Amateur Radio

CQ

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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur radio

NEW!

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**

Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.

More TS-940S information is available from authorized Kenwood dealers.

KENWOOD

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

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handfull"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- ST-2 base stand
- MS-1 mobile stand
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/ alkaline battery case
- RA-3 telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.

• Simple to operate

Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.

• Large LCD

Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.

• Extended frequency coverage

Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz; transmit capability is 142-149 MHz, (TR-3600A covers 440-450 MHz).

• Programmable scan

Channel scan or band scan, search for open or busy channels.

• SLIDE-LOC battery case

• 10 Channels

10 memories, one for non-standard repeater offsets.

• 2.5 watts high power, 350 mW low

TR-3600A has 1.5 watts high or 300 mW low.

TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
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"DX-traordinary"

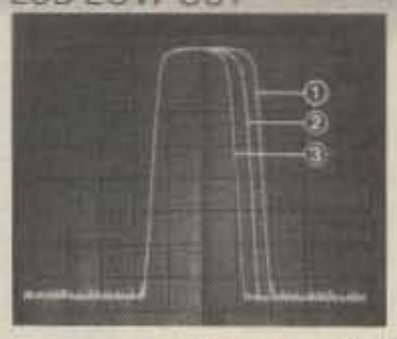
TS-930S

All band HF transceiver/ general coverage receiver.

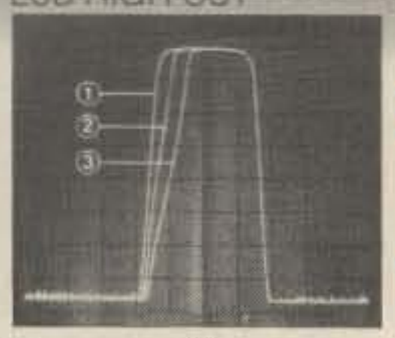
The TS-930S (with or without automatic antenna tuner) is a high performance DX and contest transceiver delivering superior features and field-proven performance. Compare the TS-930S with other HF rigs in its price class and see why no other rig comes close!

- **160-10 meters, with 150 kHz-30 MHz general coverage receiver.**
  A innovative, quadruple "UP" conversion digital PLL synthesized circuit provides superior frequency accuracy, stability, and greatly enhanced selectivity.
- **Easily modified for HF MARS and CAP operation.**
- **Excellent receiver dynamic range.**
- **All solid state, 28 volt final amplifier for lowest intermodulation distortion.**
- **Power input rated at 250 watts on SSB, CW, FSK, and 80 watts on AM.**
- **Full break-in or semi-break-in CW.**
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. The CW pitch control shifts the IF passband and simultaneously changes the beat frequency pitch.

LSB LOW CUT



LSB HIGH CUT



- **SSB slope tuning—Another Kenwood First!**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection.
- **IF notch filter.**
- **Tunable audio filter built in.**
- **Dual mode noise blanker ("pulse" or "woodpecker") with threshold control.**
- **Eight memory channels.**
  The VFO-MEMO switch allows use of each memory as an independent VFO or as a fixed frequency.
- **RF speech processor.**
- **High stability, dual digital VFOs.**
- **AC power supply built in.**
- **Fluorescent tube digital display.**
  Separate two digit indication of RIT frequency shift.
- **One year limited warranty on parts and labor.**

Optional accessories:

- AT-930 automatic antenna tuner
- SP-930 external speaker, with selectable audio filters
- YG-455C-1 (500 Hz) CW filter
- YG-455CN-1 (250 Hz) CW filter
- YK-88C-1 (500 Hz) CW filter
- YK-88A-1 (6 kHz) AM filter (all plug-in type)
- SO-1 commercial stability TCXO
- MC-60A deluxe desk microphone
- MC-80 desk microphone
- MC-85 multi-function desk microphone
- MC-42S mobile hand microphone
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor
- PC-1A phone patch
- SW-2000 SWR/power meter, 160-6 m
- SW-200A SWR/power meter
- SW-100A SWR/power/volt meter 160-2 m
- HS-4, HS-5, HS-6, and HS-7 headphones.
- LF-30A low-pass filter

More TS-930S information is available from authorized Kenwood dealers

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hy-gain®

"Heavy Duty" is Relative!

In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.

HDR300

AR40

CD45 II

HAM IV

T2X

TELEX hy-gain

TELEX COMMUNICATIONS, INC.
9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord,
93153 Le Blanc-Mesnil, France.

A Letter from the President . . .

TEN-TEC INC

HIGHWAY 411 EAST • SEVIERVILLE, TENNESSEE 37862 • 615-453-7172

Dear Fellow Amateurs:

Here is a picture of our newest Amateur Radio transceiver - the CORSAIR II. It is, without question, a superb piece of gear I am proud to put the TEN-TEC name on. New features include a computer designed, 16 pole crystal ladder filter, 8 pole audio bandpass filter, built-in 40 character memory keyer, dual mode noise blanker and out-of-the-box AMTOR compatability.

Performance improvements start with typical dynamic range in excess of 95 db, better unwanted sideband suppression, and, when using the variable audio filter, up to 10 db improvement in noise floor.

We also think you'll like the stylish new appearance of the CORSAIR II. The gold and green digital readout, the contrasting gray and black cosmetics and the textured, matte finish knobs make an attractive package you will be proud to have on your operating desk. At TEN-TEC, we offer no gimmicks, just technology. Write us for full details.

73,

TEN-TEC, INC.
Jack Burchfield
Jack Burchfield, K4JU
President

Corsair II

SEE YOUR DEALER OR WRITE

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

CIRCLE 48 ON READER SERVICE CARD

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CQ The Radio Amateur's Journal

ON THE COVER: Dick Knadle, K2RIW, poses proudly with one of the best known VHF projects, his strip line amplifier. Photo by Larry Mulvehill, WB2ZPI.

JUNE 1985 **VOL. 41, NO. 6**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

Amateur Radio Needs A Unicorn

I'm still at the awkward age—not old enough to be sage and wizened and not young enough to have all of the answers. When I first got involved in amateur radio, people my present age were in charge of radio clubs and they did have all of the answers, at least as far as kids my age were concerned. People my present age were the role models, the teachers, and the ones who gave us the terrible jobs on Field Day. They were the ones who quieted us down at meetings and told us they were sorry but we couldn't attend a club social because beer was going to be served and we were minors. They collected our dues, though, and gave us our first history lesson—an understanding of "taxation without representation."

In spite of the above, we persisted in amateur radio, because at the time there were no real alternatives. There really was no TV, a Sperry UNIVAC was unaffordable and would take up the whole block, sex was not to be invented for a few years, drugs came from a pharmacy when you were sick, and drinking was something "old folks" did to keep you from their parties.

But we knew how to make things better with the world, and we especially knew what the club and amateur radio really needed. We also knew that if we waited, someday we too would be that old and we would be running things *our way*. Well, those old folks just got older and more set in their ways. We got involved in other things and drifted away to school and to starting jobs and families, putting amateur radio on the back burner for a while. Oh, it was still there, but other things were a bit more important at the time. It just wasn't time for *our* time.

About the time when it became our time and we then could give out the terrible jobs at Field Day to the kids (kids and lids) and enjoy the parties without the kids (although they helped pay for the parties) and have meetings at which we could tell them to shut up, it became apparent that there were no kids. They were into CB. The ungrateful wretches wouldn't cooperate with the Master Plan.

The kids of the mid 1960s and early 70s couldn't see the value in taking abuse and in being one license grade behind, these being the rites of passage. It wasn't worthwhile to wait and endure so that you could do it to someone else later on. They were crass enough to want something immediately. CB was "dumb" enough to offer instant acceptance to everyone on an equal level. Everyone could indulge in the same fantasy right at the same time. Everyone could talk "southern," pretend to be a truck driver, wear funny T-shirts, and display CB decals and belt buckles. CBers could form national groups, have large social gatherings for the whole family, and in general laugh a lot and have a good time. For shame, they didn't know.

We did offer to show them the error of their ways. We used all the old (there's that word again) winning ways: derision, contempt, and hostility. We honestly told them that they were not really enjoying themselves, and that we, and only we, had the answer. Some did opt for "conversion" and some kept both irons in the fire, but the majority of the 25 million went on somewhere else. They're all out there someplace doing whatever now, but it's my guess that they're still looking for fun.

The computer craze caught the next generation or two of kids for many of the same reasons. Amateurs *are* also involved with computers, doing wonderful and interesting things, but even if every licensed amateur (and bootlegger) was involved with computers, the numbers wouldn't come anywhere near the number of civilians who are. By now, however, the panic is starting to set in as the realization hits home. Where are the kids? Well, whatever the next electronic wizardy is that comes down the pike, they'll be there.

The one big, glaring fault with our amateur radio tradition is *NOT* the amateur radio part. We all agree that whatever it is, it is great. Why it doesn't attract kids may have more to do with the tradition part than the amateur radio part. To a lot of us it still is exciting, pleasurable, and immensely worthwhile. The problem is, how do you convey that? How do you share a world with someone perhaps less than half your age and treat that person as an equal and not a child being scolded? How do you explain the fun in working a "rare" one, in building a project, or in restoring a classic? How do you describe a hamfest or talk about friendships that transcend international and political boundaries? Amateur radio is an immense universe that is constantly changing. Those who limit the change in the name of "tradition," especially *their* tradition, have restricted the growth of amateur radio and have begun to choke its very life.

If we presume for a moment that we do have something of value to offer a youngster, namely amateur radio, then we have to examine it on its own and not as a character-building rite of passage. Since everyone involved in amateur radio feels very strongly about and extremely protective of his own definition of it, then there has to be a very worthwhile core to it that is universal. It is this essence that is the product, the commodity that must be sold. This essence, and I know that it's hard for some to believe, is FUN—FUN on its own terms and not part of any process.

Some of us have to loosen up and stop taking ourselves so very seriously. It's hard to sell a pastime that is so serious with portents of a lifelong career in engineering, physics, and industrial management to a 12 year old. There's nothing wrong with those ambitions, but they have nothing to do with amateur radio here and now. Many careers, including mine, have come from amateur radio, but that was not the reason or motivation for getting involved in the hobby. Initially I thought that I would enjoy it and have a good time, period. It looked like fun.

Amateur radio has a lot to offer a youngster. We should know best, as it was offered to us. Today there is tremendous competition for a youngster's time and abilities. We need and can use that talent. It is we "older" folks who will benefit in the long run. It's up to us to come up with a way of vying for that time. The traditional cod liver oil approach of "take it (*I took it*) even though it tastes bad and "some day (*maybe*) you'll understand when you're big and strong" just hasn't worked.

So it's up to *us* to find the way to sell the product. *Us* is everyone, every organization, and every group who has a stake in amateur radio. We as individuals or in groups have to compete for attention and interest. It's not easy. We have to think beyond ourselves. The product is proven and good. We have to bring it to market and sell it using modern techniques, just like an IBM. We have to develop catchy ways of drawing attention to amateur radio and creating an interest in what we do.

Recently the circus came to New York. For several days murder and mayhem, world crisis, and political unrest left the front pages in favor of the speculation on whether or not a certain animal featured in the circus was indeed a unicorn.

Prior to this the argument was academic, as the only unicorns available were those depicted in artwork and famous tapestries. However, from the numerous depictions of unicorns one would have to say that the general consensus of those who had seen these renderings would lead us to believe that a unicorn was more or less shaped like a horse. The circus unicorn was shaped like a goat, looked like a goat, made goat sounds, and in the dark with a hat on could be honestly mistaken for a goat. That it was a goat was finally and officially determined by the US government after much deliberation and careful inspection.

The circus I'm sure reveled in the publicity, and I don't think that too many people were disappointed in discovering that the one-horned goat was not really a fabled unicorn. A lot of folks, though, heard about the circus being in town and went to see for themselves to "decide" on the authenticity first hand. After all, a real unicorn is a serious thing, and we shouldn't be swayed by all of the extra tickets the circus sold.

Well, the unicorn idea was just used, and it's too soon to try to pass off a squirrel as a miniature dinosaur. The rock video option is still open, and it's still possible to get amateur radio on the charts via a hit single. Publicity is where you can find it these days. Most of our publicity has come about via extremes, natural disasters, accidents, wars, and space flights. They're hard to generate on demand, hard to control, and usually involve some measure of tragedy. It's not really an "up" sales tool.

We've got to come up with something that we can use during peacetime, sunshine, and happiness and that's exciting, novel, and captures the imagination. I know we can do it. We've waited for our time, and our time is now.

73, Alan, K2EEK

PICK A COMPUTER INTERFACE TO MATCH YOUR NEEDS

COMPUTER PATCH™ MODEL CP-1

MICROPATCH™ MODEL MP-1

COMPUTER PATCH MODEL CP-100

COMPUTER PATCH™ MODEL CP-1

The AEA Model CP-1 Computer Patch has earned a solid reputation for being the best overall interface value on the market today. We at AEA have now reaffirmed what our competitors already know; for the money, the CP-1 cannot be beat! That is why we have chosen to leave the popular CP-1 in our product line and to introduce new computer interface/terminal units with differing features and performance at different prices.

MICROPATCH™ MODEL MP-1

The new AEA model MP-1 Micropatch represents the best features and performance available for under $140.00. Featuring true dual-channel filtering of Mark and Space tones with an AM detector and Automatic Threshold Correction (ATC) circuit, the MP-1 is in a totally different performance class than competitive units that often have only a single channel filter or no filtering at all.

The MP-1 also offers a high performance CW capability. With respect to the CP-1, overall performance is nearly as good; but the CP-1 offers a few more advanced features such as variable shift tuning, RS-232 option, and a more advanced tuning indicator.

COMPUTER PATCH MODEL CP-100

The new CP-100 Computer Patch offers all the following exciting features in addition to the CP-1 features:

- 170, 425, 850 Hz Calibrated Shifts for Transmit and Receive
- 75 to 1000 Hz Variable Receive Shift Range
- Normal and Reverse FSK Outputs
- Input AGC
- Direct Coupled Automatic Threshold Control
- Front Panel Squelch
- Discriminator Style Tuning Indicator
- Current Loop Option
- Built-in Monitor Speaker
- Baud Rate Switch
- Improved AM Detector

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AEA Brings you the Breakthrough!

Our Readers Say:

More On The 2M Mobile Concealed Antenna

Editor, *CQ*:

W1JVQ, Al Kaufman—and possibly other readers of my February article describing construction of a concealed mobile 2M antenna—wonders about concealed mobile antennas in vehicles equipped with rear defroster grids. As explained in the article, the antenna described cannot be installed in such vehicles, station wagons, or hatchbacks.

A different concealed mobile antenna design may soon be available from Law Enforcement Associates, Inc., c/o Sirchie Group, Box 30576, Raleigh, NC 27622. This system can be used in practically any sedan—including those with defroster grids or short window heights. It offers electrical performance equivalent to a quarter-wave whip, mounts inside the car, and is rapidly transferable to another vehicle. Many hatchbacks and even some wagons can use it. The modular design of the new system allows rapid band-switching for 2M and up. No holes are drilled in the car, and cable routing is easy.

I do not know when or if this system will be marketed. Readers are advised to directly contact Law Enforcement Associates at the above address.

Matt Maggio, N4GSV
Burlington, NC

A Classic 4 Tube Transmitter

Editor, *CQ*:

The article on the one-tube CW transmitter by Chris Huntley in the January 1985 issue brings back a lot of memories. I used such a transmitter on 40 meters in the 1940's and 1950's. I could not get mine to work with only one tube—a rectifier was also required. But this had some advantages because a voltage of 350 was no problem and a lot more power could be had from a 6L6. In the "old" days, power transformers virtually always had a 5 volt winding, as well as one for 6.3 volts.

I also recall something of an unofficial contest on how much could be gotten from a one-tube transmitter. The old reliable 6L6G was pushed to extremes, and the "super 6L6," namely the 807, was putting out well over 100 watts! Look over the old magazines of the time and you will see these things.

But let me suggest a very "superior" four tube transmitter of moderate power. Use glass tubes—they pre-date the metal ones and hence are more "classic" (and pretty to look at as well). Then the result will reflect the late 1930's! First you must have a rectifier tube—type 80 will do just fine. Then an untuned oscillator with RFC load, such as a 6F6G. Then the tuned power amplifier, 6L6G, or 807 if you like a grid cap. The fourth "tube" is a VR150 voltage regulator which keeps the oscillator clean.

And some more suggestions. Don't use cardboard for coil forms. Rather, use *real* ceramic. That used to be the classiest way to go. Or perhaps a good dry broomstick where the broomstick can be removed for a self-supporting coil if heavy wire is used. And even more. Go to your local department store and get the "real McCoy"—a *real* breadboard.

Finally, if you really want to go back to basics, build yourself a one-tube regenerative receiver, which can also make use of the VR150 and filament winding in the transmitter power supply. A real ceramic coil form pays off in this application.

Perhaps my suggestions can start an interesting hobby of building classic rigs—maybe even back to the 01A's (but not the Model T Ford coils, which will distress the FCC).

John L. Stewart, ex-W6UJD
Eugene, OR

Keep Them Coming!

Editor, *CQ*:

Just a note to let you know how much I appreciate the articles by Dave Ingram, K4TWJ. His down-to-earth details are a great help to the understanding of the many facets of this "business"—particularly for retired auto-parts salemen turned ham at a late date (age). Keep them coming!

Kip Aslin, KD7MO
Washougal, WA

Part of 160 For Novices

Editor, *CQ*:

In January *CQ*, reader Steve Strachan, KA5KBM, relayed his thoughts on UHF Novice proposal (page 10). I have always wondered why a part of 160 meters wasn't set aside for Novices. Now, with the propagation other bands provide, 160 meters would be a perfect spot to reduce pent-up frustrations over fading QSO.

I enjoyed the short articles by Chris Huntley, KXØY, and Jim Burtoft, KC3HW, on pages 22 and 39 respectively. Both will help the newcomer and retain those "good feelings" we are lacking as our hobby makes a pit-stop and refuels for the fast-lane future.

Arnold Timm, KAØTPZ
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Here's a project for the VHFer with a little building experience that will help clear up the picture.

Construct A Low-Noise GaAsFET Preamplifier For 420 MHz

BY BILL PARKER*, W8DMR

Do you remember the 6AM4, 6J4, or the 6CW4 (8056) RF amplifiers for UHF receivers? Or how about the 417A oscillator called an amplifier? The 416B was probably the best amplifier of them all. The planar ceramic triode like the 7077 and the 7768 served many users. Then, at last, a few transistors that were touted as being UHF amplifiers such as the 2N3478 and the TIM010 were tried. Remember those parametric amplifiers with the built-in frustration?

A recent entry for RF preamplifier application is the MRF 901 bipolar transistor. In strong signal locations, a tuned cavity is absolutely necessary to aid in trying to reject unwanted commercial signals. Without a doubt, the MRF 901 represented a step forward, and perhaps a half step aside. But as we all learn sooner or later, there is something better just over the horizon.

Enter the gallium arsenide field effect transistor (GaAsFET). The GaAsFET preamplifier surpasses any preamp this writer has ever constructed, including all those mentioned thus far, be it grounded-grid, cascade, neutralized, common-emitter, grounded-base, etc.

The two-stage common-source RF preamp presented is for use in the 420–450 MHz band. It provides a gain of 12 to 14 dB with a noise figure of approximately 1.0 dB. Even lower noise figures can be obtained if the more expensive GaAsFETs are substituted, such as the D432, DXL2501 and 2503, MGF1400 and 1402, and the NE64535. The cross-modulation

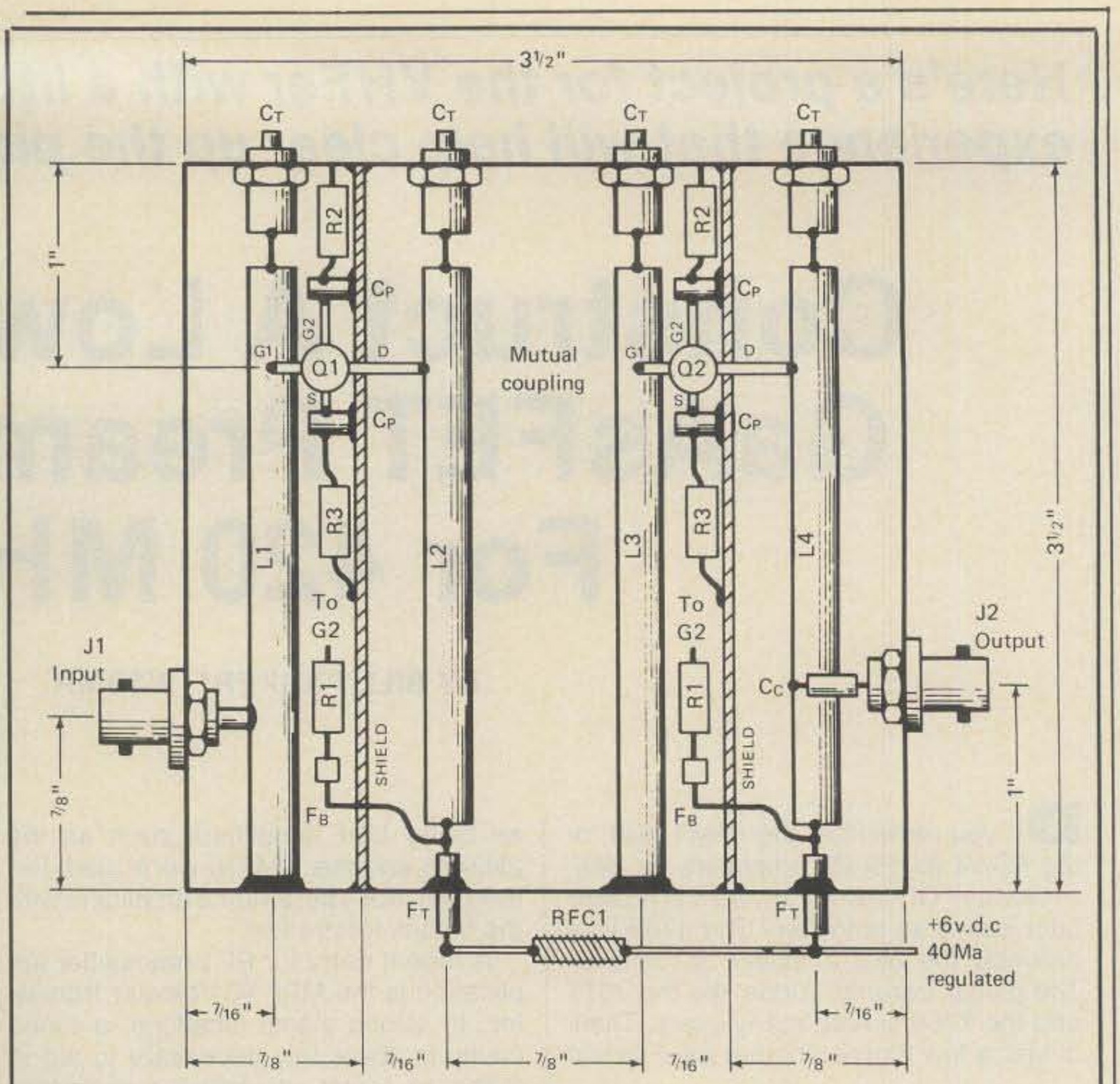
*2738 Floribunda Dr., Columbus, OH 43209

[1]"*RF Transistors,*" EDN, *June 20, 1980, pp. 155–164.*

Parts List

C_P: .01 chip capacitor (4 req.)
C_T: 1–10 trimmer (4 req.)
C_C: 100 pFd chip capacitor (1 req.)
F_T: .001, feedthrough (2 req.)
F_B: ferrite bead
L1, L3: 3.0"; 3/16" dia. brass tubing
L2, L4: 2 5/8"; 3/16" dia. brass tubing
Q1, Q2: #SK97
R1: 10K (2 req.)
R2: 10K (2 req.)
R3: 68 (2 req.)
R_{fc}: 10T, #32 AWG, 1/4" dia.

Fig. 1– Schematic diagram of a two-stage low-noise GaAsFET preamplifier.



Parts List

L1, L3: 3.0"; 3/16" dia. brass tubing
L2, L4: 2 5/8"; 3/16" dia. brass tubing
Note: Case is made of 4 pieces of 1.0" wide PCB material, copper foil on both sides. Top and bottom covers are 3.5" × 3.5". The two inner shields are trimmed to fit inside of case frame. The 3/16" brass tubing is available at hobby and craft stores.

Fig. 2– Basic parts placement, layout, and dimensions for the preamplifier.

products, even without an external cavity, are less than those of a bipolar transistor preamp with a rejection cavity in the line. The schematic of the preamp is shown in fig. 1, with a suggested parts layout shown in fig. 2.

The 3SK97 GaAsFET was introduced in an article in *EDN* magazine.[1] The specifications sounded great; the price was reasonable. The availability, however, seemed somewhat out of reach. But a source was located without a drain on the pocketbook, and I was out of the gate and running (all puns intended).

The preamp is used at my QTH for standard scan amateur TV signal amplification. A P-unit (like an S-unit) is used to judge the received signal strength of an amateur TV picture. P-5 is the strongest level of signal normally reported. A P-unit is estimated to be at least 6 dB of level change. With this preamp, preceding a varactor tuned UHF converter, a signal that is a P-Ø to a P-1 level is raised to a P-2 to a P-2.5 level. This represents about a two P-unit of picture improvement! It should be called to attention that the UHF varactor converters of today have a built-in stage of RF amplification. Some employ bipolar RF amplifiers, while others use MOSFET first-stage amplifiers. Without a doubt, this preamp is not a dog.

Compared to the junction FETs such as the 2N5397 or the J308 (the so-called super-FET), the 3SK97 GaAsFET is absolutely superior. It is manufactured by Mitsubishi Electronics for use in their UHF TV tuners. It may be purchased from Mieco Sales, Inc., Los Angeles, CA. The cost for two GaAsFETs including postage and handling is $12.00.

Although reasonable care should be exercised when handling GaAsFETs, it is felt that extreme care is not required. More care is required in soldering in the 0.01 uFd monolithic ceramic chip capacitors than for the FETs. This is my opinion, however. To be on the safe side, measure the AC voltage from the tip of your soldering iron to a known good ground. If more than a volt or two is measured with a high-input resistance meter, find a way to ground the tip of the soldering instrument used.

Compression-type tuning capacitors work just as well as the more expensive piston-style capacitors. Again, availability is the password. The compression

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Battery Pack (V/mAHr)	8.4/250	8.4/250
Receive Squelched Norm	18 mA	22 mA
RX At Full Volume	130 mA	130 mA
Transmit (Low Power)	220 mA	300 mA
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Dimensions mm	60 × 170 × 40	60 × 170 × 40
Weight (with Battery)	490 gms	490 gms
TRANSMITTER		
Output Pwr. (Hi, Lo)	1.5W, 0.15W	1.5W, 0.15W
Spurious Transmitted	< −60dBc	< −60dBc
Deviation Limit	5 kHz	5 kHz
Pickup Device	Condenser Mic	Condenser Mic
RECEIVER		
Receiving System	Dbl. Superhet.	Dbl. Superhet.
I.F. Frequencies	10.695 1st 455 kHz 2nd	21.6 1st 455 kHz 2nd
Receive Sensitivity	< 0.25 uV @ 12dB	< 0.35 uV @12 dB
I.F. Bandwidth	30 kHz @ −60dB	30 kHz @ −60 dB
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End Stop Type	Mechanical	Mechanical
Rotational Torque	350 in-lbs	340 in-lbs
Stationary Brake Torque	1750 in-lbs	1500 in-lbs
Vertical Load Max	N/A	440 lbs
Maximum Mast Size	1.5-2.5 in. dia.	1.5-2.5 in. dia
Maximum Mounting Size	1.25-1.625 in. dia.	1.5-2.5 in. dia.
Cable Type	6-#22	6-#22 or larger
Dimensions		
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CIRCLE 98 ON READER SERVICE CARD

mica capacitors are more rugged than the glass piston capacitors.

The preamp uses copper-clad glass-epoxy G10 printed wiring board for the sides, inner shields, and covers. It is easy to work and very forgiving.

The feedthrough capacitors will not withstand much mechanical abuse before the ceramic dielectric fractures. Compared to all the components involved, the GaAsFETs are the least troublesome.

I do not tune all the trimmer capacitors to the same frequency. My application requires the preamp to cover from 425 to 442 MHz, so broadbanding was desirable. In and around Columbus, Ohio there are at least 20 of this type of preamplifier in use. In addition, a single-stage preamp of this style is used for 2 meter SSB operation. WB8LGA has constructed over 60 such preamps with repeated success. Too bad these hot little 3SK97's won't perform as well on 4.2 GHz as they do on 439.25 MHz.

The operating voltages are on the schematics. Each amplifier stage draws about 20 ma. The zener consumes another 10 ma with the current required totalling about 50 ma. Don't exceed an input voltage of 12 VDC, particularly without a zener. The GaAsFETs are then subject to damage.

If the supply voltage to GaAsFETs (not to the zener) is changed, retuning will be required. The lowest noise figure is obtained when Gate-2 has 3 volts applied. The highest gain is when Gate-2 has 4.5 volts, but never exceed 6.0 volts. The current per stage nearly doubles when 4.5 volts applied to Gate-2 is increased to 5.5 volts. Nine volt battery operation is not recommended.

If the particular souce of +10 volts used is unregulated, a small three-terminal regulator may be used to assure a constant supply voltage, such as the 78M05, or 78M06 for the GaAsFETs.

If the antenna connected to the preamp does not present a resistive load, some oscillation may be experienced. With an antenna that presents mostly a resistive load, the preamp is very stable and a delight to "watch" operate. The low-noise amplifier is a real "snow-reducer" and makes the TV picture more pleasant to view.

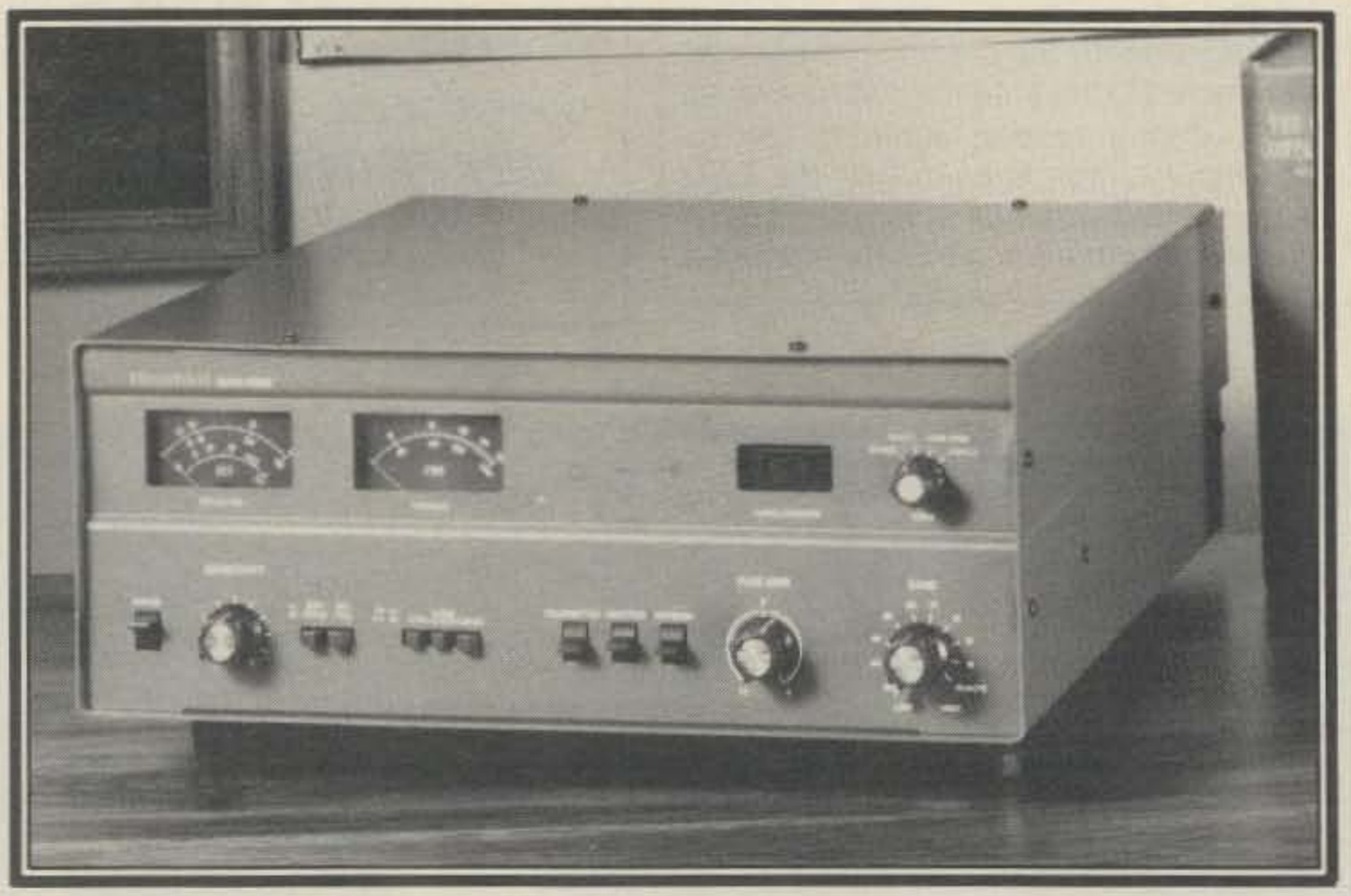
Two holes were added to the cover to permit soldering the shield partitions to the cover for increased input-output isolation.

Inadvertently the preamp has been left connected to the antenna, with power applied, during several lightning storms. The input circuit is such that the FETs were not damaged. Of the four FETs purchased, all are alive, well, and operating.

CQ REVIEWS:

The Heathkit Auto-tune Antenna Tuner Model SA-2500

BY LEW MCCOY*, W1ICP



This is what the tuner looks like. At the upper left are the SWR and power meters. The window at the right is the turns counter for rotary inductor.

Some years ago, in July 1970 *QST*, I described a circuit called the "Ultimate Transmatch." That particular circuit was the first of a basic design that is used in nearly all commercial Transmatches these days. The reason I called it the "Ultimate" was simply that it could work on all the amateur bands, 160 through 10, and match any, and I do mean *any*, antenna system impedance to the 50 ohm output of a transmitter.

When I called it the "Ultimate," I really couldn't see any way to improve on the circuit, and as a matter of fact, there have been no improvements to speak of. However, there was one important point overlooked in choosing the name "Ultimate." Someone was bound to come along and improve the concept. The Heath Company did just that in that they use a similar circuit for the Transmatch, but make the adjustment automatic. By automatic, I mean you turn one switch to the desired band and the Transmatch tunes up by itself! Motors run, lights flash, and about 15 seconds later one is tuned up on the desired band. There is no doubt that this is an extremely useful Transmatch to many types of operators, such as amateurs who are physically handicapped, or for instance the contest operator who wishes to save time.

*Technical Consultant, CQ, 200 Idaho St., Silver City, NM 88061

Some Details

The Heath Transmatch circuit itself consists of an input variable capacitor, a roller inductor, and an output variable capacitor. These components, along with the coax fittings, would make a normal Transmatch that would cover 1.8 to 30 MHz continuously. However, with the Model SA-2500, there is considerable more. There are three 12 volt drive motors to run the roller inductor and the two capacitors. There is a sensing board that "senses" the load. This sensing board feeds information to another board that makes the motor turn, tuning the Transmatch for a matched condition. In addition, there is a switching setup to permit as many as 18 different preset positions—two each for nine bands. Also, there is a coax switch that provides three coaxial antenna inputs and yet another position for a long-wire antenna or balanced feeders.

Metering

There are two panel-mounted meters. M1 is the **Reflected Power** in two scales, 0–50 or 0–500 watts. This meter also indicates standing-wave ratio. The other meter, M2, is the **Forward Power** and shows the power on two scales (in watts), 0–200 and 0–2000.

There is also a series of light indicators, one of which shows the output power level of up to 200 watts, and another for over 200 watts. Two of the lights indicate the input and output capacitor being rotated and another light for the roller inductor motor being activated. Still another light indicates an alarm which is also audible (more about that in a mo-

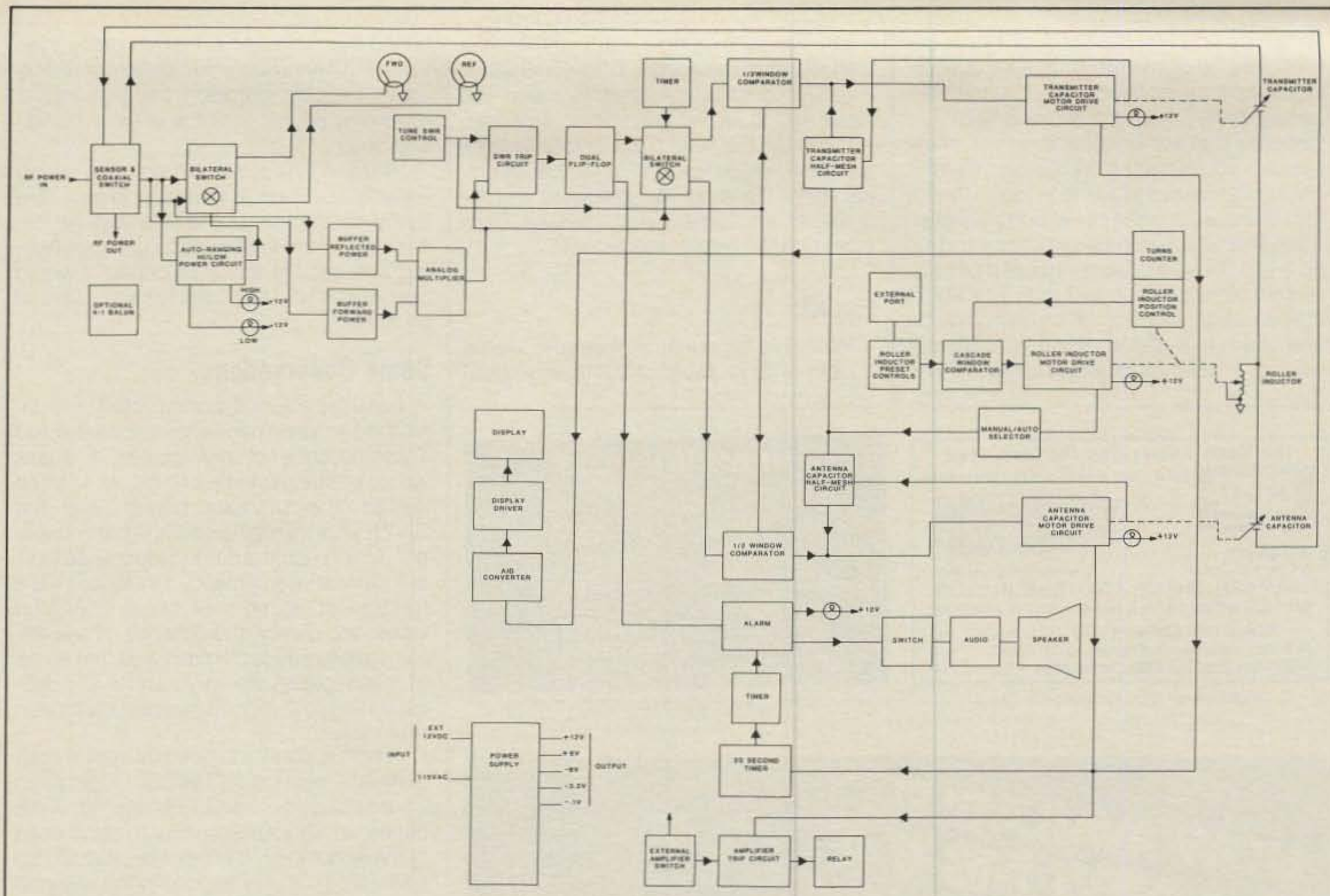


Fig. 1– The block diagram shows signal and sensing paths. See text for further information.

ment). The turns counter indicator for the roller inductor is an LED display showing the number of turns in whole numbers and fractions of a turn.

Circuit Control Board Description

I have already mentioned that the tuner-circuit proper consists of the two variable capacitors and roller inductor. When operated manually, the circuit is easy to describe. The roller inductor is set to provide an amount of inductance to approximate resonance on the desired band. The input and output capacitors are then tuned to provide a step up or step down in impedance from the antenna load, to match 50 ohms. In essence, the inductor and two capacitors form an adjustable RF transformer which always attempts to convert the unknown antenna load to a 50 ohm load. With an SWR indicator in such a circuit, it is a rather simple matter to adjust the Transmatch for a match. However, when one considers doing this automatically, it becomes very complex and is not easy to explain. For example, there are only three components in the Transmatch itself—the two capacitors and the roller inductor. The main circuit board, the board that does the sensing and turns the motors, has 434 components!

Please look at the block diagram and study it. The motor drive circuits are, of course, the heart of the unit. Telling the motors when to start and stop is the secret of the circuit. Let's take one motor and examine the procedure (which is the same for the other two motors), and we'll follow the tuner's transmitter capacitor's action. The motor drive circuit allows for either clockwise or counterclockwise travel. When an RF signal is applied from the transmitter and is fed through the tuner, the signal passes through what is called the **Sensor Board.** This board contains the RF power bridge that measures reflected and forward voltages.

The RF signal is fed to the Sensor Board from which two signals, a forward and reflected, are derived. The voltages from these signals are piped to an automatic SWR circuit, which in essence establishes the SWR limits the tuner will accept (normally below 1.5 to 1). Following the block diagram, you will note these signals are sent through buffers for reflected and forward power (voltages), through an analog multiplier, and through the SWR trip circuit.

These voltages then go through comparator amplifiers and are applied to the motor drive circuits. The transmitter and antenna capacitors rotate, seeking a setting that gives a matched, or nearly matched, condition. Of course, as they rotate, the voltages change back at the RF Sensor Board until that matched condition is met. I didn't mention the roller inductor here because it is preset via its own circuits.

There are 18 different preset conditions. The bandswitch has 9 positions, including 160 meters and **Remote.** However, it is possible to use the 18 preset conditions on a single band, if for some strange reason one wanted to do so. In the initial setting up of the Model SA-2500 the roller inductor is preset twice for each band. There is a **Hi** and **Lo** preset position for each band. In operation, when for example one switches to 20 meters and turns on the transmitter with the tuner on automatic, the roller inductor motor will activate. The roller inductor rotates to its preset condition and stops. Meanwhile, the capacitors rotate seeking a match, and they stop when the match is achieved. This procedure usually takes about 15 seconds.

My technical explanation probably left much to be desired, but the circuit is very complex,and without a large drawing to follow it would be almost impossible to explain—and not in simple terms. However, I feel the foregoing will give the reader an idea of how the Transmatch does its automatic tuning.

Other Details

There are other important points that should be covered. For example, if one

jumps up or down the band, or worse yet switches bands without using the automatic control on the SA-2500, what happens? Well, there is a warning light and sounder that will go off and let you know you are not operating correctly or that the SWR has exceeded 1.5. to 1. I say 1.5 to 1, but there is another panel control called **Tune SWR** which can be set from 1 to 1 up to 3 to 1. So it is possible to set a permissible mismatch of up to 3 to 1. This alarm has a switch which must be turned on for the alarm to activate. The alarm will also sound, in addition to unacceptable SWR, when the auto control cannot match a load within 20 seconds. There is another adjacent push-button switch called the **Linear** switch. When you use an amplifier, you engage this switch plus the **Audio Alarm** switch in. When the SWR exceeds its preset limits, the audio alarm sounds and the amplifier is automatically bypassed. Darn clever, these Heath engineers!

The Kit

With this kit construction time was a couple of days. Most of the time is spent wiring the main circuit board I mentioned earlier. The variable capacitors must be assembled from scratch, and that means mounting all the stator and rotor plates, and so on.

Frankly, I have always enjoyed wiring Heathkits. Their instruction books are really outstanding, and this was no exception. There is nothing tough about wiring and getting this kit working. I would consider it an easy task for any class of amateur.

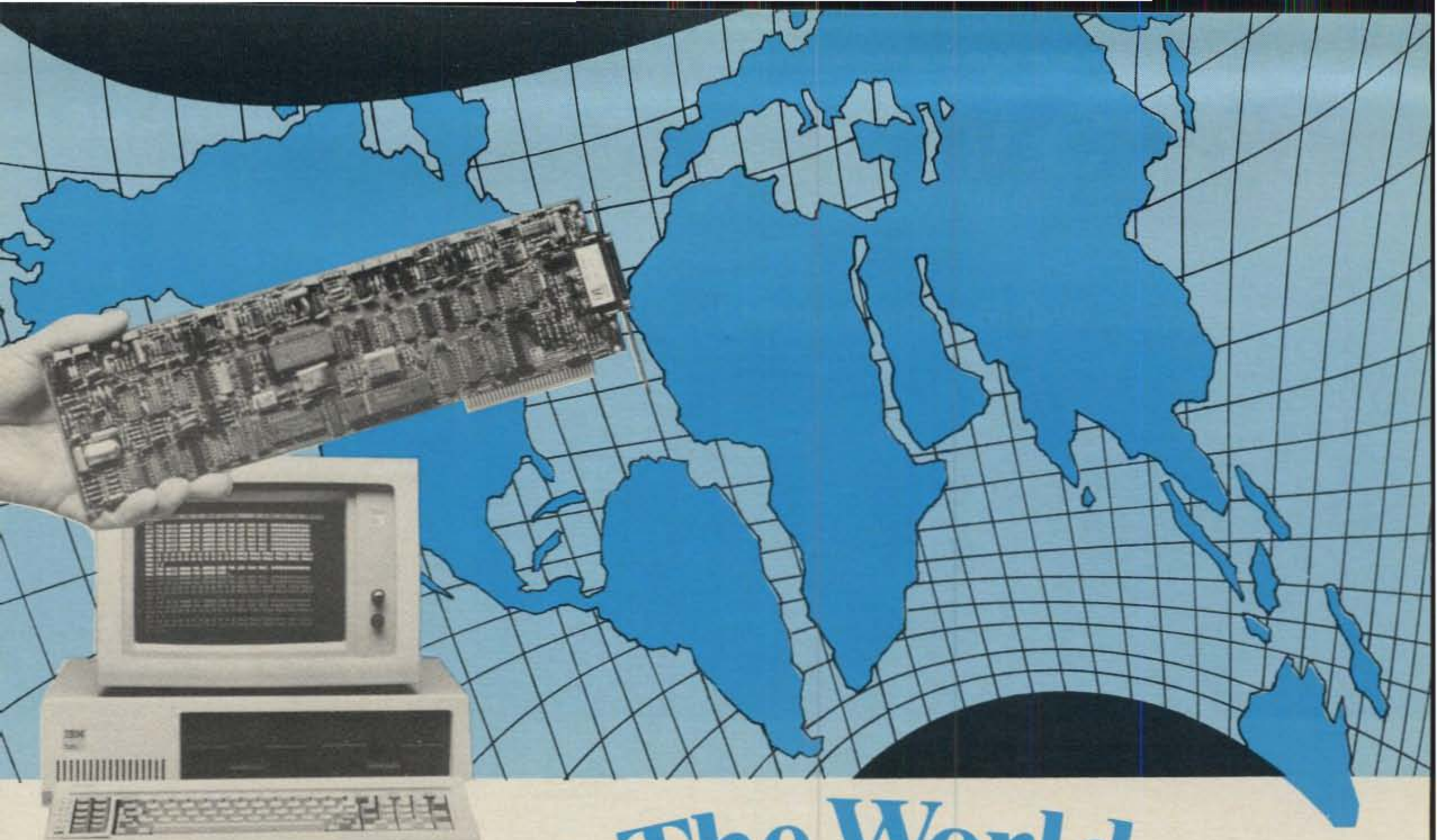
Some Observations

Having designed, constructed, and described so very many antenna tuners and Transmatches in my career, I guess would entitle me to be critical. As I stated earlier, the Ultimate circuit, and the SA-2500 or similar circuits—particularly one which uses variable inductance (roller inductor)—will match any load, be it a fraction or an ohm or some very high value with plenty of reactance. However, I would be remiss if I didn't add that some of these loads take very careful and critical tuning of the Transmatch to get a perfect match.

Heath is careful to point this out in their manual section "Typical Operating Characteristics," and I quote, "In some cases, when your Antenna Tuner is used in the **Auto** mode, it will not be able to find a match. This may happen if the antenna impedance is outside the range of the Antenna Tuner or the setting of the tuning components is very critical." First, I must disagree with Heath because as I said earlier, this circuit will match anything, so the business "outside the range of the Antenna Tuner" doesn't hold. However, there are some very critical loads, and in the **Auto** mode I found that on one very short 40 meter loaded dipole I had the tuner kept trying to find a match. I shut off the **Auto** mode and used the manual controls, and after a few minutes I found a setting of a perfect 1 to 1 match. I suppose from that observation one could say the Heath SA-2500 is still not the "Ultimate," but I have to admit that it isn't very far from it.

I have been using the SA-2500 for several months on a wide variety of antennas. I'll be the first to admit I am by nature a lazy amateur, and this tuner certainly makes life easier (and lazier!). Like I said, I have found a few (very few) conditions the tuner doesn't want to match within its time limits, but keep in mind that your inductance is preset, so it only takes a little tweaking to get a 1 to 1 match on the most cantankerous of loads. And on most loads, it is a real pleasure to watch the SWR meters move, and bingo! Everything turns off and you are tuned up for 1 to 1.

