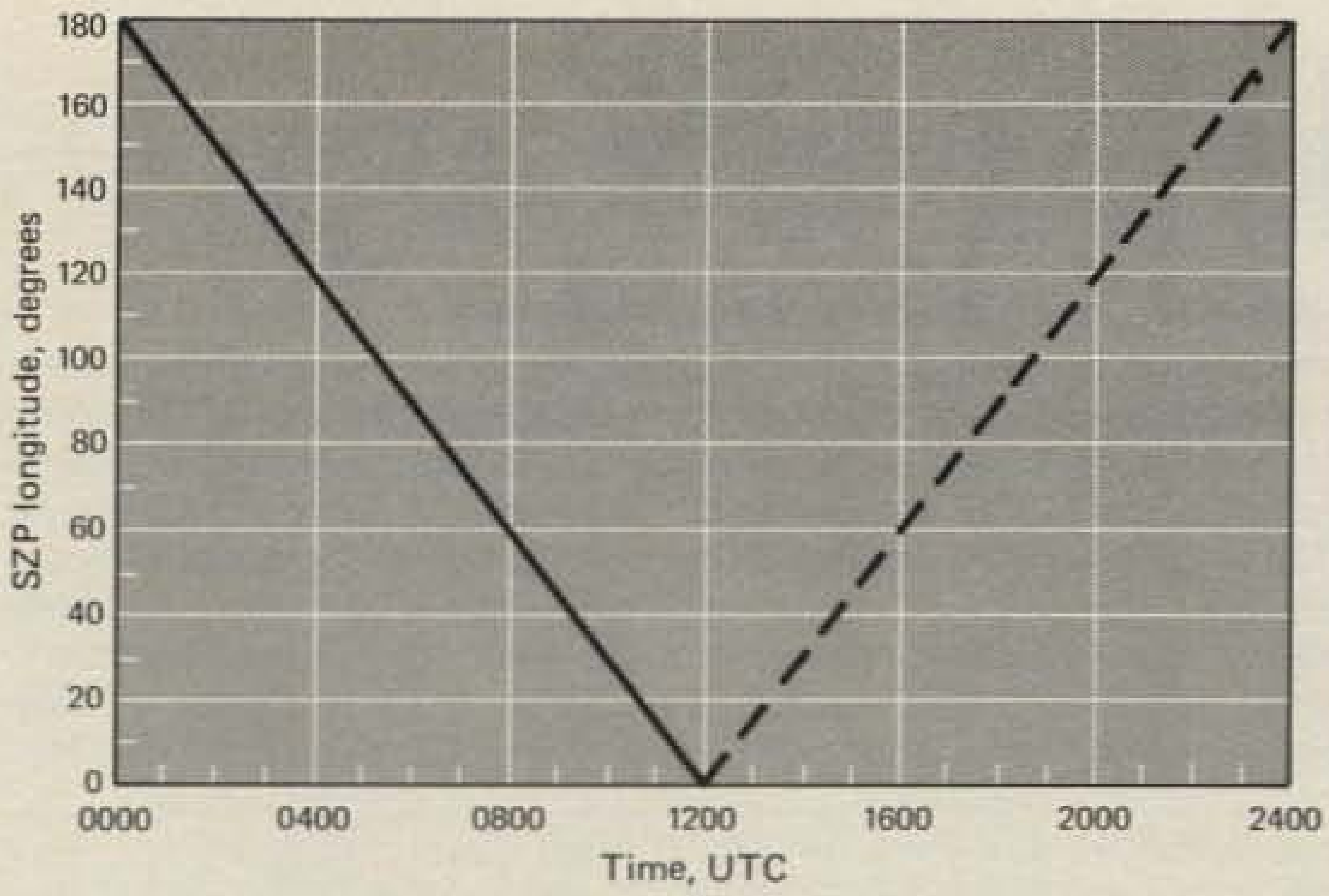

Fig. 2–Longitude of the SZP as a function of the time of day. Read the time in UTC on the horizontal axis; find the longitude in degrees on the vertical axis. The solid line represents east longitude and the dashed line represents west longitude.