The Model SA-2500 is priced at $599.95. A 4:1 balun accessory is available for $39.95. These prices do not include shipping. These products are available from Heath Company, Benton Harbor, MI 49022. CQ



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Full status line on top of screen
Full-feature editor in transmit buffer

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2 - 250 line transmit buffers with scroll
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Set-up parameters stored on disk

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CIRCLE 40 ON READER SERVICE CARD

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USA
Single Operator
All Band

K1AR	2,676,786
K2VV	2,389,164
W1ZM	2,158,425
W3BGN	1,992,977
K2XA	1,971,549
W2RQ	1,807,491
K1TO	1,799,548
N2LT	1,670,514
W@ZV	1,606,281
K1EA	1,564,156
K6HNZ	1,532,240
AI6V	1,517,620
K1YR	1,499,284
NA5R	1,489,176
K1OX	1,478,688
K3ZO	1,366,392
N3AD	1,313,284
K3OO	1,312,480
K3ZUF	1,244,995
K4ISV	1,243,920
NR5M	1,097,400
N4KG	1,066,050
K4JPD	996,969
K1VR	927,720
WZ4F	915,960
N5DU	891,540
K5RX	890,724
K6EID	886,418
AG1C	870,656
KM3T	834,309
W3YY/4	819,000
KI3L/5	790,024
W3VT/4	779,100
K2RD	759,285
N2SS	716,237
N7ABJ	695,500
K3ZJ	685,832
W1YK	617,968

Single Band
28 MHz

NU4Y	38,560
W8WPC	19,560
NG6W	12,031
AA4M/6	11,424
KB8LM	10,664
WB6MBF	9,072
W@GOR	8,142
K3UA	6,972
N8FEH	6,438

21 MHz

K2EK	539,412
K7JA	429,769
N4UM	427,824
NO4J	406,120
K6LY	276,150
K1VUT	246,312
KC2CR	121,068
W3UM	114,920
KC2VT	73,789
KC4HN	65,124
N4HHZ	64,155

14 MHz

W7IL	391,035
NB2P	315,972
KV4P	313,563
W6BH	282,321
K2WK	255,860
K5TSQ	241,902
W7FP	199,629
N4MO	194,540
K9BN	176,076
NJ8N	169,274
KT7H	141,703
KB8PK	141,081
W8TWA	140,238

7 MHz

KJ9D	103,362
KV@Q	55,610
K1MM	41,912
N8RA	43,935
N6ADI	38,000
K5NW	34,944
WB1FSW	33,490
K4RIG	29,667
W9CH	29,412

3.5 MHz

W6RJ	93,195
W@MJ	93,112
K1UO	89,200
WB2ITR	38,048
N7DF/@	31,980
W9RN	31,244
KQ5E	27,370
AD8C	24,924
W2PZV	22,032

1.8 MHz

K5UR	11,600
AA1K	10,258
AE6U	3,960
KA1SR	3,510
N4SU	3,456
KG7D	3,248
W6US	3,045

Multi-operator
Single Transmitter

K2BU	2,791,019
N4CC	2,718,682
NA8V	2,677,584
N4ZC	2,653,413
N4RJ	2,305,635
K4VX/@	2,283,966
KS9K	2,167,200
K3TUP	2,003,613
KC2NB	1,847,820
K3KG	1,893,936
N2RM	1,745,550
ND@E	1,530,887
N7TT	1,453,491
W6TMD	1,398,705
N1CQ	1,374,684
K3WW	1,277,484
N7RO	1,269,900
N3RL	1,227,630
W8GWC	1,206,500
KM1C	1,192,620
WA4IXI	1,169,350
W2VJN	1,084,976

Multi-operator
Multi-transmitter

W4DR	6,450,804
W3LPL	6,419,020
K@RF	3,576,748
K3ZZ	2,430,316
W3GM	2,148,120
K5LZO	1,876,476
AD8P	1,868,500
K1NG	1,765,632
AA4S	1,396,831
N8DLR	992,192

DX
Single Operator
All Band

PJ2FR	8,421,729
P44A	8,183,908
EX6F	6,694,000
YV5TK	6,107,744
CN8ES	4,570,874
KJ9W/KH2	4,337,992
6Y3M	3,606,168
WB6FCR/KH6	3,030,579
CE3DNP	2,938,640
ZP5JCY	2,873,404
K4YT/DU9	2,412,291
UH8EAA	2,400,775
LU1BR	2,198,196
KH6ND	1,972,870
OK6RA	1,942,575
JH7DNO	1,885,750
JA@JHA	1,870,232
PA2TMS	1,834,012
EA8ACH	1,731,620
N4NW/3D6	1,727,600
ZS3HL	1,652,145
XN3XN	1,579,648
JA1YFG	1,465,648
RF6FR	1,444,872
DA2ER	1,381,012
OK1TN	1,371,019
PP2ZDD	1,313,280
XE1IF	1,294,308
AH8A	1,283,559
EA2QU	1,248,750
DL6FBL	1,195,088
OK3CSC	1,168,728
DJ3HJ	1,114,035
OH6JW	1,063,044
4K1GAG	1,013,120

Single Band
28 MHz

CE6EZ	860,545
LU2FDR	682,560
LU1E	644,700
CX5AO	493,824
LU3MDO	451,094
CX4HS	326,616
LU1VK	211,660
LU6FDK	190,876
CE3ZI	82,445
I5MXX	68,598
IT9YHR	58,420
VE1BNN	51,219
YU3MA	50,784

21 MHz

HC1OT	1,095,770
9Y4AT	710,057
EA4LH/CE3	703,208
I1KN	605,382
YC@DPO	587,340
YT3L	512,736
YC@DNK	478,458
YV5JEA	451,209
HK4GAW	412,896
PY2FZ	411,039
ED4CFZ	378,005
IK2DVG	359,522
I3ON	330,912
VK6MD	323,635
ZL1ANJ	292,116
JR1CBC	270,595
LU8FEU	259,281
RB5QW	258,171
G3VPW	256,498

14 MHz

K@GU/8R1	1,251,096
5N24AMA	1,057,264
CT2FH	887,656
G3FXB	867,828
KD7P/KH2	783,398
RB5FF	779,868
YT3A	719,160
CE3BFZ	712,920
CR1BKW	689,236
YT3M	682,190
YV3ALK	648,448
VK2WU	602,037
IV3TQE	491,211
IO8QLS	453,424
HI@A	429,507
OH1AF	422,295
JA4CUU	418,656

7 MHz

EA8AK	776,700
9Y4VU	700,488
T32AF	677,844
XN3BMV	553,520
XL1CV	403,898
YU3EY	402,566
I2VRN	309,672
4N3E	301,562
CQ6NH	295,008
HA9RE	266,602
OH3XZ	246,704
JA5BJC	224,808
VK6IR	212,691
I4RYC	202,825

3.5 MHz

YV3AZC	405,589
ZF2IB/4X	318,852
NE4G/6Y5	275,988
YU3NA	148,500
ZL1BIL	146,280
XN3EEW	110,950
DL@LW	106,999
VK3FY	102,780
OH1RY	101,088

1.8 MHz

LZ2CJ	107,818
HB9AMO	42,092
I4JMY	28,969
IK@BYO	28,152
YV2IF	19,120
YV3AGT	13,440
VE3OME	12,690
OK2KPU	12,393
DK2WH	12,336
G3XWZ/a	12,188
VE3NNR	12,027

Multi-Operator
Single Transmitter

4V2C	8,462,596
LZ7A	7,243,456
ED9CM	6,906,942
VP2MW	6,511,509
ED7BB	5,095,400
D44BC	5,063,172
F3TV	4,992,204
VK9MR	4,985,008
HZ1AB	4,751,355
XN3BVD	4,676,484
HG5A	4,132,968
VE3CYX	3,602,912
CE4TA	3,353,028
OK7MM	3,338,826
HG6N	3,196,747
HB@BHA	3,163,212
LU4US	3,081,456
CE2AA	2,877,872
HG7B	2,861,015
4N2D	2,855,160
HG9R	2,626,000
9H3DN	2,602,504
OH@BH	2,499,237
HB@AON	2,364,075
UR1RWX	2,305,488
JH7YJF	2,291,630
DX1A	2,286,387
KL7IRT	2,244,487
JA2YKA	2,204,856
RL8PYL	2,177,175
UZ2FWA	2,152,080
ED6MDX	2,150,078
UZ9AYA	2,116,092
F6KAW	2,103,588
DU1DBT	2,098,572

Multi-Operator
Multi-Transmitter

TI2C	22,202,390
VP2VCW	17,888,585
VP9AD	16,794,200
ZY5EG	13,502,946
XE2SI	9,970,380
YT7W	7,196,000
DF@DX	5,866,732
GB4ANT	4,737,051
JA9YBA	3,843,017
L8H	3,749,280
KL7Y	3,349,000
KL7RA	2,951,144
JA3YKC	2,740,904
VE7ZZZ	2,390,553
CE3AA	2,304,078
PA6WW	2,252,432
JA7YFB	2,203,278

QRPp
All Band

UP2BIM	348,440
4X6IF	220,159
K7SS	209,132
K3WS	193,800
YU2OB	182,608
K7BTB	134,505
K7UR	115,868
OK3IAG	104,095
YO2AQB	54,769
JA1WSK	54,240
W6YVK	52,128

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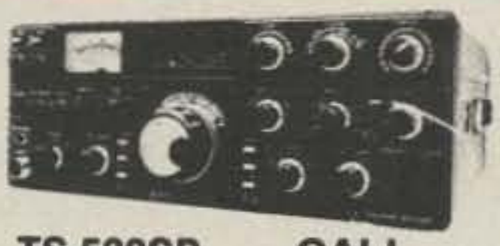

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IC 02AT	$229.00	TS-930S W/AT	$1175.00				

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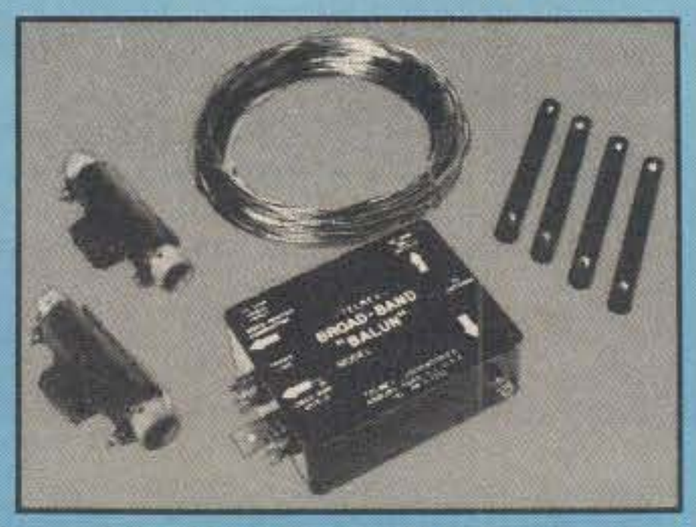

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10M636	10 Meter 6 element	(14.6 DBD)	878.00	**675.00**
15M532	15 Meter 5 element	(13 DBD)	631.00	**485.00**
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20M646	20 Meter 6 element	(14 DBD)	1294.00	**995.00**
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40M329	40 Meter 3 element	(8.3 DBD)	1294.00	**995.00**
40M346	40 Meter 3 element	(9 DBD)	2210.00	**1700.00**
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TB5ES	10, 15, 20M Tri-Band	(8.5 DBD)	468.00	**359.00**
TB6EM	10, 15, 20M Tri-Band	(10 DBD)	774.00	**595.00**

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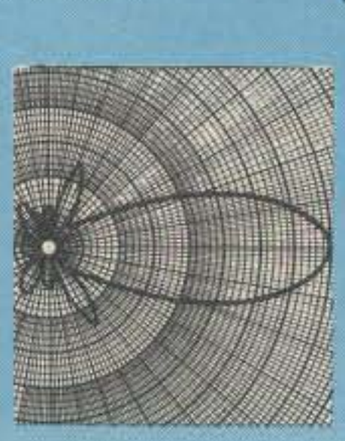

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USA
Single Operator All Band

N2LT	2,192,972
WA8YVR	1,928,259
K1OX	1,843,428
W1KM	1,741,922
W4RX	1,663,305
N4WW	1,615,940
K3WW	1,450,345
K3ZO	1,398,558
K1AR	1,366,182
W9RE	1,365,200
N3AD	1,351,607
K3LR	1,300,650
W2VJN	1,222,208
N8II	1,219,972
N4ZC	1,198,449
W3XU	1,118,000
K8NZ	1,106,638
W6TMD	1,052,814
K3OO	1,031,638
W7IR	1,016,049
W1DA	975,380
K1XA	926,720
K1ZX/4	898,782
W3VT/4	824,512

28 MHz

W8WPC	8,550
W6FAY	5,814
W9VA	2,046
W1WEF	1,431

21 MHz

N3RS	314,505
W4UM	228,384
W6YA	189,810
W5VX	176,596
K5TSQ	171,336
K3VK	122,109
WB4TDH	118,826
N4MM	111,384
NF6H	107,640
AD5Q	99,004
W8QID	75,043
KE7C	72,562
K9QVB	70,967
KI3L/5	65,450
KV8Q	54,684
KU7M	49,000

14 MHz

N5CR	336,708
KM9D	307,024
N6GG	247,628
W6BH	247,324
W5FO	222,267
W1YN	189,375
K2WK	187,566
N3BJ	184,404
N8ET	154,147
KN4B	144,584
KR7G	138,570

7 MHz

N5JJ	424,853
N6RO	376,301
K1BW	314,360
WT4A	254,898
N2IC/0	236,610
AI7B	169,723
W8FJ/3	165,827
K4ISV	161,602
KJ9D	160,428
WA4CTA	156,780
WB9POH	154,330
N4CC	142,984
W3AP	133,750
K5LP	124,762
NE6I	100,848
N4XM	91,015
N7RT	82,340
W8UVZ	67,354
W1PL	60,605

3.5 MHz

W1FV	99,495
AA6AA	92,133
N4RJ	69,258
N7DF/0	51,354
W9LT	37,051
W5RK	35,840
N7CW	35,728
K3TW	34,830
K9BGL	28,575
W4XJ	20,538
K8MN	19,698

1.8 MHz

K5UR	28,032
K1ZM	19,323
N4SU	9,604
W1CF	8,240
N9NB	7,728
K6SE	7,500
W6RW	7,488
AA1K	6,512
K1MM	6,345
KG4W	5,966
K4UEE	4,864
N4IN	4,592
K8MFO	3,286
K9UWA	2,808
W0ZV	2,635
W2BHK	2,392

Multi-operator Single Transmitter

K5RC	3,234,540
K1ZZ	2,573,744
W3BGN	2,349,839
W8UA	2,147,508
N2RM	2,052,705
K5LZO	2,036,208
AD8P	2,001,213
K3KG	1,968,894
KM1C	1,508,910
K5RX	1,427,242
K1XM	1,194,032
W8GWC	1,087,403
W2GD	1,083,600
ND0E	972,356
N4KG	853,312
K6ZM	795,906

Multi-operator Multi-Transmitter

W3LPL	4,646,621
K6UA	4,229,281
W3GM	3,508,160

QRPp All Band

K8IA	271,656
AA2Z/1	192,864
K3WS	171,380
KA2AEV	108,224
W8VSK	103,488
K7SS	98,735
W5VGX	85,973
N8BJQ/6	83,020
WB9HRO	35,750
KC0Q	33,938

DX
Single Operator All Band

9Y4VT	5,662,625
EX6F	5,653,656
EA9KF	5,014,224
N3RD/VP9	3,668,256
CT1BCM	3,295,152
4V2C	3,207,384
ZL3GQ	2,756,467
YB0ARA	2,663,424
FM/W6SZN	2,581,176
EA2IA	2,468,804
NH6J/NH8	2,087,734
OK3CGP	1,957,666
KH6ND	1,851,525
DL6FBL	1,847,310
HH2VP	1,818,600
VS6TA	1,809,310
OH0BA	1,784,800
ZS6BCR	1,624,576
G3FXB	1,489,714
XE2MX	1,465,671
VE7WJ	1,389,025
G3WPF	1,376,781
4U1ITU	1,361,120
OZ1LO	1,354,311
OK6RA	1,298,440
UB5EC	1,271,400
YU3BC	1,240,266
UW3HV	1,233,936
JA1BWA	1,099,280
JA1XAF	1,040,841

Single Band 28 MHz

4M7QP	14,980
JH2KKW	5,254
JO1NZT	4,448
CE0AE	1,680
OK1AD	1,652
JE2SOY	1,386
YU2CQ	1,056

21 MHz

9Y4W	729,872
LU4FDM	411,308
UP2BM/UF	258,405
KA2DIV/V2A	206,136
YU1DW	175,515
YT2L	168,817
JR6EZE	166,075
ZL1BXW	157,392
IK2CKR	138,200
KP4HZ	119,280
YY5A	110,814
JF2EZA	110,356
ON5SQ	106,424

14 MHz

LU8DQ	1,197,066
OH8OS	723,190
YU4GD	539,384
YV1TO	482,202
YU7AV	388,088
YZ2AW	350,901
DL1VJ	337,631
YV3ALK	319,935
WP4D	275,525
UA9ND	263,648
RB5IZ	252,765
JR1RNC	222,860
UA0SAU	198,800
IY4FGM	196,272
UP2NA/UF	175,468
SM5AD	151,749
SK3AH	133,273
LZ2BW	132,048
UB5LAJ	122,436
I2JIN	119,280
UR2RE	118,104
JH4UYB	106,590

7 MHz

DK3GI	608,612
UP3BA/UF	573,648
9Y4VU	547,995
TE1C	533,392
XN3BMV	436,100
KH6XX	427,230
RB5IM	422,664
JA5BJC	409,370
YT3M	390,688
I4IND	370,432
YU7AD	341,648
OH1RY	337,524
OK3YX	337,408
UA1DZ	299,915
OK2BFN	277,982
VK2CIA	272,970
HA9RE	264,888
UA9CI	253,470
YU2SD	215,375
UA9CJK	209,412
JH0LFE	207,920
JA2JW	182,608

3.5 MHz

ZF2IB/4X	365,911
LZ1KVV	294,084
UP2NK/UF	283,362
UH8EAA	210,820
HA8KQX	210,540
EA8RL	207,823
I4EAT	161,368
UA9SA	150,556
UL7LCZ	146,328
YU1FJK	131,760
SP5GIQ/5	129,428
UA9AL	127,300
YU4EJC	119,451
4N2W	115,893
UQ2GN	106,216
VE7IG	100,595
VE3FRA	98,124
YU3MM	88,720
OE3DSA	88,111
RA9YD	88,008
SM6CPY	87,590

1.8 MHz

LZ1KDP	78,174
LZ2CJ	60,844
HB9AMO	59,860
YV1OB	50,208
YV3AGT	48,024
SP1ADM	43,617
YU7AJH	37,120
RA9AKM	35,751
UA9GDT	35,500
UG6GAW	35,475
PA3BFM	35,070
UB5ZAL	30,030
UA9KAA	28,128
LA7JO	27,328
UC2WAZ	23,479
OK1MG	22,464
G3XWZ/A	22,034
DK8NG	20,646

Multi-operator Single Transmitter

FY0GA	7,638,500
KD7P/KH2	4,493,125
EA3VY	4,053,000
5H3BH	4,036,290
HZ1AB	3,916,375
OK5R	3,656,054
F3TV	3,579,950
HG5A	2,959,003
RL8PYL	2,753,608
JA2YKA	2,671,650
UP1BZZ	2,670,454
HG9B	2,583,799
HG6N	2,518,845
HG9R	2,290,869
UZ2FWA	2,162,364
GJ0AAA	2,111,472
DX1A	2,072,323
UR1RWX	2,066,903
UZ9SWY	1,987,128
OH2VY	1,841,644
UZ9FWR	1,809,458
UQ1GWW	1,718,147
OH5NQ	1,692,603
OK1KSO	1,644,786
YZ2CRT	1,552,870
V9ADC	1,418,310

Multi-operator Multi-transmitter

EA9CE	9,213,320
YU1EXY	5,561,988
JA3YBF	3,552,630
NL7G	3,326,250
DL0KF	3,140,258
JA3YKC	3,056,776
XN3BVD	2,996,269

QRPp All Band

4X6IF	260,184
UP2BL	161,109
DL8CM	80,262
SM1CNS	61,200
JA7AS	58,006
JA2DN	49,050
UB5GJP	48,875
JK1MAZ	48,412
UB5IOZ	46,574

For the more advanced tinkerer among you we present the following food for thought.

A Simple Phase-Locked-Loop Method

JOHN C. REED*, W6IOJ

When an experimenter requires a high-resolution tuner for a VHF/UHF receiver or transmitter, he no doubt considers a synthesized phase-locked-loop method (PLL). A key characteristic of modern commercial equipment, it can provide excellent performance, and the digital microchip circuitry is a natural for production methods. However, on a single piece of equipment basis, and using readily available integrated circuits, the project becomes fairly involved and complex. Although the described system may not compete with the better synthesized systems, it can adequately serve many applications. It provides up to 400 kHz tuning range with essentially an infinite tuning resolution capability. All parts can be purchased from Radio Shack except for two ferrite cores and a reference crystal, and these can easily be purchased by mail order.

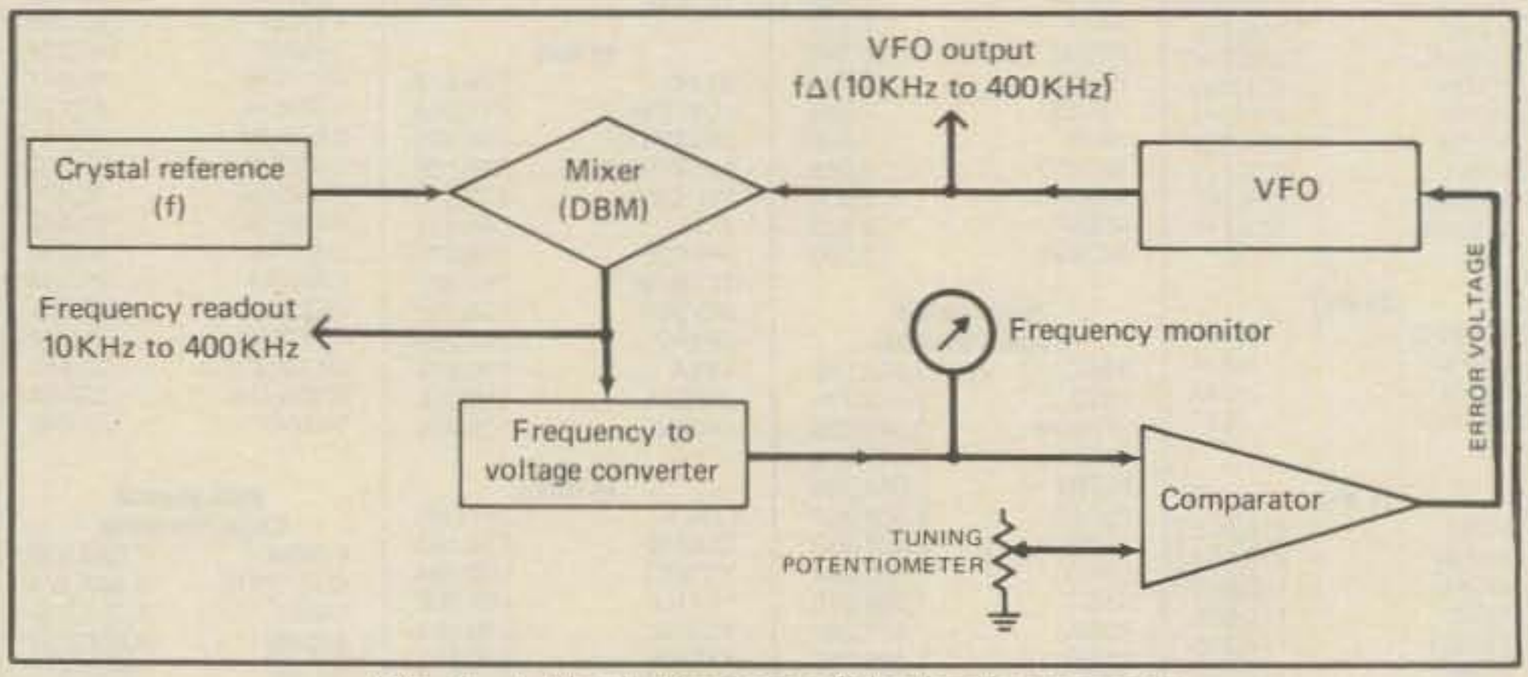


Fig. 1– A block diagram of the basic concept.

Concept

The concept is indicated in the block diagram, fig. 1. The VFO operating at the desired frequency has the feature that it can be varied over the required frequency range by changing a DC voltage. A fraction of its output is mixed with a crystal-controlled reference having a frequency at one end of the desired frequency range, resulting in an output of 0 to 400 kHz either side of the reference frequency, depending upon the VFO control voltage. The 0 to 400 kHz applied to a frequency to voltage integrated circuit (F/V IC) produces a DC output voltage that is linearly proportional to the input frequency. This is compared to a potentiometer controlled "tuning voltage," the comparitor output applied as the VFO error control voltage. PLL lock-on occurs either side of the reference frequency, depending upon how the inputs are applied to the comparitor. Frequency is displayed by monitoring the F/V IC output, the accuracy primarily a meter-reading capability. An accurate alternative method is to monitor the Δf output with a frequency counter. The errors in this case are limited to calibrations concerned with the reference crystal and the frequency counter.

Intermodulation distortion products are controlled to less than – 80 dB by: (1) minimal VFO-mixer coupling (– 90 dB), (2) feedback-loop filtering (0.1 sec tc), and (3) complete shielding of the mixer-reference assembly to prevent stray pick-up.

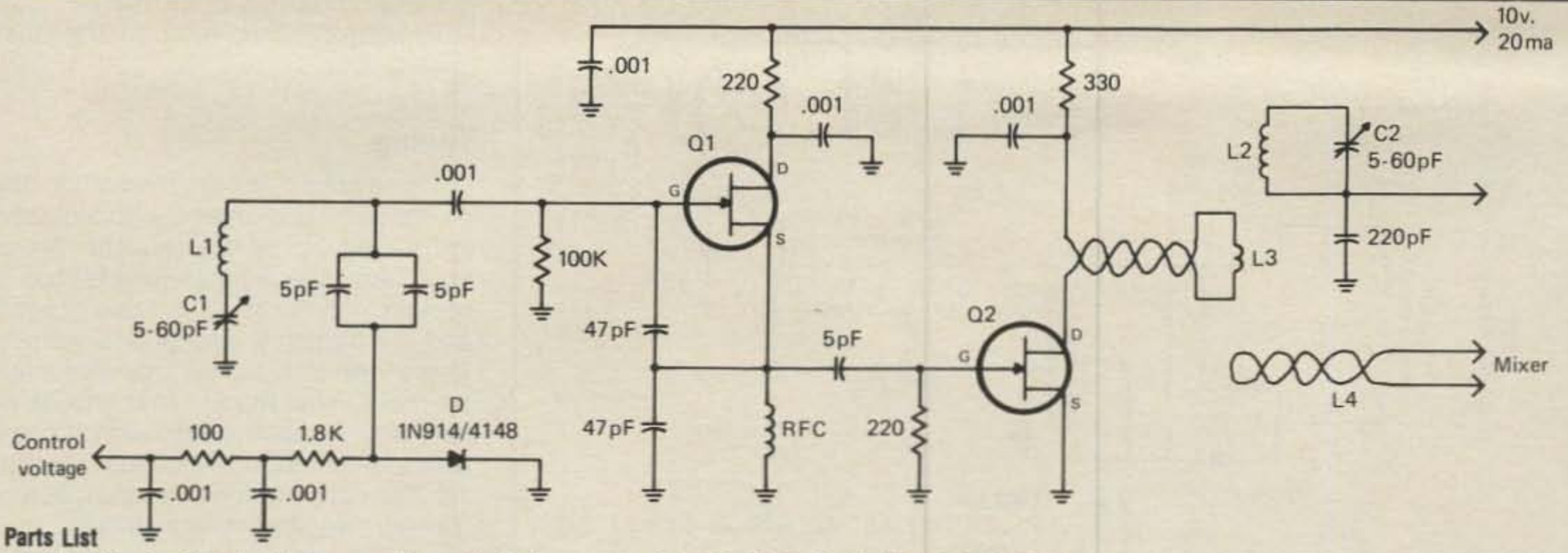
VFO

The concept has been evaluated using the 50 MHz VFO shown in fig. 2. The one unique feature of the circuit is the method of applying the frequency control voltage. Frequency shift is accomplished by varying conduction of a 1N914 diode in series with a 10 pF capacitor paralleling the VFO frequency control LC. The variable reactance produces a frequency shift of 900 kHz, the transfer function indicated in fig. 3. The general method is applicable for any frequency when an appropriate diode is used for the reactance change.

Mixer/Reference

The 90 dB isolation between the VFO and mixer is accomplished by (1) light coupling to the VFO (– 30 dB), (2) attenuation pad between the two assemblies (– 20 dB), and (3) port-to-port isolation resulting from a double balanced mixer (– 40 dB). The diode ring mixer shown in the mixer/reference circuit in fig. 4 can easily be assembled by the experimenter. It shows a port-to-port isolation of 40 dB even though it uses unmatched diodes. Resistive pads mounted as close as possible to the related transformer terminations at each DBM port assure optimum isolation. The trifilar transformers use Amidon FT37-61 cores (μ125 ⅜ inch diameter) wound with 8 turns of #26 wire.

**770 La Buena Tierra, Santa Barbara, CA 93111*

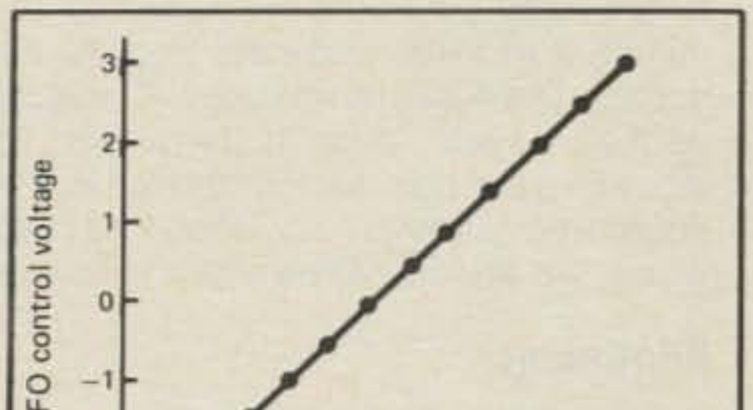


Parts List

L1: 9T #22 wire ⅜" plastic form, coil length ¾"
L2: 8T #14 wire ⅜" dia, coil length ¾"
L3: 2T #22 hook-up wire wound on end of L2
L4: 1T #14 wire loosely coupled to L2 (~ ½" from L2)
ch: 1 watt high value R single layer #30 wire

Q1, Q2: 3819, Radio Shack 276-2035
D1: 1N914/4148, Radio Shack 276-1122
C1, C2: Radio Shack 272-1340
All fixed capacitors are disc ceramics
All resistors are ¼ watt

Fig. 2– Schematic diagram of the 50 MHz VFO used in modeling the concept.



Measurement Data

−3	0	+.5	529
−2.5	85	+1	600
−2	157	+1.5	685
−1.5	233	+2	770
−1	307	+2.5	850
−.5	380	+3	940
0	450		

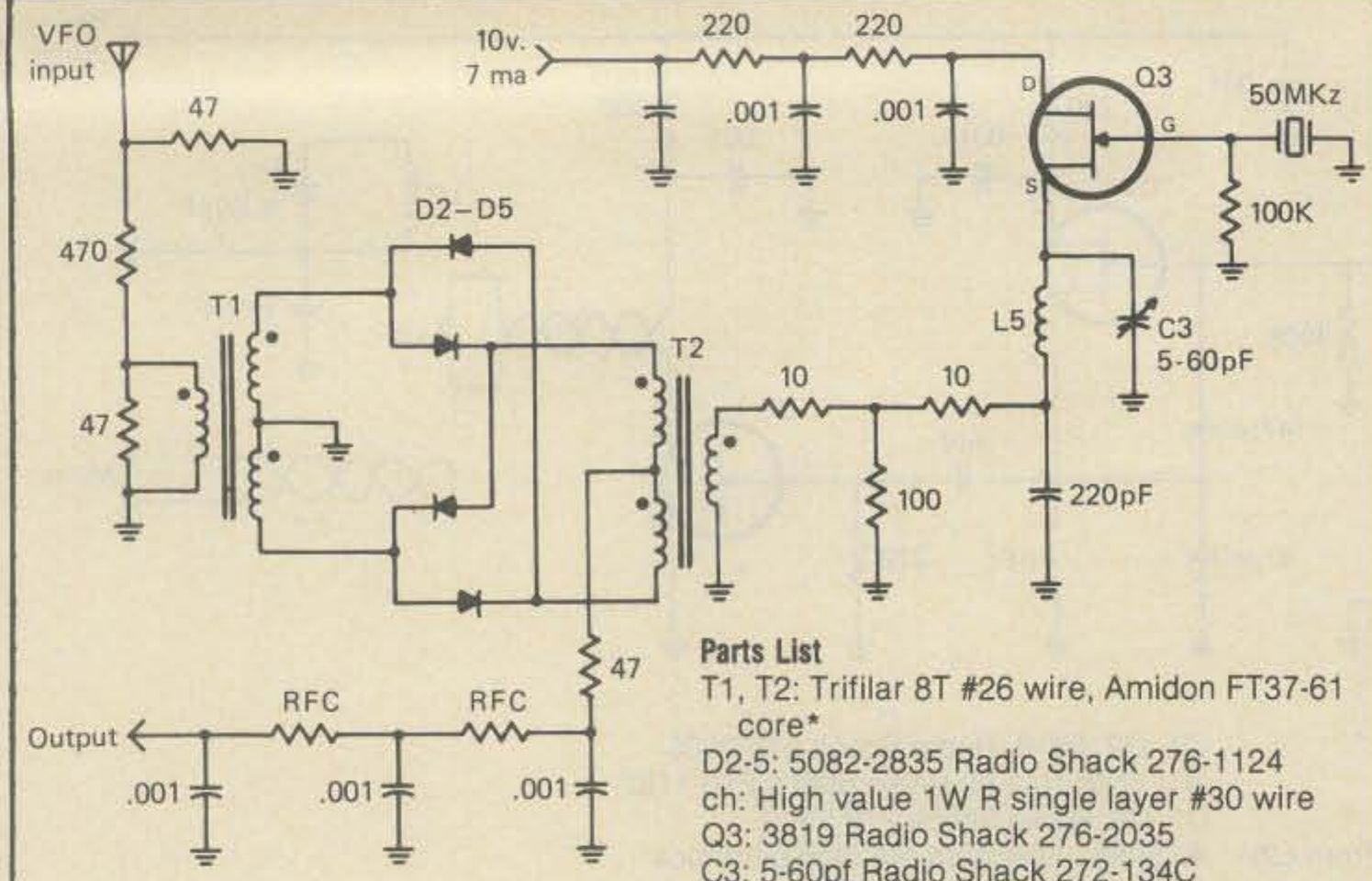
Fig. 3– The frequency-shift transfer curve.

One convenient way of winding so as to avoid scraping the wire insulation is to twist three wires (approximately 1 foot long and ¼ inch between twists) so that the transformer is essentially wound with one wire. The eight turns fill the inner core surface. The DBM layout must retain symmetry, short transformer leads, and ground connections soldered directly to the pc board.

The reference FET circuit uses a third harmonic crystal. It should be noted that the zero crossover triggering application makes it relatively insensitive to waveform distortions. Alternate reference circuits using frequency multipliers can be used without risk of harmonic distortions degrading the PLL performance.

Logic Circuit Board

The key circuit in this assembly is the F/V IC (9400), converting a 10 Hz to 100 kHz input to a linearly proportional output voltage having a typical linearity of 0.02% of full scale. The 400 kHz input is divided 4:1 to accommodate the 100 kHz frequency limit. Referring to the circuit diagram, fig. 5, the 4 mv low-level mixer output is increased to 8 vpp with two dual op-amp BIFET ICs with an overall bandpass of 5 to 500 kHz. The 5 kHz low-frequency cutoff is deliberately set to avoid amplifier response to frequencies concerned with the PLL feedback loop. The 4093 Schmitt Trigger IC is used as a buffer between the amplifier and the 4013 dual flip-flop divider for discriminating against false triggering by amplifier noise (0.1 vpp). The 4013 output is the F/V 9400 input with parallel back-to-back protec-



Parts List

T1, T2: Trifilar 8T #26 wire, Amidon FT37-61 core*
D2-5: 5082-2835 Radio Shack 276-1124
ch: High value 1W R single layer #30 wire
Q3: 3819 Radio Shack 276-2035
C3: 5-60pf Radio Shack 272-134C
L5: 9T #22 wire ⅜" plastic form ¾" long
Xtal ICM 031081 (OX-HI)**

Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607
***ICM Mfg. Co. Inc., 10 N. Lee St., Okla City, OK 73102*

Fig. 4– The mixer/reference circuit.

tive diodes. All three ICs are input sensitive MOSFETs. However, the 9400 is the only one not having internal protective diodes. The F/V 9400 output contains high-frequency transients that are eliminated with a following 200 Hz cutoff op-amp low-pass filter.

The 9400 F/V output is compared to a tuner potentiometer voltage, both of the input voltages representing differential frequencies between the VFO and the reference. The resulting proportional error voltage when applied to the VFO control voltage shifts the frequency to cause PLL lock-on. Negative feedback associated with the comparitor limits the gain to ten. There are two variable trim resistors concerned with the tuning potentiometer. One varies the maximum limit for controlling the scale factor, and the second controls the minimum tuner potentiometer output as compared to the F/V 9400 minimum. This adjustment limits the tuner range to no less than 10 kHz.

The feedback time constant is mainly determined by a resistor in series with the comparator output together with parallel back-to-back 100 mF electrolytic capacitors. A second time constant, 1000 mF capacitors, prevents possible PLL lock-up during the turn-on settling period. This effectively short-circuits the VFO control voltage to ground for a short period when power is applied. It has minimal effect on the PLL operation once the capacitors have been charged through the back-to-back diodes.

Tuning

There are a number of reduction drives on the surplus market capable of driving the tuning potentiometer. The inexpensive Radio Shack potentiometer has less friction than the usual variable capacitor, and the friction is exceptionally smooth. There are also ten-turn potentiometers on the surplus market that should work very well. An op-amp follower will convert any potentiometer resistance to less than 1K. The simplest tuner is a dual potentiometer arrangement, one covering the entire bandpass, and the second trimmer potentiometer covering only 10% of the range. In addition, since no indicator is required, a homemade cord driven reduction drive is also a practical solution.

Fabrication

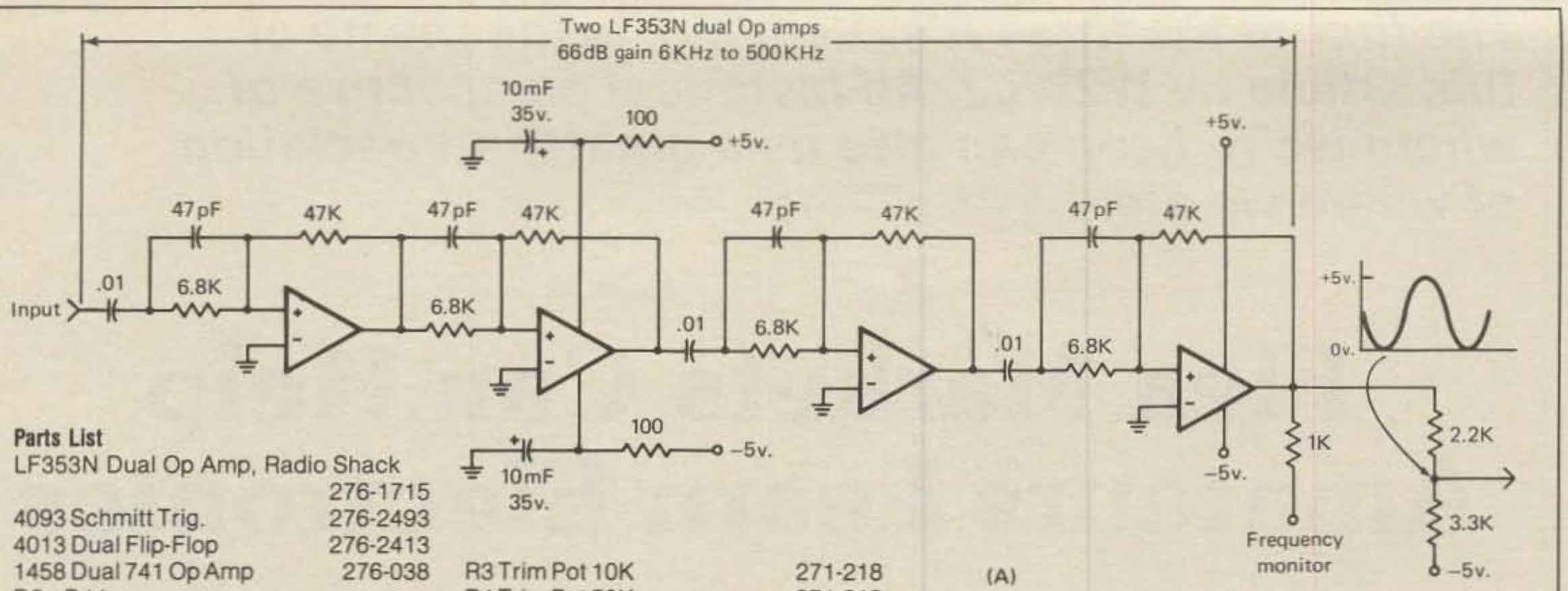
The RF circuits are constructed using single-sided pc board with push-in terminals, the foil reamed away from the terminals. The logic board uses IC spaced perfboard with push-in terminals for mounting the discrete components. The integrated circuits are mounted with wire-wrap sockets wired with Kynar wire.

Alignment

Troubleshooting under closed loop conditions is a nearly impossible task. A practical procedure is to open the loop by shorting the VFO control voltage to ground and then confirm operation of each subassembly. Once the comparitor output can be varied by tuning the VFO trim frequency adjustment, the system is capable of PLL lock-on. Before closing the feedback loop, the VFO trim frequency should be adjusted to make approximately zero comparitor output with the tuning potentiometer at mid-range. If PLL lock-up occurs, the VFO is on the wrong side of the reference frequency. This is corrected by either tuning the VFO to the opposite side or reversing the comparitor inputs. In the event of lock-up during the alignment procedures, turn the equipment off and on, hesitating a few seconds between to allow discharge of the 1000 mF capacitors.

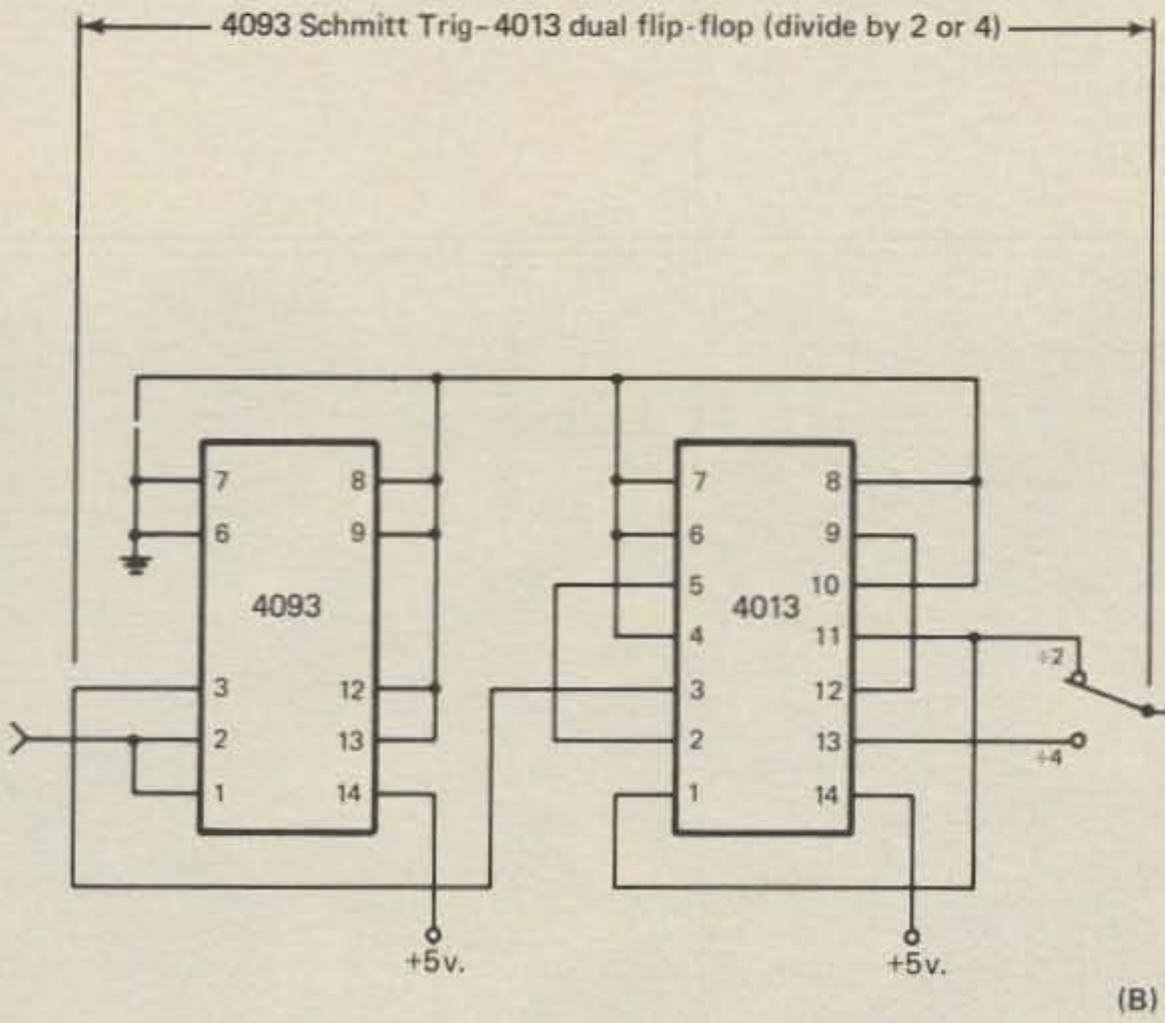
Application

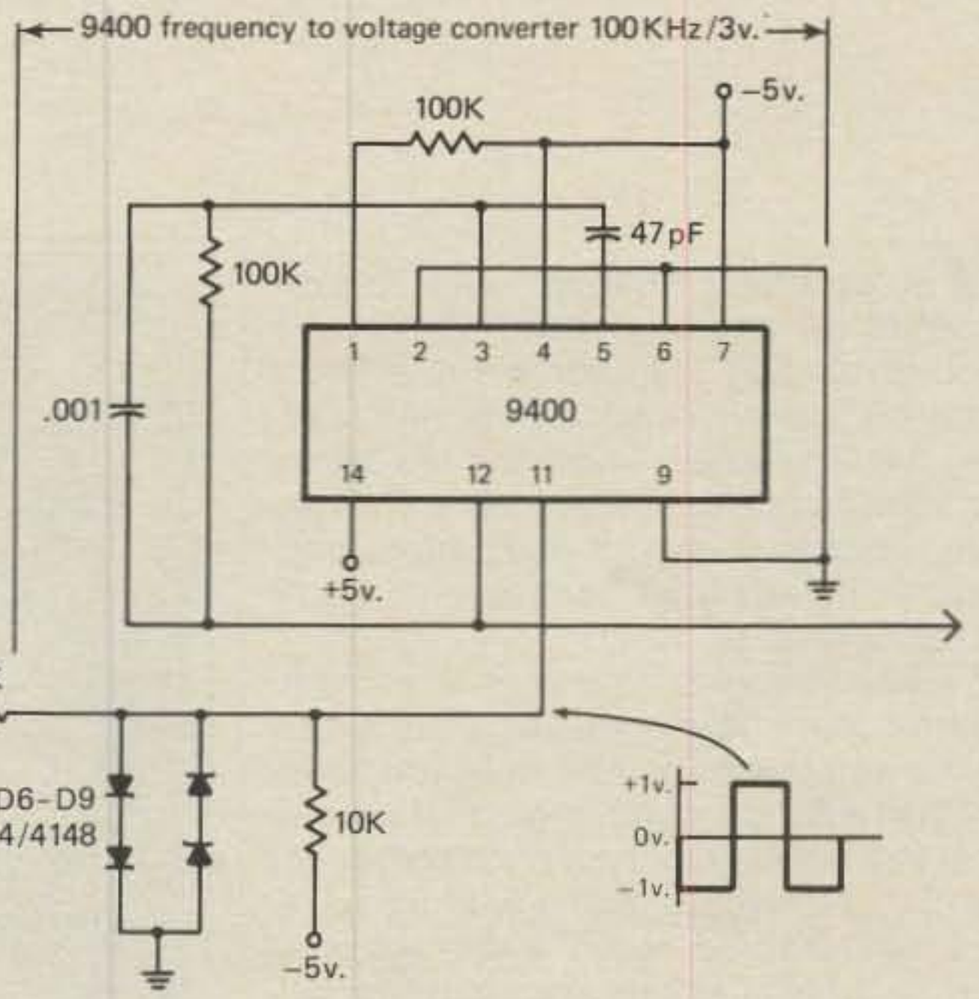
Due to the 9400 IC frequency limitation, this method becomes simpler if the bandpass is limited to 100 kHz. The narrower bandpass permits use of one dual preamplifier rather than two (with circuit modifications), and the amplifier can drive the 9400 IC directly, eliminating the 4093 and 4013 ICs. It is a question of comparing the added complexity with possible disadvantages concerned with frequency multiplication for obtaining equivalent tuning range.



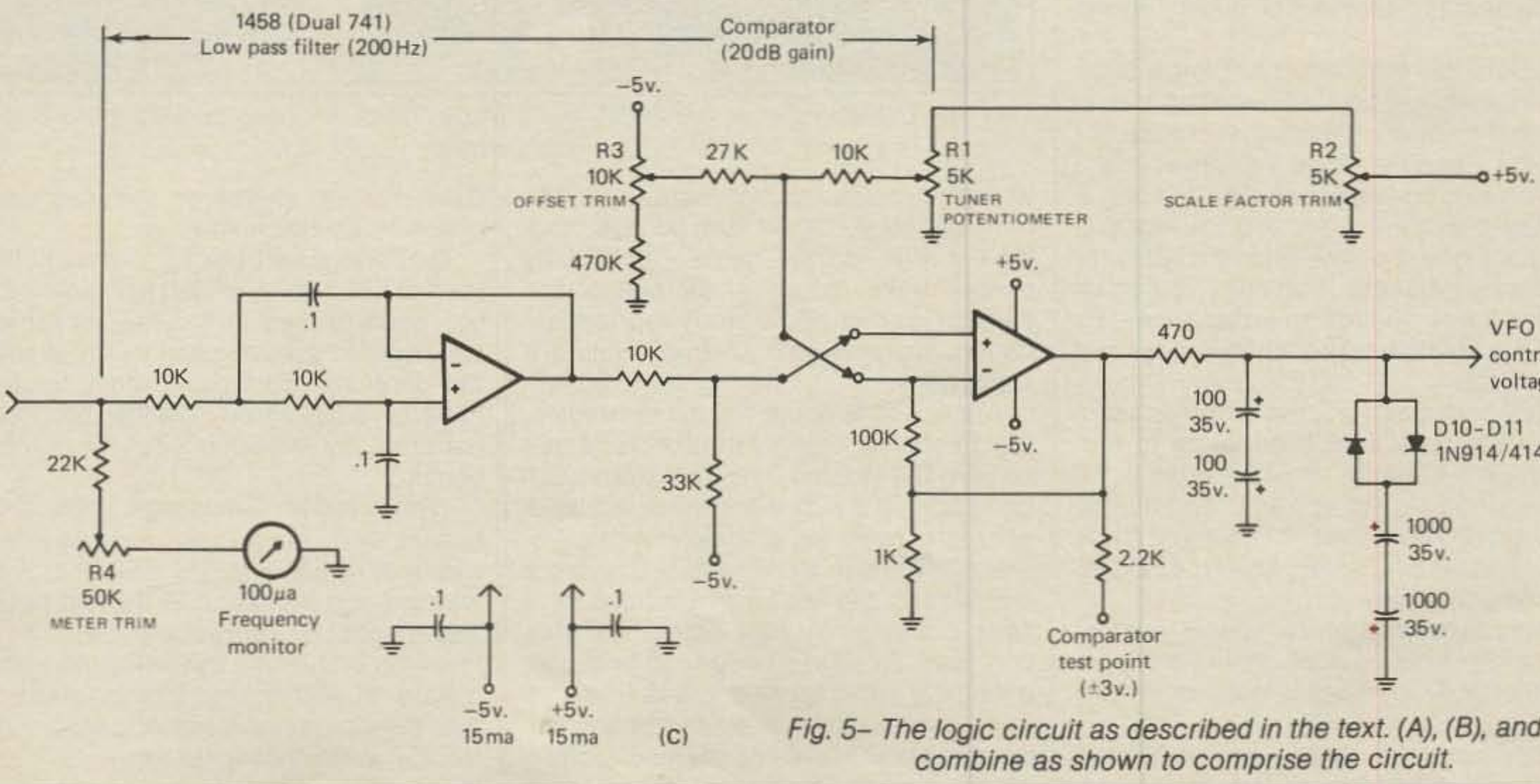
Parts List

LF353N Dual Op Amp, Radio Shack	276-1715			
4093 Schmitt Trig.	276-2493			
4013 Dual Flip-Flop	276-2413			
1458 Dual 741 Op Amp	276-038	R3 Trim Pot 10K	271-218	(A)
D6 - D11		R4 Trim Pot 50K	271-219	
1N914/4148	276-1122	All Resistors ¼ watt		
R1 Tuner Potentiometer 5K	271-1714	All Capacitors Disc Ceramic 50v		
R2 Trim Pot 5K	271-217	(except for electrolytics)		





(B)



(C)

Fig. 5– The logic circuit as described in the text. (A), (B), and (C) combine as shown to comprise the circuit.