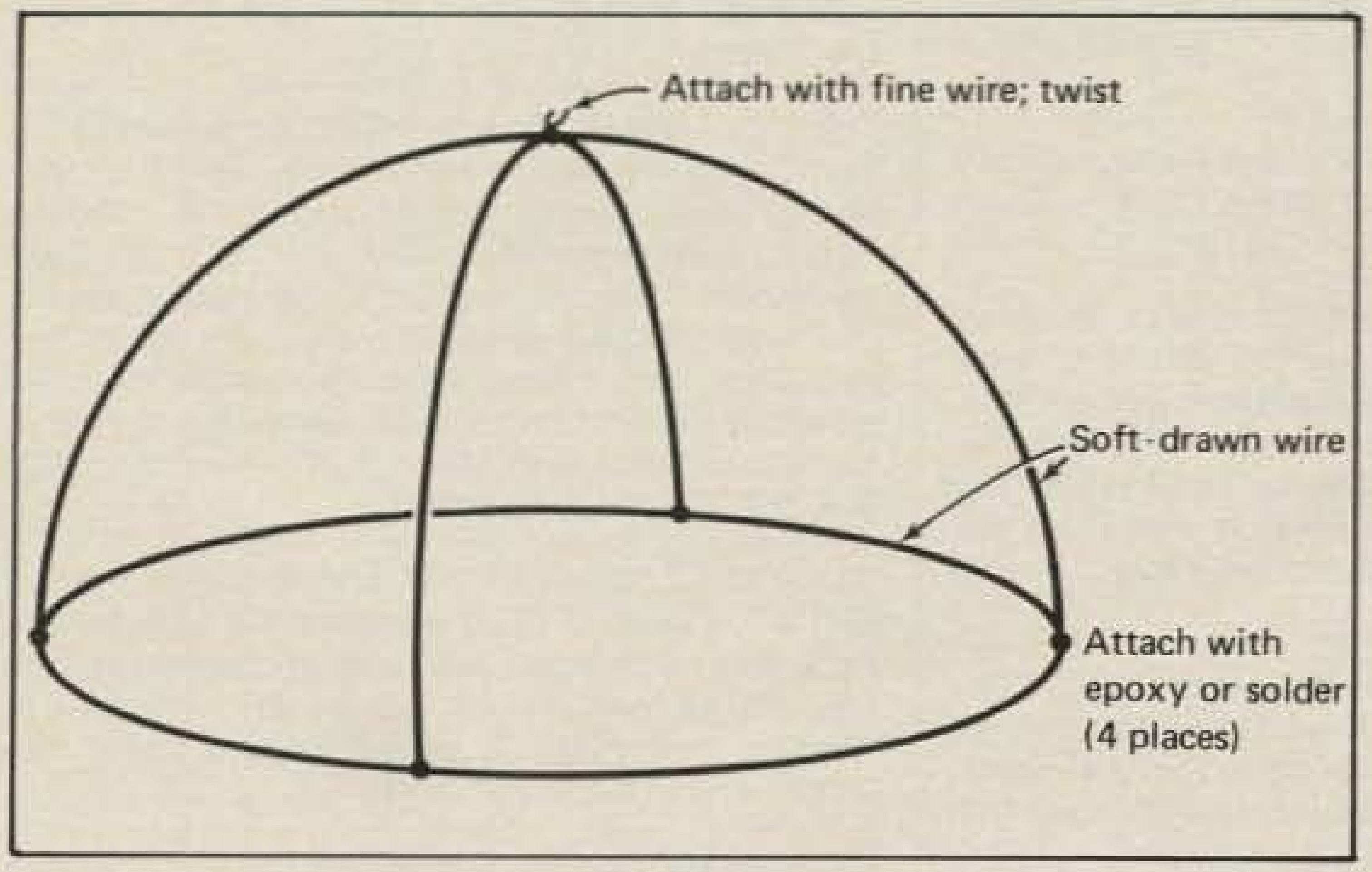

Fig. 3– The "terminator locator." Soft-drawn No. 10 or 12 copper wire works very well for construction of this device. The finished locator should fit neatly over the globe. Place the vertex (where the wires cross) at the SZP; the terminator is then indicated by the postion of the circular wire on the globe.

epoxy or solder so they stay this way. (Don't ruin the globe! Take the wire off it first!)

Position Of The Terminator

The wire thing you have built is a terminator locator! When you know the whereabouts of the SZP, simply place the locator on the globe so that the two semicircular wires cross at the SZP. Then the circular wire shows the exact location of the terminator; the half of the globe nearer the SZP is the daylight side, and the other side is the nighttime side.

By experimenting with this device, you can see that the terminator may not run north and south at a given QTH at a given time. In fact, this is almost *never* the case. In some places the terminator actually runs east and west. In some places, whole months go by without the terminator ever paying a visit at all.

Now you can find out, conveniently and quickly, the dawn and dusk orientations of the terminator for your QTH. You can determine, at any time, what part of the world is in darkness and what part is in daylight. You can observe the path that your signal will travel over the earth's surface. Will the signal always be in daylight, or always in darkness, or will it pass through both? Knowing this, you can figure out which band and beam heading is best for a shot at the DX you're after.

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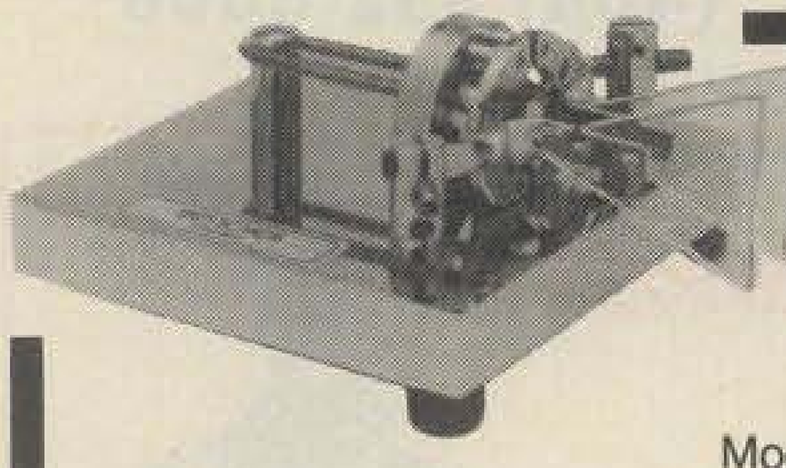

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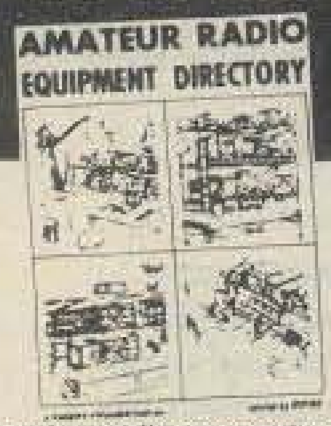

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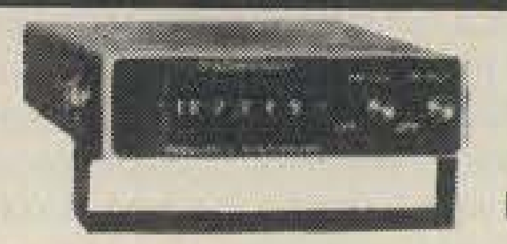

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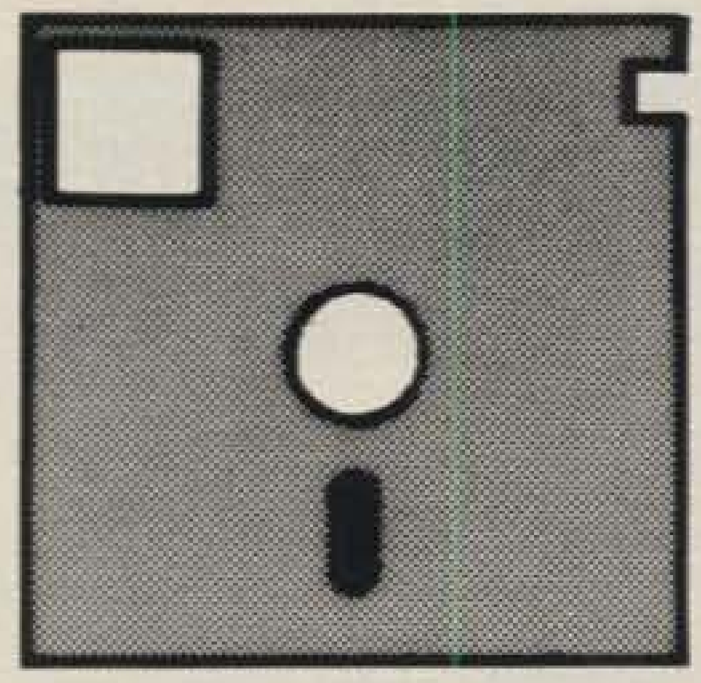