The first of the three R's, Reading, is the theme of this article by W2WLJ. An historical perspective of where we've been can give us a greater appreciation of where we are.

Flea Markets Can Help Amateurs Learn Electronics

BY WALTER S. ANDARIESE*, W2WLJ

You're newly licensed and forever hooked on amateur radio. That's why you're reading this month's *CQ*. From now on, along with your magazine reading, you'll probably acquire a few books to learn more electronics theory. A home-study course might fit in, too. Before long, you'll upgrade your license—but you'll keep right on studying.

Of course, *reading* is your chief method for learning electronics theory. And while you buy or borrow what you need, or visit a library, don't forget that your local *flea market* can be a good source for slightly older stuff. Along with those recently-discarded books and magazines on electronics, flea markets can offer valuable reading that is *not* usually found elsewhere.

Before this other source of knowledge is revealed, however, a few further words about the value of *reading to learn electronics*. Reading, alone, will never make you an electronics expert. But reading is a very important first step for learning theory. Once you have enough theory for whatever you are studying, you must match it with "hands-on experience," be it at the shack workbench or maybe in a school lab.

Learning electronics is a two-part process, and practical experience is that other part. Happily, amateur radio is, by its very nature, lots and lots of on-the-job training. But to repeat, theory must come first, and reading is your chief method for learning this theory.

At college or technical school, reading is the chief means for learning electronics theory. True, much is learned from listening to professors and instructors, but more will be absorbed from outside reading—that is, doing "homework." Many people take courses in electronics through formal home-study (correspondence courses) without ever visiting a classroom.

Flea markets can provide an excellent source of unusual books on electronic theory and history.

A few words about the *art of reading*, too. First of all, technical subjects cannot be read like a novel. Detective stories can be read rapidly, but technical material generally must be *studied*. Each paragraph may have to be read two or more times. Also, the reader might have to sit back occasionally and reflect on what was read. A pad and pencil can help, too, especially when some math is involved. Each paragraph must be thoroughly understood before starting the next. (Jotting down the key points or outlining each chapter can also help.)

That brings us back to your local flea market. For years, all sorts of radio gear has been offered at flea-market tables, and amateurs have been quick to grab the bargains. Books and other reading material on electronics have also been bargains, but low price is not the primary benefit.

While recent textbooks, reference books, and magazines are generally available (and most of these provide worthwhile reading), it is the old books and magazines on radio and electricity that offer something special. Understandably, with technology changing rapidly over past decades, many who study electronics will consider this material obso-

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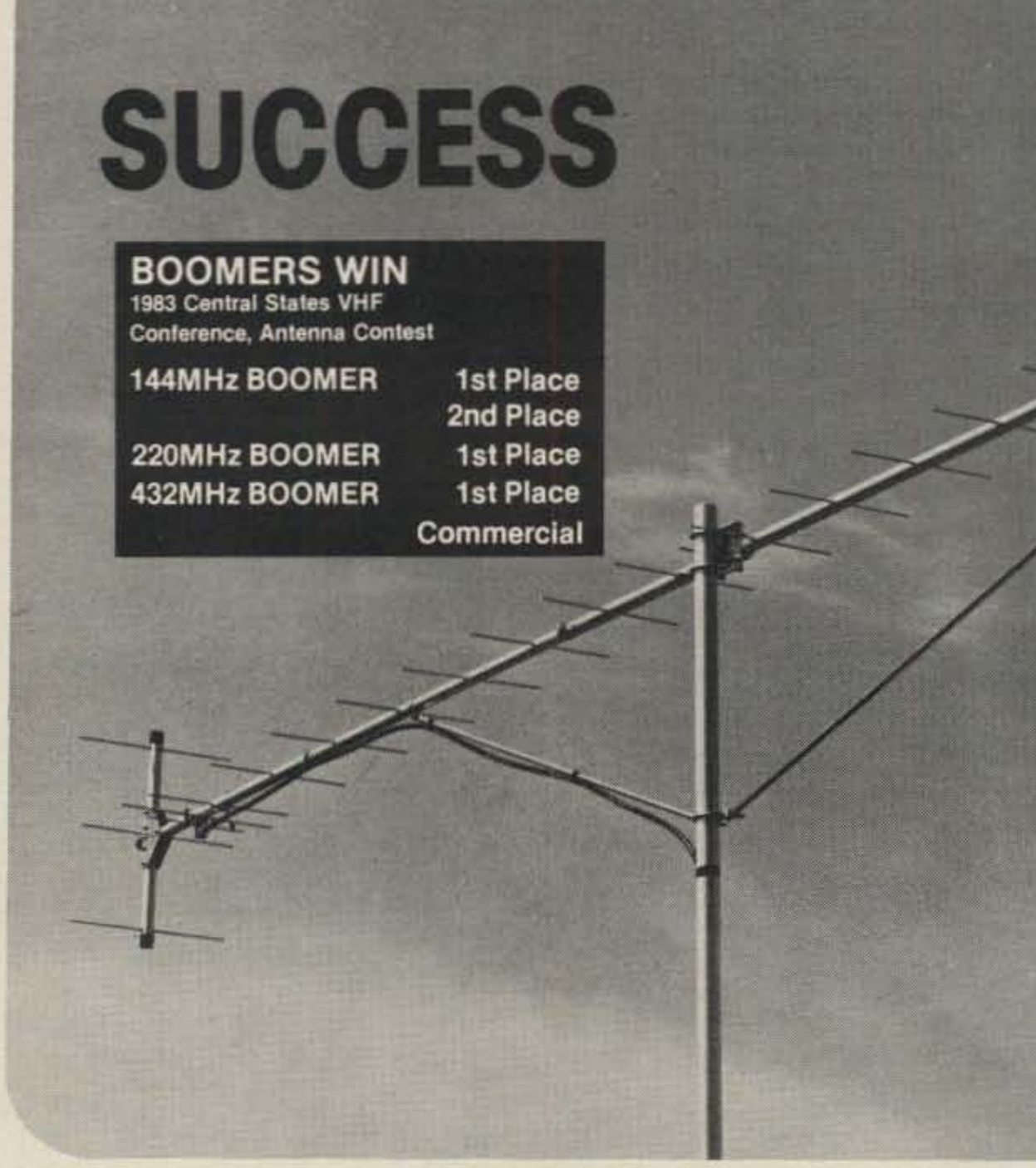

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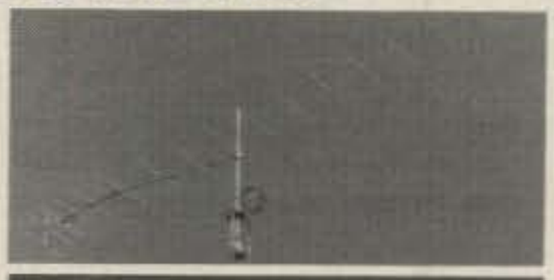

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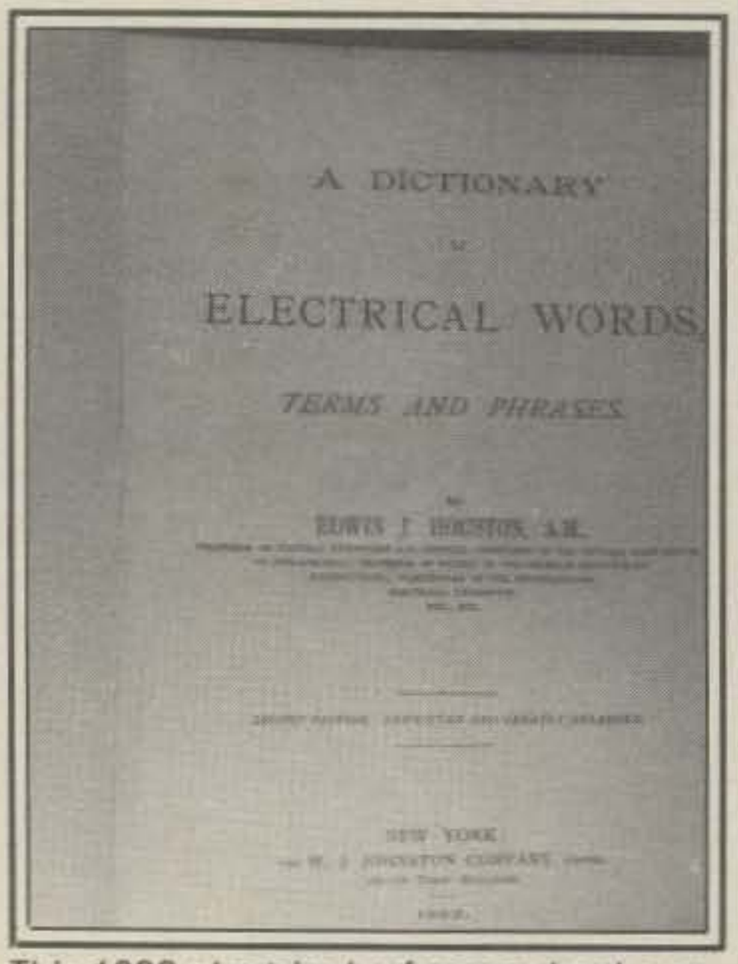
A 1956 biography of Edwin Howard Armstrong, creator of the superheterodyne receiver.



This 1892 electrical reference book contains 562 pages of entries—a great find.

lete and worthless. However, they are absolutely wrong.

Reading old books and magazines can be a dynamic supplement to your learning of modern-day electronics. Not only will your knowledge improve, but the time spent will also be very enjoyable—even fascinating. You must study these old publications with the proper frame of mind. You must read between the lines and reconstruct in your mind what the state-of-the-art was in those days. Because you will recognize what authors knew (and didn't know) back then, you'll be able to anticipate the actual discoveries that followed.

In short, you will uncover the *history* of electronics. You'll see the sequence of developments that brought us modern electronics. Reading electronic history will help in two ways. First, because it is enjoyable reading, efficient learning takes place. Second, a sense of history gives you a wider background in electronics, adding meaning to the electronics you will study in the future.

Let's see what actually can be found at a flea market. Obviously, old radio books go back only to 1900 or so. Books on electricity can go back much earlier than that. Old magazines, because they were less durable (and more disposable) than hardcover books, are not as available today. Nevertheless, radio monthlies from the 1920s occasionally surface (and might cost more—maybe a dollar or two).

The following books were recently purchased at flea markets in southern New Jersey (prices ranged from only ten cents to a half dollar):

•A 1956 biography of Edwin Howard Armstrong (*Man of High Fidelity* by L. Lessing). According to this book, Lee DeForest invented the triode vacuum tube in 1906, but it was Major Armstrong who first put it to work six years later in his famous regenerative circuit. That led to Armstrong's greatest contribution—the superheterodyne receiver. (But then, he also introduced the world to frequency modulation.)

An interesting anecdote concerns Armstrong's early FM experiments. In 1935 he set up a receiver at the Jersey shore to test signals from his transmitter in Yonkers, New York. But the reception (on 110 MHz) was barely audible. After working late into the night and, right after that, making a quick 60 mile trip to Yonkers (and back) to check his equipment, he was ready to give up. As dawn appeared, however, his curious assistant rotated the receiver dipole a few degrees, and the volume almost blasted them from the room. (Pardon the reference to TV, but was that the first time in history that "rabbit ears" were adjusted to get a better signal?)

•An 1892 electrical reference (*A Dictionary of Electrical Words, Terms and Phrases* by E. J. Houston). Marconi made the first long-distance radio transmission (just over a mile) in 1896, less than four years *after* this book came out. In this reference it is fascinating to see how much was known about electronics in those days. Of course, many radio buffs will attribute man's first electromagnetic transmission (10 feet or so) to Gustav Hertz in 1887. Hertz's theory is well described in this book.

Strangely, "electro-negative ions" and "electro-positive ions" are defined in this reference, but nothing is said about the excess or deficiency (of electrons) that causes atoms to be positive or negative ions. Actually, the electron was discovered a short time after this book was published, during the same time that "X-rays" were discovered. (Electrons were called "cathode rays" at first, and the name "electron" evolved later.)

Among the other 562 pages of entries are found "crystal," "thermo-electricity," and "hysteresis," to name just a few. Amazingly, in spite of what wasn't known back then, much of the wording for each definition is little changed in today's reference books.

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•A small 1854 volume for physicians (*Electricity and Galvanism in Their Physiological and Therapeutical Relations* by G. Bird). Less than 100 years after Luigi Galvani announced his famous twitching frog-legs discovery, author Bird described the effects of electricity on human muscle. From there he went on to reveal the effects of electricity on all types of disease. One illustration shows how to place a chair on four thick cups of glass, to isolate a seated person from the effects of ground electricity.

Although this book seems to preach quackery by today's medical standards (and that is surely an unfair statement about the author's intentions), much can be learned about man's understanding of electricity 130 years ago. Who knows? An old book like this might disclose some forgotten fact about the historical development of electricity theory.

•A large and informative 1975 paperback (*Mission Communications—the Story of Bell Laboratories* by P. C. Mabon). Not an old writing, this one is 198 valuable pages of compiled electronics history. The narrative is attractively presented, and once finished the reader feels that most electronics since 1925 was born at AT&T's Bell Labs, which is not very far from the truth.

Unfortunately (but fortunately), flea markets might be the public's sole access to company-produced books such as this.

A passing observation: This paperback implies that a Bell Labs inventor, Harold D. Arnold, first put DeForest's triode to work for the 1915 inauguration of transcontinental telephone service. Apparently, Major Edwin Armstrong was not alone those days in exploiting the three-element vacuum tube.

•A 1917 textbook (*Practical Wireless Telegraphy* by E. E. Bucher). Many photographs show the huge broadcasting towers and related equipment of World War I times. More important, today's reader sees the transition of (low-frequency) transmitters from mechanical (rotary) generators and alternators to those using vacuum-tube oscillators and amplifiers. Also, it is explained that radiotelegraphy back then utilized spark gaps to produce *damped* oscillations for producing code characters (rather than constant-amplitude pulses). This was an early form of amplitude modulation and provided a "musical pitch" in the operator's headphones. Had spark-gap telegraphy utilized constant-amplitude oscillations instead, those 1917 crystal detectors would have put ear-popping DC pulses into the operator's phones. Modern circuitry and the code operator's BFO solve that problem today.

Just five books provided all of this historical and technical insight. Many more books await radio amateurs across the nation via flea-market tables as attics and old book cases are emptied. Flea markets seem to offer the best selection, but garage sales, used-book stores, and charity book-sales can also be sources. Antique shops are also a possibility, but prices will be much higher.

Newcomers to amateur radio are not the only ones who can benefit from this gold mine of old books and magazines. Experienced amateurs can always learn something new, no matter how much they already know. What's more, the old timers can enjoy some nostalgia. Many grew up with radio almost from the time it was invented.

So for new amateurs or old, the flea market has something to offer. The next time you're searching for used rigs, tubes, and other electronics parts, keep an eye open for old radio books and monthlies. Also watch for books on electricity from the last century. Early books on telegraphy and telephone theory are good, too. There's no telling what you might find.

A bonus might also appear. Not only will you learn more electronics and have fun doing it, but that 25¢ purchase could turn out to be a *rare book*. Then it would bring a few bucks (that is, if you want to part with it).

Saturday and Sunday are the big flea-market days. Have fun looking, and have more fun reading—and learning. CQ

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CIRCLE 92 ON READER SERVICE CARD

Here's a little weekend project that will allow hands-free operation of your TR2500.

How To Connect A Boom Microphone/Headset To Your TR2500 HT

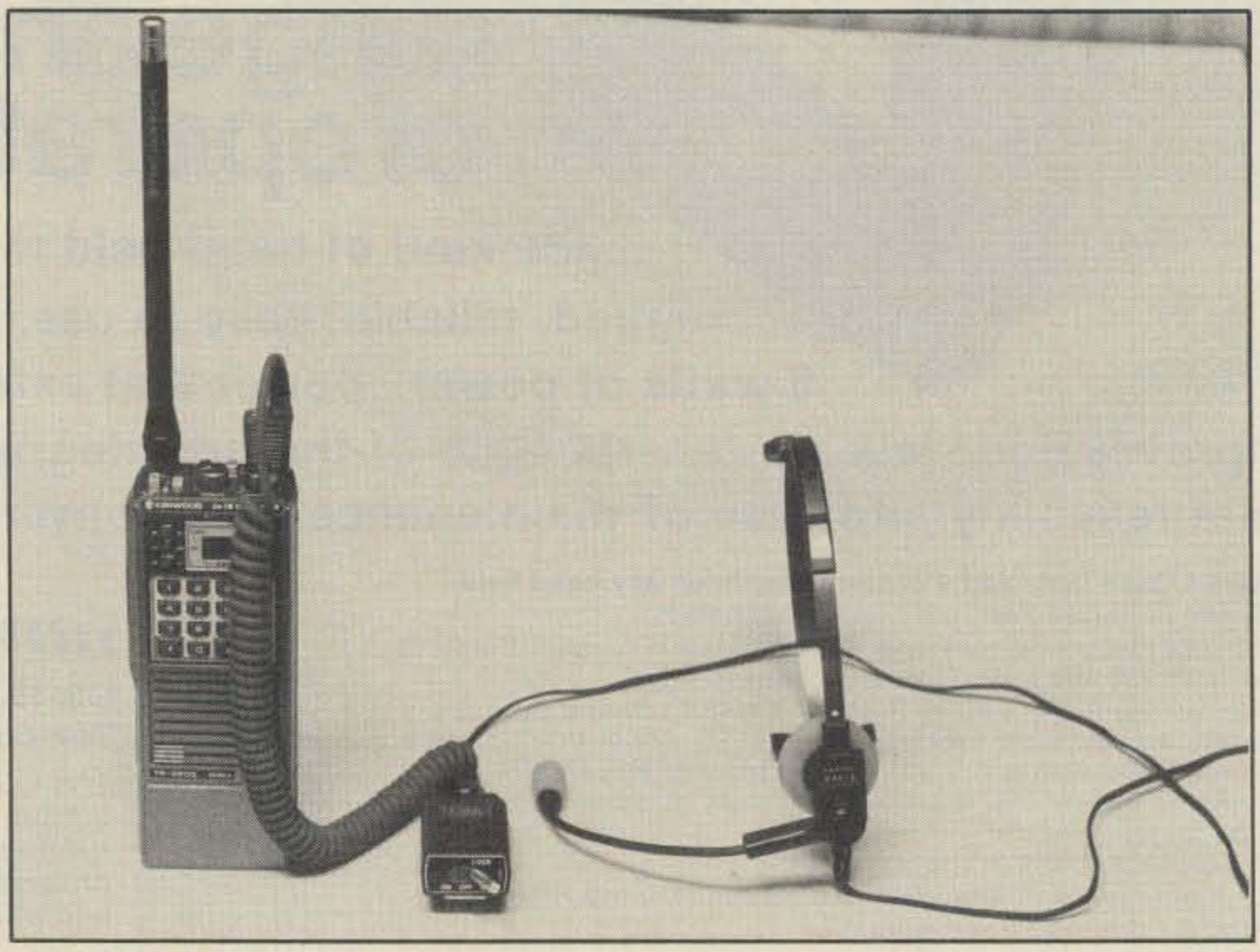
CARL SCHULTZ, JR.*, KA6KWB

Did you ever have a need to talk on your HT without holding onto the unit or the microphone? Read on and learn how to connect a boom-mic/headset to your TR2500.

It all started with the purchase of two personal walkie-talkies. These units have PTT or VOX and boom-mic headsets. For working on the tower, they are great for hands-free communications. I knew there had to be a way to add this convenience to my HT!

A trip to the radio store produced a new Yaesu YH-1 boom-mic headset for about $20. There are many units on the market, and some have a switch box made for a particular model or brand of HT. Other HT units have VOX, but VOX becomes difficult to use when working local repeaters. The solution was to make a push-to-talk interface.

Two interfaces are described here. One is a deluxe version based on the Yaesu SB-1 Switch Unit (cost approximately $33). It features momentary or locking PTT, an LED transmit indicator, convenient belt clip, and an external speaker jack. The second is the economy version which uses readily available parts (cost approximately $12).



The completed deluxe switch box and boom-mic with the TR2500.

How To Build The Deluxe Version

1. Remove the screw from the side cover on the Yaesu SB-1 Switch Box.

2. Remove the side cover from the switch box. You can now see the circuit board and parts inside the unit.

3. Carefully remove the circuit board from the switch box and desolder all the wires from the end of the board. Desolder the wire connected to the PTT switch; be careful not to disconnect the black jumper wire from that switch terminal. Keep the coiled cord for use in step 5.

4. Desolder and remove all the components except the headphone jack from the circuit board. (*Note:* The schematic diagram on the box is not the same as the actual wiring on the circuit board.)

5. Note the position of the coiled cord clip and strain relief. Remove the metal clip and the strain relief from the switch box coiled cord.

6. Place the strain relief and then the metal clip onto the new Kenwood coiled cord. Be careful to locate the parts in the same position as on the original coiled cord.

7. Refer to the circuit board by looking at the foil side with the headphone jack to your right. On the left edge of the board there are five foil "pads" running from the top-most (#1) to the bottom-most (#5) of the board. On the right edge of the board is the jack with three foil "wires," the top-most, the middle one (connects to #4), and the bottom-most (runs almost the length of the board to near #5).

8. Solder a 2.2k ohm resistor (red, red, red) between pad #1 and pad #3 (there are holes for the leads in both pads).

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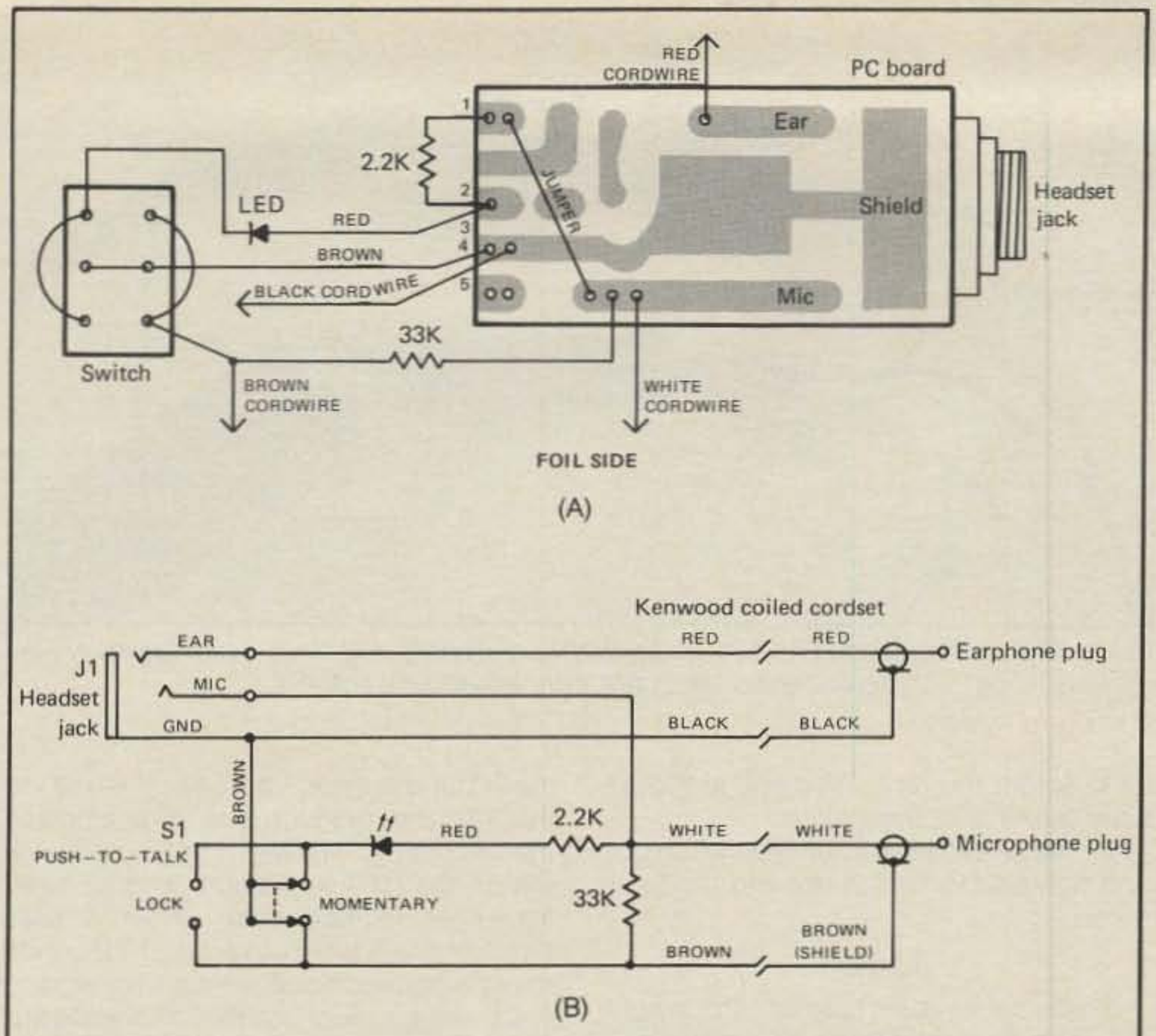
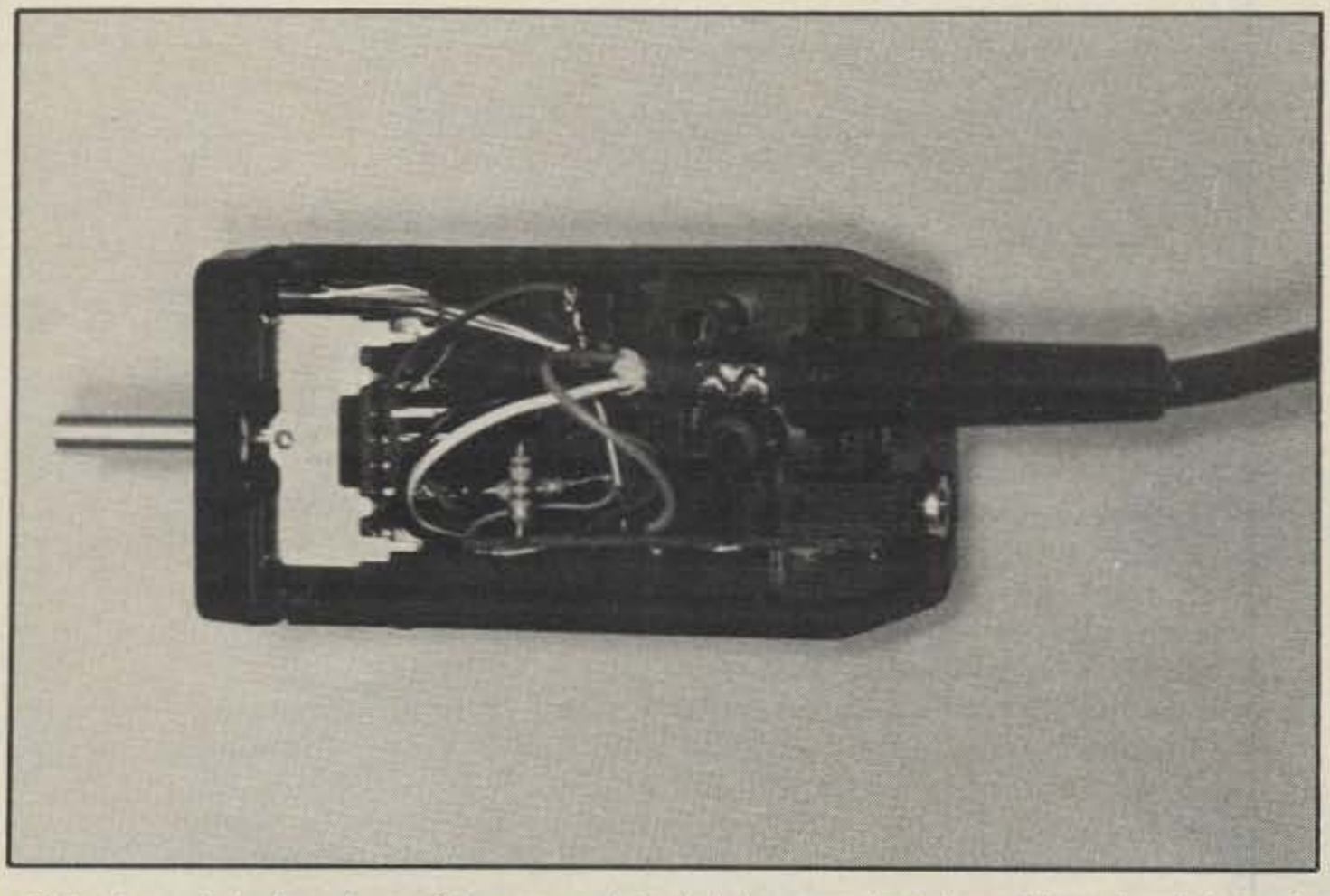


Fig. 1– (A) A pictorial view of the deluxe switch-box PC board as seen from the foil side. (B) Schematic diagram of the deluxe version. (RS denotes Radio Shack in the parts list.)

Quantity	Part Number	Brand/Description
1	SB-1	Yaesu/switch box
1	E30-1695-08	Kenwood*/SMC-25 cord
1	271-1325	RS/2.2k ohm, ¼ watt resistor
1	271-1341	RS/33k ohm, ¼ watt resistor

**Available from Trio-Kenwood Service/Parts, 111 West Walnut Street, Compton, CA 90220.*



This is an interior view of the completed deluxe switch box. The circuit board described in the text is on the edge near and parallel to the bottom of the SB-1 switch box. Towards the lower right end of the box can be seen the headphone jack. The PTT switch is on the left-hand end of the switch box.

9. Solder a jumper wire between pad #1 and the bottom-most "wire" from the jack, near #5 (again there are holes for the jumper wire).

10. Cut the leads on a 33k ohm resistor (orange, orange, orange) to ¾ inch on each end. Solder one end of this resistor to the same place as the wire in step #9. The other end will be connected later.

11. Take the lead end of the Kenwood coiled cord and solder the leads to locations as follows: **RED** to top-most "wire" from the jack; **BLACK** to the middle "wire" from the jack (pad #4); **WHITE** to the same place as the resistor in step #10; and **BROWN** to the other end of the 33k ohm resistor.

12. Solder the red wire from the LED of the switch box to pad #3, where the 2.2k ohm resistor is connected.

13. Solder the brown wire from the center switch terminals of the switch box to the middle "wire" of the jack (pad #4).

14. Now you are ready to reassemble the switch box. Solder the end of the 33k ohm resistor, with brown wire to the end-lower terminal of the switch. This is the same switch terminal that has the jumper in place from step #3.

15. Place the clip in its notch and place the strain relief in between its notches in the switch-box case.

16. Carefully place the circuit board back into place in the switch-box case. The 33 ohm resistor must be bent to allow the board to be seated properly. Be careful not to have any shorts from wires or components touching.

17. Place the side cover onto the switch box. Replace, then tighten, the screw holding the cover in place.

To Test

Place the headset plug into the switch-box jack. Plug the coiled cord into the HT's microphone/speaker jacks. Turn on the HT. You should immediately hear signals or noise (squelch off, volume up). Try to transmit by moving the switch-box toggle switch to the momentary or lock position. Both the LED on the HT and the switch box should be illuminated.

How To Build The Economy Version

1. Use a pencil to mark the location of the switch "toggle" handle hole. Make reference lines on the box top to locate center. The jack and cable holes can be located on the sides toward the bottom. The belt-clip holes should be marked while holding the clip onto the rear of the box in the proper position. Make sure the bottom of the clip is located on the box material.

2. Drill the holes for: switch handle and mounting, headset jack, cable entry, and belt clip. The hole for the switch handle should be elongated in the direction of the handle movement. This can be done easily by tilting the drill left, then right, during drilling. The plastic material is very

soft, so be careful. Use a 5/16 inch drill for the switch "toggle," 7/64 inch for the switch and belt-clip mounting holes, 3/16 inch for the jack and cable holes. You may decide to use a rubber grommet at the cable entry, and that hole size would differ.

3. Mount all the hardware in the appropriate locations. Make sure to tighten all the screws and pass the cable end through the box before wiring begins.

4. Start by connecting the mini- and submini-plugs to the outside end of the shielded three-wire cable. The shield and one wire is used on the mic (mini) plug. After stripping the cable covering away from the wires, put the plug covers over the cables before soldering. Now solder the shield to the "mic" plug shield and the wire to the center connector. Next solder the remaining two wires to the "ear" submini-plug. Make a notation as to what color wire is connected to what plug terminal. Screw on the plug covers and use tape or shrink tube to cover the wiring.

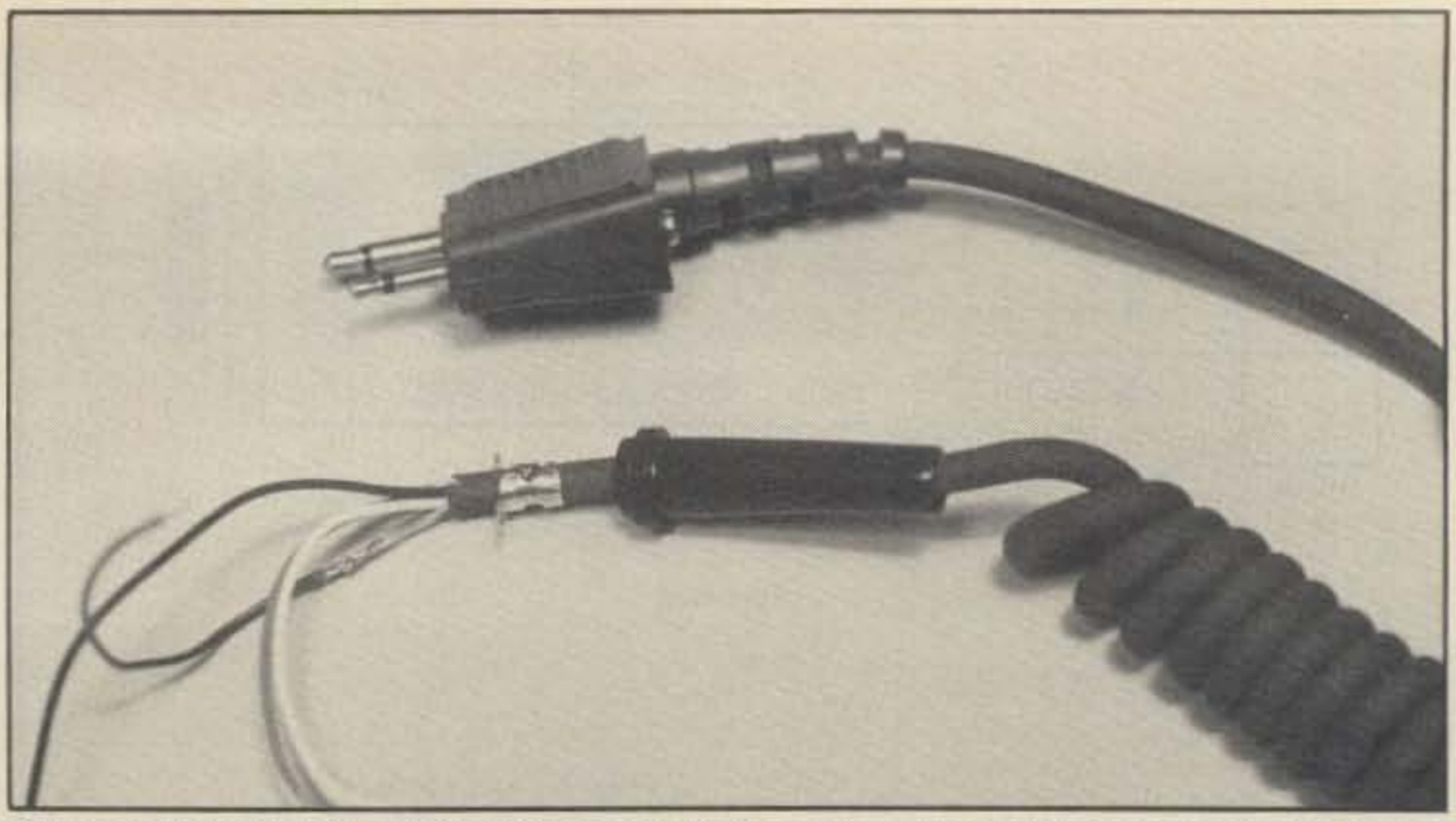
5. Solder the mic shield to one side of the switch. Solder the other "mic" wire (check your note) to the "tip" connection of the headset jack.

6. Solder the "ear" (speaker) shell connection wire to the shield (barrel) connection of the headset jack. Solder the "ear" plug tip connection wire (check your note) to the "center" (barrel) connection of the headset jack.

7. Solder one end of the 33k ohm resistor (orange, orange, orange) to the mic shield wire that is connected to the switch. Solder the remaining end of this resistor to the mic wire that connects to the "tip" connection of the headset jack.

8. Prepare a 4 inch piece of hookup wire by stripping about ¼ inch of insulation from each end. Solder one end to the shield (barrel) connection of the headset jack. Solder the remaining end to the unused terminal of the switch.

9. Replace the cover on the switch box and tighten the four screws to hold it in place.



Closeup of the Kenwood SMC-25 cord with the metal clip and strain relief in place. The color-coded leads are connected as per fig. 1.

To Test

Place the headset plug into the switch-box jack. Plug the two plugs into the HT's microphone and speaker jacks. Turn on the HT. You should immediately hear signals or noise (squelch off, volume up). Try to transmit by moving the switch handle so that the HT's LED illuminates.

Summary

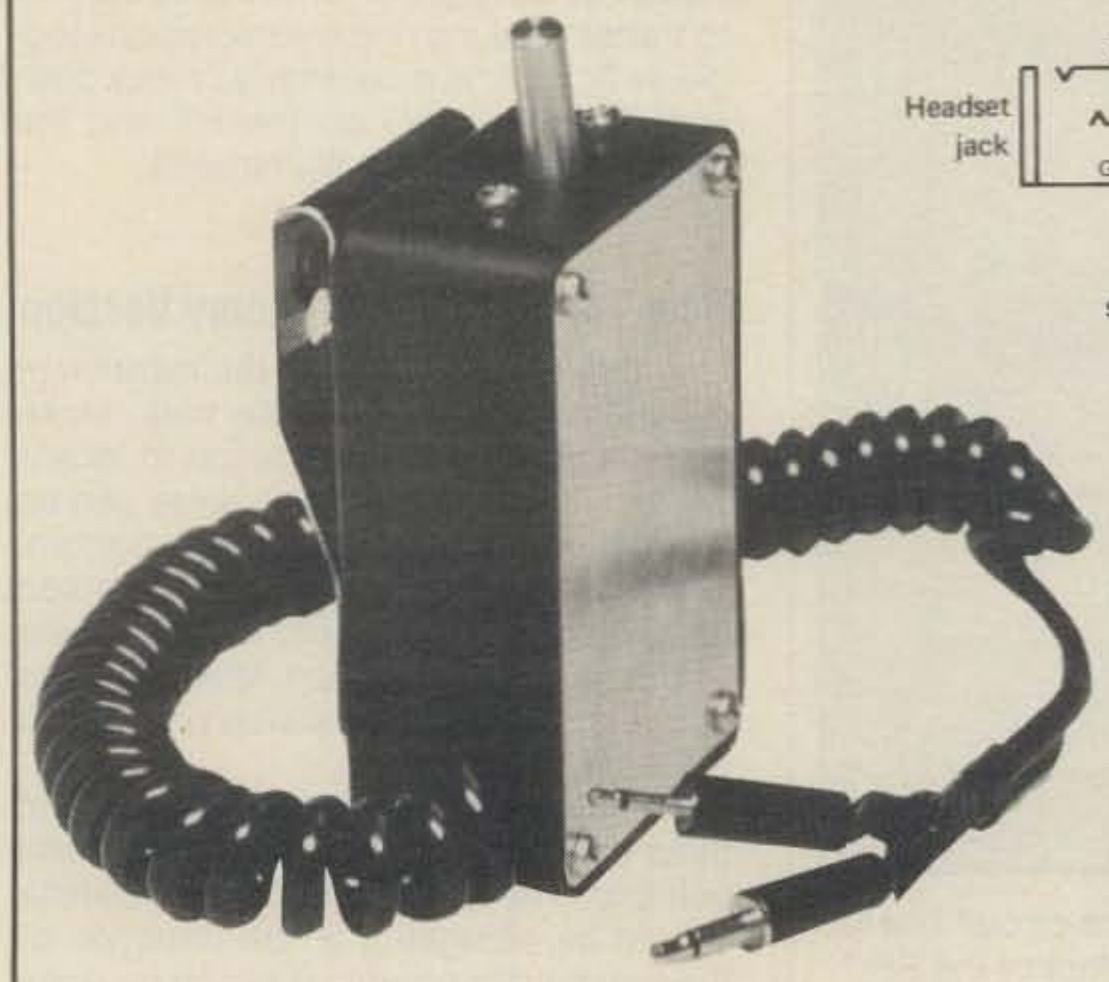
If you have any difficulty with either system working, carefully recheck your wiring against the instructions and the schematics.

The headset contains an electret microphone. This requires a small voltage to operate. The voltage is supplied from the HT and applied "across" the mic via the 33k ohm resistor. The impedance of the headset's "speaker" of 32 ohms will match the HT's audio amp without need for other components. Other similar headsets will work and other HF units may be hooked up, if similar in design.

On-the-air reports with the headset are excellent for audio quality, and the volume to the earphone is more than ample for even high-level background noise.

A word of caution if you are considering using the headset mobile: some states prohibit the use of headphones while operating a motor vehicle.

Since interfacing the headset, I've discovered many more operating uses: bicycle mobile, pedestrian mobile, and recently it was the "only way to go" when bouncing around in a powerboat providing communications for a swimming event! I'm sure you too will discover how handy a headset can be. CQ



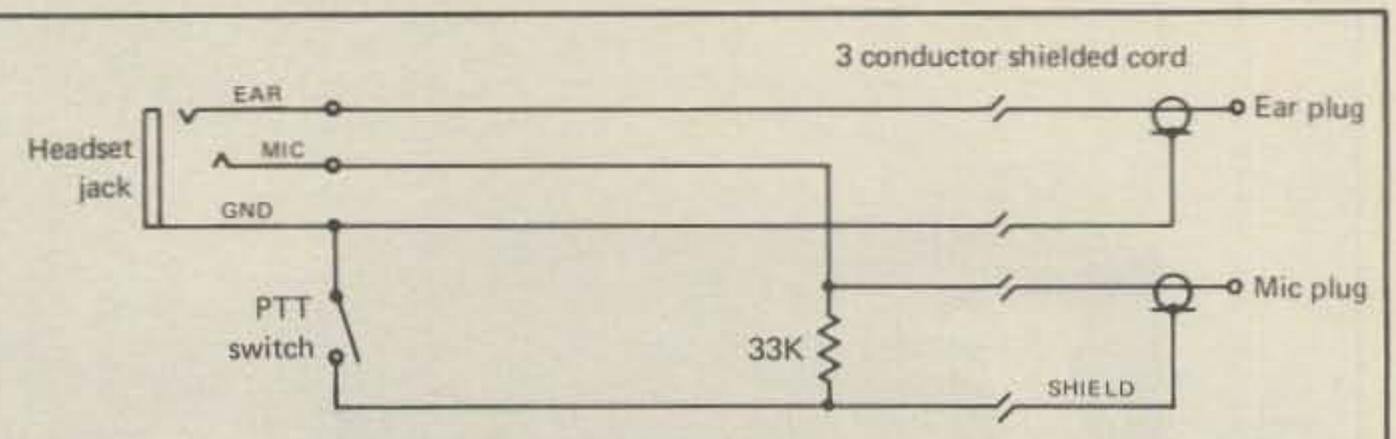
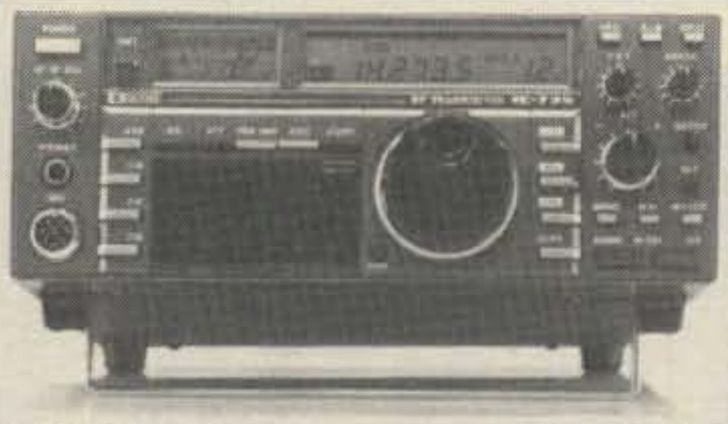


Fig. 2– The economy switch-box schematic. All parts except the belt hook are available from Radio Shack. The completed economy version is shown at the left. This switch box is quite simple and effective.

Quantity	Part Number	Brand/Description
1	270-230	RS/experimenter box
1	271-1341	RS/33K ohm, ¼ watt resistor
1	274-250	RS/3 conductor, ⅛" jack
1	274-286	RS/2 conductor, ⅛" mini-plug
1	274-289	RS/2 conductor, 3/32" submini-plug
1	275-630	RS/SPST toggle switch
3 ft.	misc.	3 conductor shielded cable
1	BH-2	Kenwood/belt hook



HF Equipment	Regular	SALE
IC-735 Xcvr/SW rcvr/mic	849.00	749.95
PS-55 Power supply	TBA	
AT-120 Automatic antenna tuner	TBA	
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-730 8-band 200w PEP xcvr w/mic	829.00	569.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	1349.00	799.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	999.00	779.95
PS-35 Internal power supply	160.00	144.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44A SSB filter (2nd IF)	159.00	144.95
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	

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FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
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SP-3 External base station speaker	49.50	
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OPC Optional cord, specify 2 or 4-pin	5.50	
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EX-144 Adaptor for PS-15/CF-1	6.50	
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

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IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95

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IC-27H Compact 45w 2m FM w/TTP mic	409.00	359.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	299.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
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IC-3200A 25w 2m/440 MHz FM xcvr	549.00	489.95
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Accessories for Deluxe models	Regular
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BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
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LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95

Accessories for both models	Regular
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BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
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HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier SALE	79.95
SS-32M Commspec 32-tone encoder	29.95

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RC-11 Wireless remote controller	59.95	49.95
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
EX-257 FM unit	38.00	
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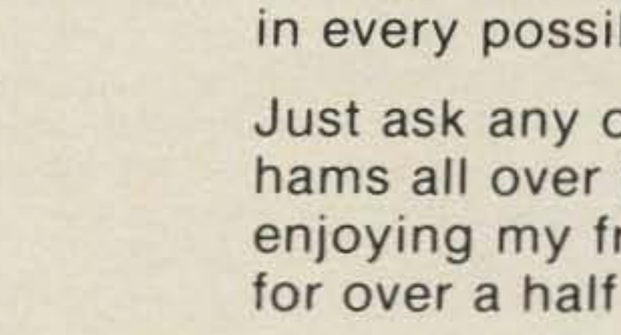

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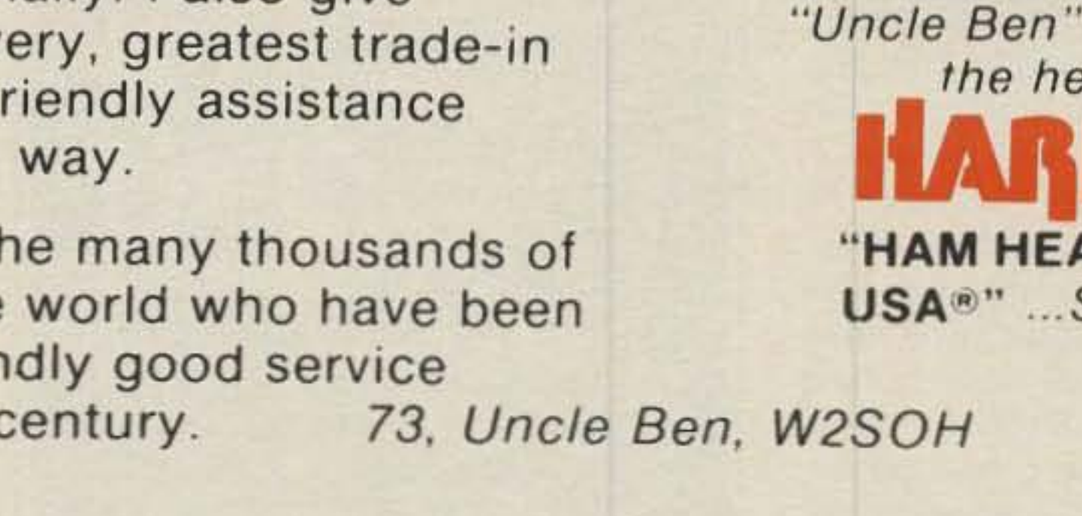

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CQ SHOWCASE

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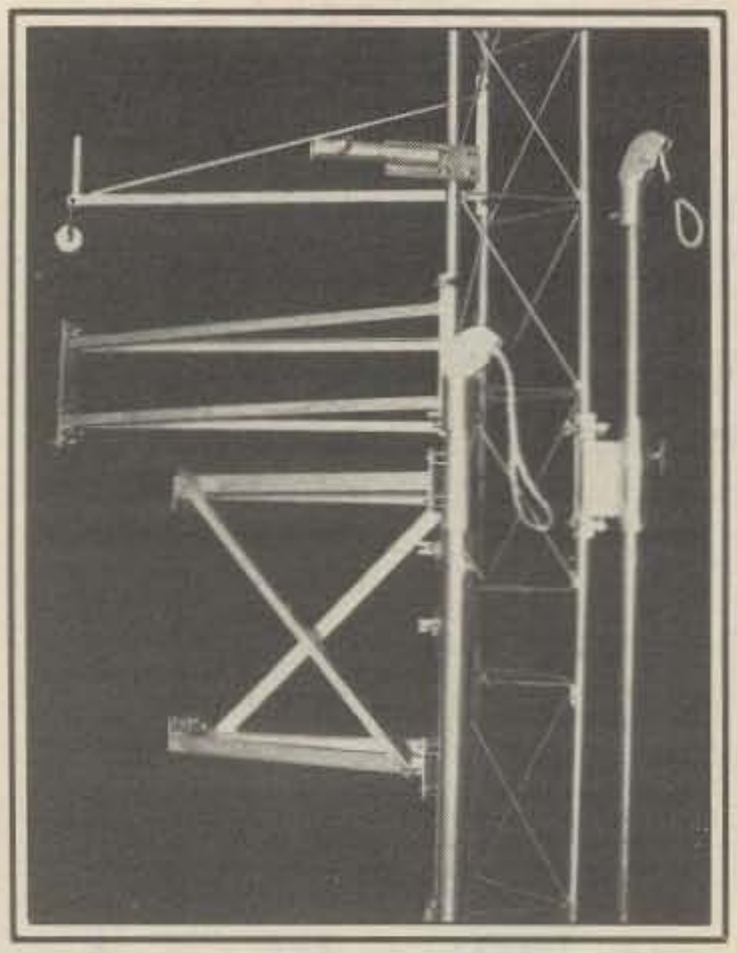

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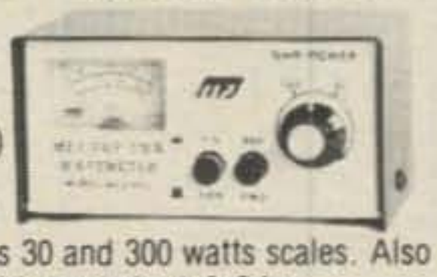

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CIRCLE 11 ON READER SERVICE CARD

Here's a nifty idea on how to get more mileage out of your Azden PCS-4000.

How To Get Quick Repeater Selection On The Azden PCS-4000

BY ALEX F. BURR*, K5XY

The Azden PCS-4000 is a small, synthesized 2 meter transceiver which is push-button controlled. Like many similar transceivers, a given repeater frequency has to be punched in one digit at a time. Because three digits must be set and each digit could require as many as five punches (the digits can be stepped up or down), it could take as many as 15 switch pushes to tune to a given repeater. This is quite an operation without taking your eyes off the road if you are driving.

Fortunately, the transceiver is so flexible that it is possible to arrange the various memories in such a way that five different repeaters are available with the push of but one (or at most two) buttons.

Most users of these transceivers are aware of the *priority memory channels*. The transceiver has two independent memory banks with the first of the eight channels in each denoted as a priority channel accessible instantly with the push of a priority button. You can (if you do not wish to scan) create three other priority channels by careful manipulation of the memories.

One of these new priority channels is created by placing the desired repeater frequency in the main register. One can instantly call up this register when listening to one of the memory channels by pushing either button 1, 2, 4, 5, or 6.

The other two new priority channels can be set up by careful manipulation of another channel in the two memory banks. You should place the desired repeater frequency in any memory channel other than channel 1. The address button (8) is then pushed until that memory channel is lit. One frequency is put in memory bank A, and the other is placed in the same channel in memory bank B. These repeaters can then be accessed while listening to one of the other three by just pushing the call (Ø) button. Most of the time you will get the repeater in the A memory bank. To get the one in the B memory bank, you must have been listening to the repeater in B1 memory or else push the B priority button (#) just before the call (Ø) button. This information is summarized in Table I.

Priority Channel	Memory Location	Button To Push
1	A1	M1A (9)
2	B1	M1B (#)
3	main register	1
4	A6	CALL (Ø)
5	B6	CALL (Ø) after M1B if needed

Table I– Priority memory channels.

To set up this system of five priority channels, place the desired repeater frequencies in the correct registers and then push the address (8) button until memory light 6 is lit. Now you can have instant access to any one of five specific repeater frequencies by pushing the button listed in the last column of the table. I put my priority channels 4 and 5 in memory location 6 because locations 7 and 8 have special attributes. You can, however, use any location except 1. Of course, the location you use is the one whose indicator light must be lit.

This arrangement is particularly useful if you are in an area with up to five busy repeaters which you want to sample for an interesting conversation, or if you regularly listen to a calling frequency and want to have available a selection of QSY frequencies. If the repeaters in your area are not busy, you will probably want to scan. One way to scan less than eight frequencies is to program the same frequency into more than one channel. Place the repeated channels next to each other so that if they become occupied, you receive a longer portion of the transmission before the automatic resume scanning carries you to the next channel.

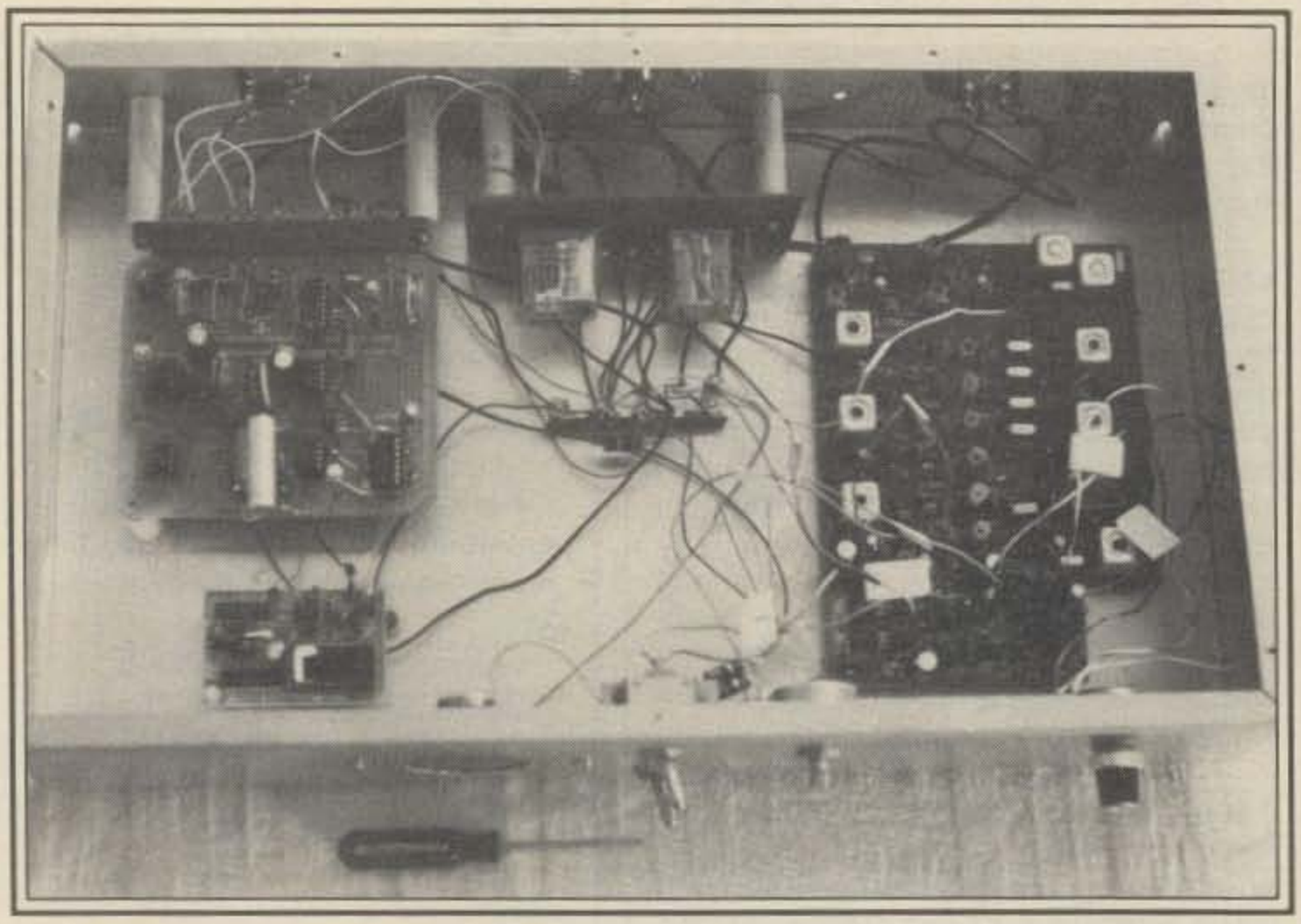
The flexibility of the Azden's duplicate memory banks, coupled with imaginative use of the front-panel pushbuttons, gives you many interesting operating possibilities. Study of the various functions available will allow you to create the operating mode best suited to your style. CQ

*2025 O'Donnell Drive, Las Cruces, NM 88001

It's time to visit the elephant graveyard of radio equipment and resurrect some of those discarded "bones."

How To Build A 2 and 10 Meter Repeater System On A Shoestring Budget

BY JIM MEYER*, WB2NGN



Inside the receiver/control box. The receiver board is on the right. The COR board is on the left. The CW ID board, lower left. Note volume and squelch controls along with the remote speaker.

Locally over the past couple of years there had been many hours of discussion off and on the air concerning putting together a small, *cheap*, solid-state 2 meter repeater. It was to be used as an emergency and special-events repeater, or as a backup for the local machine.

The time had come to try something. We had talked long enough. An old Heath HW-202 10 watt, 2 meter mobile rig fit the bill for the above requirements. The neat thing about this little rig is that the transmitter and receiver are built on separate pc boards and run pretty much independent of one another via a relay.

It took all of about 20 minutes to physically "split" this radio apart, with the receiver board in one hand and the transmitter board with the PA intact, in the original chassis. The receiver board was mounted in a separate aluminum box with room enough for some control logic. The required volume and squelch pots, local speaker, and supply voltages were also added to the box.

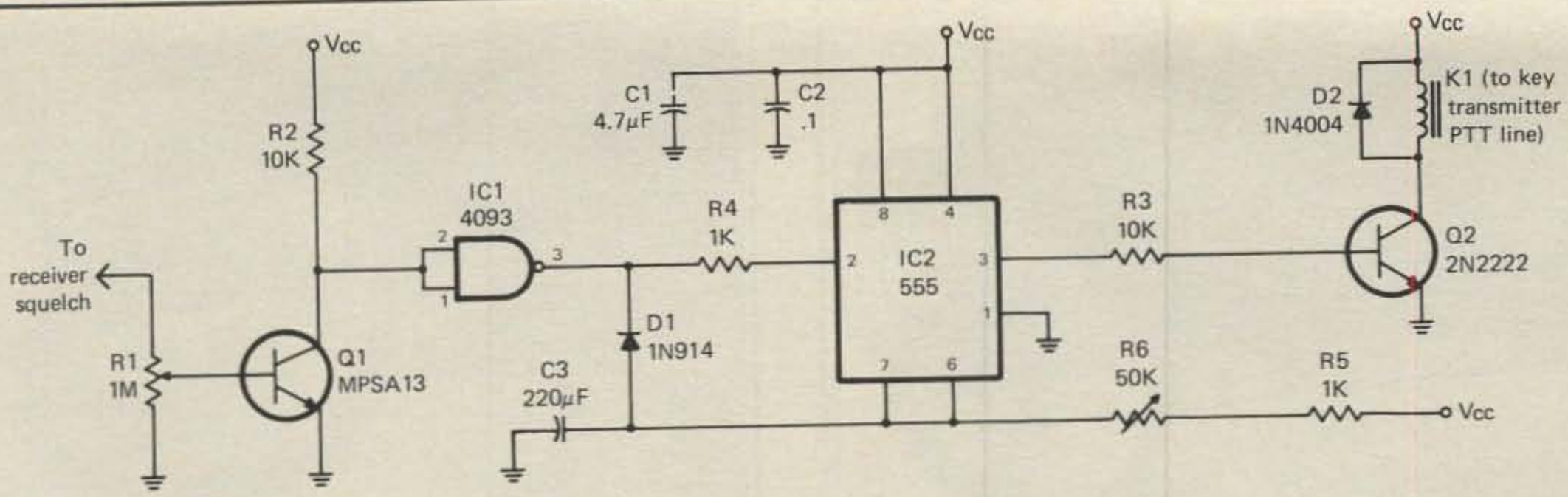
The next step in the operation was wiring together the two independent radios. I used shielded cable for the PTT, receiver audio, and transmit audio. The actual length of the shielded cable depends on whether or not you have a 2 meter duplexer. If cavities are out, lengthen the cable to 100 feet or so in order to get as much separation as possible between the repeater transmitter and repeater receiver. Use extreme care in wiring the audio lines and other controls. An RF tight receiver/control box is a must, and I used ferrite beads, shielded cable, and .01 bypass capacitors just about everywhere. After that all you need are two antennas and a convenient hilltop location to place the repeater, and you're on the air.

This was my first attempt at putting together a VHF repeater. The moral support and guidance from the local repeater owners group was an added benefit to me. One of my worst fears was that the old mobile rig wouldn't handle the duty cycle and that by cutting corners I had really cut performance. Well, it didn't take long to find out that the old work horse could and did handle continuous duty with no sweat.

Well, smug and satisfied with my first repeater project, once I discovered that it worked and worked well, it was time to improve the system.

The next project was a 2 meter duplexer, a six-cavity affair based on a W1GAN design and made from old copper fire extinguishers. I added a GLB CW ID to the control box and gave the newest repeater on the block a "name" for itself. It was getting there.

26 E. Genesee Rd., Auburn, NY 13021

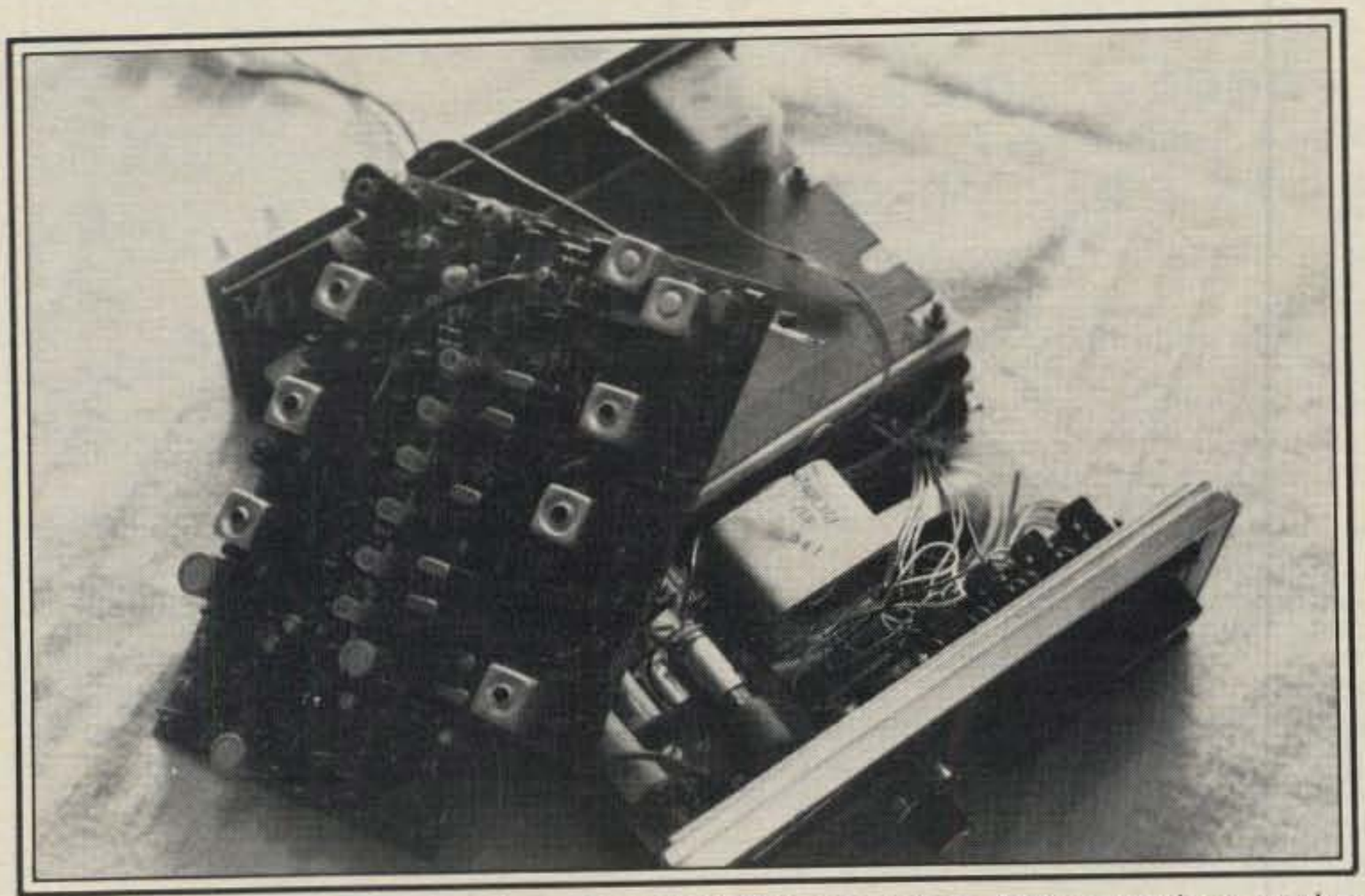


Parts List

COR
R1: 1 megohm PCB mount pot
R2, 3: 10K, ¼ watt
R4, 5: 1K, ¼ watt
R6: 50K PCB mount pot
Q1: 2N2222 NPN
Q2: MPSA-13 NPN-D
U1: 4093 Schmitt Trigger
U2: 555 timer
C1: 4.7 uF electrolytic
C2: .1 disc cap.
C3: 220 uF electrolytic
D1: 1N914 diode
D2: 1N4004 diode
RY1: 12 VDC relay

Miscellaneous
PC board
Enclosure box
RG-174 cable

Fig. 1– The COR (Carrier Operated Relay) which was designed by WB2LHP. R1, which goes to the Receiver Squelch, is mounted on the receiver board between R-175 and R-176. Vcc is 12 VDC. RY1 keys the transmitter PTT line on pin 2 on the microphone jack. R6, the 50K pot, adjusts the length of the squelch tail. The Schmitt Trigger, U1 (4093), should have pin 7 at ground and pin 14 at Vcc. Tie all unused inputs low.



The receiver board removed from the HW-202 transceiver. All connections unplug from the board, a 20 minute job.

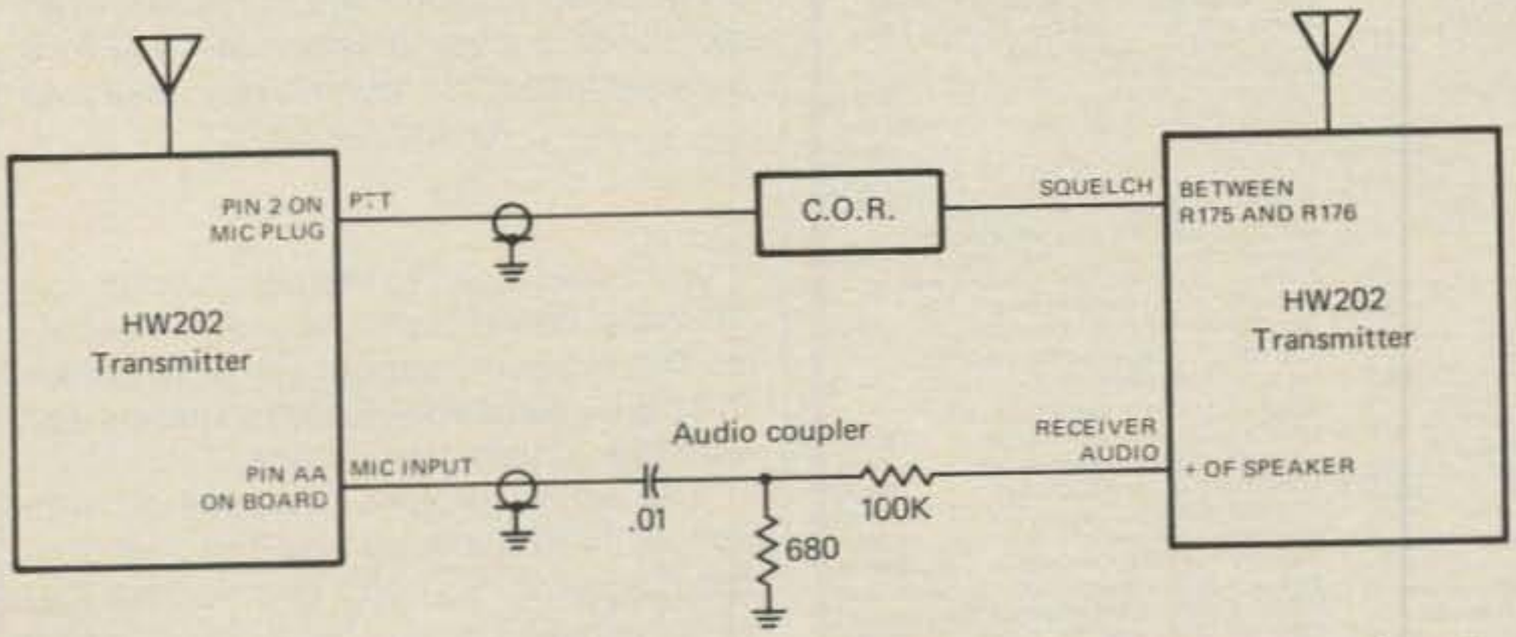
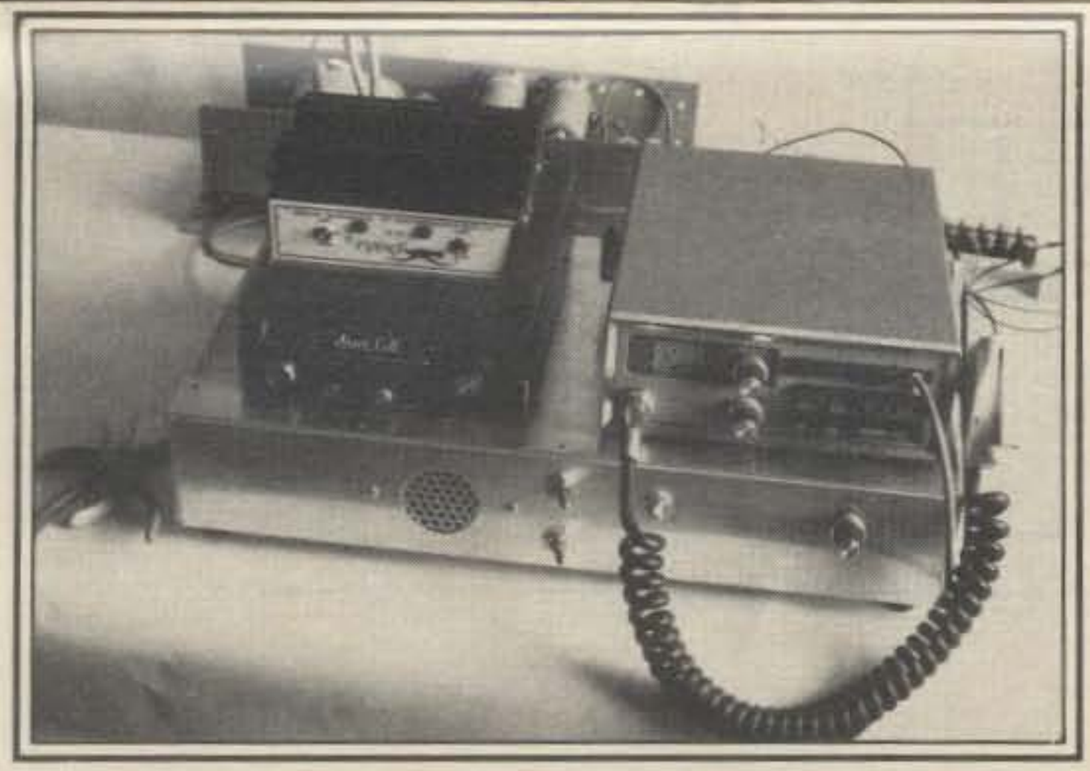


Fig. 2– The audio coupler which can mount on the COR board. As can be seen from the photos, I mounted the receiver, COR, and audio coupler in the same enclosure. Use shielded cable between the transmitter and receiver. The coupler is comprised of three components: a .01 disc capacitor and two ½ watt resistors, 100K and 680 ohms.

I discovered shortly, however, that my repeater was just another 2 meter machine in the area, complete with 5 second tail and CW ID. It had no real purpose in life, so it was time to fancy on a shoestring budget again. A 10 meter link was born out of my converted Kraco CB rig when it was coupled to the repeater. Now



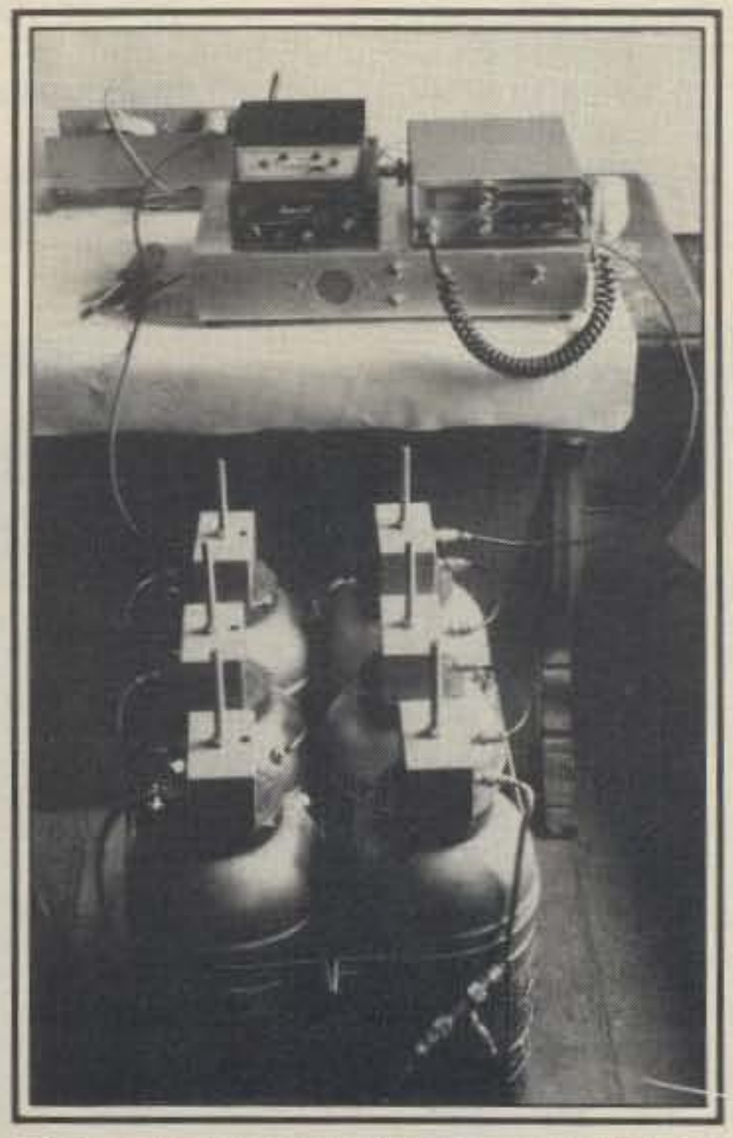
The 2 meter repeater runs 10 watts, and the 10 meter link runs 50 watts. A 12 amp power supply is in the background.

Complete 2 meter repeater. Local speaker and microphone add to on-site adjustments.

the system seemed complete, with something to do.

Now when I listen in on the locals using the 2 meter repeater, chatting all over the country via the WB2NGN/RPT 10 meter FM link, I'm pleased with my first experience at constructing a 2 meter repeater, and on a shoe-string budget no less.

The transmitter runs 10 watts output continuously, without any problems, and



The entire WB2NGN/RPT, with link on 29.600 MHz simplex although switchable from front of 10 meter radio. The W1GAN design cavities are built from old copper fire extinguishers. The soda/acid-type extinguishers are outlawed, and easy to find. I found mine in the attic of an old building after a telephone call to a building inspector friend. They were free for the taking.

if you could listen to the action when the 10 meter band is open, you'd be a believer. The receiver, without any help, comes in at .5 uv sensitivity, which matches well with the 10 watt transmitter.

The entire project was geared with simplicity in mind, as you can see from the diagrams. So don't get the idea that simple doesn't work. These circuits are in use and work great.

Maybe I'll find another HW-202 at a hamfest next summer, so I can build another special-events repeater soon. CQ

This quick project can help you enable someone else to enjoy our hobby or it can even find use closer to home.

Help For The Hearing-Impaired Amateur

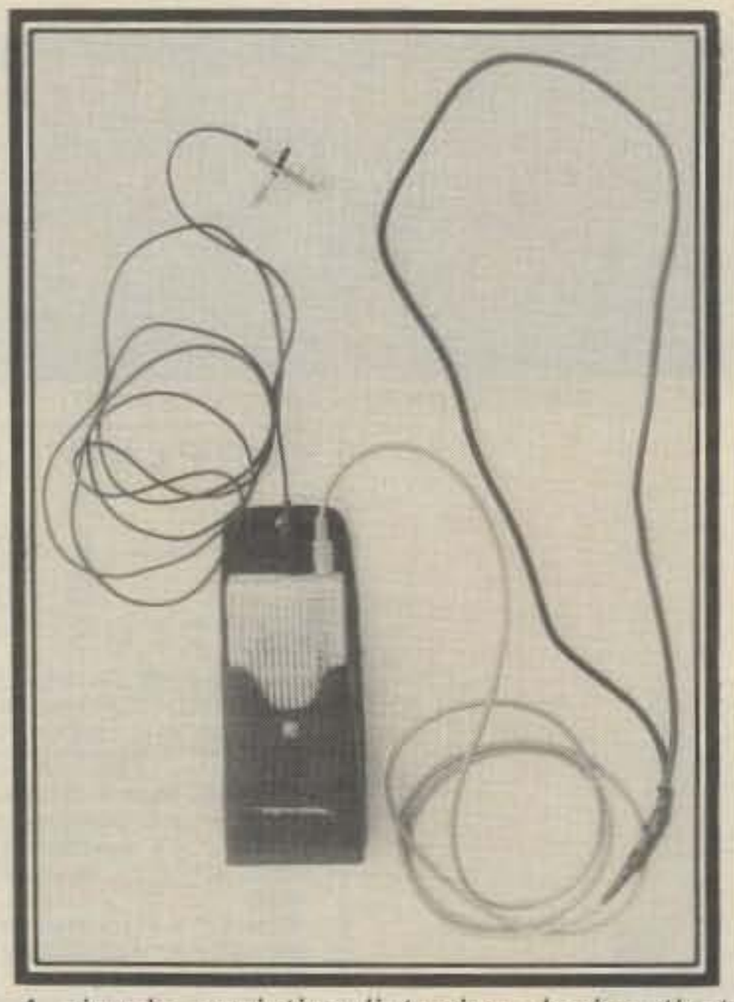
NORRIS BLACKBURN*

"Yes, Charlie, I've been off the air for several months due to some 'internal interference' caused by my hearing loss. But thanks to a little gadget I now have, maybe I can continue my favorite hobby for many more years."

If you are one of the amateur radio enthusiasts who comprise part of the 15 million hearing-impaired Americans, and you have virtually given up hope of future communications with old and new friends, you may soon be able to tell Charlie the same thing.

Those with normal hearing cannot know and appreciate the deep depression and frustrations encountered by others who lose their ability to hear or comprehend. They do not understand that the need to be able to communicate with others becomes more important than ever before . . . and more difficult. The frustration which accompanies constantly missed punch lines, garbled phone calls, and requests that others speak louder or more slowly is frequently very traumatic. The normal tendency is to avoid any and all situations in which the problems are magnified, such as dining out, movies, lectures, parties, and even church activities. A good hobby is often instrumental in minimizing this tendency to become a hermit.

Because of its very nature depending upon the ability to communicate with others, those who have enjoyed amateur radio may find it more difficult to continue their favorite pastime. To the uninitiated, hearing aids can be a liability in many situations. They amplify all sounds, not just the ones desired. The background noise at a restaurant or party may totally obliterate the conversation we want most to hear. Many newer hearing aids are equipped with a telephone, or "T," switch. When the switch is in the normal position, background noises, as well as the voice in the telephone are amplified. When switched to the "T" position, the signal is picked up by inductance through a coil in the hearing aid. ONLY this signal receives amplification. Although still present, the background sounds do not receive the boost.



A simple assistive listening device that you can put together from readily available parts.

"**A**ssistive **L**istening **D**evices" is a generic term which includes both commercial and personal devices and systems to improve one's ability to hear and understand. Some utilize AM or FM radio transmission. Others use infrared light sources. Another type finding considerable success incorporates an audio loop which acts as the inductance coil in the hearing aid. These are available in various sizes to meet different needs. Large loops and amplifiers are found in churches and theaters. Medium-size units are used for programs involving smaller groups. And personal **ALDS**, as they are known, are beneficial to many individuals.

For portable use at seminars, churches, or your local amateur radio club meetings, the device would consist of a small amplifier which may be carried in a jacket pocket or worn on the belt, a tie-clip microphone, and a necklace-style audio loop which may be worn under the clothing if desired. Sounds detected by the microphone are amplified and sent to the audio loop which "transmits" the signal to a hearing aid by inductance when the "T" switch is in the correct position. The mike may be held in the hand and pointed at the desired voice, placed on a conference table, or even held by another passenger in a car to minimize wind and road noises.

CQ readers, due to their knowledge of and interest in electronics, will visualize the benefits, theory of operation, and almost unlimited number of applications in which the device will prove helpful, particularly when an audio patch cord is substituted for the microphone. By connecting the small amplifier to other sound sources, such as a television, stereo, or shortwave receiver through an external speaker or headphone jack, only the desired signal reaches the hearing aids, whereas the mike will pick up some extraneous background noises.

Those with normal hearing may adjust the TV volume to a comfortable level. The hearing-impaired person can then adjust the volume controls of his ALD and hear-

*P.O. Box 703, Morristown, TN 37815

Marathon, Greece, was the site of a victory of Greeks over Persians in 490 B.C., the news of which was carried to Athens by a long-distance runner. Today, a marathon is defined as a long-distance race (usually 26 miles, 385 yards [42.195 km] characterized by immense concentration and effort on behalf of the participants. In modern times amateur radio operators have provided the communications link for many of these events.

Amateur Radio and The Miami Orange Bowl Marathon

BY ELLEN WHITE*, W1YL/4

Installing the starting line banner.

EC W4IYT's certificates awarded to the amateur volunteers.

The January 5, 1985 Miami Orange Bowl Marathon, a race with over 2000 participants, began at 7:09 a.m., a dark, cold sunrise on what should have been a traditionally mild south Florida winter morning. Three hours earlier, the 100-plus participating radio amateurs had begun to man their posts, determined to demonstrate to the south Florida community just how a fraternity of enthusiastic amateurs get together to serve their community, justify the terms of their license, and have a great time! The specific job of communications undertaken was one of considerable magnitude, involving individuals and repeaters in both Dade and Broward Counties. In fact, this was their largest amateur radio communications undertaking *ever*.

The Course

This may well be one of the most scenic marathon courses in the world, stretching over 26 miles from the race start at Haulover Beach (north of Bal Harbour), past the glittering hotels of Miami Beach fronting on the Atlantic, through the Art Deco district, skirting the memorable cruise ships, crossing the MacArthur Causeway (with a non-stop view of Miami's impressive skyline), continuing through the city's metropolitan center, and into the tropically landscaped and shaded Coconut Grove, finishing up at Miami's City Hall.

The Organization

This operation came under the umbrella of the Dade County Amateur Radio Public Service Corps (ARPSC). As is traditional, responsibility for this unique runner's event was once again willingly assumed by race enthusiast Don Gilliamsen, K4EAU. Weeks, albeit months, of coordination with race officials and the local amateur radio community took place prior to those hectic days preceding the Marathon when net managers selected their operators to perform the manifold communications requirements. The uniqueness of the course (distance, ter-

*19620 SW 234 St., Homestead, FL 33031

ing aids to meet his own needs without disturbing others. Plugged into your receiver, nearby conversations and the window airconditioner noise will remain unamplified.

The device will not, of course, reduce or eliminate any internal interference riding piggyback on the carrier. Whatever enters through your antenna and receiver will be picked up, amplified, and transmitted to your hearing aids. Still, the benefits far outweight any negative aspects of the device.

Several personal ALDS are now on the market. They have been found to be extremely helpful to thousands who have tried them. The one described should not be expected to perform as well as the superior commercial units. However, it may be all you need at the present time, depending upon the type and degree of hearing loss you have. It will, at least, let you know if such a device will help you and enable you to make a more knowledgeable decision related to the purchase of a commercial unit.

In actual tests, when the necklace audio loop is plugged directly into a headphone jack, some primary sound sources have been sufficient to "drive" the audio loop without the use of the mini-amplifier. For this reason, it is suggested that you first try the loop with your receiver without using the amp. If you are unable to get an adequate signal, than add the amplifier. Remember to start your initial tests with all volumes set at the low position. This includes your receiver, hearing aids, and the ALD. Some find optimum benefit is obtained when the ALD volume is near maximum and the actual volume controlled by the source and hearing aids. Yours may differ, so to prevent further hearing damage due to excessive volume, start low and adjust all to meet your particular needs.

With various patch cords, the ALD may be used with a portable radio while jogging to reduce traffic noise, with a metal detector to minimize the exaggerated sound of a breeze on a windy day, or with an aircraft radio or mobile amateur rig to offset the wind, road, and engine noises.

Self Help for Hard of Hearing People, Inc., known as SHHH, is a non-profit organization devoted to hearing conservation and improving the quality of life for those affected by severe hearing loss. *The Journal*, the magazine for members, frequently contains articles and product reports on new equipment which may help many of its readers. The membership fee is currently $10.00 per year. SHHH maintains a file on manufacturers of these and other devices and systems for both personal and commercial functions. Hearing impaired readers of *CQ* are urged to write to SHHH, 4848 Battery Lane, Suite 100, Bethesda, MD 20814, for further information on membership and products that are now available.

Before pricing your rig for sale, visit a local distributor of ALDS and try one of the commercial units or assemble the simple one described. Hopefully, you will find, as many others have, that an Assistive Listening Device will reopen doors to entertainment and pleasure previously closed, including amateur radio. Good luck!

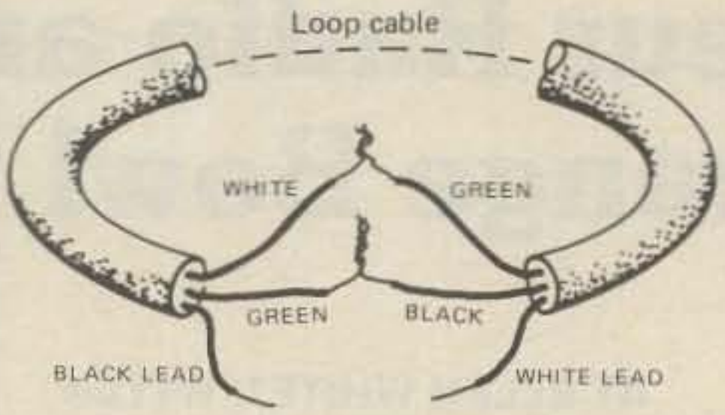
Parts List

	Radio Shack No.	*Price*
42" length of wire for loop	—	$ 1.25 (est.)
Mini-amplifier	277-1088	$11.95
Tie-clip microphone	33-1058	$ 9.95
Audio 2-conductor cable	—	$ 2.00 (est.)
Optional: various patch cords		

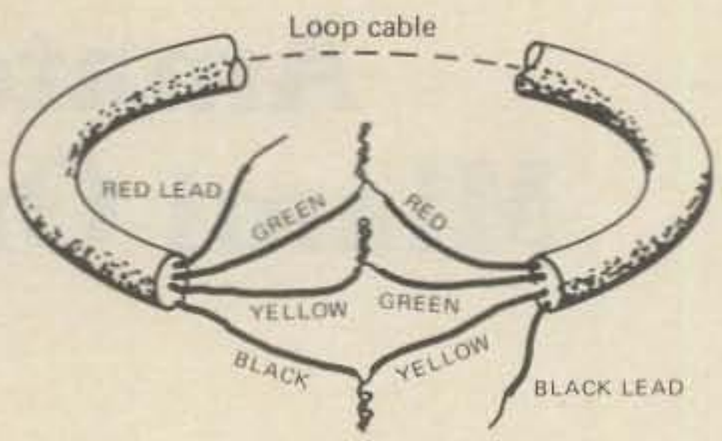
Note 1. To eliminate any possibility of shock, an inline fuse may be used in the lead attached to the necklace-style loop, if desired.

Note 2. Several loops may be assembled, one with an 18 inch lead to be used in public and with microphone. It is also suggested that experiments be conducted with various sizes of 3- and 4-conductor wires to achieve optimum results with your particular type of hearing aid and degree of hearing loss. If wire is bought from bulk rolls, the cost is nominal.

Note 3. Although a discontinued item, some Radio Shack stores still have a small plastic case, Part No. 44-691, which makes an ideal holster for wearing the mini-amplifier on a belt.



3-CONDUCTOR LOOP



4-CONDUCTOR LOOP

Audio Loop Instructions

Plan 1

1. Using a 42 inch length of 3-conductor (minimum) wire, remove 1¼ inch of outer insulation, any paper wrapping present, and ⅜ inch of insulation from the internal wires.

2. Fold the two ends into a large loop. Twist the bared wires together as shown in the diagram. Solder the connections and wrap with electrical tape.

3. To the two remaining leads, attach a length of audio two-conductor cable sufficient to reach from your chair to the headphone jack of your receiver. Solder and wrap.

4. Attach a ¼ inch phone plug to the other end of audio cable. This will connect to the headphone jack of your receiver.

5. Place this loop around your neck, plug into the receiver, set hearing aid(s) in the "T" position with volume on low. Turn on the receiver and adjust volume controls of receiver and hearing aids to meet individual needs.

Plan 2

1. If sufficient volume cannot be attained, connect the audio loop to the mini-amplifier with an adapter. Use an audio patch cord between the mini-amplifier and your receiver to boost the receiver output.

Communications van net managers (left to right): KE4QF, N4BO, W4SQG, WB4HFK.

Marathon communications organizer K4EAU (right) with Runners International, Inc. President Basil Honikman.

rain variation, etc.) made repeater use both desirable and mandatory. Local repeater clubs cooperated in superb fashion, permitting constant access to their machines, with sponsoring clubs additionally furnishing numerous race aides. Special kudos to the Fellowship Repeater Club, the South Florida FM Association (both machines), the Southern Bell Pioneers, the ARD (925 machine), and the Mercy Hospital Repeater Group. Simplex operation also was utilized on both 146.52 and 146.94.

The Jobs

The jobs were many: spotters with official time clocks throughout the course to be sure elapsed times were perfectly synchronized; mobiles to spot and report problems; amateurs at medical stations to assure prompt relay of necessary requests; hand-helds with the Press Truck and with the double-decker English-style bus which functioned as a VIP van containing the many race sponsors; coordination with police of five different municipalities; etc.; all backed up by the operations base, Dade County's Emergency Communications Van, at the race end.

Communications Center

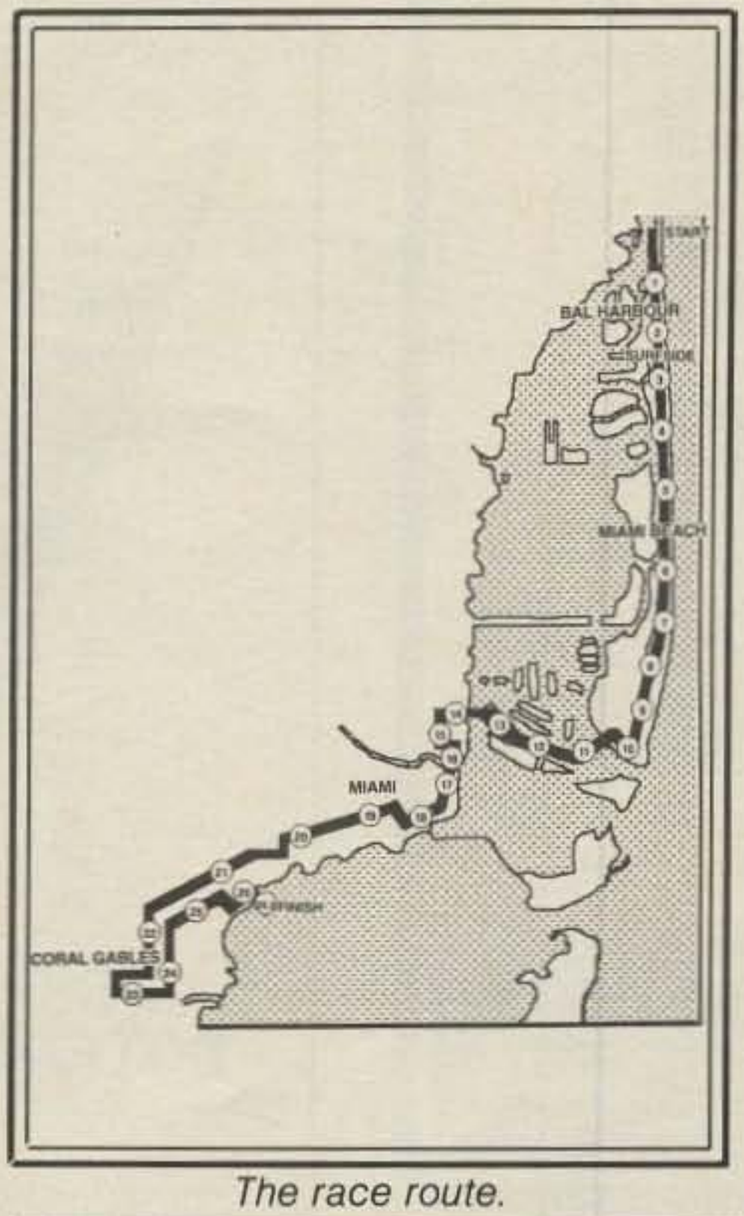
This centralized communications facility housed the individual net managers running their own specialized race nets. We were fortunate in that van equipment was provided by the Dade County Emergency Management Center. Similar control stations would be in other areas, thanks to the ease of 2 meter operation.

Media coverage for this world-class event, an event sponsored by Runners International Inc., was extensive. A truck filled with reporters, cameramen, and your semi-frozen reporter preceded the race, while helicopters hovered overhead for video coverage of significant race events. Local radio station WIOD literally provided blow-by-blow race coverage, while giving numerous plaudits to the amateur radio community for the service it was rendering.

Critique

Immediately following the race, K4EAU gathered his net managers together at the communications van and held an on-the-spot critique—a review of problems needing correction. It was evident that the Medical Net itself needed to be isolated and not combined with the "service net." Next year five fully manned medical triage stations will be in-

Dade County's Emergency Communications Van, the amateur radio "center" for the Miami Marathon.



The race route.

W4KGJ, long-time South Florida SCM, acted as a spotter along the route to provide emegency assistance and service.

Post-race critique (left to right): KE4QF, W4IYT, W4SQG, WD4LKY, WB4HFK, and head honcho K4EAU (wearing one of the orange official marathon shirts supplied to the volunteers). Missing net managers were N4BO and K4CAG.

KI4T managed a smile as early as 5 a.m. Joel is the new Southeastern Division member and chairman of the ARRL's Emergency Communications Advisory Committee.

terconnected as one "autonomous" entity. Large placards spelling out "Communications, thanks to Amateur Radio" will be placed prominently by each participating amateur radio "station." These placards will be of a size immediately identifiable to the viewing spectators and the media. There is a distinct possibility that the 1986 Marathon will be looking at utilizing Packet and/or RTTY for faster reporting of emergency and service problems. At this critique session EC W4IYT had the opportunity to bring up to date his participant's roster to be able to accurately and rapidly provide ARPSC awards.

Quality

There is a fine line in numbers involved in any public-service event, that tenuous line whereby on one side there really aren't enough warm bodies with HT's to go around and on the other side there are too many eager amateurs falling over one another. The *Miami Herald's* January 4, 1985 issue had a marvelous line which seems to sum up all of it: whether in operating, in spotting, in reporting, in running, or even in life, "Quantity yields to quality in the long run." CQ

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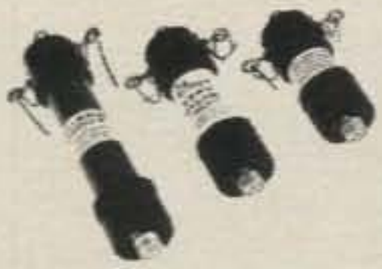

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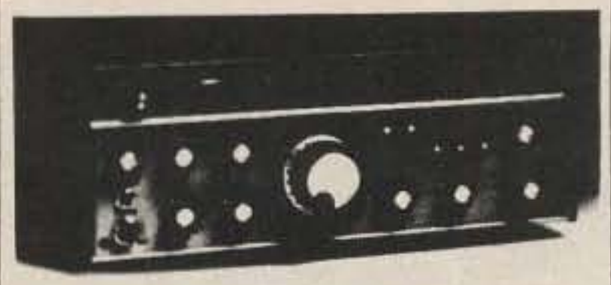

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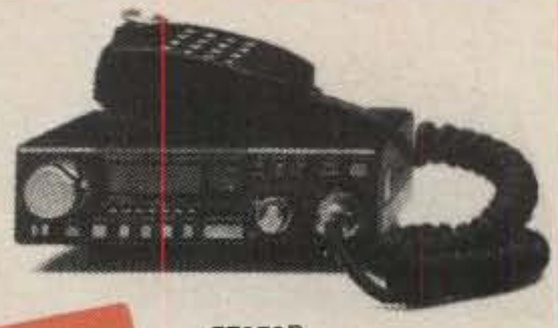

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- Dual VFO
- 40 Memories
- Memory & Band Scan
- 25W Output
- Built-in 120 VAC Power Supply
- Nose Blanker

TS-711A List $699.95 **TS-811A List $899.95**
CALL FOR SPECIAL SALE PRICES

TS-670 Quad Bander—All-Mode Transceiver
6m, 10m, 15m, and 40 m

- Dual VFO
- IF Shift
- 10W Output
- 80 Memories
- Noise Blanker
- VOX, Narrow Filters, AC Supply and Other Accessories Available

TS-670 List $699.95
CALL FOR SPECIAL SALES PRICES!

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special KENWOOD Sale Prices and Save $$$!!

TEXAS TOWERS

Telephone (214) 422-7306

Div. of Texas RF Distributors Inc.
1108 Summit Ave., Suite 4 • Plano, Texas 75074

Store Hours: Mon-Fri: 9am - 5pm
Sat: 9am - 1pm

(Prices & Availability Subject To Change Without Notice)

VISA MasterCard

CIRCLE 49 ON READER SERVICE CARD

ICOM SPECIALS

IC-751
Plus 2 Bonus Items
- PS-35 Internal AC Supply
- SM-6 Desk Microphone

Regular $1598.50
$1399 Save $199.50

IC-27A, IC-27H,
IC-37A, IC-47A
All Now Available
Call For Special Sale Prices!
Save $$$!