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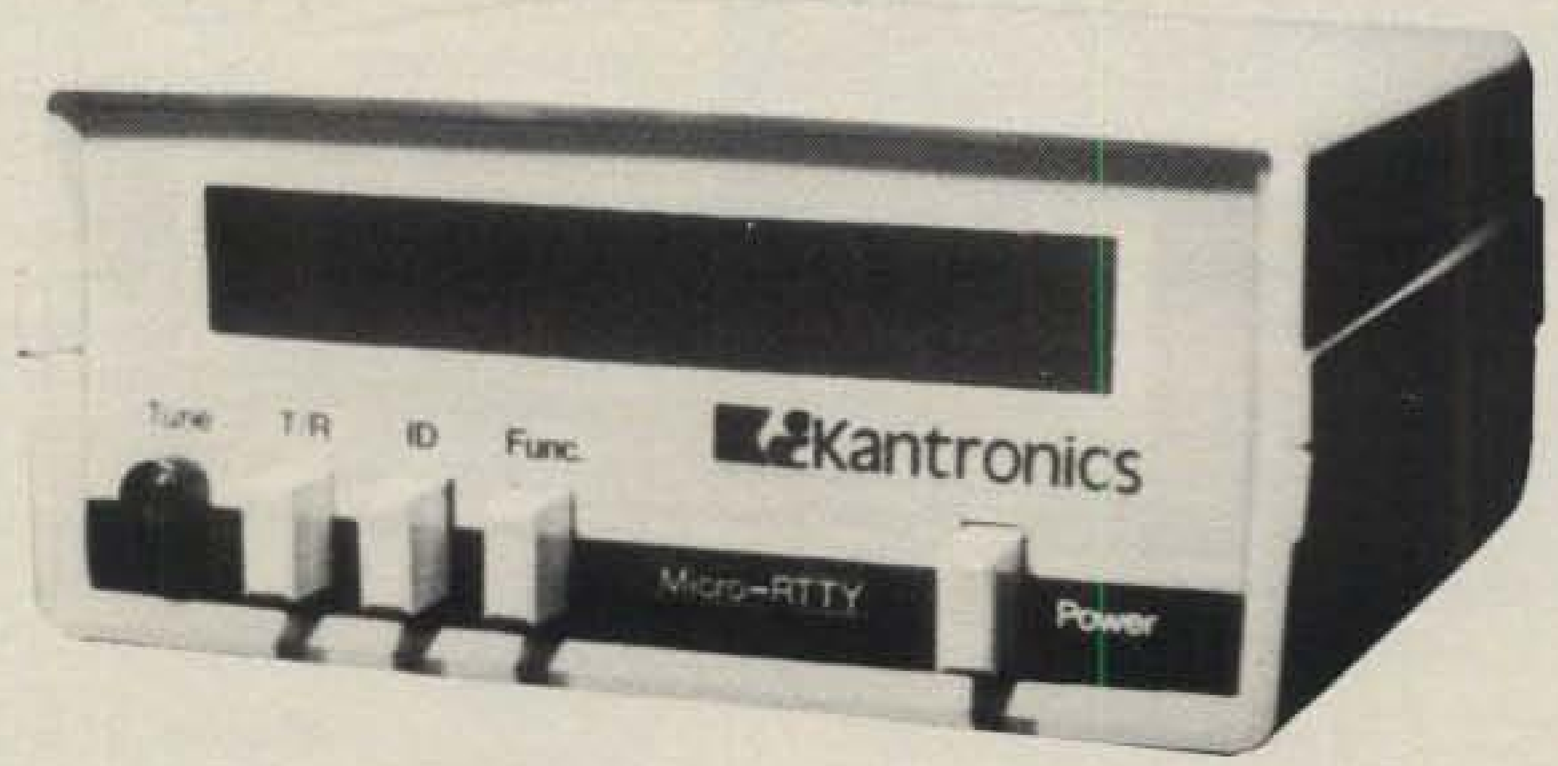

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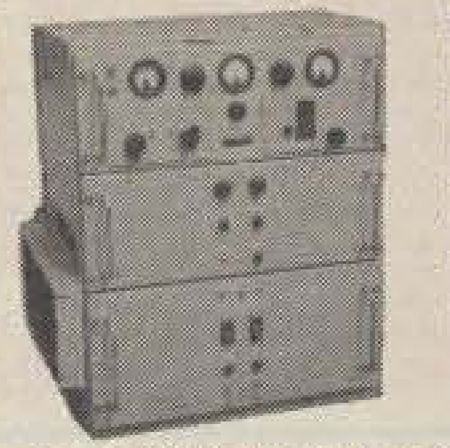