IC271A/H 2 mtrs
IC471A/H 70 cm
Perfect Oscar Equipment
Call For Special Prices!

IC-3200A
- Compact Dual Bander
- 2 Meter (140/150 MHz) & 70 cm (440/450 MHz)
- 25 Watts • 10 Memories

List Price $549 CALL FOR PRICE

IC-2AT $219
IC-3AT $239
IC-4AT $239

All Accessories In Stock!

BP2 Battery Pack	$39.50
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC35 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95

IC-745
List Price $999
Compact General-Coverage
Full-Feature HF Transceiver
Call For Special Low Price!

IC730 80-10m mobile unit
Special Price $589

IC505
6m multimode
List $449

Call For Special Price

IC-290H 2 mtrs
IC-490A 70 cm
All-Mode Transceiver
Call For Special Price

IC-02AT
New 2m HT

Call! For Your Special Price!

IC-120 1200 MHz Receiver
List $499 Call For Price

R71 Receiver
Call For Special Price

YAESU SPECIALS

FT980 CAT SYSTEM
AC Power Supply, Full Break-in CW,
SSB/AM/FM/FSK, RF Speech Processor

List Price $1659
CALL FOR SPECIAL PRICE

FT757GX
with General Coverage RCVR
includes CW keyer, AM/FM, CW filter

List Price $859
CALL FOR SPECIAL PRICE

FT-ONE
With Four Free Filters
List Price $3074
Call For Your Special Sale Price

FT726R
(Optional modules for 6m, 430, 440 MHz)
Great for Satellite Work

List $899.00
CALL FOR SPECIAL PRICE

FT-270RH
New 45 watt 2M mobile.
List $439
Call For Your Special Sale Price

FT-77
Perfect Mobile Rig

List $599
CALL FOR SPECIAL PRICE

FT-230R 2mtr FM . . . . . List $359
FT-730R 440 MHz FM . . . . List $399
- 10 Memories • Two VFO's
- LCD Readout • 25W Out
- Memory of Up/Down Scan

Call today for Special Discount
Price & Save $$

VHF/UHF Multimode Portables

FT-690R 50MHz . . . . . List $379
FT-290R 144MHz . . . . . List $399
FT-790R 430MHz . . . . . List $399

Call today for Special Discount
Price & Save $$

FT-209RH
NEW High Tech
2mtr HT
5 Watt Output
NOW IN STOCK

CALL FOR YOUR SPECIAL PRICE

FT-2700RH
- Dual Band 2 Mtr & 440 MHz
- Compact Size
- 25 Watts
- Crossband Full-Duplex Capability

List Price $579
CALL FOR PRICE

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CIRCLE 9 ON READER SERVICE CARD

OTHER SPECIALS

MIRAGE AMPLIFIER SALE!

B1016
$249

Model	Band	Pre amp	Input	Output	DC Pwr	Sale Price
A1015	6M	Yes	10W	150W	20A	$249
B23	2M	No	2W	30W	5A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak Reading Wattmeter $99

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

CP1-20 ..... $219 CP1-64 ..... $219
MP-20 ..... $129.95 MP-64 ..... $129.95
VIC-20 MBAText $79 C-64 MBAText $79

All AEA Keyers, Antennas & Accessories In Stock!

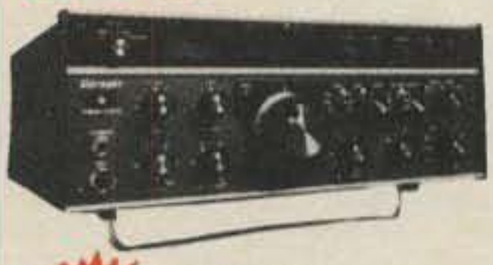
KANTRONICS

The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

CHALLENGER $89.95 UNIVERSAL TU $189.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

TEN-TEC SALE!



NEW! CORSAIR II
Call For Information And Price

425 Titan New 3KW amplifier in stock-only $2195!

TEN-TEC
New 2M HT
Full Featured!
List $319 Sale $279.95!

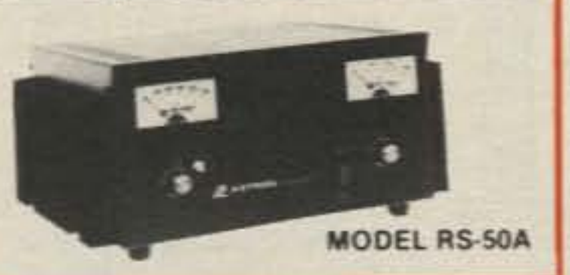
4229 2KW Tuner Kit $189.95!

ASTRON POWER SUPPLIES

Heavy Duty · High Quality · Rugged · Reliable

- Input Voltage 105-125 VAC Output 13.8 VDC ± 05V
- Fully Electronically Regulated – 5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M Series With Meter – A Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



MODEL RS-50A

AMERITRON AL-80A SALE $679

AL-80A 1000W Output (single 3-500Z) $679
AL-84 600W PEP Output (4-6MJ6 Tubes) $379
AL-1200 1500W Output (3CX-1200 tube) $1399
RCS-8 5 Pos Remote Antenna Switch $119
ATR-15 1500W Antenna Tuner $289

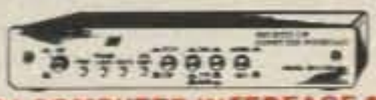
SALE! NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

SANTEC

ST142 $249
ST222 $279
ST442 $289
LS202 $229

KDK FM2033
List $339 Sale $299



MFJ 1224 COMPUTER INTERFACE $89.95
MFJ-1229 COMPUTER INTERFACE $159.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941D 300 W Tuner	$99.95
989 Deluxe 2KW	$299.95

OSCAR/VHF DX EQUIPMENT

TRANSCEIVERS

KENWOOD

TR9130 2m All Mode 25W	$CALL
TR711A 2m Base 25W	$CALL
TR9500 70cm All Mode	$CALL
TR811A 70cm Base 25W	$CALL

ICOM

IC290H 2m All Mode 25W	$469
IC271A 2m Base 25W	$599
IC271H 2m Base 100W	$789
IC490A 70cm All Mode 10W	$579
IC471A 70cm Base 25W	$689
IC471H 70cm Base 75W	$949

YAESU

FT290R 2m All Mode 2W	$349
FT726R Triband All Mode	$779
726/70 70cm module	$269
726/SU Duplex Module	$95
FT790R 70cm All Mode 1W	$349

TEN-TEC

2510 Satellite Station	$439

ROTORS

Ken Pro KR500 Elev Rotor	$189
Ken Pro KR400 Azim Rotor	$149
Alliance HD73 Azim Rotor	$99
Hy-Gain Ham 4 Azim Rotor	$219

AMPLIFIERS

MIRAGE

B108 2m 80W out/10W in	$159
B1016 2m 160W out/10W in	$249
B3016 2m 160W out/30W in	$199
D24 70cm 40W out/2W in	$179
D1010N 70cm 100W out/10W in	$289

THL CORP.

HL110V 2m 100W out/3-10W in	$219
HL160/25 2m 160W out 25W in	$269
HL160V 2m 160W out/3-10W in	$289
HL45U 70cm 45W out/10W in	$179
HL90U 70cm 90W out/10W in	$319

ANTENNAS

CUSHCRAFT

A144-20T 2m 20el cir pol	$75
416TB 70cm cir pol	$59
PS4 70cm Circularity Switch	$69
AOP1 2m/70cm Oscar Pack	$149

KLM

2m-14c 14el 2m w/cir switch	$89
2m-22C 22el 2m w/cir switch	$119
435-18C 70cm w/cir switch	$119

HARDLINE & HELIAX

½" Aluminum Hardline	$.79/ft
½" LDF-50 Heliax	$1.69/ft

OSCAR PACKAGE DEALS

PACKAGE #1

Ten-Tec 2510 Satellite Station	List $489
THL HL45U 70cm 45W Amplifier	List $199
THL HRA-2 2m Mast Mount Preamp	List $159
Cushcraft AOP-1 Antenna Package	List $219
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $1533
PACKAGE PRICE—ONLY $1249 DELIVERED!
SAVE OVER $300!!

PACKAGE #2

Yaesu FT290R 2m Transceiver	List $399
Yaesu FT790R 70cm Transceiver	List $399
Mirage D24 70cm 40W Amplifier	List $210
THL HRA-2 2m Mast Mount Preamp	List $159
Cushcraft AOP-1 Antenna Package	List $219
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $1853
PACKAGE PRICE—ONLY $1499 DELIVERED!
SAVE OVER $375!!

PACKAGE #3

Kenwood TR9130 or Icom IC290H	List $549
Kenwood TR9500 or Icom IC490A	List $649
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $2428
PACKAGE PRICE—ONLY $1999 DELIVERED!
SAVE OVER $450!!

PACKAGE #4

Yaesu FT726R VHF/UHF Duplex Xcvr	List $899
430/726 70cm Module	List $289
SU/726 Sat Duplex Unit	List $109
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $2527
PACKAGE PRICE—ONLY $2125 DELIVERED!
SAVE OVER $425!!

Select Low Loss Transmission Line, Coax, Rotor Cable and Power Supplies from Listing in our other advertisements.

We can substitute items and make any changes needed to fit your requirements. Please call for our Special Sale Prices and SAVE $$$.

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CIRCLE 20 ON READER SERVICE CARD

ANTENNA/TOWER SALE!

hy-gain

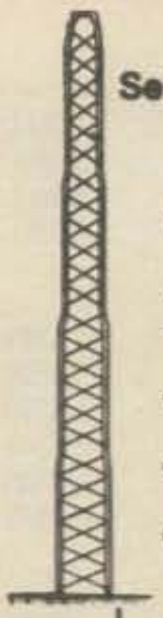
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq. ft.	$749
HG52SS	52 ft	9 sq. ft.	$1099
HG54HD	54 ft	16 sq. ft.	$1699
HG70HD	70 ft	16 sq. ft.	$2699

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN

Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

BUTTERNUT ELECTRONICS CO.

HF6V $129 Delivered (Cont. USA)

- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160HD $49

New 80/40 Meter Vertical Antenna HF2V $129 Delivered (Continental USA)

- Optional 160 Meter Resonator Kit Model TBR 160S $49

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

RG-213U

$.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

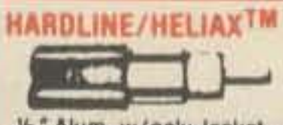
$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss Foam Dielectric
- Non-contaminating Vinyl Jacket

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™



Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax ™	$1.69/ft
⅞" LDF5-50 Andrew Heliax ™	$3.99/ft

select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259	$1.25	UG23D N Female	$2.95
UG21B N Male	$2.95		

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld	$.10/ft
450 Ohm H.D. Line	$.16/ft
18 Ga. Copper coated steel wire ¼ mile long	$30
H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun	$11
Van Gorden Center Insulator	$6

HUSTLER

4BTV 40-10 mtr Vert	$89	5BTV 80-10 mtr Vert	$109
G6-144B 2-mtr Base	$89	G7-144 2-mtr Base	$119
6BTV 80-10 mtr Vert	$129		

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander	$219	A4 4-el Tribander	$289
R3 20/15/10mtr Vert	$279	A743/A744 40mtr Kit	$75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Discoverer 2-el 40-mtr Beam	**$319**
Discoverer 3-el Conversion Kit	**$199**
EXPLORER-14 SUPER SPECIAL	**$309**
QK710 30/40 mtr. Add-On-Kit	$79
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$189
TH2MK3S 2-el Triband Beam	$179
205BAS 5-el 20-mtr Beam	$349
155BAS 5-el 15-mtr Beam	$199
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$259
64BS 4-el 6-mtr Beam	$69
66BS 6-el 6-mtr Beam	$139
18HTS 80-10 mtr Hy-Tower Vertical	$439
LC-160 160-mtr Coil Kit for 18HTS	$49
214BS 14-el 2-mtr Beam	$49
2BDQ 80/40 mtr Trap Dipole	$69
5BDQ 80-10 mtr Trap Dipole	$129
BN86 80-10 mtr KW Balun W/Coax Seal	$22

MOSLEY

Pro37 7-el Triband Beam	$469
CL-33 e-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40 mtr Kit for TA33	$119

MINI-PRODUCTS HQ-1

LIST $182.50 SALE $159

- Wing Span - 11 ft
- Boom - 54 in. long
- Wind Area - 1.5 sq ft
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
RT 200W Deluxe UHF Type	$29
RT/N 200W Deluxe N Type	$32
HV 2KW Deluxe UHF Type	$32
HV/N 2KW Deluxe N Type	$35

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16-el 432 MHz Beam	$69
435-40CX 435 MHz Satellite Antenna w/CS-2	$159

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$109
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating)	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
Kenpro KR-500 Heavy duty elevation rotor	$189
KLM EL-3000 Moon Tracker Elevation Rotator	$369

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 25G $49.50
45G $112.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399
25G Foldover Double Guy Kit			$219
45G Foldover Double Guy Kit			$249

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.15/ft
1/4" EHS Guywire (6000 lb rating)	$.18/ft
5/32" 7 x 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.45
1/4" CCM Cable Clamp (1/4" Cable)	$.55
1/4" TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8"EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2"EE (1/2" Eye & Eye Turnbuckle)	$9.95
1/2"EJ (1/2" Eye & Jaw Turnbuckle)	$10.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
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PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
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HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
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Length	5 FT	10 FT	15 FT	20 FT
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CIRCLE 3 ON READER SERVICE CARD

Announcing

● **Thessaloniki, Greece Anniversary Celebration** - The Greek Radio Amateur Union, Macedonia Division, will celebrate the anniversary of Thessaloniki by having 30 amateurs with the special prefix SW2 on the air during the year on all bands. Each QSO will be accompanied by a special QSL card. To receive a certificate, contact at least three SW2 ops, or one SW2 op and the radio club SW2SV, and mail the appropriate cards to QSL manager SV2SV, P.O. Box 10483, Thessaloniki, Greece (include 10 IRCs).

● **Charlestown, New Hampshire Special Event** - Fort No. 4 at Charlestown, NH will operate W1GUA on June 1 from 10 a.m. to 5 p.m. local time up 25 kHz from the bottom of the General band portion of 80, 40, 15, CW and phone, with a station set up on 2 meter simplex and a packet station. For commemorative QSL send QSL and SASE to W1GUA, Rudy Adler, Dodge Hollow Road, Lempster, NH 03605.

● **Wireless Institute of Northern Ohio Special Event** - W.I.N.O. will be on the air from 2300Z June 1 to 0300Z June 2 on 3860 and 7235 kHz, and on Sunday from 1500–1900Z on 7235 and 14235 kHz. They will use the call KO8O. For certificate send legal-size SASE to KO8O–W.I.N.O. Weekend, 7126 Andover Drive, Mentor, OH 44060.

● **Southside Amateur Club's N0EWP** - N0EWP will be on the air from Grandview, Missouri on June 1–2 to celebrate Harry S. Truman's birthday. Times: 1700–2400 UTC June 1, and 0001–0400 and 1700–2200 UTC June 2. Frequencies: 7235 and 14235 ± QRM. A certificate available for 9 × 12 SASE (39¢) to Southside ARC, P.O. Box 412, Grandview, MO 64030.

● **Tri-City ARC From Ice Harbor Dam** - The Tri-City ARC will operate W7VPA from Ice Harbor Dam, the highest lift navigable locks in the US. Operation will be from 1700Z to 2400Z June 8. W7VPA will operate on the low end of the General phone bands of 10–80 meters. For a QSL, send an SASE to W7VPA, P.O. Box 73, Richland, WA 99352.

● **N9BAT From Brookfield Zoo** - The Chicago Suburban Radio Assoc. will operate N9BAT from the Brookfield Zoo in celebration of the 75th Anniversary of Boy Scouts of America on June 8–9 from 1500Z to 2300Z using phone frequencies of 7.250 and 14.250 MHz. A special QSL card will be available for QSL card and a #10 business-size SASE to N9BAT Special Event, P.O. Box 88, Lyons, IL 60534.

● **Special Event From Spivey's Corner, NC** - The Cape Fear ARS, Fayetteville, NC will operate on June 15 using the call WB4YZF from 8–5 p.m. eastern time on or near 7235 kHz. A special certificate will be available for QSL and $1.00 sent to Hollerin, WA4LZD, P.O. Box 332, Dunn, NC 28334.

● **Cobb Island, Maryland** - The Bowie ARC of Maryland will operate N3GR/3 from Cobb Island from 1400Z June 15 to 1400Z June 16. Phone and CW in the General band segments of 80–15 as propagation permits. CW: 30 kHz up from the bottom and Novice portion. Continuous operation on 7.250 MHz. Certificate for SASE to confirm contact with N3GR/3.

● **W7UFM From MARA Convention** - The Northwest Div. of the Mercury ARA will host the first annual MARA convention at Camp Ester Applegate, near Klamath Falls, Oregon, on June 20–22. MARA will operate special-event station W7UFM from 2000Z June 20 to 2400Z June 22. Approximate frequencies will be 3.875, 7.275, 14.325, 21.425, and 28.525 MHz on SSB, and 3.575, 7.115, 14.075, 21.115, and 28.115 MHz on CW. For a special QSL send a large SASE to MARA, c/o Jack Jakoubek, KD7EZ, 477 Deep Creek Road, Chehalis, WA 98532.

● **WB9TEA From Macomb, IL** - Members of the Lamoine Emergency ARC will operate WB9TEA in celebration of Macomb Heritage Days, Macomb, IL June 22–23. Frequencies will be 3.860, 7.235, 14.235 phone from 1500Z to 2300Z. Certificate for SASE and QSL to Lamoine Emergency ARC, Dave Nissen, N9DZP, R.R. #4, Box 210, Macomb, IL 61455.

● **WA0HPW/6 From Anaheim, CA** - The Nazarene Amateur Radio Fellowship (NARF) will operate WA0HPW/6 from Anaheim, CA from June 22–29. Frequencies will be 14.280, 14.305, and 21.385 during daylight hours. There will be some 40 meter activity. For a special

QSL send SASE to WB6UCO, Robert Buck, 5162 W. Ave. L 12, Quartz Hill, CA 93534.

● **W4JNB From Tuscumbia, AL** - The Muscle Shoals ARC will operate W4JNB on June 29 from 1600–2300Z on the 80, 40, and 20 meter bands. Also CW in the Novice bands. They will operate from the Helen Keller Festival in Tuscumbia, AL. For special certificate send business-size SASE to P.O. Box 2745, Muscle Shoals, AL 35662-2745.

● **Special Event Station From Fort Laurens, OH** - The Tusco ARC, W8ZX, of Tuscarawas County, OH will operate from Fort Laurens State Memorial near Bolivar, OH on the lower 25 kHz of General bands 10 through 80 meters, SSB and CW, and Novice 7.130 and 21.150 ±10 kHz from 1400Z June 29 until 2200Z June 30. Confirmation will be issued. Send legal-size SASE (3 IRC's for DX) and QSO info to William K. MacNealy, WD8LFM, RR#1 DOC, Bolivar, OH 44612.

● **Special Prefix XJ4 From Manitoba, Canada** - For the Centennial of Parks Canada a special prefix, XJ4, will be used from Manitoba from June 29 to August 29. XJ4RMP will operate from Riding Mountain National Park on the HF bands (there will be a commemorative card). Also, XJ4AEX will be on CW near 14.012 MHz. To QSL send SASE to VE4AKN, 15 Jupiter Bay, Winnepeg, Manitoba R3T 0W5, Canada.

● **The following hamfests, etc., are slated for June:**

June 1, **North Area Repeater Assoc. Swapfest & Exposition,** St. Paul, MN. Contact Amateur Fair, P.O. Box 857, Hopkins, MN 55343 (612-566-4000).

June 1, **Independent Repeater Assoc. Hamfestival,** Grand Rapids, MI. Contact I.R.A., 562 92nd St. S.E., Byron Center, MI 49315 (WD8IZB 616-538-8241).

June 1, **Northern Colorado ARC Superfest 7,** Loveland, CO. Contact Rick Hubbard, WA0DDC, 303-353-8366.

June 1, **11th Annual Manassas Hamfest,** Prince William County Fairgrounds, south of Manassas, VA. Contact Art Whittum, W1CRO, c/o Ole Virginia Hams ARC, P.O. Box 1255, Manassas, VA 22110 (703-361-4819).

June 2, **Breeze Shooters Hamfest,** Pittsburgh, PA. Contact John Colbert, K3SDL, 1831 Highland Ave., Irwin, PA 15642 (412-863-5167).

June 2, **Rome Radio Club Ham Family Day,** Rome, NY. Contact Rome Radio Club, P.O. Box 721, Rome, NY 13440.

June 2, **Starved Rock Radio Club Hamfest,** Princeton, IL. Contact Starved Rock Radio Club, W9MKS, RFD #1, Box 171, Oglesby, IL 61348 (815-667-4614) (FCC/VEC exams will be given).

June 2, **Battelle ARC Hamfest,** Columbus, OH. Contact Bill, W8LLU, 614-261-7053.

June 2, **Chelsea Swap & Shop,** Chelsea, MI. Contact William Altenberndt, 3132 Timberline, Jackson, MI 49201.

June 5–8, **Antique Radio Club of America International Convention,** Niagara Falls, NY. Contact Niagara Frontier Wireless Assoc., P.O. Box 68, Central Park Station, Buffalo, NY 14215.

June 7–9, **Armored Forces Amateur Radio Nationwide Emergency Team Eyeball Bivouac,** Fort Knox, KY. Contact Carl Quickmire, WB4UBS, 6341 Cloverdale Drive, Columbia, SC 29209.

June 8, **Kootenai ARS Hamfest '85,** Coeur D'Alene, ID. Contact Jim Monroe, N7ESU, W. 2455 Hidden Valley Rd., Rathdrum, ID 83858 (208-687-0136).

June 8, **Kentucky Colonels ARC Hamfest,** Bowling Green, KY. Contact Ed Gann, N4HID, 445 Elrod Rd., Bowling Green, KY 42101 (502-843-8911).

June 8–9, **Apple City Radio Club Hamfest,** Rock Reach Dam, north of Wenatchee, WA. Contact Merton Hiatt, 1002 North Surry Road, Wenatchee, WA 98801.

June 8–9, **John Ross ARC Hamfest,** Ft. Oglethrope, GA. Contact JRARC, P.O. Box 853, Rossville, GA 30741 (N4ECA 404-861-5610).

June 9, **Long Island Hamfair,** Melville, LI, NY. Contact Hank Wener, WB2ALW, 53 Sherrard St., East Hills, NY 11577-1712 (evenings 516-484-4322).

June 9, **Milton ARC Hamfest,** Winfield Fire Hall Grounds, south of Lewisburg, PA. Contact Jerry Williamson, 10 Old Farm Lane, Milton, PA 17847 (717-742-3027).

June 9, **Goodyear ARC Hamfest,** Akron, OH. Contact Don Rodgers, WA8SXJ, 161 S. Hawkins Ave., Akron, OH 44313 (SASE) (216-864-3665).

June 9, **Six Meter Club of Chicago Hamfest,** Willow Springs, IL. Contact Val Hellwig, K9ZWV, 3420 South 60th Court, Cicero, IL 60650.

June 9, **Muncie Area ARC Hamfest,** Muncie, IN. Contact Charles Stanly, WB9BSE, 3609 N. New York, Muncie, IN 47304 (317-282-9738).

June 9, **Newington Amateur Radio League Fleamarket,** Newington, CT. Contact Tom Namnoum, KM1O, 55 Spruce St., Newington, CT 06111.

June 15, **North American Teleconference Radio Network,** 0100Z. Contact NA Teleconference Radio Network, c/o Tim Loewenstein, WA0IVW, Box 1231, Kearney, NE 68847-1231.

June 15, **Raritan Valley Radio Club Hamfest,** Dunellen, NJ. Contact Jack, W2WIK, 201-756-2546 (10 a.m. to 10 p.m.).

June 15–16, **Northern Kentucky ARC Hamorama '85,** Erlanger, KY. Contact John A. Thernes, WM4T, 60 Locust Ave., Covington, KY 41017.

June 16, **Lake County ARC Fathers' Day Hamfest,** Crown Point, IN. Contact Gene Hunkins, KC9LH, P.O. Box 1909, Gary, IN 46409 (312-821-3210 days, 219-937-9652 evenings).

June 16, **LYARS Fathers' Day Picnic,** Glendive, MT. Contact Dave Brueni, KC7AA, 215 Third St. H.P., Glendive, MT 59330.

June 16, **Satellite ARC Swapfest & Barbeque,** Union Oil Picnic Grounds, south of Santa Maria, CA. Contact Satellite ARC Swapfest, P.O. Box 1753, Santa Maria, CA 93456.

June 16, **Frederick ARC Hamfest,** Frederick, MD. Contact Jim Kasunic, KA3LPC, 9419 Highlander Ct., Walkersville, MD 21793.

June 20–23, **YLRL International Convention,** Las Vegas, NV. Contact Jan Weaver, N7YL, 2195 East Camero Ave., Las Vegas, NV 89123 (SASE, 39¢ postage).

June 27–30, **YL International Sideband System's Convention,** Sugarloaf/USA, near Kingfield, ME. Contact Phyllis Davis, KA1JC, P.O. Box 805, Presque Isle, ME 04769 (SASE, 39¢ postage).

Antennas & Accessories

a monthly feature by
KARL T. THURBER, JR., W8FX

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

From the Notebook—Part III

This month author Thurber continues with more jottings from his Antennas notebook. We think that you will find the discussion of coaxial cable considerations of particular interest. —K2EEK

Last month when we got together in the column we "opened the notebook," if you will, with a discussion of hamshack power relationships. We discussed several important points concerning power and S-units, hoping to put into perspective the old "dime on the antenna versus a dollar on the transmitter" dilemma. Following that opener, we noted some interesting antenna products, and we again dug deep into the W8FX mailbag. We also brought readers' attention to WA9GFR's Smith Chart computer program, and finished up with some interesting software topics.

This time we'll take a look at considerations regarding coaxial cable in the hamshack, to include a handy "shortcut" cable loss measurement technique. We'll do a new-product scan of the FrameMaker™ clamps (useful in tower construction and other projects), and two new Slopers from Vector Radio. Of course, we'll take our customary peek into what's new in amateur software, too. First, let's look at coax.

Straight Talk on Coax

Amateurs rarely give much thought to the long skinny cable that connects their transmitter to the antenna system. For the most part, coaxial cable is a utilitarian "select, install, and forget" product that is not all that interesting. Such may be the case, but it's nevertheless wise to review some basic facts about coaxial cable, particularly from the selection and installation standpoint.

Coaxial cable is, of course, much more than simple shielded wire. The fact that the cable is required to "do its thing" at radio frequencies, rather than at far lower AC power or audio frequencies, constitutes the main difference, and makes coax a great deal more than just shielded wire.

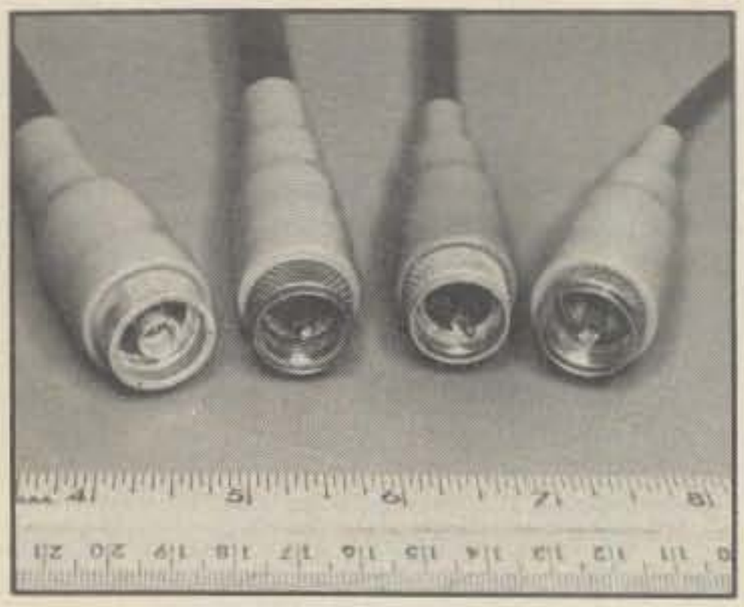
I consider coax to have five major characteristics you should consider when selecting and installing cable. Four of these are electrical factors, while the fifth is a mechanical one. These five are:

1. Surge Impedance: This ranges from about 30 to 200 ohms, but 50–75 ohm cable is most popular in amateur work. Interestingly, while foam coax is often preferred because of its tendency to low loss, many foam coax cables exhibit poor centering of the center conductor, which causes "hot spots" and impedance bumps on the line. These can increase line loss and significantly reduce the cable's effective power-handling capability. It almost goes without saying that you should not introduce discontinuities by mixing coax having different characteristic impedances in the same line run, unless you intend for transformer action to take place.

4. Velocity Factor: The dielectric material used in the core of the cable determines the speed at which RF travels through the cable. This speed is usually expressed as a percentage of the speed of light. For example, foam polystyrene exhibits a velocity factor of about 91%, while solid polyethylene exhibits a velocity factor of 66%. These figures don't generally mean much in an amateur installation, unless you're trying to match impedances, in which case the electrical, rather than the physical, line length is what counts. Hint: when constructing stubs, phasing lines, or other networks in which long cable lengths are required, use solid-dielectric cable with a low velocity factor, to enable your cable to be physically short.

3. Attenuation: The dielectric and conductor materials used primarily determine cable attenuation, which is specified by the manufacturer and expressed in "dB per 100 feet" at a given frequency. As expected, the higher frequencies exhibit the highest cable loss for a given cable length. Attenuation at 30 MHz, for example, typically ranges from about 0.2 dB per 100 feet for costly RG-246/U or RG-247/U, ⅞ inch hardline, to a whopping 5.5 dB per 100 feet for the miniature RG-174 or RG-174/U coax often used for in-cabinet wiring. To be sure, a 5.5. dB loss in your 100 foot transmission line run would not be insignificant!

Note that there is rarely any such thing as "bargain" coax, with the possible exception of a good used length of hardline or other large-diameter cable. Stay away from inexpensive cables for transmitting applications. Be careful of buying used cables at hamfests and swapmeets, as the braid and center conductor may corrode under certain conditions, which increases attenuation, and the outer jacket may be in poor shape. Invest in high-quality new cable that should bring years of trouble-free service.



Flexible, reusable weather boots, such as these boots from Kilo-Tec, are helpful in minimizing coax deterioration from weather effects. The boots are slipped over the cable prior to soldering the connectors. (Photo courtesy Kilo-Tec)

4. Power-Handling Capability: Voltage and current limitations determine the amount of power that a given cable can safely handle. Power-handling capability, maximum safe RMS working voltage, and duty cycle are usually published by the manufacturer. True, most of us primarily consider the power-handling capability when selecting coax. However, with a high line SWR, it is possible to exceed the cable's maximum safe working voltage even if operated within the cable's rated power limit. Exceeding the cable's voltage limit can result in pin holes in the dielectric, carbon tracks through the hole, arcing, and ultimate failure.

5. Mechanics: Not the least important coax considerations are the mechanical ones. While coax is a "sturdy" cable, you should exercise care in its installation, avoiding placing undue stress on the cable. Try to avoid running it unsupported for great lengths; doing so overly stresses the cable. Often ignored is the fact that coax has a "minimum bending radius" that should be observed. A rule-of-thumb is that this is about 20 times the outside diameter (O.D.) of the cable. This means, for example, that the typical half-inch diameter cable requires a minimum bending radius of about 10 inches. If you don't observe this rule, your cable may experience a "cold flow" of the center conductor toward the inside of the turn, in which

317 Poplar Drive, Millbrook, AL 36054

the conductor may ultimately make its way through the dielectric over a long period of time.

So far we've discussed five major coaxial cable selection and installation factors. Considering that most cable faults occur because of improper installation methods, it's wise to highlight a few specific selection and installation tips that may save you a good deal of grief.

1. Since moisture is the number one cable enemy, try to install cables where they are not inordinarily "dumped on," as would be the case if snaked underneath rain gutters. Be sure to seal all of the points where moisture could possibly enter the line.

2. In hot, sunny climates select polyethylene-jacketed cables over PVC-jacketed cables, for longer cable life. In some sun-intensive climates the latter type of cable may hold up for but half the life of the former.

3. If you bury cables, select and install them with special care. After all, you don't want to have to dig them up and replace them after a few short years. Invest in a more expensive coax that is impregnated with a special low-loss compund that helps prevent air, dirt, and moisture from penetrating the cable. Such impregnated cables have extremely long lifetimes as a result.

4. Avoid using small-diameter cables for long runs, say over 50–75 feet above 30 MHz. Consider the use of the "new technology" cables and hardline types for tough installations and VHF/UHF work. If you can't afford the latter types, consider such good "compromise" cables as RG-213/U, RG-214/U, 8213, or 8237. And if you use RG-8 type cable, look for one with a noncontaminating sheath cover and at least 95% braid coverage.

5. Test the cable before installation. As a minimum, using an ohmmeter, check for continuity of both conductors and for a shorted cable. Check the cable for RF-handling performance using a dummy load. And write down the physical and electrical lengths of the cable for later analysis should you have matching problems (electrical length equals physical length times the velocity factor). Bear in mind that it's a great deal easier to do these things on the ground rather than later on, when the antenna is in the air!

6. Use the right connectors for the cable and frequency of operation: the familiar UHF-type PL-259 connector is just not designed for microwave operation! The mil-spec type "N" connector is a far better choice for amateur use, especially above 30 MHz. It is waterproof, not too expensive, and easy to install. Adapters can be used to convert the "N" to UHF-type (PL-259 compatible) connectors. Avoid the use of RCA-type "phono plugs" and other non-RF connectors.

What about the "for real" attenuation of your own cable installation? It's not a bad idea to check all coaxial cables for loss when new, and then every six months to a year thereafter, with the data recorded for future comparisons and indications of cable deterioration. These procedures are described in the standard antenna texts and will not be repeated here. However, these procedures can be inconvenient, either requiring the installation of a dummy load at the cable's far end, or involving a lot of math for determining the attenuation.

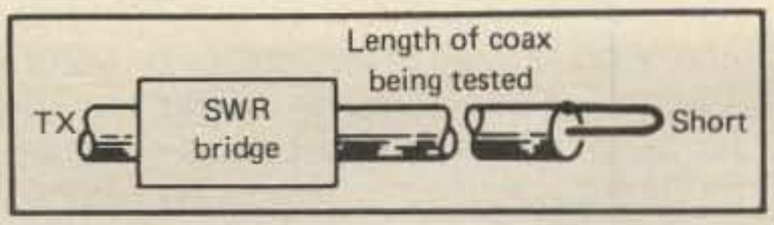


Fig. 1– Coax loss determination setup. A very simple method of measuring the line loss in dB of a length of coaxial cable is described in the text. This method involves the use of an SWR bridge or directional wattmeter. With a shorted stub on the "far end," the measured SWR is divided into 9. The simple setup needed is shown above.

A very simple method of loss determination was described by Ken "Judge" Glanzer, K7GCO, in his *CQ* article, "Measuring Coaxial Line Loss," which appeared in the August 1967 issue. This simple procedure does not require the installing of a dummy load at the far end of the line or making complex calculations.

A look at Ohm's Law and the power/SWR relationships involved discloses that SWR and reflected power percentage, and line loss, may be correlated. An easy way of determining the line loss is to simply measure the SWR at the transmitter end, with a far end *short* installed (with the antenna disconnected, of course), and divide the measured value into 9. Thus, if you observe a 3:1 SWR, the loss expressed in dB is 9/3, or 3 dB, while if you observe an SWR of 6:1, the loss is 9/6, or 1.5 dB. Note that the higher the reflected power value you obtain, the lower the feedline loss.

In this article K7GCO cautions that you should be sure to use an SWR bridge that is intended for the line impedance to be checked (i.e., a 70 ohm bridge for 70 ohm cable), and that only the minimum power required to obtain full-scale deflection on the SWR indicator be used. Naturally, the reading obtained will be valid only for the actual length of cable in your installation, and you will have to "proportionalize" the loss figure obtained if you wanted to convert to "dB loss per hundred feet."

We suggested the K7GCO procedure to Jack C. Petree, WB4OVX. He tried it to measure line loss of his 15-year-old installation of high-quality Times Wire double-shielded coax, which he suspected of deterioration. Jack reported some interesting results. Wrote he:

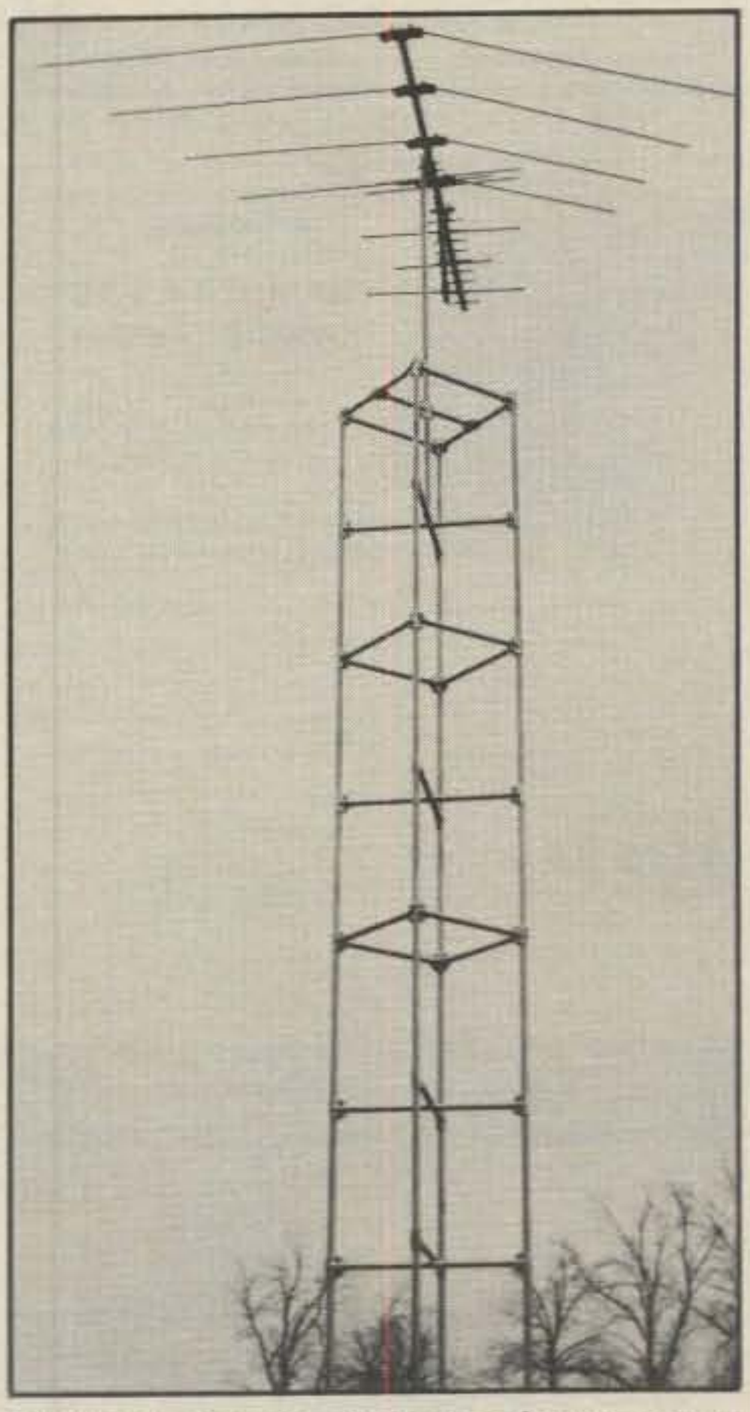
"I had a Drake direct reading SWR meter, and I hooked it up and went to work. The results were very gratifying to say the least. My SWR (*with the antenna connected—ed.*) was 1.3:1. After shorting out the coax at the antenna, the SWR was 10.1:1. Dividing into 9 gave me a loss of .89 dB. As my coax is approximately 100 feet in length, the loss factor can be ignored. The coax was the best I could buy at that time (1970): Times Wire double shielded, and each shield insulated with vinyl. This coax is installed half-inside, ¼ underground, and ¼ on top of the ground."

Obviously, Jack's careful 1970 choice of coax was a good one, as confirmed by his actual loss measurement, which is depicted in fig. 1. How do your own coax runs stack up?

New Product Scan

FrameMaker Clamps. A novel, Erector-set-like approach to antenna tower construction has been put forward by Bullseye Products, Inc., 28506 Hayes, Roseville, MI 48066. This approach makes use of the firm's trademarked FrameMaker clamps in conjunction with common ¾ inch electrical conduit or small-diameter pipe.

This type of tower construction is surely novel, but it has some advantages in that unlike towers whose joints are welded or brazed, a tower using the clamps

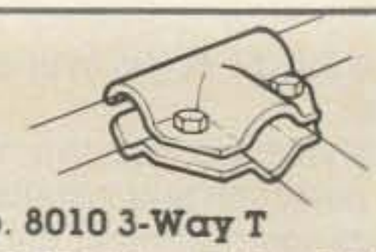


Shown here is an example of an antenna tower constructed of FrameMaker™ clamps and electrical conduit. Practically any type of ¾ inch through 1 inch O.D. tubing or pipe may be used for assembly using the clamps, described in the text. (Photo courtesy Bullseye Products)

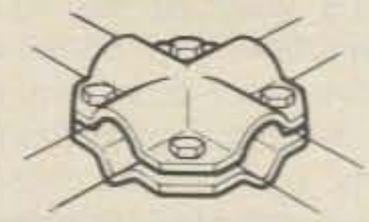
can easily be taken down, and the clamps and conduit used to build other projects. The design can be made strong enough for permanent erection, or less-complex for field day and other temporary setups.

According to the manufacturer, the only tools required for assembly are a hacksaw or tube cutter to cut the conduit, and a couple of wrenches. Conduit sections are simply placed into the openings of the clamps, and the plated nuts and bolts are tightened, locking the clamp jaws securely around the conduit. Several different kinds of clamps are offered: four-way fixed and adjustable; three-way 'T'; two-way adjustable; and parallel configured. The five clamp styles offered are shown in fig. 2.

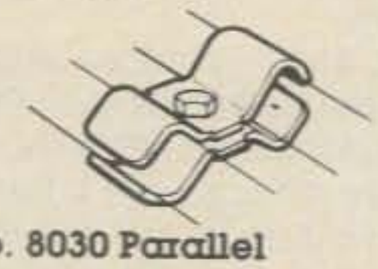
True, I would have some reservations in climbing a tower so constructed, and the firm's literature properly cautions that although such structures are strong, "FrameWorks" should not be used for scaffolding, ladders, or other personnel-supporting structures. Frameworks towers are **not** freestanding, **do** require support, and should be anchored securely in concrete or imbedded in the earth just like other towers. But they do have some very useful applications, especially for temporary installations. And, when cross sections are constructed at 20–30 inch intervals, total materials cost should run $7–$10 per running foot—not cheap, but within reason. Of course, the clamps may also be used for dozens of other DITY (do-it-yourself) construction projects such as fleamarket booths, gates, awnings, and the like.



Part No. 8010 3-Way T
Joins 2 or 3 sections at fixed 90° angles—Makes a strong splice



Part No. 8020 4-Way Fixed
Joints up to 4 sections at fixed 90° angles—The strongest way to splice at a joint (3 sections)



Part No. 8030 Parallel
Joins 2 sections parallel to each other—Can be used to secure your framework to a pipe driven into the ground

Part No. 8120 4-Way Adjustable
Joins up to 3 sections at angles from 0° to 90°—The best joint for a ridge pole—Can be used for a 3-way or 4-way corner

Part No. 8140 2-Way Adjustable
Joins 2 sections at angles from 0° to 180°—Best way to make simple angles without bending sections—Also use them for sway bracing (be sure sections touch each other to distribute weight equally)

Fig. 2– Bullesye FrameMaker™ clamps. Sketch illustrates the five types of available FrameMaker™ clamps, which may be used with electrical conduit or pipe to make antenna towers and other structures. (See text for details.)

Vector Slopers. We're somewhat partial to slopers for low-budget, low-radiation-angle HF DX antennas. To review, the term "Sloper" describes an antenna (normally a half-wavelength) which is neither horizontal nor vertical, but which has one end sloping downward at a distinctive angle, normally 30 to 60 degrees. One of the main advantages of the Sloper is that it has a low angle of radiation characteristic, desirable for long skip and DX work. It is also somewhat directional, with maximum radiation being produced in the direction of the downward slope—that is, the low end of the antenna. (As you tilt the antenna more, the radiation angle will be lowered. However, if you end up with the antenna vertical, it is no longer a Sloper, but is rather a vertical having no directivity or front-to-back (F/B) ratio. Generally, about 70 degrees is the maximum slope angle for such an antenna.)

Another useful and important Sloper characteristic is that a radiation "null" is produced off of the back side (the "high end"). This null results in a pronounced F/B ratio, up to 20 dB. The angle of this null above the horizon depends on the slope angle of the antenna.

Vector Radio specializes in Slopers and has several designs available. Two new products are compact sloping, rotatable dipoles for 40 and 80 meters. These two dipoles, inductively loaded at the center and capacitively loaded at the ends, are remote-tuned from the ham-shack using one of two different in-shack tuner consoles. The tuners allow the small-size (20 and 28 foot, respectively) 40 and 80 meter loaded dipoles to be resonated exactly to the desired frequency, and to operate with a very low (under 1.3:1) SWR over either band.

For more information, contact Herb Johnson, W6QKI, at Vector Radio Co., P.O. Box 1166, Cardiff, CA 92007. *Postscript:* In case you didn't know it, Herb is no newcomer to amateur radio. He was the founder of Swan Electronics in 1961 and Atlas Radio in 1973. Unlike these two firms, whose primary business lay in transceiver manufacturing, Vector was

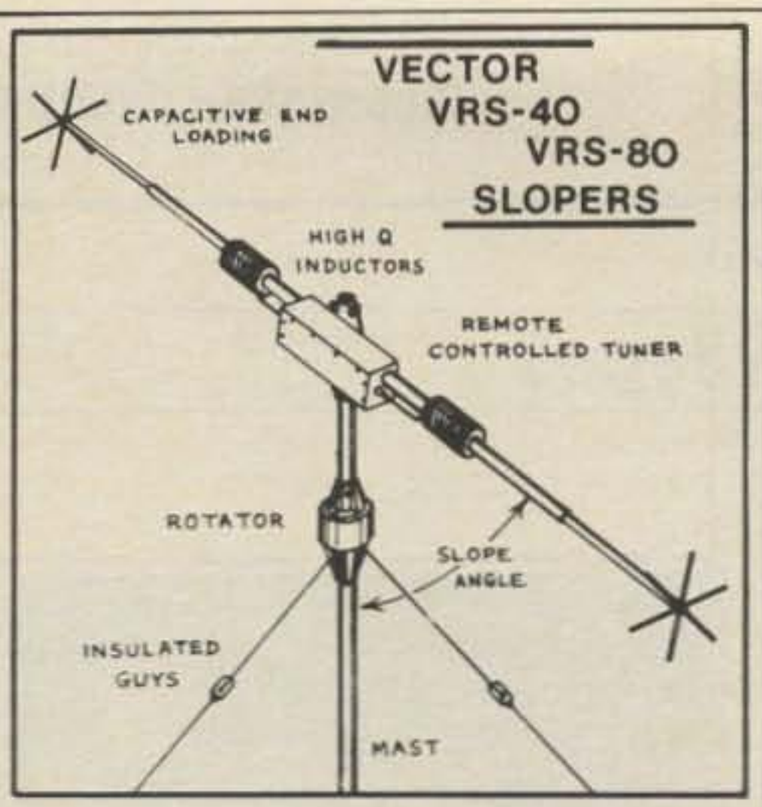


Fig. 3– Vector VRS-40 and VRS-80 Slopers. Sketch represents the center-loaded, remotely-tuned Vector series of 40 and 80 meter slopers. Sloping the dipole not only helps to generate a low angle of radiation (for DX work), but introduces a measure of directivity with a pronounced front-to-back (F/B) ratio, as well.

formed for the purpose of manufacturing and marketing antenna products.

Fig. 3 shows a sketch of the VRS-40 and VRS-80 Slopers, while Fig. 4 depicts a typical half-wave Sloper pattern.

Software Notes

A very useful and inexpensive disk-based beam heading program for the Commodore 64 is offered by Ed Barrer, N6DYU, and Roger Peck, N6CQW. Originally written for the Radio Shack TRS-80, the C-64 *Beam Headings* program allows you to do several things. Using its built-in database, which includes nearly 500 locations around the world, you can find bearings to a given callsign prefix, city, or country, and print bearings to selected U.S., Canadian, and foreign cities.

There is a "restart" option which enables you to enter a new baseline location at the beginning of the program, and another option to add more locations to the database, should this be necessary. Interestingly, you can insert new data in the file by the use of a wordprocessor that uses sequential files, such a Commodore's popular Easy Script™. The bearings printed out by the program are thoughtfully arranged in a well-structured page format, with each page being numbered and headed.

For more information, contact R & B Software, P.O. Box 81341, San Diego, CA 92138.

For the serious SWL, there is *Target File* for the Atari. This is a menu-driven filing system for keeping records of selected radio stations, which requires an Atari system with at least 48K RAM. The program was designed not so much as a general-purpose log, but rather as a database also, to organize information on "target stations" for which one may be hunting. Thus, the program represents a means of organizing the "homework" the serious SWL does before listening, such as information on station callsign, operating times, country and location, frequencies of operation, and other important data. The program is capable of storing and manipulating 240 records (station profiles) at a time.

The program supports seven operating modes called *sections*. These include Menu, View, Add, Create, Load/Save, Search, and Printout. Although the program is primarily disk-oriented, and a cassette version is not yet available as this is written, the data files may be saved to and loaded from cassette, if desired. For more information on *Target File*, which is priced at $15, contact Bill Potorti, 912 Plumas St., Reno, NV 89509.

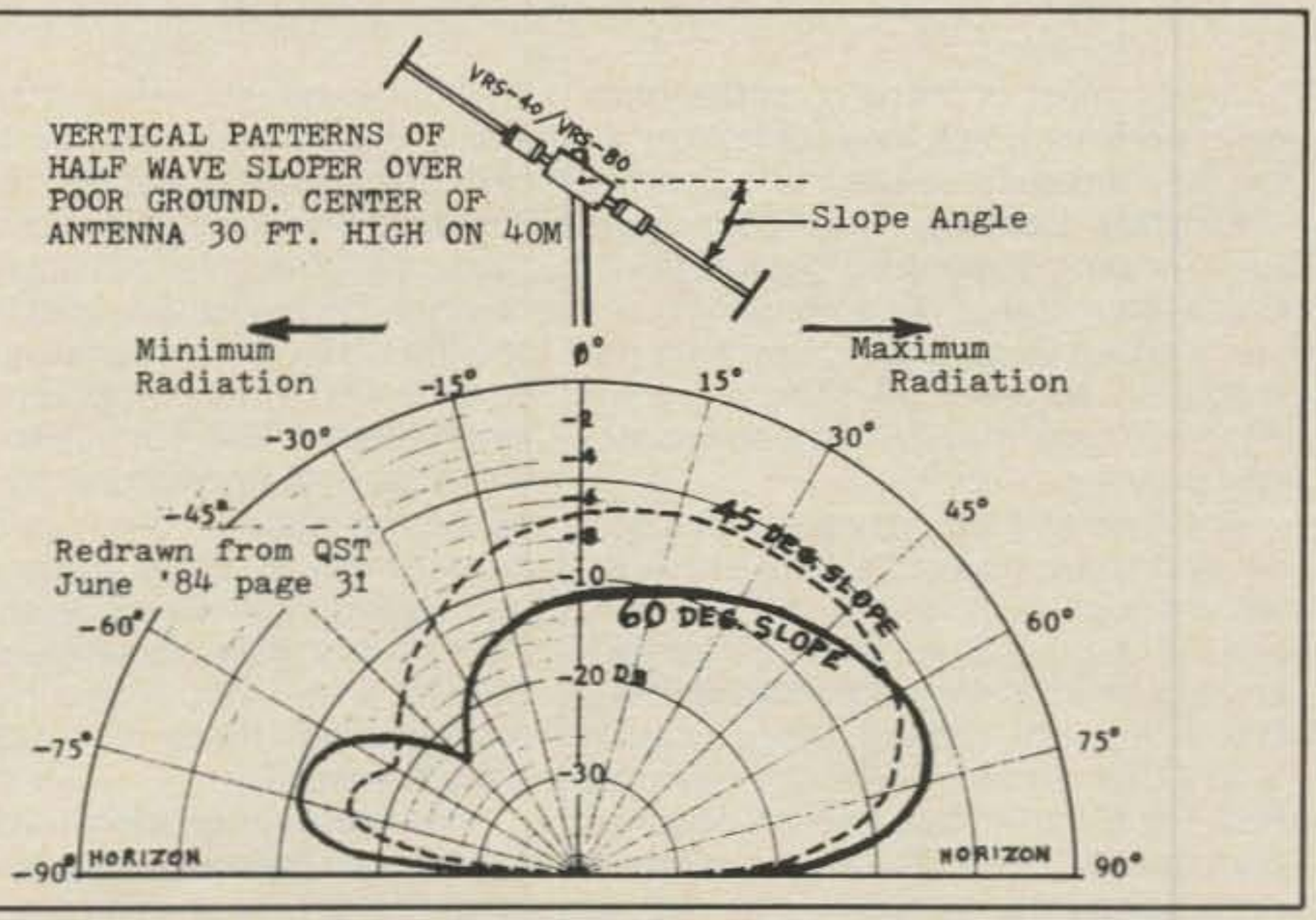


Fig. 4– Vector Slopers—typical radiation pattern. Shown above is a typical vertical pattern of a half-wave sloper over poor ground, with center of the antenna 30 feet high on 40 meters. Two patterns are shown: one for an antenna with a 60 degree slope (the solid line), and one with a 45 degree slope. The second pattern is the dashed line.

Doin's at Public Domain. In the past we have reported on the wealth of "almost-free" personal computer software which is available from various "public domain" and other free sources. These sources are many and include user's groups (and possibly some local amateur clubs), computer bulletin-board systems, information utilities such as CompuServe, public domain library services of various types, computer and amateur radio magazines, books, etc. Depending on the type of computer you own, ham-radio-related software will be found nestled in among the educational, demonstration, game, and business software usually found, and it's often necessary to "dig deep" to find it.

One of our favorite (and least expensive) software sources for Commodore computers is Public Domain, Inc., as we have so reported in the past. The company offers thousands of programs that have been contributed by users, and it groups these programs into $10-a-disk (or tape) collections. A good deal of amateur software for the Vic-20 and Commodore 64 is available from this source, though for the most part amateur radio programs are scattered through the several dozen collections offered. However, the firm has collected many of the Vic and C-64 amateur and electronic calculation programs and placed them in a single disk/tape package. The "Hamfest Special" collection was prepared specifically for last year's Dayton Hamfest, and it is still available for $10. Hopefully, we can twist the arms of Bill Munch and George Ewing to make up a second collection in the future!

If you own a Commodore computer, be sure to send for their catalog, which includes several useful accessories, a program instruction manual for the full range of software offered, and a helpful collection of computer "hints and kinks." A flyer is free, or send 60 cents in coin or stamps for a complete catalog. Write to Public Domain, Inc., 5025 S. Rangeline Rd., West Milton, OH 45383.

For whatever reasons, it seems that the Commodore 64 has become a sort of "volkscomputer" in the hamshack. However, we would appreciate it if readers who own non-Commodore equipment would advise us of "what's out there" in the way of free, "user-written" amateur radio software. We will certainly share such information with other readers via the Antennas column.

Wrapping It

This month we have presented some hopefully useful information on coaxial cable selection and installation, scanned two interesting new product offerings, and highlighted some utilitarian ham-shack software. We'll keep the notebook open next month for Part IV of the current "Notebook" series. See you then.

73, Karl, W8FX

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

160–10 Meter Operating Privileges

Most operating-privilege lists are a confusing group of bar graphs showing information that applies to all classes of amateur radio operators. However, what each of us is most interested in knowing is our own operating privileges. Table I provides data that separately applies to each class of licensee. Slow-scan TV (SSTV) and facsimile (FAX) operation is permitted in all band segments that are listed as "voice." Similarly, frequency shift keying (FSK, F1) radioteletype (RTTY) operation is permitted in all code-only band segments. One-sixty meter operation is limited to code and voice (A3) emissions.

Power input to one's final RF amplifier(s) is 1500 watts peak envelope power (PEP) maximum, except for operation in the Novice bands and the 30 meter band, where all classes of licensees are limited to 200 watts maximum PEP output power. Other power limitations apply to specific bands and segments of bands. In all cases one should not use more power than is needed to conduct satisfactory two-way radio communications.

Novice and Technician

Code
3700–3750
7100–7150
21100–21200
28100–28200

General

Code	Voice
1800–2000	1800–2000
3525–3750 & 3850–4000	3850–4000
7025–7150 & 7225–7300	7225–7300
10100–10150	14225–14350
14025–14150 & 14225–14350	21300–21450
21025–21200 & 21300–21450	28300–29700
28000–29700	

Advanced

Code	Voice
1800–2000	1800–2000
3525–3750 & 3775–4000	3775–4000
7025–7300	7150–7300
10100–10150	14175–14350
14025–14150 & 14175–14350	21225–21450
21025–21200 & 21225–21450	28300–29700
28000–29700	

Extra

Code	Voice
1800–2000	1800–2000
3500–4000	3750–4000
7000–7300	7150–7300
10100–10150	14150–14350
14000–14350	21200–21450
21000–21450	28300–29700
28000–29700	

Table I– Operating privileges listed by license class. All frequencies are in kHz.

Matt Biederman, KB6HKG, of Thousand Oaks, California is the seven-year-old son of Nancy, WA6PRW, and Ray, WB6L. His grandfather (Ray, WB6NSJ) was one of the finest amateurs I have ever known. Matt made 102 contacts during the 1985 ARRL Novice Roundup Contest. His first contact was with an 83-year-old amateur (Ethan, WB5MXD) in Woodlands, Texas. Matt is an active member of the Conejo Valley Amateur Radio Club. He shares the use of the family's Collins equipment. He is earning money to purchase a Kenwood TS-430 transceiver. Matt comes from excellent amateur radio stock. His Dad's callsign used to be WB6HDG. Notice that the B, 6, H, and G are in the same location in both WB6HDG and KB6HKG.

Reciprocal Operating Agreements and Third-Party Traffic Agreements Applicable To USA Amateurs

Our government has two sets of international agreements that are extremely important in regard to operation by US amateurs. One of these sets of agreements permits US amateurs to operate in foreign countries and permits amateurs of those foreign countries to operate in this country. In neither case are amateurs required to pass tests to operate in the other country; all licenses are accepted as proof of qualification. This reciprocal operating system is great for amateurs who visit other countries. The other set of agreements concerns the exchange of non-commercial (personal) traffic between non-amateurs in different countries via amateur radio, which is greatly appreciated as a person-to-person service.

Table II shows the countries with which we have agreements, and which permit reciprocal licensing (R) and/or third-party traffic (T) exchange. Foreign country prefixes are included as an added aid. The most commonly used prefix is listed; however, most of these countries have other prefixes which they sometimes allow their amateurs to use.

Reciprocal Licensing. The FCC only issues reciprocal operating permits to visiting alien amateur radio operators who are licensed by (and are citizens of) the indicated countries. US citizens are not eligible to receive an FCC issued reciprocal operating permit.

Any alien amateur may apply for a permit by completing an FCC form 610-A, attaching a copy of his/her valid license, and mailing these two items to the Federal Communications Commission, P.O. Box 1020, Gettysburg, Pennsylvania 17325 USA. Some US missions have this FCC form, and it can also be obtained from the FCC. An FCC issued reciprocal operating permit is valid for one year, or until the alien's license expires, depending on which comes first.

Operating privileges of a reciprocal permit holder are detailed in 97.311 of the FCC rules and regulations (Part 97) governing the amateur radio service. Basically, the permit holder is limited to the operating privileges that apply to her/his class of license in her/his home country; however, US regulations must be obeyed, and the US Extra class privileges cannot be exceeded by any reciprocal licensee, regardless of the operating privileges that exist in the home country. Reciprocal permit holders do not automatically have American Extra class privileges when operating in the US. As an example, if one holds a license equivalent to the US General ticket, the reciprocal operating privileges are those of a US General class licensee.

The exact callsign shown on the permit must be used by the reciprocal operating permit holder. As an example, if the permit shows CP5WDX/W6, it is incorrect to use CP5WD/W6, CP5WDX/6, or any other unapproved identification.

US amateurs who want to obtain a re-

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R	T	Prefix	Country
	*	VP2A	Antigua & Barbuda
*	*	LU	Argentina
*	*	VK	Australia
*		OE	Austria
*		C6A	the Bahamas
*		8P6	Barbados
*		ON	Belgium
*	*	VP1	Belize
*	*	CP	Bolivia
*		A22	Botswana
*	*	PY	Brazil
(1)	*	VE	Canada
*	*	CE	Chile
*	*	HK	Colombia
*	*	TI	Costa Rica
	*	CO	Cuba
*		OZ	Denmark
	*	J73	Dominica
*	*	HI	Dominican Republic
*	*	HC	Ecuador
*	*	YS	El Salvador
*		3D2	Fiji Islands
*		OH	Finland
*		F	France
	*	C53	the Gambia
*		DL	Fed. Rep. W. Germany
	*	9G1	Ghana
*		SV	Greece
*	*	J3	Grenada & Dependencies
*	*	TG	Guatemala
*	*	8R1	Guyana
*	*	HH	Haiti
*	*	HR	Honduras
*		TF	Iceland
*		VU	India
*		YB	Indonesia
*		EI	Republic of Ireland
*	*	4X	Israel
*		I	Italy
*	*	6Y5	Jamaica
*	*	JY	Jordan
*		T3	Kiribati
*		9K2	Kuwait
*	*	EL	Liberia
*		LX	Luxembourg
	*	XE	Mexico
*		3A	Monaco
*		PA	Netherlands
*		PJ2-9	Netherlands Antilles
*		ZL	New Zealand
*	*	YN	Nicaragua
*		LA	Norway
*	*	HP	Panama
*	*	ZP	Paraguay
*	*	OA	Peru
*		DU	Philippines
*		CT1/CT4	Portugal
	*	VP2K	St. Christopher (Kitts) & Nevis Islands
*	*	J6	St. Lucia
	*	VP2S	St. Vincent & the Grenadines
*		S79	Rep. of Seychelles
*		9L1	Sierra Leone
*		H44	Solomon Islands
*		EA, EA5, EA7	Spain
*		PZ	Suriname
	*	3D6	Swaziland
*		SM	Sweden
*	(2)	HB9	Switzerland
*	*	9Y4	Trinidad & Tobago
*		T2	Tuvalu Islands
*		G, GB, GI, GM, GW	United Kingdom
*	*	CX	Uruguay
*	*	YV	Venezuela
*		YU	Yugoslavia

Notes

(1) USA/Canada agreement authorizes reciprocal operation without permits in both countries.

(2) USA/ITU agreement authorizes third-party traffic exchange between USA and 4U1ITU (only) in Geneva.

Table II– The countries with which we have agreements and which permit reciprocal licensing (R) and/or third-party traffic (T) exchange.

ciprocal operating permit from any of the indicated countries with which we have agreements should request the appropriate forms from officials of those countries. US based embassies and legations may have the required application forms; if not, address such a request to the amateur radio licensing authority in the capital of the country concerned. The ARRL has a reciprocal licensing expert who can probably provide names, addresses, and other data in response to requests.

When US amateurs operate in other regions and countries, they must abide by the rules that apply in those areas. As the saying goes, "When in Rome, do as the Romans do."

Third-Party Traffic. Third-party traffic involves at least one person in addition to the operators handling the traffic. Third-party traffic includes message traffic handled directly between amateurs, plus telephone-patch traffic in which non-amateurs speak to each other directly via amateur radio. Third-party traffic must be of a personal nature; business messages are prohibited. No amateur radio operator is allowed to accept money, service, or goods in exchange for handling third-party traffic.

The callsigns of both the foreign station and the US station must be transmitted to identify transmissions of stations handling international third-party traffic. One's own callsign (alone) does not suffice in this case.

A Message From Canada's Northwest Territories

William Richardson, VY1CW, advised me to inform Novice column readers that VY1 is the prefix in callsigns issued to Yukon amateurs. VE8 is no longer issued to both Northwest Territories (NWT) and Yukon stations. VE8 is now just the prefix of NWT stations. Yukon stations have been assigned the VY1 prefix as of six years ago. There are only three Yukon amateurs active on the high-frequency (3 to 30 MHz) bands, so a Yukon QSO (contact) is a rarity.

The first time I worked a VY1 station, I was surprised to learn that it was in the Yukon. Canadian amateurs have used an extensive variety of special prefix callsigns during the past several years. Consequently, I initially thought VY1 was a special prefix for VE1 area stations. If the Yukon is to have separate multiplier cred-

it in contests (and operating awards), VE9 appears to be a more appropriate prefix than VY1 for Yukon stations. VE9 would complete the clockwise circle of numbers assigned to Canadian provinces.

Pete Hayes, VE8PH, frequently works American Novices to give them some code practice plus a contact with the Northwest Territories (NWT). He operates a a Heath HW-8 transceiver, which is a low-power (QRP) rig that emits a mighty 2 watts. Pete requested that I repeat some of the information that has been published in previous Novice columns, and I agree that such repetition is needed.

Keep contacts with DX (foreign) amateurs brief. Your first exchange should be limited to the RST signal report, your QTH (location), and your name. Allow the DX operator to provide you with the same information before starting a general conversation. The 15 meter band is subject to rapid and severe QSB (fading) at this declining point in the present sunspot cycle, which is a major reason why basic data should be exchanged quickly.

Do not give the DX operator instructions with which she/he may be unable or unwilling to comply. Direction to swing one's antenna toward the other station is typical of instruction that can be a waste of time, because the other amateur may be using a non-rotatable antenna, such as a random wire or dipole. Similarly, directing the other amateur to increase transmitter output power (QRO) can be useless because the other operator may already be running at full power.

It is best to send your QSL cards through the outgoing DX QSL bureau to DX amateurs. If you want a DX card in a hurry, you can enclose a self-addressed envelope and a few IRC's with the QSL card you mail to a DX amateur. IRCs are available from post offices. It is also possible to purchase foreign postage stamps to attach to your self-addressed envelope; this system is preferred over the use of IRCs, because it eliminates the need for the DX operator to exchange IRCs for stamps at her/his post office. In addition, some countries treat IRCs like money, and DX amateurs in those countries can lose their licenses due to receiving IRCs. Foreign stamp services are frequently advertised in the classified sections of amateur magazines such as *CQ*. The best way to exchange QSL cards between amateurs in different countries is through the ARRL DX QSL bureau. If for no other reason than the availability of the outgoing DX QSL bureau to members, it is worthwhile to join the American Radio Relay League. Of course, there are many other benefits related to being an ARRL member. One is not required to be an ARRL member to receive cards coming in through the League's incoming DX QSL bureau; this service is provided at no charge to all amateurs. If you contact DX (foreign) amateurs, you should have SASEs on file with your local ARRL incoming DX QSL bureau distribution group, which is listed regularly in *QST*.

If any amateur has worked Pete with his present (VE8PH) or previous (VE5ACY) callsign and wants his QSL, he advises that he responds to each QSL received through the DX QSL bureau. If that system is too slow to suit you, you can send your QSL, SASE, and a couple of IRCs to Cape Parry, Northwest Territory, c/o Felec Services, 570A Ferry Road, Winnipeg, Manitoba R3H 0T7, Canada.

Each DX amateur understands that you probably want one of her/his QSL cards. There is no need to waste time sending your mailing address and requesting a card. Keep your Novice band

Rich Gaye, KA9PTX, lives in Brookfield, Illinois. He has been a Novice since May 1983 and he is getting ready to upgrade. His station includes a Yaesu FT-301-SD transceiver and a Hy-Gain 18AVT/WB antenna. Rich operates on the 40 meter band most of the time.

Here are Emilia, KA2TXO, and Alexander, KA2TXP, Medakovich of New York, NY. They obtained their Novice licenses during January 1984 and Alexander upgraded to General four months later. Their station includes a Kenwood TS-430S transceiver, Hy-Gain 14AVQ vertical, and a homebrew 2-element Yagi-Uda. They have contacted many American amateurs, plus amateurs in 26 other countries. They were expecting their harmonic to be born in August when this picture was submitted. Emilia is a registered assistant in a brokerage house and Alexander is a physician.

DX contacts short; you can lengthen DX contacts later on when you operate outside the Novice bands.

Tel Aviv Contacts

The February 1985 Novice column included a photograph of Ilan Yacobi, who previously operated as KB6CYC. Ilan has moved to Tel Aviv, Israel, where he now operates as 4X6MU. His station includes a Swan 500-C transceiver, a homebrew 15 meter quad, a 20 meter dipole, and a 40 meter inverted Vee. His antennas are atop the four-story apartment house in which he resides. His code proficiency is above 30 words per minute, but he slows down for less proficient amateurs. Ilan has already worked about 100 countries. Ilan is attending a technical school where he is studying electricity and computers. Listen for him on the 15 meter band. If you want to arrange a schedule with him, you can write to 10 Barth Street, Tel Aviv, Israel 69104.

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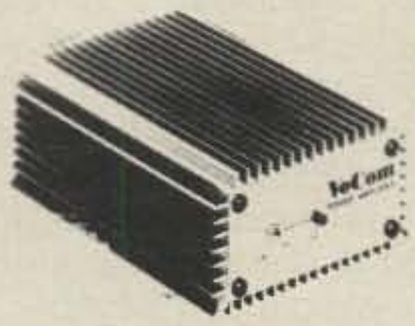

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Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

A recent letter from Bill Richardson, VY1CW, pointed out the existing confusion in the identity of VE8 the Northwest Territory and VY1 the Yukon.

Checking out the February Contest Calendar I found that Bill was justified in his complaint. Of the seven events that were using Canadian provinces/territories as a multiplier, only one properly indicated that there are 13 as a possible multiplier. Most only showed 12, completely ignoring VY1 the Yukon. Even our own 160 Contest only showed 12. (Sorry about that, Bill.)

We are making a correction as of now and hope that other organizations which use Canadian sub-divisions as a multiplier in their events will follow our example.

There are 11 VE/VO provinces and 2 territories, VE8 and VY1, and it should be listed as 13 Canadian prov./terr. as a possible multiplier. What is also sometimes confusing is that VE1 is listed as the Maritime province when it should be shown that there are three provinces in the Maritime area.

The following table should prove helpful in identifying Canadian provinces and territories.

	Area	Zone CQ	Zone ITU
VO1	Newfoundland	5	9
VO2	Labrador	2	9
VE1	New Brunswick	5	9
VE1	Nova Scotia	5	9
VE1	Prince Edward Is.	5	9
VE2	Quebec	2 & 5	9
VE3	Ontario	4	4
VE4	Manitoba	4	3
VE5	Saskatchewan	4	3
VE6	Alberta	4	2
VE7	British Columbia	3	2
VE8	Northwest Terr.	1 & 2	2-4, 75
VY1	Yukon Territory	1	2

There are not many active stations in the Yukon, but I hope this clarification will give them an incentive to participate in contests now that they will be recognized as a separate area and will be eligible for separate awards.

A new magazine, *Radiosporting*, published by the International Radiosport Association, made its appearance a few months ago. It is devoted exclusively to contesting. A card to the editor, Yuri Blanarovich, VE3BMV, P.O. Box 65, Don Mills, Ont., Canada M3C 2R6, will get you a sample copy. Contesters should find it very interesting.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

†	**May**	**25-26**	**CQ WW WPX CW Contest**
*	May	25-29	CLARA AC/DC "Mystery"
	June	1	ARCI QRP "Hootowl" Sprint
	June	1-2	New York State QSO Party
	June	1-2	RSGB National Field Day
	June	8-9	So. American CW Contest
	June	8-10	VK/ZL RTTY Contest
	June	8-10	ARRL VHF QSO Party
	June	15-16	All Asian Phone Contest
	June	15-16	NINE Land QSO Party
	June	22-23	ARRL Field Day
	June	29-30	SMIRK QSO Party
	July	13-14	IARU Radiosport Chmpship.
	July	13-14	West Coast 160 SSB Contest
	July	13-14	Colombian DX Contest
	July	**20-22**	**CQ WW VHF Contest**
	July	27-29	County Hunters CW Contest
	Aug.	3-4	Wild Bunch 160 SSB Contest
	Aug.	3-4	ARRL UHF Contest
	Aug.	10-11	European CW Contest
	Aug.	17-18	SARTG RTTY Contest
	Aug.	24-25	All Asian CW Contest
	Aug.	24-25	GARTG RTTY Contest
	Sep.	9-15	QCWA Invitational Party
	Sep.	14-15	European Phone Contest
	Oct.	**26-27**	**CQ WW DX Phone Contest**
	Nov.	**23-24**	**CQ WW DX CW Contest**

**Covered last month.*
†Not official.

A reminder: the mailing deadline for logs for our recent WPX CW Contest is July 10th, and this year all logs go to CQ Magazine, 76 N. Broadway, Hicksville, NY 11801. Be sure to indicate CW on the envelope.

Deadline for material for the September issue is June 15th, and July 15th for the October issue. You gain a week advantage if you send it to my home address.

Have you checked the expiration date of your license lately?

73 for this time, Frank, W1WY

(Just as we were going to press, Bernie Welch, W8IMZ, and Steve Bolia, N8BJQ/6, our WPX Contest Director, reported that the WPX SSB Contest had a very successful weekend, and they predict that many of the existing records will be broken, except on 10 meters, which was almost a complete blackout.)

ARCI QRP "Hootowl" Sprint

0200Z to 0800Z Saturday, June 1

This is a shorty (only 6 hours) on CW organized by the QRP ARCI.

Exchange: RST, state, province, or country. ARCI members will include their membership number; non-members their power output.

Scoring: Contacts with members 5 points; non-members 2 points if in the same continent, 4 points if in a different continent.

Multiplier: If your power output is:

4 to 5 watts ×2
3 to 4 watts ×4
2 to 3 watts ×6
1 to 2 watts ×8
Less than 1 watt ×10
Over 5 watts as a check log only.

Bonus: Use of natural power (solar, wind, hydroelectric, etc.) with or without storage, ×2. (With storage, cells must be charged by natural power source for at least 8 of the 48 hours preceding the contest. Battery power ×1.5.

Final Score: Total QSO points × state/province/country multiplier × power multiplier × bonus if any.

The same station may be worked on each band for QSO and multiplier credit.

Frequencies: 1810, 3560, 7040, 14060, 21060, 28060. Novice and Tech.—3710, 7110, 21110, 28110.

Awards: Certificates to the highest scorers in each state, province, and country, and second and third place awards in areas with 10 or more entries.

Use a separate log sheet for each band. It is recommended that official ARCI forms are used. A large SASE to KA5NLY will get you a supply.

Logs must be received by July 1st by the QRP ARCI Contest Chairman, Gene Smith, KA5NLY, P.O. Box 55010, Little Rock, AR 72225. Include a large SASE if you wish the results.

RSGB National Field Day

1600 to 1600Z Sat.–Sun., June 1–2

Activity for this c.w.-only Field Day is concentrated on the British Isles. Operation is from portable locations specifically set up for Field Day operation. (You may also hear some activity from other Europeans.) Although overseas stations are not directly eligible to participate, they are invited to work Field Day stations and submit a report of the stations contacted.

A certificate will be awarded to the overseas station in each continent whose check log shows the most points contributed to competitors.

Send logs to: RSGB HF Contests Committee, c/o Mr. D.J. Lawley, 220 Shipbourne Road, Tonbridge, Kent TN10 3EL, England.

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- **Telescopic antenna** for FM and SW reception

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Frequency Range: AM: 150-29,999.9 kHz; FM: 76-108 MHz; Air: 116-136 MHz

Antenna System: LW, MW: Built-in Ferrite Bar Antenna; FM, Air, SW: Telescopic Antenna

Inputs: DC-In 4.5V, External antenna input (minijack x 2)

Outputs: Earphone (minijack); Record output (minijack)

Speaker: 4-inch dynamic

Power Requirements: Batteries "D" x 3 (4.5V) (optional); "AA" x 2 (3V) (optional) for programmable clock/timer; AC 120 Volts, 60 Hz with AC Adaptor (supplied); DC-12 Volts with DCC-127A Car Battery Cord (optional)

Dimensions: 6¼" H x 11⅜" W x 2⅛" D

Weight: 3 lbs. 12 oz (with batteries inserted)

Color: Black

Supplied Accessories: AC Adaptor; Earphone, Shoulder Strap, Long Wire External Antenna, External Antenna Connector (x 2); Short Wave Handbook

Optional Accessories: DCC-127A Car Battery Cord; AN-1 Active Antenna

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North America

U.S.A.		Canada	
W2YV	**990,095**	**VO1AW**	**36,816**
	(Opr. KQ2M)	**VE1CBF**	**20,111**
N2VW	**195,936**	VO1CA	11,155
N4UH	**131,026**	**VE4RP**	**10,416**
K4YKZ	**115,522**	VE3ST	60
N1AU	**76,858**		
WI4K	**61,920**	**Dom. Rep.**	
N4BS	**47,628**	**HI8LC**	**34,500**
WC4E	46,184		
WA8DCQ	**38,906**	**Multi-Opr.**	
KC8XK	**37,440**	**U.S.A.**	
W3ARK	**33,304**	**K6OKW**	**181,176**
W6BH	**31,040**	K1XM	6,132
KV9S	**25,440**		
WK4F	24,182	**Continental Winners**	
K6EID	**18,670**	Europe	Y23EK
N6AW	17,476	Africa	EA9KF
KB8C/9	**14,175**	Asia	UF6CR
W2GKZ	13,608	No. Amer.	W2YV
N5JB	8,316	So. Amer.	PY5EG
KQ1F	6,794	Oceania	VK3EZ
W4UW	6,272		
KC1F	4,641	**Multi-Opr.**	
KU7Z	4,536	Europe	LZ4@KTS
W5FO	3,434	Africa	ZS6TUK
KA1DSQ	2,688	Asia	RF@FWW
K7LXC	2,688	No. Amer.	K6OKW
W@KEA	2,686	So. Amer.	YV1AVO
W5EIJ	1,368		
KT1O	1,326	**Special Award**	
WA5IYX	900	PY5EG and DJ9KH	
K2KTT	828		
WA1TBV	132		

* *Boldface indicates winners.*

ARRL VHF QSO Party

1800–0300Z Sat.–Mon., June 8–10

Action will be found on the 50, 144, 220, and 420 MHz bands, and even higher up in the spectrum.

The scoring varies with the different bands used, and there are certain requirements and restrictions in the rules. Working WAS on 6 meters is a possibility. Complete rules will be found in the May issue of *QST*.

I strongly recommend that you write to ARRL Headquarters for official forms. Include an s.a.s.e. with your request to: ARRL VHF Contest, 225 Main St., Newington, CT 06111.

South American CW Contest

1500Z Sat. to 1500Z Sun., June 8–9

Sponsored by *Electronica Popular* magazine of Brazil, and supervised by the Grupo Argentino de CW of Buenos Aires, this is an annual affair the second weekend of June.

It's still a CW contest only, but the format and scoring have been changed. Now you can work stations in other continents as well as South Americans. Use all 6 bands, 1.8 through 28 MHz.

Classes: Single operator both single and all band, multi-operator, single transmitter, all band only and SWL.

Exchange: RST plus a QSO number starting with 001.

Points: Contacts with stations in own country zero points but okay for multiplier credit. Other countries but same continent, 2 points. Countries in other continents, 4 points. Contacts with South American stations, 8 points. (For stations outside of S.A.)

Multiplier: Different countries (DXCC list) plus the different South American prefixes worked on each band.

Final Score: Total QSO points times the sum total multiplier from each band.

Awards: Certificates to the top-scoring station in each country and the three top scorers in each class.

Use a separate log sheet for each band and a summary sheet showing the scoring and other essential information.

Logs must be received no later than August 31st and go to: WWSA Contest Committee, P.O. Box 18003, 20772 Rio de Janeiro, RJ, Brasil.

VK/ZL RTTY DX Contest

0000Z Sat. to 0000Z Mon., June 8–10

The Australian National ARTS is again conducting the contest this year. Rules are more or less the same as last year with a rather elaborate scoring system.

All five bands may be used, 3.5 to 28 MHz in that portion of the band used by RTTY (no 10.1 MHz).

Classes: Single operator, multi-operator, and SWL.

Exchange: RST, zone, and time in UTC.

Scoring: QSO points are determined as per the CARTG Zone chart. Multiply total by the number of countries and again by the number of continents worked (maximum of 6). After above calculations, add 100 points for each VK/ZL worked on 14 MHz, 200 points if on 21 MHz, and 300 points if on 28 MHz. (Example: 720 points from zone chart × 29 countries × 5 continents = 104,400 points, plus 6 VK/ZL worked on 14 MHz gives a final score of 105,000 points.)

A station may be contacted only once on each band, but again on another band for a multiplier. The ARRL country list is used as a standard. In addition each VK, ZL, JA, VE/VO, and W/K call area will be considered a separate multiplier. (We are unable to include the CARTG zone chart due to lack of space. Include 2 IRC's for a copy from VK2EG.)

Use a separate log sheet for each band and column them in this order: date, time (UTC), station worked, message sent and received, and points claimed.

A summary sheet showing the scoring, name, and address in Block Letters and signature of each operator is also required.

Awards: Will be issued to first-, second-,

and third-place winners on a world basis and also on a country basis.

All entries must be received no later than September 1st and go to: W.J. Storer, VK2EG, 55 Prince Charles Road, Frenchs Forest N.S.W., 2086 Australia.

NINE Land C.W. Contest

1700Z Sat. to 1700Z Sun., June 15–16

This is the third annual contest organized by the Joliet ARS in which there is no limit to whom you can work; however, contact with NINE Land stations (Ill., Ind., and Wisc.) have double QSO point value. Only one contact per band with the same station permitted.

Classes: Single and multi-operator, one transmitter and portable field operation, multi-operator maximum of two transmitters.

Exchange: Consecutive QSO numbers beginning with 001, and state, VE province, or DX country.

Scoring: Contacts with NINE Land stations count 2 points; with all other stations 1 point.

Multiplier: Number of states, VE provinces, and DX countries worked (counted once only). There is a bonus multiplier of 1 for each 20 NINE Land stations worked.

Final Score: Total QSO points from all bands times the number of states, provinces, DX countries, and bonus points worked.

Frequencies: 1805 and 60 kHz up from lower edge of 10 through 80 meters (no 30 meters). Novice: 25 kHz up from low edge of their bands.

Awards: Certificates to high scorers in each class in each state, VE province, and DX country. Plaques to high scorer in NINE Land and outside NINE Land, and multi-operator.

Dupe sheets are required for entries with over 200 contacts, and a summary sheet showing the scoring, etc. Include a large s.a.s.e. for a copy of the results.

Mailing deadline is July 21st to: Joliet ARS, Att.: Paula Franke, WB9TBU, P.O. Box 873, Beecher, IL 60401.

All Asian DX Contest

Phone: June 15–16 C.W.: Aug. 24–25
0000Z Sat. to 2400Z Sun.

This is the 25th year of this activity sponsored by the JARL. The exchange is between Asian countries and the rest of the world.

Classifications: Single operator, both single and all band. Multi-operator, both single and multi-transmitter, all band only (one signal per band only).

Club stations are classified as multi-operator and each operator will give his age in the exchange.

Exchange: For OM's—RS(T) plus age of operator. For YL's—RS(T) and 00.

Scoring: 3 points for contacts on 160; 2 points for contacts on 80; 1 point on all other bands. (KA contacts do not count.)

Multiplier: For Asians the multiplier is determined by the number of different countries worked on each band (DXCC list). For non-Asians it is determined by the number of different Asian prefixes worked on each band (*CQ* WPX list).

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Keep in mind that non-Asians use Asian prefixes as their multiplier, not countries.

Note: JD1 stations on Ogasawara (Bonin and Volcano) are in Asia, and JD1 stations on Minamitori Shima (Marcus) are in Oceania.

Awards: Certificates to the top scorers, both phone and c.w., in each country and each U.S. call area. In each class, both single band and all band, up to the fifth rank, depending on the number of returns. Medals to the all-band continental leaders, both single and multi-operator.

Logs: Keep all times in GMT. Use a separate column for the country or prefix multiplier, and fill in only the first time it is worked. Use a separate log for each band. Include a summary sheet showing the scoring and other information, and a signed declaration that all rules and regulations have been observed.

There is a strict disqualification clause for taking credit for duplicate contacts in excess of 2% of the total on each band, as well as other infractions.

Logs must be received no later than Sept. 30th for the Phone section, and Nov. 30th for the C.W. section. They go to: JARL Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Asian Country List: A4; A5; A6; A7; A9; AP; BV; BY; CR9; EP; HL/HM; HS; HZ/7Z; JA-JR; JD1; JT; JY; OD; S2, TA; UA/UK/UV/UW9-Ø; UD6; UK6C, D, K; UF6/UK6F, O, Q, V; UG/UK6G; UH8/UK8H; UI8/UK8A, G, I, L, O, T, Z; UJ8/UK8J, R; UL7/UK7; UM8/UK8M, N; VS6; VS9M/8Q; VU; VU (Andaman & Nicobar); VU (Laccadive); XU; XV/3W; XW; XZ; YA; YI; YK; ZC4/5B4; IS (Spratly); 4S; 4W; 4X/4Z; 70 (S. Yemen); 70 (Kamaran); 8Z4; 9K; 9M2; 9N; 9V; (Abu Ail).

ARRL Field Day

1800–2100Z Sat.–Sun., June 22–23

Without a doubt, this activity generates more stateside participation in manpower than any other amateur radio activity. It is mostly a club-organized activity, and therefore requires that the coordinator be knowledgeable about what is required.

Entries are separated into many classes. Rules and requirements are quite extensive and will be found in the May issue of *QST*. It is advisable that you read them thoroughly.

Official log forms are a must. Direct your request with a large s.a.s.e. to the ARRL, ARRL Field Day, 225 Main St., Newington, CT 06111.

Six Meter QSO Party

0000Z Sat. to 2400Z Sun., June 29–30

This is the 11th annual QSO party sponsored by the Six Meter International Radio Klub. The party is open to all, members and non-members, but it seems to be geared for membership participation.

Cross-band contacts are not permitted, and competition is for single-operator stations only. Operation, of course, is confined to the 6 meter band.

Exchange: SMIRK number, ARRL section, VE province, or country. (ARRL U.S. only; KH6 and KL7 count as countries; VE use provinces.)

Scoring: Contacts with members count 2 points, with non-members 1 point. Multiply total QSO points by the number of ARRL sections, VE provinces, and foreign countries worked.

Awards: Certificates to the top-scoring stations in each ARRL section, VE province, and country. There are two SMIRK certificates for the overall winners in the U.S./Canada and foreign areas.

Since the party is geared for membership participation and requires the use of official log forms, it is suggested that you write for more details. Include a large s.a.s.e. with your request.

Mailing deadline for entries is July 31st to: Mark S. Anderson, WB5NPK, 8932 Saddle Trail, San Antonio, TX 78255.

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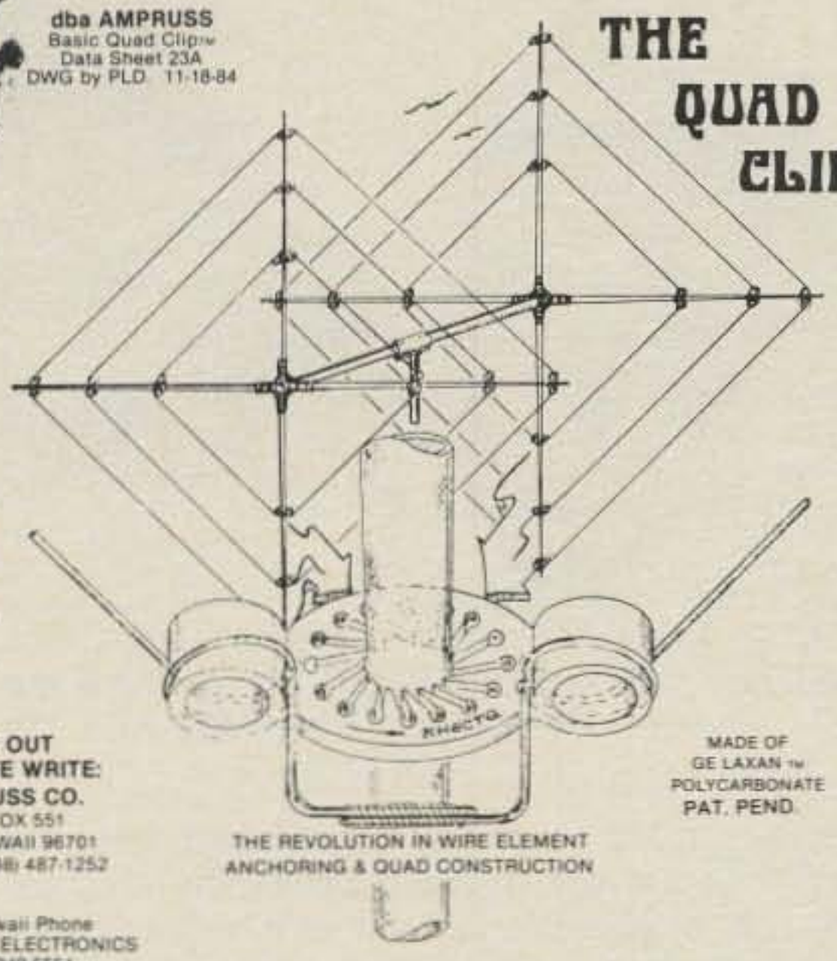

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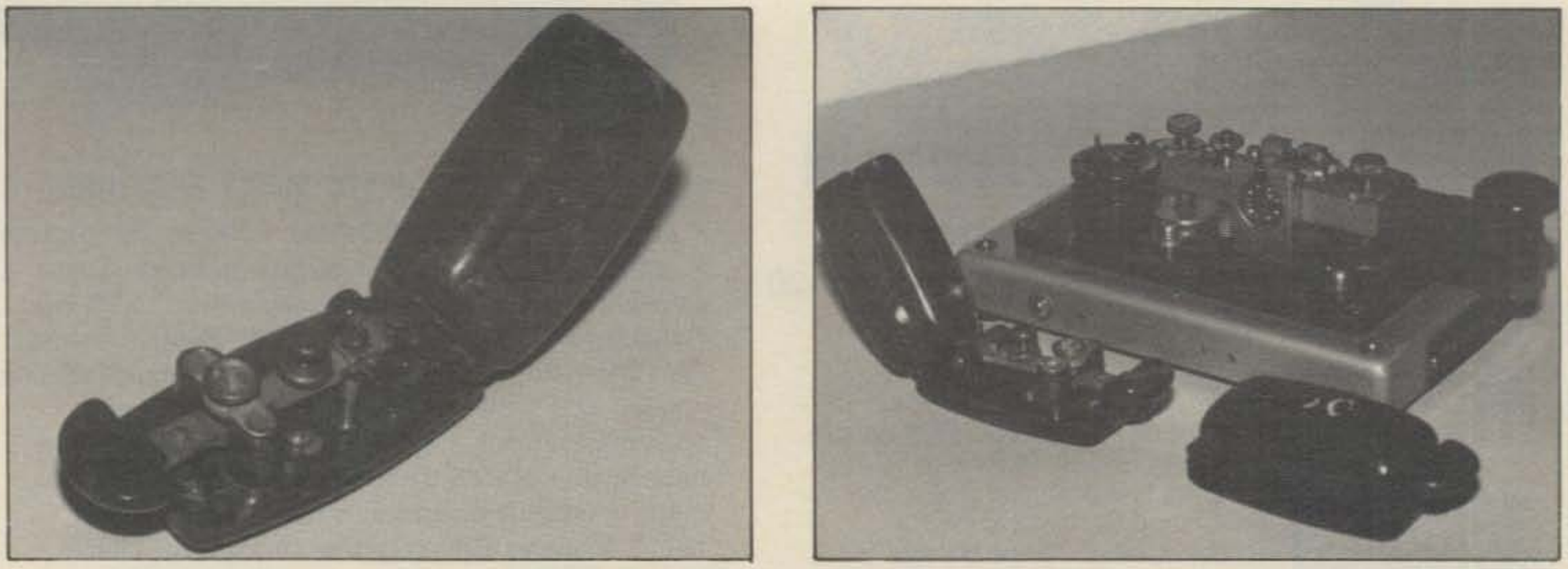
A LOOK AT THE WORLD AROUND US

Part II of the K5RW Key Collection/Museum Tour



Last month we mentioned the German "Mouse" key used during the war. Since that column was prepared we have received pictures of that unusual model and present them here. The little keys came with leg straps so one can suppose that they were used on moving vehicles. On the left is how the key looks, and on the right are two different "Mouse" keys beside a Marconi 365A.

As you'll recall, last month's column carried the first part of our "magazine tour" featuring K5RW's phenomenal key collection/museum. We discussed spark keys, the early years and models of Vibroplex and several competing bugs, plus the classic and fully automatic "Melehan Valiant" bug. This month we'll complete the tour with views of special-interest keys, a glimpse at the life and keys of champion telegrapher Ted R. McElroy, and an overview of K5RW's full collection/museum setup.

Again this month we wish to recognize the patience of B. Neal McEwen, K5RW, and the ever active camera of traveling photographer Joe Veras, N4QB, in making this mini-tour possible. We also would like to know your situation on older keys/bugs and encourage their preservation as artifacts of our proud heritage. Don't throw away any old key; move it into the hands of a concerned collector. Perpetuate your call! Return with us now to those thrilling days of yesteryear and . . . wait . . . did I really hear Morse eminating at over 50 words a minute from somewhere in the showcase?

Figure 1. These two classic bugs were made by the world's fastest radio telegrapher, Theodore Roosevelt McElroy, shortly before World War II. The bug on the left is mounted on a teardrop or flatiron-type base and nicknamed the "McElroy Teardrop." Its official designation is the Speedstream PC600. This particular key belonged to Brownie, W3CJI, who used it aboard a DC-3 flying South American routes during the 1940s (old timers may recall reading about those flights or hearing Brownie's familiar call on the air). Notice the key's feet have been replaced with rubber suction cups for sturdiness during airborne operation.

The bug on the right in fig. 1 is known as the "McElroy Deluxe" and features a solid iron base painted to resemble marble. The Tee Bar across the key's top is an interesting item that's also functional. It provides a convenient handle for telegraphers to carry their key to and from shifts by merely curling a few fingers under the bar and lifting the key. The bar also allows the bug to operate on its side as a hand key, assuming the pendulum is position-locked with a damper post clip. These were heavy and rugged keys which held their adjustments with miniscule maintenance. Three models of MAC-KEYs were advertised in *QST* during late 1937. The "Deluxe" model had a simulated marble base and sold for $9.50. The "Standard" model had a black wrinkle base with nickled upper parts and sold for $7.50. A "Junior" model with a stamped steel base and the same working parts as the "Standard" was also available for $4.95. McElroy explained his exclusion of chrome-base models in a 1938 flyer as follows: "I know as an operator of 25 years' experience that it is very poor practice to have a chrome or nickle-plated base on a key. Light reflection from such a base is a severe strain on an operator's eyes."

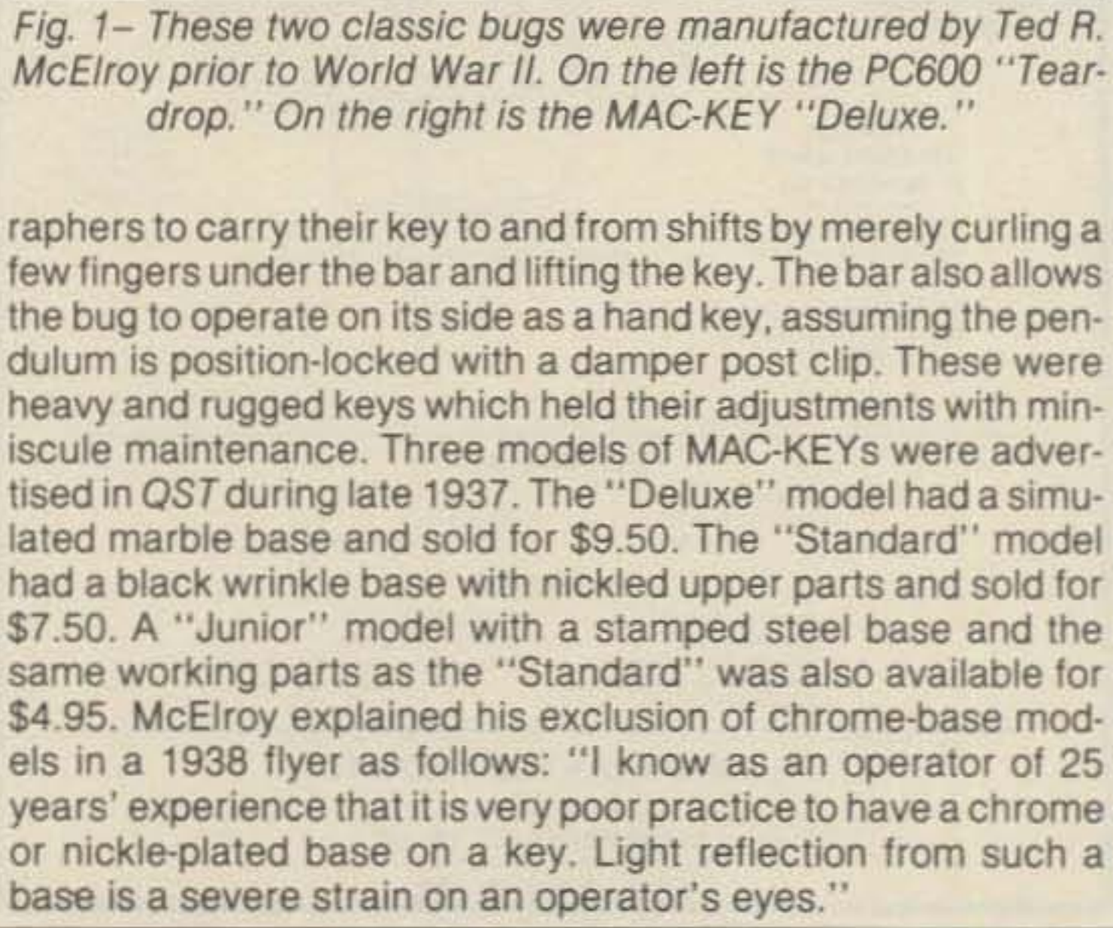


Fig. 1– These two classic bugs were manufactured by Ted R. McElroy prior to World War II. On the left is the PC600 "Teardrop." On the right is the MAC-KEY "Deluxe."

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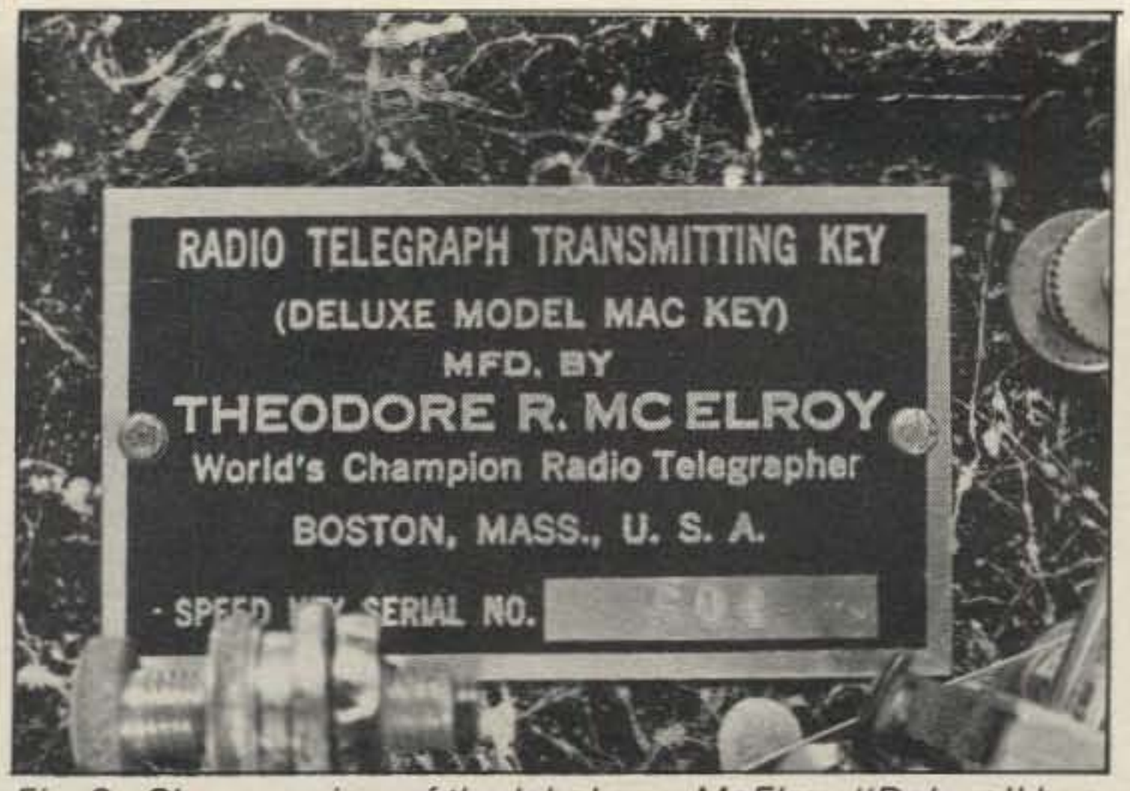


Fig. 2– Close-up view of the label on a McElroy "Deluxe" bug, with proclamation as World's Champion Radio Telegrapher.