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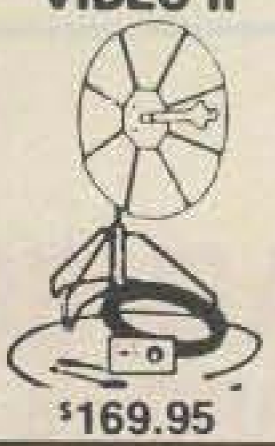

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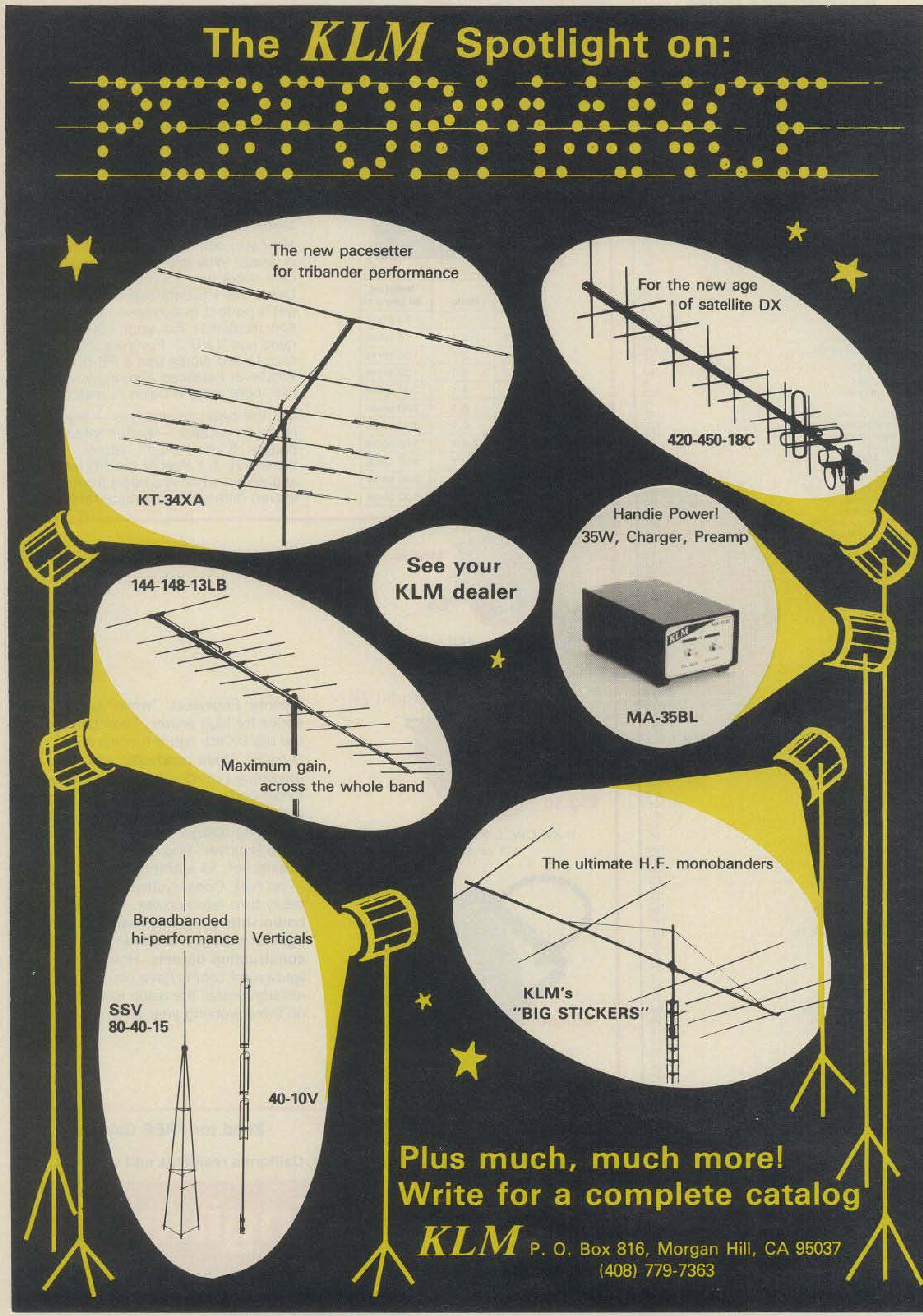
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