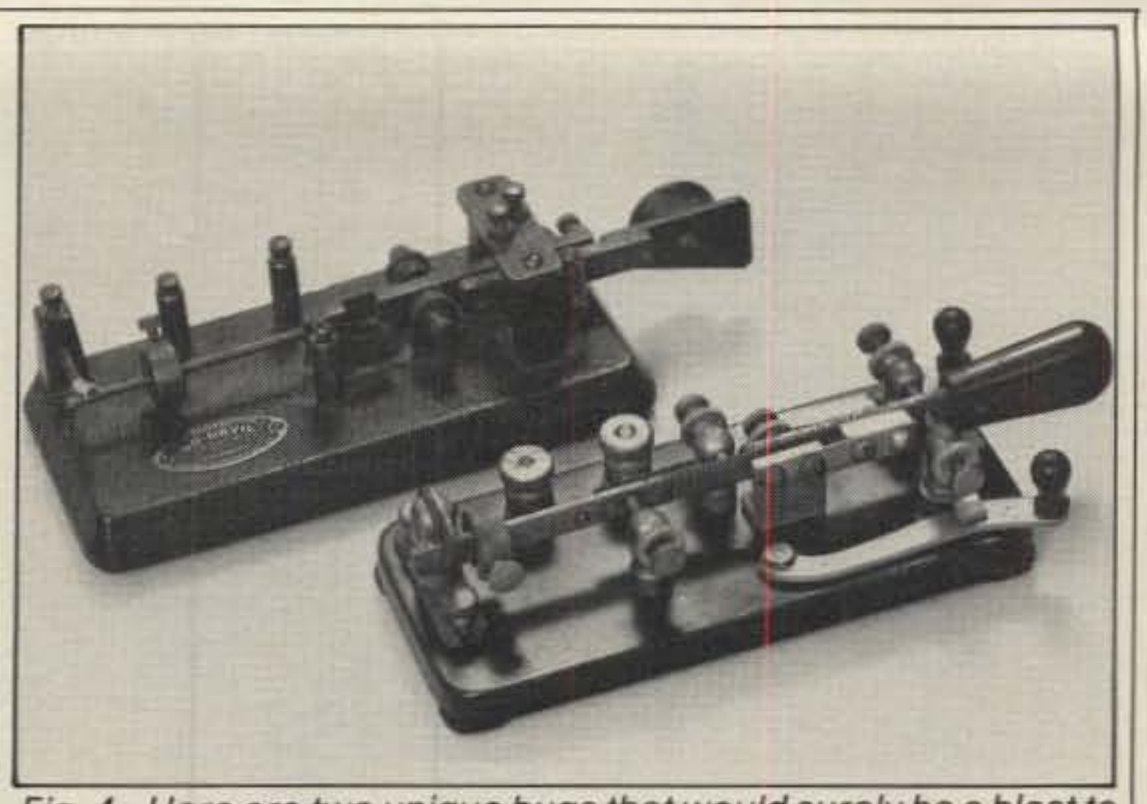


Fig. 4– Here are two unique bugs that would surely be a blast to operate! On the top is a sleek, low, and obviously fast Go Devil. Beneath it is a convertible bug or sideswiper made by Signal Electric Company.

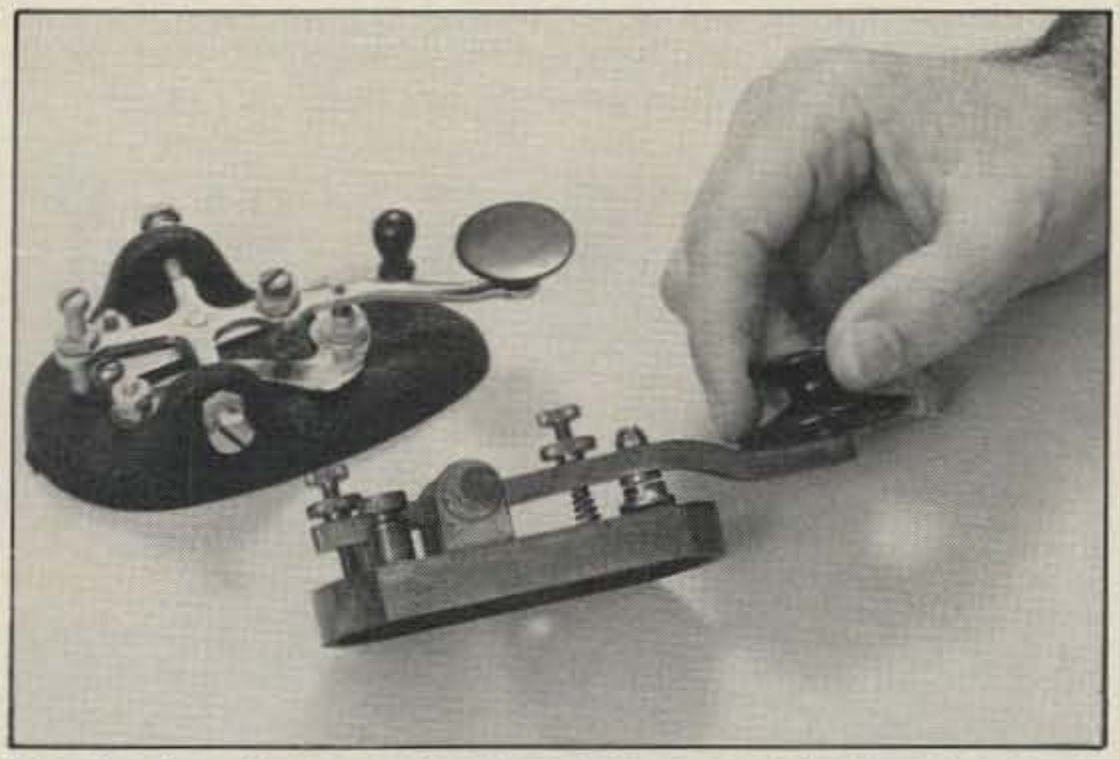


Fig. 3– Two finely crafted hand keys manufactured prior to World War II. On top is a McElroy; below is a Signal Electric Company spark key. Note the large silver contacts.

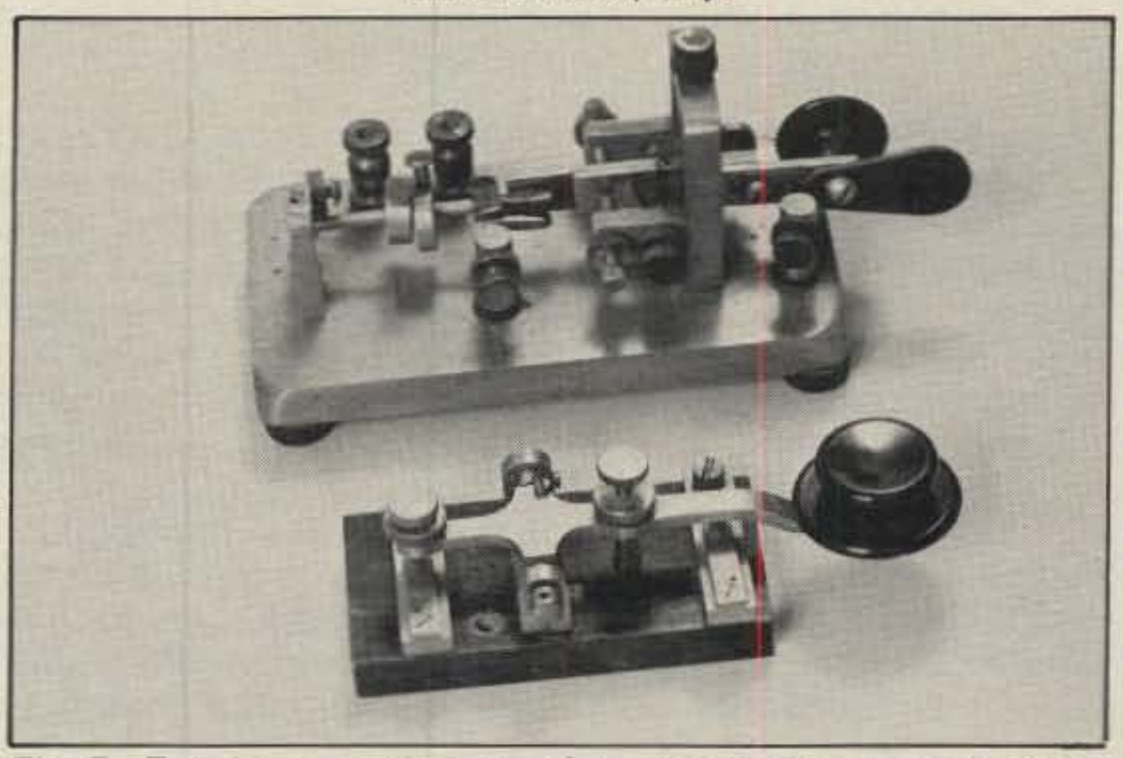


Fig. 5– Two homemade keys of past eras. The upper key features a flat nickle base and was made by W2CFX. The bottom key was made by William Griffith.

Figure 2. Close-up view of the MAC-KEY's label recognizing McElroy as the World's Champion Radio Telegrapher and revealing early serial number of K5RW's classic item. This brings us to the point of briefly discussing the man himself—a legend in the world of Morse and CW.

Ted McElroy was born and raised in the Boston area, and he learned to type a phenomenal 150 words per minute while in the seventh grade of school. He began working the wires of Western Union's telegraph at age 15, and he was widely known as the world's champion radio telegrapher during the 1920s and 1930s. During 1922 McElroy entered his first code competition and zapped all challengers with a copying speed of 56 words per minute. He was beaten in 1934, but regained the championship title in 1935. Beyond that point, the man was untouchable. During the last official competition in 1939 at Asheville, North Carolina, McElroy won a speed of 77 words per minute. His record remains unchallenged to this date.

During the late 1930s McElroy toured the country giving code-copying demonstrations. He loved an audience and thrived on the attention. One of his popular stints was stopping in the middle of a high-speed run to drink a glass of water, then resuming copy without missing any text. What a blast that must have been!

McElroy began his own business of manufacturing telegraph equipment in 1934. During World War II Ted's organization produced more telegraph gear for the government than any other company. They finished contracts ahead of schedule and received the Army-Navy "E" Award for Excellence. McElroy rewarded his "gang" with jam sessions and parties—another trend that's fading in the annals of time. McElroy sold his company and went into semi-retirement during 1955. He passed away in Boston in 1963. All of the MAC-KEYs were quality instruments, and we hear that many are still used today (here's hoping someone will remember us when one of those classic keys is retired!).

Figure 3. Here are two finely crafted hand keys with rather interesting backgrounds. The key at the top in the photo is a McElroy item manufactured on a teardrop base prior to World War II. This was one of four available models in the price range of $1.20 to $2.25 each.

The key in the lower part of fig. 3 is a late era spark key manufactured by Signal Electric Company. Notice the large (⅜ inch diameter) silver contacts. You can almost visualize sparks shooting from this one as the operator's hair stands on end and the smell of ozone fills the air.

Figure 4. The key in the upper part of this picture is a "Go Devil" made by Al H. Emory in Poughkeepsie, New York during the mid-1930s (bug with little oval-shaped label). Approximately 400 of these keys were made. There's something about this bug that really captures my interest (*K4TWJ*). Maybe its trim design or smaller size reminds me of the classic Vibroplex Blue Racer. Judging by that single small weight on the pendulum's bar, I would surmise it truly lives up to its name. Bugs are usually "slowed down" by adding weight to their pendulum bar or extending their mainspring (that's the vibrating metal piece).

The key in the lower part of fig. 4 was made by the Signal Electric Company between the late 1920s and 1930s and was called the "Sematic." It can be used as a bug or sideswiper by locking or unlocking the pendulum. Notice the two sets of contacts nearest the handle; the "extra set" is sideswiper con-

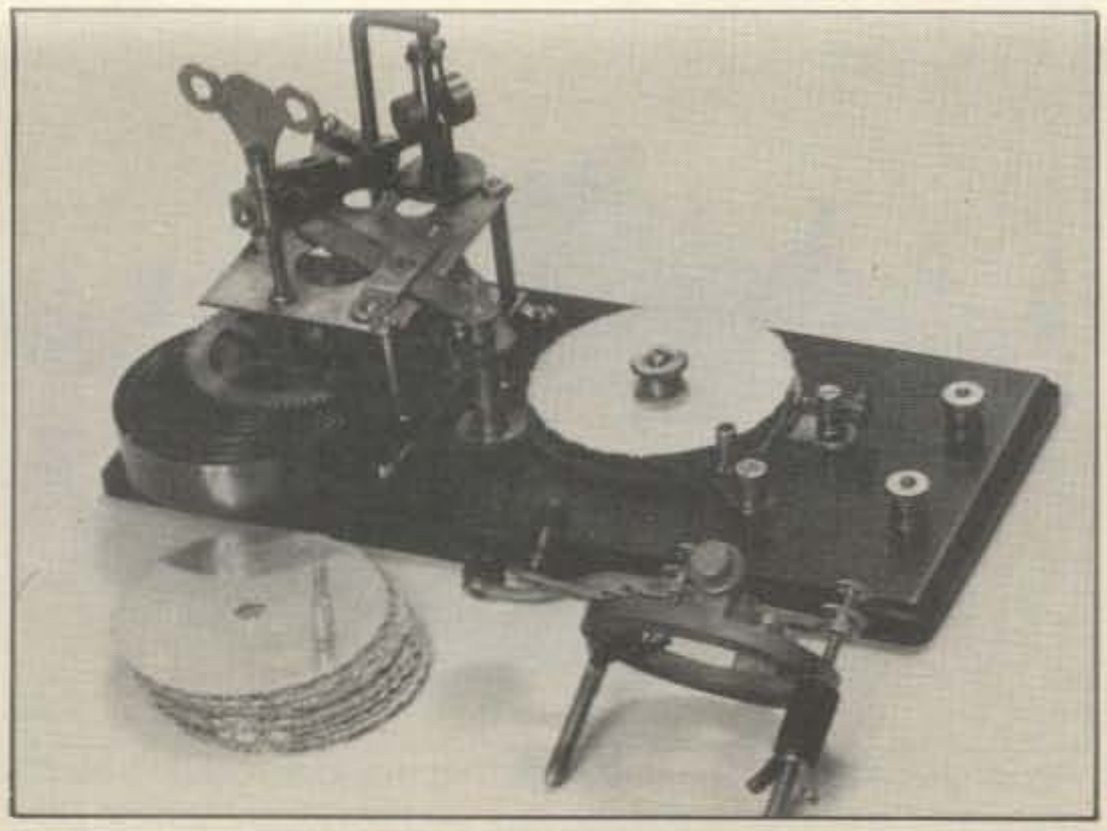


Fig. 6– The Omnigraph—a windup code trainer which realized widespread popularity during the teens and 1920s. The hand key in the foreground is an historical item from RCA's longwave wireless station is New Jersey.

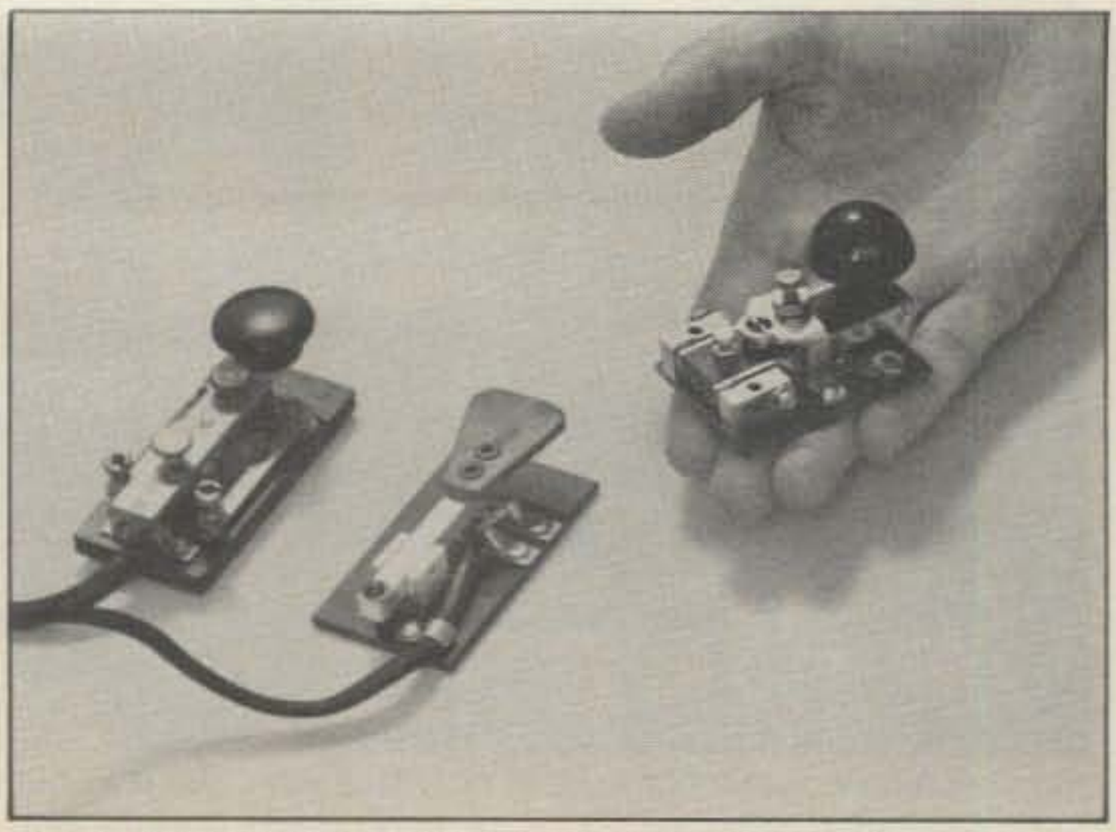


Fig. 7– A trio of miniature keys capable of surprisingly good operation. On the left is a Dutch lifeboat key, in the middle is a smoke Juniper key, and the gem on the right was used by English and Canadian services with portable radios.

tacts. Say you're fairly new in amateur radio and haven't heard of a sideswiper key? Relax. Many amateurs are in the same situation. A sideswiper differs from a bug in that a vibrating mainspring isn't included for automatic dot generation. It's a form of "sideways key" with make/break contacts on each side, like a modern keyer paddle. Some operators made "Hs" by tapping the left side four times; some alternately tapped the left and right sides twice each. Using a key like that took some getting use to, eh?

Figure 5. A surprising number of keys were homemade during past times, and here are two classic examples of that craftsmanship. The bug at the top in the photo was made by W2CFX during 1936, when he was an apprentice jeweler. Notice the flat nickle finish on the base and major parts; this was a popular finish on jewelry during that period.

The key in the lower part of fig. 5 is a simple hand key made by William Griffith, who worked in the Portsmouth Naval Shipyard. The key reveals quality machine work, and Neal comments that it's one of the finest hand keys he's ever used.

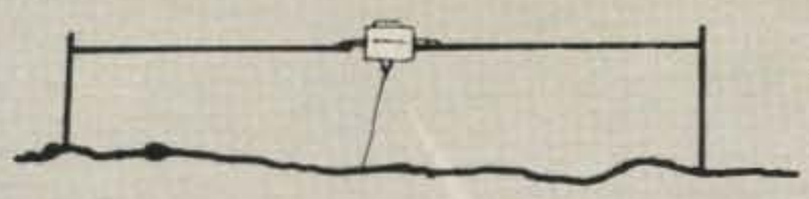
Figure 6. This is an early version of the "Omnigraph": a code training instrument used by individuals, the military, and licensing examiners between 1902 and 1920. A windup clockwork drive, which bears a striking resemblance to those in music boxes, turns a central wheel or turntable. An aluminum disk which has notches cut along its outer edge representing dots and dashes is secured to the turntable, and a little arm follows the notches while making and breaking a set of contact points. The person studying code would then connect a buzzer setup in series with the contacts. The Omnigraph shown dates between 1905 and 1910. Later versions permitted stacking up to 15 discs, and the tooth/space following arm would "track" for longer operating times. Incidentally, a brief review and cover photo of the classic Omnigraph was featured in February 1981 *CQ* magazine.

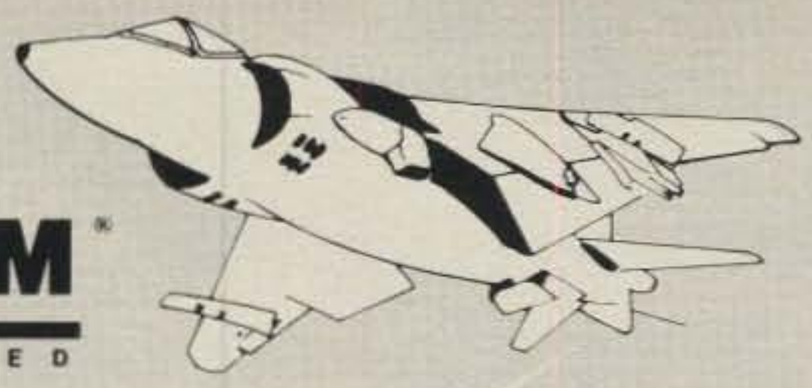
The key in front of the Omnigraph is a standard Bunnell key of historical interest. This key came from the Rocky Point Riverhead RCA longwave wireless station in New Jersey. It saw many years of service on their famed "Pony Wire."

Figure 7. This is a trio which Neal calls the "little keys." The small key on the left side came from a lifeboat setup used on a Dutch freighter. The middle key (one with phenolic handle) is a U.S. Forest Service smoke jumper's key. It was used by firefighting paratroopers equipped with backpack radios before World War II. The key on the right was used with portable radios during the war years by the English and Canadians. Due to their general use with small communications sets, each of these items acquired the informal designation of "Spy Keys." Their design was also often attractive for leg-strap use in armored vehicles or airplanes.

Fig. 8– The first showcase of K5RW's key collection. There are an Omnigraph and 50 amp Navy key on top, and some recognizable and unusual items inside.

Figures 8, 9, 10. Our mini-tour winds down with full views of the showcase housing K5RW's outstanding collection. Beautiful aren't they? An extensive amount of printed information and historical documentation is also included, although not readily visible in the photos. These listings and factual materials are continually updated, which makes Neal's research into the Golden Age of Communications an ongoing activity. The search for new keys, bugs, and related instruments is endless. Neal's goal is to have one of every key manufactured, complete with documentation. Stated in Neal's own words, "There is so much to be learned, so much interesting history, and so many instruments to be rescued from oblivion, that I plan to





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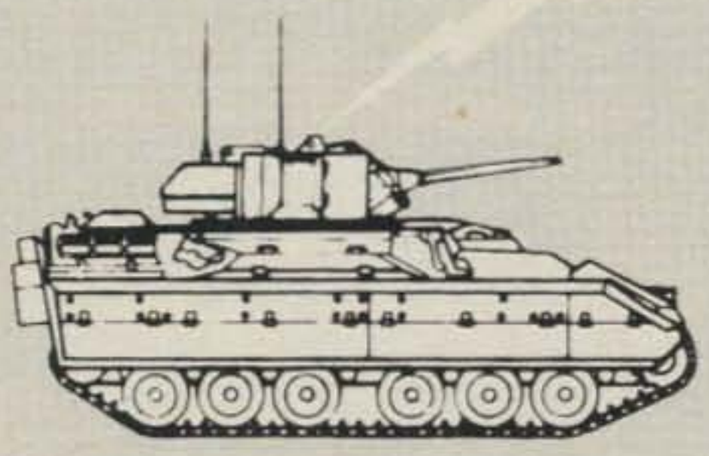

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Fig. 9– The second K5RW showcase—a heartwarming mass of beautiful bugs.

Fig. 10– The third showcase of immaculately preserved bugs. Notice that each has its own documentation. Doesn't this rekindle your CW interest?

continue present activities as a lifetime avocation." Looking at the twinkling reflections from keys in the showcases, Neil continues: "It's unfortunate the keys in my museum can't talk. What stories they could tell. How many sent messages that saved lives? One might tell us about trans-oceanic DX with a TGTP rig it keyed. Another might tell about train wrecks or torpedoed ships, or a message sent to a secret invasion force. Still another might tell us about the craftsman who made it or interesting stories of its owner.

Figure 11. A view of the workshop area where Neal refurbishes the keys in his collection. A vast number of spare parts are necessary for restoring some items. Occasionally, two or three identical model keys must be used to assemble a complete piece. Neal is just "getting into" duplicating paints and electroplating, but enthusiastically looks forward to guidance from others and ultimate success.

In conclusion, I (*K4TWJ*) would like to add a couple of personal thoughts. While key collecting is a highly rewarding pursuit which we heartily endorse, newer members in our amateur radio society may ponder the attraction and logic in actually using an "older style" bug on the air during this modern age of memory-equipped electronic keyers. Go ahead and enjoy one! There are a number of personally justified positive reasons among avid bug users, and they generally boil down to "beauty is in the eyes of the beholder." Why do some folks enjoy driving a classic older car, writing with old-style pens, or even setting up vintage radios for occasional operation when they could use "modern" equivalents. Maybe nostalgic interest and appreciation for diminishing qualities would start the list. Personally, I think they are an integral part of our proud heritage. If you're really not proficient in bug use, however, you're well advised to do your initial practicing off the air!

Fig. 11– The workshop area where Neal refurbishes keys. Often parts must be salvaged to assemble a like-new item.

Thanks once again to B. Neal McEwen, K5RW, and Joe Veras, N4QB, for making this mini-tour possible. If you have a question about the museum or keys (or if you would like to contribute an item!), Neal offers his assistance and invites you to write to him. Remember to include a large SASE. Better yet, Neal invites you to visit his museum. Visitors have come from as far away as Denmark and South Africa for the tour. The city of Richardson is the first suburb north of Dallas, Texas. An advance telephone call to K5RW (214-234-1653) or letter (1128 Midway, Richardson, Texas 75081) is the first step.

73, Dave, K4TWJ

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DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

In 1967 one of the first actions by the newly created *CQ* DX Awards Advisory Committee was the creation of a DX Hall of Fame to honor those very few DXers who had made major contributions to the world of DX. The 1967 Committee recommended no rigid guidelines for DX Hall of Fame qualification, preferring to leave future committees the flexibility to base their choices on a wide range of accomplishments. The sole benchmark was that the person's achievements should be described as "above and beyond any call of duty, made often at great personal sacrifice of time and resources with no thought of personal gain or recognition, and as having stood the test of time." As a result, those elected to the DX Hall of Fame have included great DXpedition operators, leading QSL Managers and DX writers, and others who have given fully of themselves and their time for DX. The first to be honored, on November 1, 1967, was Gus Browning, W4BPD, considered by many to be the world's greatest DXpedition operator. Gus operated from over 100 rare countries. The most recent inductee, February 25, 1984, was Rod Newkirk, W9BRD, who never missed a deadline as DX Editor for *QST* for 30 years.

This year the *CQ* Award's Advisory Committee followed a slightly new tack. Past members of the DX Hall of Fame were all very well known for their achievements at the time they were nominated. Generally, their names were "household words." However, the 1985 Committee said let's look back and honor some of those great individuals who made their mark in years past and whose names may be remembered only by their peers. As a result, we have elected two DXers to the Hall of Fame this year, one from the list of current actives and another whose contributions were made in the 1930s and 1940s. The currently active DXer is Ronald W. Wright, ZL1AMO, who just concluded a DXpedition to Tonga Island. The prominent DXer from time past is Herb Becker, W6QD, the father of WAZ and the monthly DX Column.

Ron Wright, ZL1AMO, was first suggested as a DX Hall of Fame nominee two years ago by several prominent DXers. His nomination was in the category of DXpedition planner and operator and was based on several years' activity in the Pacific area. The nomination described Ron as "an operator's operator," and as a "superb CW operator." His DXpeditions include VR6HI from Pitcairn Island in March and April of 1979, ZK1MB from South Cook Island in August 1979, H44RW from the Solomans in April and May 1980, ZK2EA from Niue Island, A35EA from Tonga Island, and 5W1CW from Western Samoa all in August and September 1980, ZL1AMO/C from Chatham Island in November and December 1980, ZL1AMO/LH from Lord Howe Island in July 1981, YJ8RW from the New Hebrides in November and December 1981, 3D2RW from Fiji in September 1982, ZK1CQ from the Northern Cook Islands in August 1979 and again in April 1982, ZK9RW from Niue in October 1983, ZL8AMO from Kermadec in March 1984,

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H. Dale Strieter, W4DQS
May 23, 1970

Stuart Meyer, W2GHK
Oct. 31, 1970

Martin Laine, OH2BH
Jan. 22, 1972

Ted Thorpe, ZL2AWJ, and
Chuck Swain, K7LMU
Aug. 6, 1972

C. J. (Joe) Hiller, W4OPM
March 30, 1973

Ernst Krenkel, RAEM
April 14, 1974

Frank Anzalone, W1WY
June 19, 1976

Lloyd Colvin, W6KG, and
Iris Colvin, W6QL
Nov. 12, 1976

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Eric A. Sjolund, SMØAGD
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Franz Langner, DJ9ZB
May 9, 1982

Dr. Sanford E. Hutson, K5YY
Jan. 22, 1983

Rodney H. Newkirk, W9BRD
Feb. 25, 1984

Ronald W. Wright, ZL1AMO
April 20, 1985

Herb Becker, W6QD
April 20, 1985

Ron Wright, ZL1AMO, center, was elected to the CQ DX Hall of Fame in 1985 in recognition of his outstanding achievements on the Pacific DX Trail. During the past six years Ron has organized major DXpeditions to Pitcairn, the South Cook Islands, the Soloman Islands, Niue, Tonga, Western Samoa, Chatham, Lord Howe Island, the New Hebrides, Fiji, the North Cook Islands, Kermadec, and Wallis Island. With Ron in the photo are Mr. and Mrs. Murph Ratteree, W4WMQ.

*Herb Becker, W6QD, is the tall man on the left. Herb is one of two prominent DXers elected to the prestigious CQ DX Hall of Fame in 1985. He received this honor for his many accomplishments in developing amateur radio awards and journalism. These accomplishments included writing the first purely DX column in a monthly magazine (*RADIO Magazine, *1935), introducing the WAZ Award (1936), and in the post World War II years initiating the CQ WW DX Contests.*

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1148	WA3HUP		

S.S.B.

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WPNX

225 ..... WD9BDW

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Mixed: 450 KX7J, WA3HUP, I4GHW. 500 KX7J, WA3HUP, I4GHW. 550 KX7J, WA3HUP, I4GHW. 600 KX7J, WA3HUP, I4GHW, K@HQW. 650 KX7J, WA3HUP, I4GHW. 700 WA3HUP. 750 WA3HUP, HB9BYZ. 800 WA3HUP, HB9BYZ. 850 WA3HUP, VE2PD, HB9BYZ, DF7QD. 900 WA3HUP. 1000 W9NO. 1050 WB4RUA, N4IB. 1100 WB4RUA. 1150 IT9QDS. 1200 IT9QDS. 1250 K4RDU. 1550 N7TT. 1600 N7TT. 1950 N4NO. 2000 N4NO. 2050 N4NO. 2100 N4NO. 2150 W4BQY. 2200 W4BQY.

S.S.B.: 350 HC2IX. 400 VE2JO, KM1I. 450 KM1I. 550 NB5C. 800 DK5WQ. 850 KK@L, VE2PD, N4IB, W6LQC. 900 KK@L, W6LQC. 950 W6LQC. 1000 W6LQC, NJ@C. 1050 W3ARK. 1100 W3ARK. 1250 I6NOA. 1300 N4NO, N7TT, WF4V. 1350 N4NO. 1400 N4NO. 1450 W4BQY, N4NO. 1500 N4NO, W4BQY. 1550 N4NO, WD8MGQ. 1600 WD8MGQ. 1700 VE7WJ. 1750 VE7WJ. 1800 VE7WJ. 1900 WA2HZR. 2150 I@AMU.
850 EA7AZJ. 900 K5RPC, EA7AZJ, XE1XF, W1NG. 950 WA@DCQ, K5RPC, W1NG, EA7AZJ, AC2J. 1000 EA7AZJ, W1NG. 1050 OE1PC, W1NG. 1100 W1NG. 1150 W1NG.

C.W.: 400 KA1CLV. 450 YU4ELI, KA1CLV. 500 PA3DBG, KA1CLV. 550 KA1CLV. 600 KA1CLV. 700 WA2CNF/1. 750 K2POF, PP2ZI. 800 OE1KJW. 850 DJ1YH. 900 AK9Z. 950 KA7T, W1OPJ. 1000 IS@FPH. 1050 IS@FPH. 1200 N7TT. 1250 N4YB. 1300 N4YB. 1350 N4YB. 1450 K8MFO. 1500 K8MFO. 1550 N4NO. 1600 N4NO. 1650 N4NO. 1700 W4BQY, N4NO. 1750 N4NO. 1800 N4NO.

VPX: 1400 . . . UB5-0683

Award of Excellence: SM@DJZ with 160 meter endorsement.

10 meters:	KA1CLV, IT9QDS, DK5WQ.
15 meters:	WD9BDW, OK2PO, KA1CLV, IT9QDS, DF7QD.
20 meters:	OK2PO, IT9QDS.
40 meters:	WA3GNW, IT9QDS.
80 meters:	IT9QDS, KB9BYZ.
Asia:	IT9QDS.
Africa:	I6NOA, IT9QDS.
No. America:	KA1CLV, IT9QDS.
Europe:	OK2PO, KA1CLV, IT9QDS.
Oceania:	OK1KYS.

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.

ZL7AMO from Chatham in May 1984, FW@BX from Wallis Island in October 1984, and Tonga Island again this year.

By profession, Ron is a self-employed taxicab driver in Auckland, New Zealand. He and his wife, Jeanette, have one son, Glenn, and four daughters, Lisa, Karen, Terri, and Jeannie. As we write this column in early March, Ron is enroute to Tonga to operate as A35EA for three weeks. He plans a 160 through 10 meter operation with 80% of his time on CW.

Many U.S. DXers met Ron personally and enjoyed a DXer who runs CW at 25–35 words per minute without writing anything on paper, talks while receiving, and prefers to operate with his shoes off. (Literally, this has nothing to do with the so-called "barefoot" operations without a linear.) Hosts are urged to have plenty of ashtrays, tea, and lemon meringue pie.

The second DXer elected to the Hall of Fame this year, Herb Becker, W6QD, is a man whose name was legend to DXers of the World War II era. His *tremendous* achievements include writing the first pure DX column ever written for a monthly magazine, and jointly with Larry LeKashman, W2IOP, fathering both the WAZ Award *and* the *CQ* World-Wide DX Contests.

Herb Becker's first column, entitled simply "DX," appeared in the October 1935 issue of *RADIO* magazine several months in advance of the first DX column in *QST* written by By Goodman. Herb Becker and By Goodman worked very closely with regard to what was considered a country and what was not considered a country.

WAZ was first announced in the February 1936 issue of *RADIO*, with the first listing later this year. The name of the column was changed to *DX and Overseas News*, until in October 1940, with DX going down the drain as World War II spread, Herb changed the name of the column to *X-DX and Overseas News*. It appeared under that title until October 1941, when it was discontinued.

Herb recalls that his last contact before Pearl Harbor was with W9VOX on November 30, 1941. He planned to move to a new house two days later and build an ideal station, but on the morning of December 7, 1941, as W6VB was helping him take down his four 74 foot poles, the neighbor's radio began blasting out the news of Pearl Harbor, which ended amateur radio until 1946.

In the meantime, *RADIO* was sold to Sandy Cowan, and the name was changed to *CQ*. Larry LeKashman became the editor, and Heb Becker's DX column resumed in the April 1946 issue. Herb finally relinquished the column to Dick Spenceley, KV4AA, in 1952, as business pressures no longer left him the time to write.

Herb recalls that the *CQ* World-Wide DX Contests came into being because the ARRL Test at that time was a nine-day affair, and many DX and contest enthusiasts wanted something less time-consuming.

More about the early days of WAZ and the *CQ* World-Wide DX Contests in a later issue. Congratulations to Herb Becker, W6QD, and Ron Wright, ZL1AMO, DX Hall of Fame!

De Extra

In the December 1984 DX column, *De Extra* discussed the importance of the *CQ* World-Wide DX Contests to a new DXer anxious to increase his count of zones, prefixes, and countries, and offered comment on suggested changes in the scoring system for these contests. Opinions from our readers were requested. Today's *De Extra* carries the views of two very active contest operators located in geographically dissimilar spots with opposing types of propagation: Joel, KG6DX, in the western Pacific, and Siggi, TF3CW, in the far north Atlantic.

De KG6DX: "I think we should leave the *CQ* World-Wide Contest scoring system just as it is. If people want a different system, it should be tried out in an entirely new contest. The *CQ* World-Wide is the olympics of amateur radio contesting. Let's keep this great tradition as it is. There are records for each continent, and I think that makes people equally competitive. You against your own continent and you against the world, two contests in one. Perhaps you could give more of a breakdown in the results. You list the top scores in each category, but you could also list them by continent and show the top 10 in each category and top 5 on each continent in each category. At present you only do this for the U.S. stations.

"All in all, I think a serious contester can find a contest some time during the year when the conditions, type of contest (WAE, VK-ZL Oceania, All Asia, Sweepstakes, Sprint, Can-Am, etc.), and the band it may be on will give him an edge on the rest of the world. For instance, you would be hard pressed to beat me in the All Asia Contest and I couldn't touch you in a Sweepstakes.

The WAZ Program

10 Meter Phone

296 ..... DF4TD

15 Meter Phone

213	K@ZZ	214	JA7OOO

20 Meter Phone

525	JR6PGB	526	N6VO
527	LZ1HA	528	I1TLJ

80 Meter Phone

28 ..... K@ZZ

All Band WAZ

S.S.B.

2937	YU2EZA	2940	IK1BOD
2938	K6CZN	2941	N3ARV
2939	3A2LF		

C.W. and Phone

5854	OK2BVX	5859	K9DDO
5855	W8CVU	5860	JA4DBV
5856	OE1TKW	5861	JH7QXL
5857	JJ1KXM	5862	JA8BKI
5858	JA1MS		

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 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.

5 Band WAZ

Standings as of March 1, 1985

All 200 zones worked:

1. ON4UN	32. SM5AQD	63. HB9AMO
2. K4MQG	33. W0MLY	64. LA6OT
3. SM4CAN	34. I0RIZ	65. UR2QD
4. AA6AA	35. ON5NT	66. UK2RDX
5. W8AH	36. OH6JW	67. ZS5LB
6. W6KUT	37. OK1AWZ	68. F6DZU
7. EA8AK	38. IV3PRK	69. DL4YAH
8. LA7JO	39. DJ6RX	70. LA7ZO
9. EA3SF	40. OH3YI	71. W9ZR
10. OH1XX	41. I4RYC	72. W1NG
11. EA8OZ	42. ZL1BIL	73. VK9NS
12. W0SD	43. I4EAT	74. N4KG
13. K0ZZ	44. ZL1BQD	75. YU7DX
14. ON6OS	45. TG9NX	76. DL8MAG
15. OK3TCA	46. XE1J	77. OK3DG
16. K6SSS	47. F5VU	78. ZL1BOQ
17. ZL3GQ	48. W3AP	79. EA9IE
18. OK3CGP	49. YO3AC	80. DL7HZ
19. SM0AJU	50. K3TW	81. DJ9RQ
20. OZ3PZ	51. XE1OX	82. EA5SP
21. I3MAU	52. VE7IG	83. EA2IA
22. I2ZGC	53. OK1ADM	84. SP3BQD
23. 4Z4DX	54. CT1FL	85. LZ1NG
24. N4KE	55. WA1AER	86. N4JF
25. K5UR	56. N4RR	87. CT2AK
26. K9AJ	57. UW0MF	88. HB9CIP
27. SM3EVR	58. W4DR	89. OK1MG
28. LA5YJ	59. OK1MP	90. CT1BD
29. DL3RK	60. W1NW	91. VK6HD
30. N4WJ	61. OE1ZJ	92. EA6ET
31. G3MCS	62. HB9AHL	

The top 13 contenders for 5 Band WAZ:

1. DK5AD, 199	8. W6GO, 198
2. JA3EMU, 199	9. K4CEB, 198
3. N4WW, 199	10. W2YY, 198
4. EA8XS, 199	11. SM5AKT, 198
5. K6YRA, 199	12. G3GIQ, 198
6. W8UVZ, 199	13. CT3BM, 198
7. LA9GV, 198	

305 Stations have attained the 150 zone level

"In 1980, at the peak of the sunspot cycle, I took the world in the ARRL 10 Meter Contest, even beating N7DD and KH6XX, Hi Hi! However, I couldn't do it today, as I can't even hear the stateside multipliers. During the sunspot peak, 10 meters is open 24 hours a day out here and I have that edge over the rest of the guys. The point is that everyone has a time and contest in which they have the edge; they just have to find it and go for it."

De TF3CW: "Your column in December *CQ* certainly caught my attention. I have often worried about the inequity when North American stations get two points for contacts with each other, but European stations get only one point for QSOs within their own continent. This situation is exceptionally bad here in Iceland, as activity is not high either from our country, or, for that matter, from all of Zone 40. Thus, when a TF station appears in the test it is in great demand for the two multipliers, country and zone. Because of the many stations taking part from

Italian amateur Brizzi Nicola, I6NNJ, is a new WAZ certificate holder. He is 28 years old and has been licensed since February 1980. WAZ was earned using a Drake line to a two-element quad. His most difficult zones were 12, 19, and 31.

Europe, we are forced to run one point QSOs for hours on end, long after we have exhausted all the European multipliers. At this latitude, propagation is such that you run Europe for hours or nothing at all.

"I feel you should change the system. I favor the proposal suggested by some prominent European contesters—namely, zero points for your own country and three points for all other countries, including the countries in your own zone. That would leave us all equal point-wise at the start and would be a positive step in bettering the world's greatest contest, the *CQ* World-Wide.

"TF has been drastically affected by the decline of Cycle 21. During the 1984 *CQ* World-Wide, 10 meters was closed for both weekends (it isn't expected to open again for several years), 15 meters had very few signals, weak and far between and no U.S., 20 meters was fair but closed during the night from 2000 GMT to 0900 GMT, while 40 and 80 meters were also fair but difficult into the U.S. and impossible to JA or to VK/ZL.

"These are the cold facts, and thus I am already planning for 1986 to operate from either Gibraltar or the Gambia. As Hugh says, 'The DX is greatest where the sun is brightest.'"

Thanks to Siggi and Joel for two very interesting, though different, opinions. The debate goes on, and we are looking forward to the Contest Forum at Fresno.

What do *you* think?

How To Become A Better Dxer

In *Totem Tabloid*, K7ZR advises that "the secret of becoming a DXer is to never stop becoming a DXer. Read the DX columns and DXpedition articles in the magazines. Read the DX bulletins. Learn world geography and a little about history and politics. Once at a DX convention I heard someone respond to a speaker saying, 'I didn't come here to go to school.' Obviously, he didn't feel he had anything left to learn. Listen to the club reporter and the DX nets. Listen, listen, listen on the bands. Most of all, *work DX*, even G's, JA's, and other populous countries. Many of us have spent 20 or 30 years or more becoming DXers, and we aren't there yet."

This is good advice. K7ZR says it well. The complete DXer does all of the above. He subscribes to *all* the QSL Manager lists, he takes at least one DX bulletin, preferably more, he reads all the DX columns, and he listens, listens, listens, and listens some more—*K4IIF*.

Some Rare Prefixes

A99—Station A99A was active from the Middle East Communications Exhibition. QSL to the A9 bureau.

CG—The special prefix CG3 was used in Canada February 17–24 to celebrate the anniversary of the Girl Guides movement in Canada.

CT0—CT0BI was an operation from Berlenga Island March 29 to April 11. QSL to CT4UW. Berlenga counts as Portugal for country awards.

EM, EO, EU, EV & EW—These prefixes were used by Soviet stations to commemorate victory in World War II.

HW—This was a special prefix used by blind French amateurs. HW3 was substituted for FC, HW4 for FD, and HW5 for FE.

HI0—In March 1985, stations in the Dominican Republic used the HI0 prefix in place of the normal HI8.

VI3—Australian amateurs have been permitted to use the VI3 prefix, instead of VK3, to celebrate Victoria's 150th anniversary.

ZL0—This prefix is reserved for visitors to New Zealand. ZL0AAA was Otto, W5YU.

ZC4—The British Soverign Bases on Cyprus use the ZC4 prefix and count separately from 5B4 for country awards.

4J5—4J5JYS was a special operation from the Ukraine to celebrate the 40th anniversary of the Joint Yalta Conference, February 3–11, 1945.

160 Meters—USSR

Stations in the USSR are not authorized to use the frequencies 1830–1930 kHz on a secondary basis. Mode segments are as follows: 1830–1860, CW only; 1860–1900 kHz, CW and LSB; 1900–1930 kHz, CW, AM, and LSB. (Thanks *QRZ DX*).

From The Mailbag

De Glynn B. Burhouse, ZC4CZ: "As ZC4 has been given separate country status, here is a report on the British Sovereign Bases here in Cyprus.

"Presently there are 25 ZC4 calls, including the two club stations, ZC4EPI in the Western Base and ZC4ESB in the Eastern Base. Of these 25, about 10 are active and only 5 could be called very active, including ZC4WW and myself. At least four licensees will be leaving soon, so we will be even more rare. Only 3 of the 10 active stations regularly use CW; I use

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

2715	F9RM	1727	N2AC	1291	K8LJG	1040	N4IB	837	VE2FOU
2690	YU2DX	1726	YU1DZ	1282	N6JM	1018	G4FAM	829	VE5ADA
2647	YU1HA	1699	SM7TV	1250	N4NX	1017	K2QF	827	PY1DFF
2433	K6JG	1689	I2PHN	1245	WA8YTM	1008	WD9IIC	801	YU1OHF
2305	K2VV	1677	I8YRK	1240	N6AW	1003	N3ED	754	I@AOF
2277	K6XP	1660	YU7AW	1226	W7CB	999	KS7T	752	JH4UVU
2237	VE3GCO	1648	W8CNL	1212	PY4OD	999	G3ZRH	745	KX1A
2109	N4MM	1603	I6SF	1207	NN4Q	994	YU2CBK	742	JH8NYK
2100	W4BQY	1577	K9BG	1200	KL7AF	980	K2POF	741	DF6EX
2082	W9DWQ	1542	W@SFU	1200	N5TV	971	N8BJQ	739	NE6I
2046	N4NO	1536	W1NG	1194	JH1VRQ	955	N3RL	707	OE1KJW
1951	YU7BCD	1501	KF2O	1187	EA9IE	933	N2AIF	701	K8HF
1905	N6CW	1491	WA1JMP	1164	CT1LN	922	W6YMH	662	K9LJN
1875	N4UU	1467	K6ZDL	1146	YU7AJD	913	AI6Z	657	ND6U
1855	N6JV	1464	EA2IA	1140	I2MQP	910	YU1SZ	630	WI4K
1840	N9AF	1444	IN3ANE	1126	YU4YA	905	W@JIE	622	KN1J
1837	K5UR	1401	K6DT	1125	LA7JO	876	VE2PD	619	JA6GWU
1815	PA@SNG	1338	SM6DHU	1116	WB8ZRL	860	WD4RAF	605	W9PWM
1801	YU7BPQ	1330	YU7KV	1095	KA3A	858	K7CU	600	N3KR
1790	YU2TW	1311	W9NUF	1070	YU2CQ	853	AI8S		

S.S.B.

2632	F9RM	1588	PA@SNG	1208	WB2NYM	946	I1POR	748	N3ED
2316	I@ZV	1578	YU7BCD	1167	W1NG	944	AC2J	747	N3RL
2088	K6JG	1561	K5UR	1153	WA4OIB	933	K5RPC	736	K3IXD
2074	I@AMU	1534	N4NO	1131	W2CC	908	WB6GFJ	712	PY4VX
2026	K6XP	1524	W9DWQ	1108	ZP5RS	903	XE1XF	707	WB6SRK
2016	ZL3NS	1495	I6ZJC	1103	W3ARK	902	KC8YM	699	EA7AZJ
1994	K2POA	1481	W4BQY	1100	G4CHP	900	K8LJG	693	ON6IT
1968	K2VV	1396	YU7AW	1048	I8KCI	895	WA2FKF	690	WO4L
1895	N4MM	1383	N4UU	1029	EA2IA	858	VE2PD	667	JH5FQO
1706	W@YDB	1380	N2SS	1028	JH1VRQ	850	N4IB	663	KB@C
1690	OZ5EV	1348	VE1YX	1013	N4NX	846	W3GXK	661	K8ZZU
1684	CT1UA	1341	WA4QMQ	1008	I1HAG	845	WA@DCQ	650	W6YMH
1678	HB9AAA	1299	WF4V	1003	N2AC	810	I@SGF	649	KK5P
1653	I2PHN	1271	I6NOA	1000	N5TV	801	CT4UW	649	IK5ACO
1646	I8YRK	1248	KF2O	994	KL7AF	795	PY4OD	617	WI4K
1646	I8KDB	1241	CT1FL	992	W9NUF	787	W@ULU	610	VO1AW
1634	I@MBX	1234	PY3BXW	958	WB8ZRL	787	W2XQ	600	W7KWI
1600	WD8MGQ	1222	CT4NH	956	NN4Q	759	CT1BY		

C.W.

1860	WA2HZR	1568	G2GM	1278	4X4FU	921	K8LJG	741	EA1JO
1850	DL1QT	1544	N4UU	1239	N4YB	918	IT9VDQ	732	JA5SIX
1841	K2VV	1513	N2AC	1162	K6ZDL	900	N5TV	723	YU2CQ
1817	W8KPL	1500	VE7CNE	1148	EA2IA	897	KL7AF	708	YK1AO
1799	K6JG	1452	N4MM	1117	I2DMK	841	DJ1YH	700	VE2FOU
1795	N4NO	1445	K5UR	1107	JA1KRU	827	NN4Q	687	G4FAM
1794	N6JV	1442	YU7SF	1092	W4WJ	813	JH1VRQ	655	SM5DAC
1700	K6XP	1372	I6SF	1032	I1YRL	781	N3ED	652	OE1KJW
1670	W9DWQ	1345	VO1AW	1011	W1NG	767	WD9IIC	633	W2XQ
1655	W4BQY	1305	LZ1XL	1000	KF2O	755	N4NX	616	VE1ACK
1643	W3ARK	1298	YU3NP	990	PY4OD	750	AI6Z	601	F6HKD
1638	ON4QX	1294	K9QVB	945	KA7T	748	AK2H	600	W6YMH
1573	YU7BCD	1292	YU7AW	929	W9NUF	748	N2AIF	600	N3RL

it 95% of the time. If stateside stations would like a sked, I will be happy to oblige. Write to me via my call to JSB, BFPO 53, c/o General Post Office, London. I prefer CW skeds, but can come up on SSB if needed. In addition, ZC4ESB will be on RTTY.

"Station equipment at ZC4ESB is a Yaesu FT-107 to a homebrew 3-element, triband Yagi up 15 meters. Equipment at home is a TS-830S and an 80 meter dipole, open-wire feed through a Z match. Maximum permissible output here is 100 watts. We have the privileges of the WARC bands here, and I am regularly on 30 meters. My QSL Manager is G4MGQ/G8MWS.

"I hope this information is useful. We have been a regular subscriber for three years. *CQ* is a great magazine."

De Wm Richardson, VY1CW, and K. Carter, VY1CC: "Please note that Yukon has been VY1 for the past seven years. We have no political association with the Northwest Territories, VE8. It is very discouraging for us to make a point of being on in the various contests for the sake of giving out multipliers or the zone with no chance of winning due to the poor propagation at this latitude. It is even more discouraging to have people not even know where we are. The ARRL even sends our *QSTs* with YV1 instead of VY1, and various DX nets put us with South America for lists. We have two active and two semiactive stations now, and we are VY1, not VE8."

De Bill Gurkin, N4AVV: "In reply to your March 'De Extra' on a code of practice for lists and nets, under *NO* circum-

CQ DX Awards Program

S.S.B.

1397	I4GHW	1402	JA0SU
1398	NP4FR	1403	KC2RS
1399	KB0VM	1404	WS4R
1400	OH1DG	1405	KX8N
1401	WB3GPR	1406	W6FCF

C.W.

628	OK2BVX	629	W0JLC

S.S.B. Endorsements

310	W4UG/316	275	W6NLG/299
310	4Z4DX/315	275	WB3DNA/299
310	VE2WY/314	275	WB3GPR/296
310	W4DPS/314	275	W6MFC/291
310	I2LLD/312	275	W9NUF/284
310	VE7WJ/312	275	KX5V/279
310	W0YDB/312	275	W9OKL/279
310	K9BWQ/310	250	WB3DWH/268
310	W8ILC/310	250	KC2RS/260
300	K1UO/309	150	OH1DG/158
300	G4CHP/305	150	G4MBT/150
28 MHz	KC2RS	Mobile	W6FCF
28 MHz	W8ILC	3.5/7 MHz	W8ILC
1.8 MHz	W8ILC		

C.W. Endorsements

310	K6LEB/313	28 MHz	OK2BVX
275	W0JLC/263	150	K9DDO/154
275	W9NUF/272		

Total number of active countries is 315. 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. Please make all checks payable to the awards manager.

stances are DX lists or nets a good operating practice. *NO* contact made via lists or nets is free from the taint of at least part of the necessary information having been passed by other than the primary operator. *CQ* and the ARRL should highly discourage this type of operation."

De John Parrott W4FRU: "Just a note of comment on your March '85 'De Extra' item. DX lists and net operation are not new. They are only an extension of the courtesies of days gone by when hams helped hams work a new or rare country. The lists and nets are only a refinement of this practice, and I think that recognition by the IARU of this method of working DX

Here are three prominent members of the Carolina DX Association. Left to right are Gary Dixon, K4MQG, second winner of the coveted 5-Band WAZ; Ted Goldthorpe, WA4VCC, President of the Carolina DX Association and Vice President of Marketing for Shoney's Restaurants; and last, but not least, Rick Porter, AA4SC. Ted recently qualified for 40 meter Single Band WAZ #29.

may cool the element among us who oppose it.

"I strongly support the Code of Practice as set forth by the IARU Region I, HF working group. I believe the IARU should be encouraged to adapt this Code of Practice as a guide to ethical conduct of a type of operation which has become routine around the world.

"Just a casual observation—it seems like Region I is the only active region in the IARU. Their proposed band plan for the new WARC frequencies is excellent. Maybe Baldwin should stir up some activity in Region II."

DX Club Officers

It has been *CQ*'s policy for many years to list DX club officers. We feel that they deserve recognition for their efforts to further DX, and it is also useful in promoting contacts between DX clubs. Here are the results of some recent club elections.

Carolina DX Association: Ted Goldthorpe, WA4VCC, President; Robert Denton, KF4NO, Vice-President; Gary Bader, KD4RH, Secretary/Treasurer; Jack Lennox, WB4GCB, Net Manager; and Murf Ratterree, W4WMQ, Bulletin Editor. The "Carolina DX Association Bulletin" lists local sunrise and sunset times for various areas of the world each month. To our knowledge, this service is not available in any other club bulletin.

Central Arizona DX Association: Hal Beebe, W9RY, President; Dave Hollander, N7RK, Vice-President; Ed Cunningham, NF7S, Secretary; and Jim McDonald, N7US, Treasurer.

Kansas City DX Club: John Chass, W0JLC, President; Larry Wilson, K0RWL, Vice-President; Steve Gecewicz, K0CS, Secretary; and Tom Bishop, K0TLM, Treasurer.

Mile High DX Association: Burt Myer, W0RLX, President; Bob Sherwood, NC0B, Vice President; and Jim Griffiths, KB3EI, Secretary/Treasurer.

National Capitol DX Association: Stu Meyer, W2GHK and DX Hall of Fame, President; Larry Kettlewell, W3HHG, Vice-President; Bob Chapman, WB4FTU, Secretary; and Henry Herman, W3UJ, Treasurer.

Northern California DX Foundation: John Troster, W6ISQ, President; Bob Ferrero, W6RJ, Vice-President; Jim Maxwell, W6CF, Secretary; and Ernest ZumBrunnen, WB6UOM, Treasurer. Directors are Bud Bane, W6WB; Dave Bell, W6AQ; Rusty Epps, W6OAT; Stan Kaisel, K6UD; Dave Leeson, W6QMS; Merle Parten, K6DC; and Cam Pierce, K6RU.

North Florida Amateur Radio Society: Billy Williams, N4UF, President; Pete Nissen, W4PTT, Vice-President and DX Editor of "The Balanced Modulator"; Bob Gillespie, N4JFQ, Secretary; and Tom Crompton, WB4STB, Treasurer.

Southeast Michigan DX Association: Ted Drake, W8JBI, President; George Goldstone, W8AP, Vice-President; Elmer Priebe, KK8E, Secretary; and Don Patterson, N8AFV, Treasurer.

Western Washington DX Club: John Gohndrone, N7TT, President; Tad Cook, KT7H, Vice-President; Jack Wichels, W7YF, Secretary; and Don Walter, W7NG, Treasurer. Jack Bock, K7ZR, continues his fantastic job as editor of "Totem Tabloid," and Trustees are KB7WD, NA7O, KM7E, KR7G, K7HBN, and KE7V.

Congratulations, fellows, and have a good term!

Operating Aids For The DXer

DX'Press from the Netherlands reports two new QSL Manager listings. Lars, SM5CAK, has a new list for 1985 with issues published monthly. It is said to be the most complete QSL Managers list available. For further information, contact Lars E. Bohm, Stora Angesby, S-59190 Motala, Sweden. The second new list is by JH1HWN and includes over 7000 DX stations. You can order it by sending 9 IRCs to Hiromichi Katsurashima, JH1HWN, 5-2236-33 Iriya, Zama City, Kanagawa, Japan. He will send your list by airmail. Meanwhile, Jay and Jan O'Brien are still publishing their excellent

list available from P.O. Box 700, Rio Linda, CA 95673, and DL8BL offers 2005 QSL Managers for the period January–December 1984 for $5.00. His address is Arthur Maurer, Beim Weisenstein 9, 6602 Dudweiler, West Germany.

The *Table of Allocation of International Call Sign Series* is the official prefix reference issued by the International Telecommunications Union in Geneva. When you hear an unusual prefix, this table will help you pinpoint the country. It is reproduced on page 4 of both the Foreign and U.S. Callbooks for 1985. (Thanks *Totem Tabloid*).

Volume 4 of *DX Nets Around The World* is now available for 6 IRCs from Dieter Konrad, OE2DYL, Bessarabierstr. 39, A-5020, Salsberg, Austria. (Thanks *DXers Magazine*).

DX-MB/DX-NL

This venerable German DX Bulletin is now in its 32nd year. From 1954–1961 it was written by DL7AA, and since 1962 is has been written by DL3RK. *DX-NL* is an English-language translation of the German version, *DX-MB*. Is this the oldest continuously-published DX Bulletin in the world, or is there one older? Perhaps the *Long Island DX Bulletin* or *DX'Press* is older. DX historians, let us know.

Most Wanted Countries— A Japanese and French Perspective

DX'Press reports that the 10 most needed countries among French and Japanese DXers at the end of 1984 compared as follows.

Needed by JA's

1. Albania
2. Bouvet Island
3. South Yemen
4. Burma
5. San Felix Island
6. Libya
7. Yemen
8. United Arab Emirates
9. Andaman & Nicobar Islands
10. Sao Tome & Principe

Needed by F's

1. Albania
2. Bouvet Island
3. South Yemen
4. Vietnam
5. Burma
6. Andaman & Nicobar Islands
7. Spratly Island
8. Kingman Reef
9. Afghanistan
10. Clipperton Island

It is interesting to note that Albania, Bouvet, and South Yemen are tops on both lists, but in the second five geography becomes a major factor. The Japanese need the Middle Eastern countries such as 5A, 4W, and A6, while the French need the rare Pacific spots such as 1S, KH5K, and FO/Clipperton.

73, John, K4IIF

QSL Information

Gary Abercrombie, N8CQ, reports that he is *not* the QSL Manager for TA2CN and TA8CN, as was mistakenly published in the September 1984 issue. He has about 50 cards for these stations and needs to know where to forward them. Anyone with information, please contact him via the Callbook address.

A22ME to AK1E
AH2U to K9XR
C21DX to Box 29, Nauru, Oceania
C90A to WM4N
CE8AE to WA3HUP
CT2AK to W3HNK
CX7BY to WØIJN
DPØGVN to DJ4SO
EL2EF to KM8E
EL2FJ to JF2QHC
EM2C to UC1AWB
EU1Q to UQ2GWW
FG4CP to FG7BT
FM5WD to W3HNK
FOØXX to YASME Foundation, Box 2025, Castro Valley, CA 94546
FT8YB to F1FLN
HI8LC to W2KF
HP1XKR to JA7AGO
HS9FK to YU1HA (ex-YU4HA)
HV2OO to K2VV
IQ1RAI to I1XA
JD1AMA to W7EDA
JW6UDA to LA5NM
JY4MB to W4HYL
JY5CI to G4WFZ
K5LZO/KP5 (Desecheo Island) to K5LZO
KB3KM/TF to WD4BKK
KX6BU to Box 444, APO San Francisco, CA 96555
KX6DS to North Alabama DX Club, Box 4563, Huntsville, AL 35815
OE8NOK/ZL5 (Antarctica) to DJ4SO
OX3SG to LA5NM
SMØDQE/C9 to SM4CLR
T3OAT to G4GED
TI2BEV to W4ZD
TR8DM to F3CY
TR8AHO to DK1PO
VK9XJ to Box 138, Christmas Island, Australia
VK8AK to VK2DEJ
VK8GL to VK3YTU
VP2VEG to WØDVZ
VQ2DG to WA3HUP
VQ9YR to KA4SPA
XE1IF (1984 *CQ* Worldwide Contest) to XE1XF, Manual G. De Lera, CDA, De Fujiyama 17, Aguilas 01710, Mexico, D.F., Mexico
XF4MD to XE1MDX
YB3ATB to PAØLOU
Z21BQ to DJ5DA
ZC4MR to G4SDJ
ZD8JP to G3ATK
ZD8KM to G3IFB
ZD9CA to KA1DE
ZF2FK to K9QVB
ZS2MI to ZS6BCR
ZS3YJ to K6TQ
3D2ER to W5RBO
3X4EX to N4CID
5N2RTF to DK2IF
5R8AL to WA4VDE
5V2NG to WB4LFM
5X5GR to JA1HGY
5Z4ED to JH6FMU
6W1DY to VE4SK
6W1NQ to DL1HH
6Y5IC to KE3A
8P6MI to VE3JTQ
9M2FK to YU1HA (ex-YU4HA)
9Q5MA to K1VSK, 108 Great Road, N. Smithfield, RI 02895
9U5JB to ON5NT
9V1WC to DF2GP
9Y4VE to VE3GCO

Propagation

a monthly feature by

GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Solar activity continues to decline at a relatively steady rate. The Royal Observatory of Belgium reports a monthly mean sunspot number of 16.1 for February 1985. This results in a 12-month running smoothed number of 39 for August 1984. A smoothed number of 27 is forecast for this June. This means that DX propagation conditions on the *10, 15,* and *20* meter bands will be considerably *below* those experienced last summer when solar activity was in the high 40s. Conditions on the *40* and *80* meter bands are expected to be somewhat *better* than last summer.

Twenty meters looks like it will be the best band for DX during June. It should open shortly after sunrise and remain open for several hours in almost all directions. When propagation conditions are normal or better, chances are good for openings to Europe, Central and South America, the South Pacific, Australasia, and the Far East, before noon-time absorption sets in. A second, and stronger, peak is expected during the afternoon and early evening hours. During this time span good openings should be possible towards Europe and Africa, Central and South America, and towards the Middle East. Later in the evening, and until midnight, openings should peak towards South America, Antarctica, the South Pacific and Australasia, and the Far East. When conditions are somewhat better than normal, look for *20 meter* openings towards the south and to the Pacific and Oceania well past midnight.

Few, if any, DX openings are expected on *10 meters,* except to those areas of the Caribbean and Central America within the 1300 mile range of short-skip sporadic-*E* openings from the USA. An occasional longer opening into South America may be possible during the late afternoon hours. Except for sporadic-*E* openings within a 1300-mile radius, not much DX is expected on *15* meters either until after noon. During the afternoon hours the band should open towards Central and South America, with signals building up to very strong levels by the later afternoon.

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

Plenty of good short-skip openings are expected on the HF amateur bands during June. For distances less than 250 miles try *80 meters* during the day and *160 meters* at night. For openings between 250 and 750 miles, *40 meters* should be best during the day and *80 meters* at night. For openings beyond 750 miles, *20 meters* should be optimum during the day and *40 meters* at night.

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1985. Instructions for the use of this month's DX Charts appear elsewhere in this column. Short-Skip Charts for June for distances between 50 and 2300 miles and from Hawaii and Alaska appeared in last month's column.

10 Meter Beacons

Although not much DX activity is expected on the *10* meter band during the summer months, Table I, a list of beacon stations operating between 28.2 and 28.3 MHz, may provide a guide when and if the band should open in a specific direction. The list has been compiled by the Interna-

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for June 1985

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 9, 12, 23	A	A	B	C
High Normal: 3, 8, 11, 13, 15, 22, 27-28	A	B	C	C-D
Low Normal: 1-2, 4, 6-7, 10, 14, 16-17, 20-21, 24-25, 29-30	A-B	B-C	C-D	D-E
Below Normal: 5, 18, 26	B-C	C-D	D-E	E
Disturbed: 19	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, 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 good-to-fair (B-C) on June 1st and 2nd, good (B) on the 3rd, good-to-fair (B-C) on the 4th, fair-to-poor (C-D) on the 5th, etc.

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. 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 Propagation column for the actual *dates* on which an opening with specific propagation index is likely to occur, and the signal quality that can be expected.

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

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

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

June 15-August 15, 1985
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

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

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

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

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

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

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

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

Frequency (MHz)	Call	Location
28.2025	ZS5VHF	Natal, South Africa
28.205	DLØIGI	West Germany
28.2075	WD4HES	Englewood, Florida
28.2125	ZD9GI	Gough Island, South Africa
28.215	GB3SX	London, England
28.2175	VE2TEN	Quebec, Canada
28.220	5B4CY	Cyprus
28.2225	HG2BHA	Hungary
28.230	ZK2MHF	New Zealand
28.235	VP9BA	Hamilton, Bermuda
28.2375	LA5TEN	Norway
28.240	OA4CK	Lima, Peru
28.2475	ZS1CTB	Capetown, South Africa
28.2575	DKØTE	West Germany
28.260	VK5WI	Adelaide, Australia
28.262	VK2WI	New South Wales, Australia
28.270	ZS6PW	Transvaal, South Africa
28.2725	TU2ABJ	Ivory Coast
28.2775	DFØAAB	West Germany
28.280	YV5AYV	Caracas, Venezuela
28.285	VP8ADE	Adelaide Is, British Antarctica
28.290	VS6TEN	Hong Kong
28.295	VU6BCN	India

Table I– Beacon stations operating between 28.2 and 28.3 MHz.

tional Amateur Radio Union (IARU). Be sure to save this list, since it should be even more valuable during the fall and winter months when somewhat better chances for *10* meter DX openings are expected.

VHF Ionospheric Openings

Sporadic-*E* short-skip propagation should increase considerably during June, resulting in fairly frequent *6 meter* openings over a range of 1000 to 1400 miles. During periods of widespread ionization, two-hop *6 meter* openings may occasionally be possible up to about 2300 miles. An occasional *2 meter* short-skip opening, between approximately 1200 to 1400 miles, may also be possible during periods of intense sporadic-*E* ionization. Short-skip openings are most likely to occur between 10 a.m. and 2 p.m. and again between 6 and 10 p.m. local daylight time, although they can occur at other times as well. No major meteor showers are expected during June.

Check the Last Minute Forecast at the beginning of this column, since whatever auroral propagation that may be possible during June is most likely to occur on those days expected to be Below Normal or Disturbed. 73, George, W3ASK

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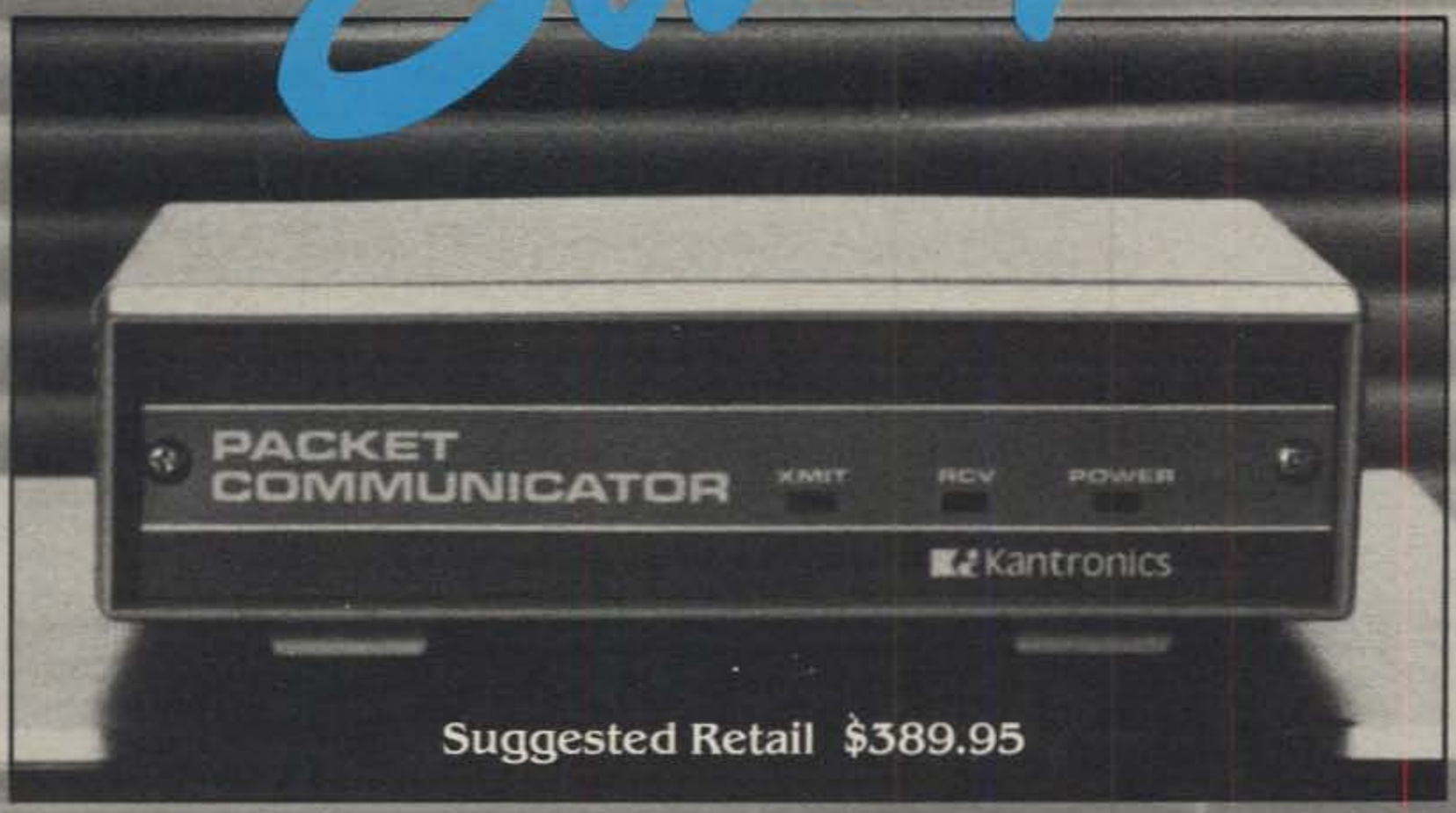

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June 1985

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THE INS AND OUTS OF THE WASHINGTON SCENE

Commission Incensed Over Inadequate Reporting In Amateur Press

By now most amateurs are aware of the fact that the FCC took action earlier this year against two VHF operators, one in South Carolina and one in Georgia, for alleged interference to cable television systems. According to certain publications serving the amateur community, the actions—which included the imposition of operating restrictions on the amateurs involved—were termed "unjustified," by some reporters, and were said to have possibly violated the amateur's rights. The Commission's Engineer in Charge for the Atlanta, GA, Field Office, Angelo Ditty, was also faulted for his handling of the cases in question.

In reviewing the cases with officials in Washington, however, another story emerges. Specifically, in one of the two cases cited, the Commission was responding to 28 (!) complaints of interference. Two engineers and two public service specialists from EIC Ditty's office spent several days in the field investigating the complaints and analyzing six of the cases in great detail. They found that the amateur involved was using an antenna system that, together with the power amplifier employed, gave the station an effective radiated power level of 34 kw. Harmonics were measured in the range −50 to −60 dB. Since the CATV cables in the area are buried, interference to the television receivers involved was determined to probably have resulted from power-line pickup and direct radiation into the cable TV channel selector. Other electronic equipment in the complainants' homes was also being affected. To complicate matters, the amateur involved, according to the FCC, was uncooperative and belligerent.

Cavity filters were found to reduce the radiated levels of the harmonic signals to the range −64 to −78 dB. In addition, a reduction in the power output level of the amplifier used at the station further reduced the interference. As a result of these actions, the amateur involved was allowed to resume operations pending further consideration of the case by the Field Operations Bureau (FOB) in Washington.

Richard Smith, Chief, FOB, and Jeffrey Young, Chief, Inspections and Investigations Branch, Enforcement Division, FOB, were understandably upset and incensed over what they considered to be unfair and unfounded criticism of the Commission in these actions. From the report filed by EIC Ditty, and from their own analyses of the situation, they believe that the FOB took every precaution to ensure that the rights of the amateurs involved—as well as the rights of their neighbors—were protected. The actions they took were based on exhaustive field tests conducted by trained engineers and on the Commission's obligation to serve the "public interest." In Smith's and Young's views, stories published in the amateur press that present but one side of a very emotional issue serve only to fan the fires of discontent. Further, they contribute little to the reason and restraint required for early resolution of the issue involved.

Commission Checks Power of Amateur Stations

Earlier this year the FCC visited over 170 amateur stations across the United States in a study that, according to Jeffrey Young of the Field Operations Bureau (FOB), had three objectives:

1. To learn what means were available to amateurs to reduce power;

2. To determine what a 50% reduction in power (3 dB) had on QSOs in progress;

3. To learn whether amateurs were aware of, and were complying with, the rule regarding use of "minimum necessary power."

Field work for the study was completed in late February, and the data are now being analyzed. As a result of the effort, however, a number of amateurs have contacted the ARRL to voice fears that the study is only the first step in a Commission move to reduce the power limit. The chances of this happening, according to Richard Smith, Chief, FOB, are "very remote!" According to Smith, the study is an attempt to remind amateurs of the "minimum power" rule (Section 97.67(a)), and to encourage the use of minimum power, especially when alleged interference to electronic home-entertainment equipment is of concern.

Watch for the results of the study to be released in the June–July time frame.

FCC Investigates Activities of Amateurs on 3895 kHz

In March the Commission released a public notice which read as follows:

"In response to complaints from amateur radio operators and others, the FCC's monitoring network has been investigating a group of amateur radio operators violating the Commission's amateur Rules. These operators are normally operating on the frequency 3895 kHz and have been identified by long-range direction-finding techniques to be in the vicinity of 22 cities, which are targeted for concentrated enforcement by the Commission's Field Operations Bureau.

"The most flagrant violations noted have been use of excessive power. Other violations include use of fraudulent 'amateur-like' callsigns; commercial or business type communications; use of unauthorized frequencies; and malicious interference to other amateur operators and home electronic entertainment equipment of their neighbors."

The 22 cities targeted by the Commission for concentrated enforcement activies are: Kenova, WV, Dalton GA, Falls Church, VA, Saparta, TN, Ottumwa, IA, Bowdon, GA, Knoxville, TN, Cairo, IL, Crawfordsville, IN, Barbourville, KY, Shady Spring, WV, Clarksburg, WV, High Point, NC, Williamsburg, IA, Indianapolis, IN, Paducah, KY, Chesterfied, VA, Newton, NC, Bloomington, IN, Terre Haute, IN, Madison, OH, and Paden City, WV.

The FOB's enforcement work has already yielded results, with Jerry R. Dyke, WD8LEU, of Spring, TX, fined $2,000 for the use of excess power. In addition, fines of $2,000 each were issued to Harris E. Maulden and Arthur A. Partain, both

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of Pearland, TX, for unlicensed operation of a repeater system on frequencies allocated to the Amateur service.

The Commission warns those responsible for illegal or over-power amateur transmissions that they should voluntarily stop their activities. Failure to do so will result in fines, license revocations, or actions in criminal court.

Persons having information relating to violations by amateurs on 3895 kHz are urged to notify the FCC in writing at the following address: Engineer in Charge, Federal Communications Commission, P.O. Box 1588, Grand Island, NB 68801.

Contentious Issues Face FCC Re Allocation of Additional Frequencies to Amateurs

As reported earlier, the Commission, in October 1984, issued PR Docket No. 84-960, a Notice of Proposed Rulemaking (NPRM), addressing the allocation of additional frequencies to the Amateur service. In the Notice the FCC set forth its proposals for the 30, 17, and 12 meter bands (10, 18, and 24 MHz, respectively) and for the 420–430 MHz and 902–928 MHz bands. Comments on the 900 MHz proposal by the Personal Radio Steering Group, however, now threaten to delay action on the NPRM.

For background, the Commission proposes to implement allocation of the 902–928 MHz band to the Amateur service in all of the United States and its possessions except for Colorado, Wyoming, and U.S. possessions in Region 3. Amateur operation in this band would be on a Secondary basis, and the band would be available for the use of all amateur operators above the Novice class.

The Personal Radio Steering Group, a private organization devoted to the advancement and promotion of personal radio in the United States, challenges the Commission's 900 MHz proposal on the grounds that no one has shown a need for an allocation to the Amateur service in this part of the spectrum. Further, the Group notes that its recent actions on a proposal to create a Personal Communications Radio Service (PCRS; originally proposed by GE) in the 800 MHz region of the spectrum, while unsuccessful, demonstrated the need for such a service. Thus, argues the Group, a portion of the 902–928 MHz band should be allocated to Personal Radio.

This filing will undoubtedly act to complicate consideration of the proposals contained in Docket No. 84-960. However, your Washington Editor predicts that by the time this column is read, or shortly thereafter, the Commission will issue a First Report and Order on the docket which will act favorably on the noncontroversial items contained in the Notice. Later, a Second Report and Order will be released to resolve contentious issues, which, presumably, include allocation of the 902–928 MHz band.

Other Commission Actions

According to John Johnston, Special Services Division, Private Radio Bureau, FCC, the Commission will issue an *Order* this year to reformat the frequency and emission charts for the Amateur and Amateur-Satellite services (remember, the ITU recognizes *two* Amateur services). The *Order* is the result of numerous inquiries received by the PRB regarding U.S. allocations, and it is intended to clarify many of the areas that amateurs find difficult to understand.

In another action the Commission has released an NPRM (PR Docket No. 85-51) that would prohibit an amateur whose license was suspended or revoked from using the third-party rule to get around the law. Further, the FCC proposes to amend its rules so that an amateur who allows such a person to operate from his or her station would be in violation of the rules governing amateur operations.

Volunteer Monitoring Program Moves Into Full Swing

League participation in the new volunteering monitoring (VOLMON) program, which began on 1 September 1984 as a result of the enactment of Public Law 97-

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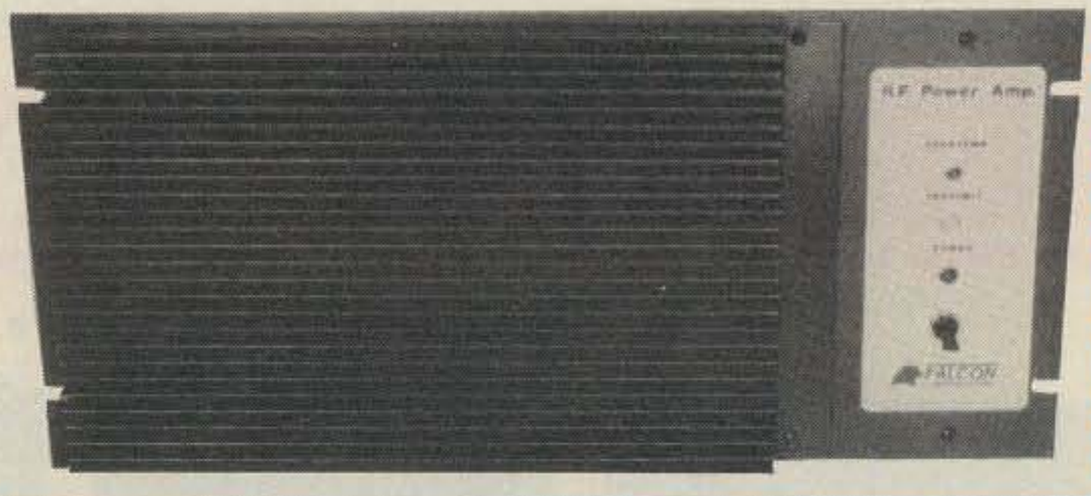

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259, is intensifying at a rapid rate. Under the VOLMON program, the Amateur Auxiliary to the FCC's Field Operations Bureau is at the heart of the ARRL's efforts. This Auxiliary, administered by the League's Section Managers and Official Observer (OO) Coordinators, provides the "maintenance monitoring" necessary to assist the Commission in monitoring our bands for violations.

According to *The ARRL Letter*, members of the Amateur Auxiliary sent out 1038 advisory reports to fellow amateurs in the last quarter of 1984. Of these, chirp discrepancies accounted for 25% of the reports, while 19% cited out-of-band operation.

Amateurs who are interested in volunteering for the OO/Amateur Auxiliary should contact their ARRL Section Manager. To participate, however, you must be properly certified for this work through a training and testing procedure agreed to under an agreement signed by the ARRL and the FCC.

Personal Communications Industry To Abandon FM

The headline read: "Ready or Not, Here It Comes: 12.5 kHz Channels For Private Land Mobile Radio." According to Benn Kobb of *Personal Communications* magazine, the personal communications industry appears ready to leave FM behind when it develops the new frequencies allocated to Land Mobile in the 896–902 and 935–941 MHz bands.

The 12.5 kHz wide channels proposed for use in these bands by the FCC—together with the requirement to use non-FM transmission—will not only encourage the use of more spectrum-efficient technologies, but will also provide private Land Mobile users with the spectrum they desperately need for growth. And while no equipment is commercially available now for use in the new bands, the demand for mobile systems employing advanced modulation techniques such as amplitude-compandered sideband (ACSB) should rise quickly as users flock to the new frequencies.

Washington insiders are split over the move to narrowband equipment. Some simply remain unconvinced of the wisdom or necessity of making such a move. Others, however, claim that the FCC's action is much too conservative, and that retaining wideband systems has delayed development of new Land Mobile services.

Finally, observers of the amateur scene have increasingly remarked that a shift to non-FM, narrowband systems at, say, 2 meters, would significantly reduce the competition for today's limited number of repeater pairs, and would virtually eliminate the need for the Notice of Proposed Rule Making (NPRM) on repeater coordination (PR Docket 85-22) now under consideration by the Commission and the public.

Plans For Computer-Controlled Weather Station Available

According to Dr. Philip Johnson of the University of Minnesota, plans are now available from him for an inexpensive computer-controlled, automatic weather station. The weather station, which was developed at the UM School of Physics and Astronomy, was successfully demonstrated to the local chapter of the American Meteorological Society at the University late last year. At that time, data consisting of temperature, pressure, relative humidity, wind speed and direction, and precipitation were transmitted every minute by amateur radio (using packet radio protocol) from a remote station in New Brighton, MN, to a receiving site some 6 miles away. Johnson believes that the use of such stations in a radio network linked by amateur stations would not only increase our knowledge of local weather, but would be an important factor in building student interest in both meteorology and amateur radio.

For more details on the inexpensive, computer-controlled weather station, write: Dr. Philip S. Johnson, University of Minnesota, School of Physics and Astronomy, Tate Laboratory of Physics, 116 Church Street S.E., Minneapolis, MN 55455. Please include a business-size, self-addressed stamped envelope with your inquiry.

EE Schools Curb Enrollment

Writing in *The Institute*, a publication of The Institute of Electrical and Electronics Engineers (IEEE), John Horgan says that "almost all major engineering schools—public and private—limit their admissions of students, generally through the imposition of academic standards." And though students, once admitted, have been free to specialize in the field of their choice, says the publication, this practice is now being changed at a number of the nation's schools. The problem, in part, stems from the popularity of disciplines such as electrical and computer engineering, and the schools' inabilities to cope with the resulting high levels of enrollment.

Schools that have already begun restricting admissions in their EE programs include the Georgia Institute of Technology and the University of Texas at Austin, while Purdue University will place a cap on its EE enrollment in 1986. Even the Massachusetts Institute of Technology, with almost 30 percent of its students now enrolled in electrical and computer science, has empowered a committee to impose admission restrictions if the need arises.

The "push" by students into technical disciplines, says Horgan, stems from the perceived financial rewards found here. And for now, those rewards, plus career security, are being realized. What will happen in the future, however, is less certain. Currently, there is unemployment in many engineering fields, and the demand for manpower is not increasing except in fields such as computer engineering. Thus, limits on enrollment in a school's engineering programs may, in the long run, work to everyone's advantage.

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Since we started this column in January 1985, we've received several letters from readers who are interested in knowing more about VHF/UHF FM operation. I won't dedicate a lot of column space to this, as our real intent here is to deal with weak-signal modes and equipment, but most active amateurs do have at least a 2 meter FM rig and might like to read a bit about the subject.

The most frequently asked questions regarding amateur VHF FM include:

•Why FM? Why not AM or SSB for mobile work and repeaters?

•Why vertical polarization? All the other modes use horizontal. Why should FM work be different?

•Why is my working range so limited on FM, as compared with SSB?

•Why does my vertically-polarized beam antenna perform so poorly? I thought these things were supposed to have gain!

•Why am I nearly always noisy into my local repeater, even when I hear it fine?

•Why shouldn't I install my own repeater? I'm on the road a lot, and it sure would be nice to have a repeater I can use any time I wish.

I'll address these questions here. It would be wasteful to start a lengthy discussion on why repeaters exist and how they work when so much has been written on this subject.[1] If you're just starting out on FM and would like to know more about repeaters and their operation, I'd recommend you read one of the references listed in note 1 at the end of this column, as reiteration of all this material would consume this column for several months.

Why FM?

This is a good question which bears answering. FM is easy to generate, because the modulation system is so simple. This allows the equipment to be small, lightweight, and inexpensive. Frequency-modulated RF signals can be amplified with simple, Class-C (nonlinear) amplifiers because only the sideband frequencies, and not their amplitudes, are detected by the receivers; thus, even considerable distortion of the RF carrier and sideband signals[2] causes no discernible distortion of the detected signal. The advantages of Class-C amplification are very high potential efficiency and low cost.

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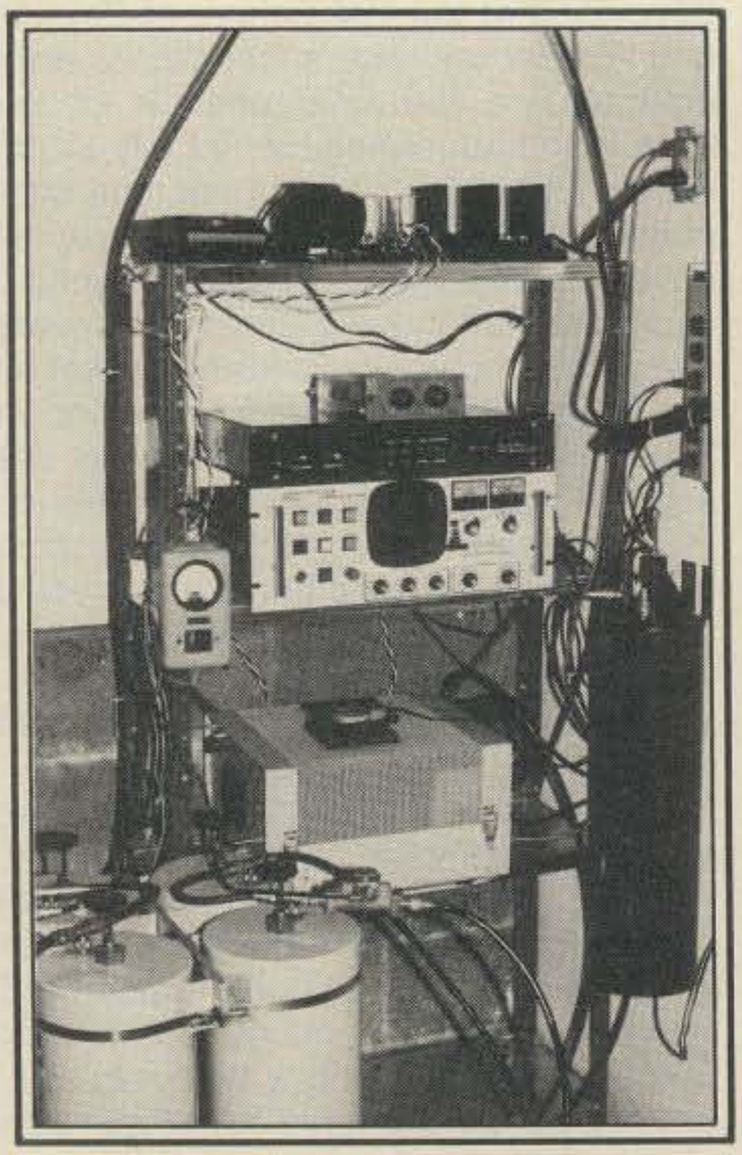


A typical, reasonably unsophisticated repeater. Shown is the WB2WIK/R equipment, 146.805 MHz (NJ). System includes a Spectrum SCR1000 repeater, 4CX250B power amplifier, GLB helical GaAsFET preselector, WaCom BpBr duplexer, single Phelps-Dodge auxiliary notch cavity, Bird Wattmeter, and homebrew 220 MHz link receiver and control system. Nothing fancy here.

Also, because there is no modulated RF envelope generated for FM transmission, the amplitude linearity of the receiver used is unimportant. In fact, FM receivers generally employ a "saturated detector," where all signals received, except very weak and noisy ones, reach the detection stage at the same signal level. This is performed by "limiters": high-gain, narrow-bandwidth IF amplifying stages which have sufficient gain to saturate the final stage. The limiters remove amplitude variations by a "clipping" process, and this serves to virtually eliminate the reception of AM noise, including many kinds of static, ignition pulses, etc.

Demodulation of an FM signal is accomplished by a discriminator or quadrature detector which, while more complex than a simple AM diode detector, is far simpler than the product detection scheme required for SSB reception. With today's technology, entire FM receiver "IF subsystems"—the IF amplifier, limiter, quadrature detector, and audio preamplifier—can be located on a single, tiny microcircuit. Since the detector is saturated anyway, it is essentially impossible to overload the detector stage of an FM receiver. Thus, all signals received, from about 20 dB "quieting"[3] up to extremely strong signals (of such intensity that an AM detector would create distortion due to overload) will sound about the same. This eliminates the need for automatic gain control circuitry or a manual RF gain control on FM receivers, and it allows stations within just inches of each other to communicate clearly and easily.

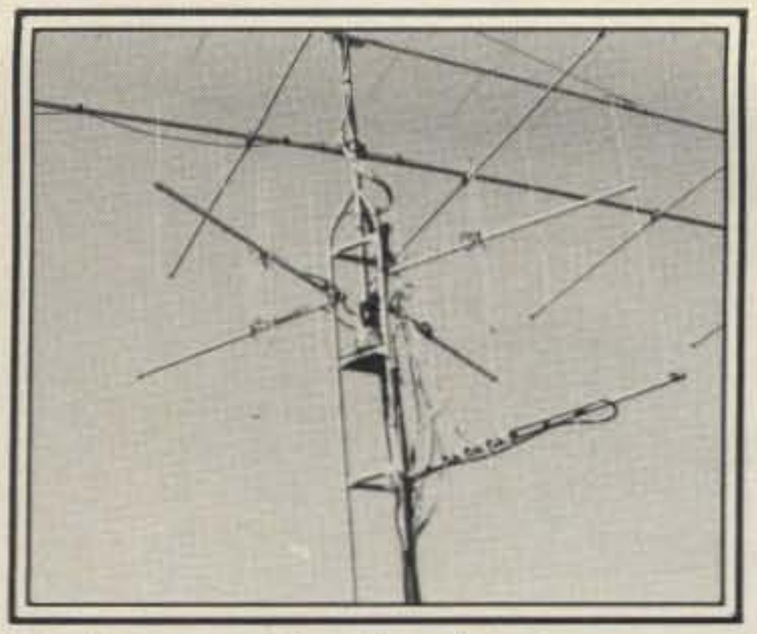
These are the advantages of FM as a mode, and you can see why FM is so useful for mobile work. AM and SSB do not have the noise-limiting advantages nor the very-strong signal handling advantages of FM, and SSB requires critical frequency alignment of the transmitter and receiver employed, making this mode more of a nuisance for mobile operations.

Why Vertical Polarization?

We all assume vertical polarization is the dominant antenna mode for FM work because vertical "whip" antennas are more easily installed on mobile vehicles and portable transceivers than horizontal antennas would be. Since the majority of FM work is *not* point-to-point over an established path, but is mobile-to-base or mobile-to-mobile (either direct or via repeaters), most of us want omnidirectional antenna systems. A vertical whip is a very simple omnidirectional antenna which is lightweight, efficient,[4] and low-cost. Omnidirectional antennas of horizontal polarity are more complex, more influenced by the presence of large masses of sheet metal beneath them (as would be the case for most mobile installations), have higher wind drag, and would tend to be more costly.

Why Is My Working Range So Limited On FM?

Well, in this life we don't get "something for nothing," and no statement is more relevant in this matter. As we discussed in the "advantages of FM" section, all signals above about 20 dB quieting sound equally strong on an FM receiver. Unfortunately, signals much weaker than 20 dB quieting can be extremely difficult to read. These weaker signals are below the threshold of limiting in the receiver and will sound noisy and unclear. While this varies from receiver to receiver,[5] I think you'll find that signals weaker than about 12 dB quieting (i.e., about 12 dB stronger than the receiver noise) will generally be of marginal intel-



Need an omnidirectional, gain antenna system for VHF-FM work but have no more mast space available? This system works well: four 4-element vertically-polarized Yagis can be clamped every 90° around a tower, below the top, and fed in phase to achieve nearly omnidirectional results with good gain. Shown is an array of four 4-element KLM Yagis for 146 MHz, fed with a 4-way power divider. Omnidirectional gain is about 3 dBd.

ligibility for NBFM[6] work. SSB signals of this strength would be received with roughly a 12 dB S + N/N and would be easily readable. In fact, the majority of weak-signal VHF work is done between stations who receive each other at much lower signal levels than this!

An experienced and competent CW operator using a narrow-bandwidth receiver and headphones can probably "copy" a signal which is only 1 dB above his receiver's noise level. On FM, a signal this weak would be totally undetectable; indeed, a signal 10 dB[7] stronger would be very difficult to read on FM. Therein lies the major difference: FM is a "strong signal" mode; SSB and CW are "weak signal" modes. They each have their place in amateur radio.

Why Does My Vertically-Polarized Beam Antenna Perform So Poorly?

Without seeing your installation, I don't know for sure, but I'd guess you've made one of the common mistakes thousands of new VHFers make in erecting and connecting your antenna. From my 20 years of experience on VHF-FM, I've developed a few guidelines which will prove helpful and should assure good results for newcomers.

1. When erecting a *single* vertically-polarized beam antenna, either *end-mount* the antenna or use a *non-conducting* support. An end-mounted antenna is one which is attached to its support (typically a vertical mast or tower leg) *behind* its reflector element. A non-conducting support is one which contains no metals; examples are fibreglas, wood, PVC, etc.

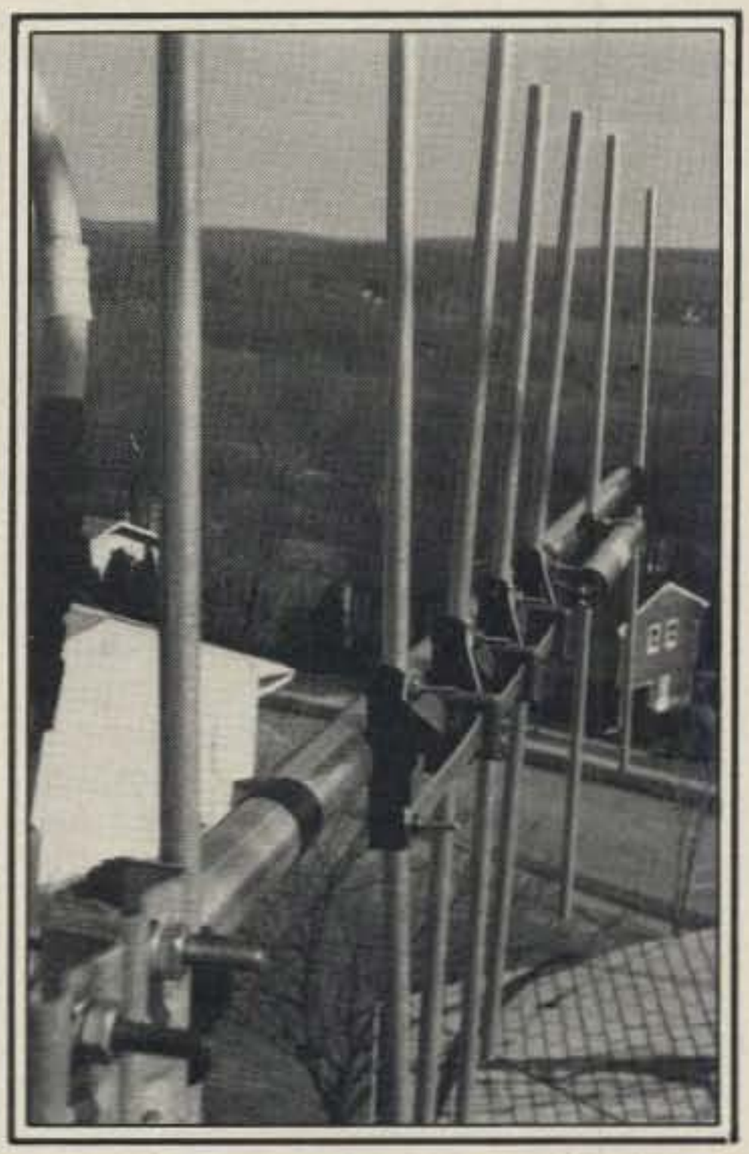
2. When erecting a vertically-polarized beam antenna, allow clearance of at least one wavelength[8] above and below its boom. This means do *not* stack a vertically-polarized beam less than one wavelength away from other antennas, your roof, your tower, or anything that might potentially interfere with its ability to radiate an undistorted pattern. More clearance is better.

3. Combining elements (1) and (2) above, we can conclude that for beams that are not end-mounted, we need a non-conducting mast more than one wavelength long to support a vertically-polarized beam antenna.

4. It is important to route the coaxial feedline for a vertical beam to the *rear* (reflector end) of the antenna, securing it to the boom *behind* the reflector element, before allowing the cable to drop down to the support mast, rotator, or tower leg. Make this "loop"—the length of cable hanging from the rear of the antenna, before it is secured to the support—at least a wavelength long. Do *not* route the feedline from the driven element along the boom to its center and then down the non-conductive support mast.[9]

If you have carefully followed these procedures and your vertical beam *still* doesn't work, then it is time to begin routine troubleshooting of the entire installation. Is the feedline connected properly? Is the antenna tuned to resonance? Is the feedline loss reasonable for its length?[10] Do you live at the bottom of a mine shaft? That last one was a joke, just to keep you on your toes.

I recommend the use of stacked-beam assemblies for vertically-polarized work.



The right way to install a vertically-polarized beam antenna: end-mounted to a tower leg behind its reflector element. Shown is a KLM 7-element Yagi with log-periodic feed system and "sleeve" balun. This is the 220 MHz "link" antenna at WB2WIK/R.

Stacking two vertical beams side by side eliminates a lot of the problems associated with support mast and feedline-to-antenna interaction and thereby eliminates the need for a non-conductive support mast and special transmission-line routing. Further, stacked beams offer a bit more forward gain and a narrower front pattern than would be available from a single beam of similar design. These attributes can be important for point-to-point work on a crowded band.

Why Am I Nearly Always Noisy Into My Local Repeater?

Again, without seeing your particular installation I can't tell you for certain. But maybe your mobile antenna doesn't work very well, or your power is much lower than the repeater's (this is likely). Remember that many repeaters are running 100 watts or more transmitter power; if your mobile transceiver runs 10 watts, you are running only one tenth the repeater's power, which gives the repeater a 10 dB signal advantage. If you're using a hand-held running 2 watts, the repeater has a 17 dB advantage. This is a *big* difference, especially on FM, where signals become very noisy rapidly as the quieting level diminishes below 20 dB.

To make matters worse, many amateurs use hand-held transceivers with "rubber duckie" (helically-loaded, shortened whip) antennas which do not exhibit reciprocity[11] and are poorer performers on transmit than receive. These "rubber duckie" antennas have lower radiation efficiency than a quarter-wave whip, which would be a marginal enough performer for low-powered applications. As if this weren't bad enough, lots of folks use handie-talkies equipped with only their remarkably poor "rubber duckies" from *inside their automobiles!* Come on, fellas, this is really pushing it.

Why Shouldn't I Install My Own Repeater?

Interestingly, ten years ago I would have given this a different title, such as "Why *should* I install my own repeater?" But in the past ten years so many repeaters have sprung up, especially on 2 meters, that most areas are pretty well saturated. A seasoned traveler, I often find myself in parts of the U.S. where there seem to be more repeaters than there are amateurs to talk on them. If nobody's using half the repeaters already in service, why add more?

Of course, there are exceptions. The 50 and 1296 MHz bands are two areas where we can stand more repeaters, and frequencies should be available for coordination in most parts of our country. When we are finally authorized to use the new 902 MHz amateur band, this will be open country for new repeaters. I cannot think of any place that needs another 146 MHz repeater.

Meet Sid, WA2FXB, who has worked 38 states and over 100 grid squares without moonbounce from this home shack in Woodbridge, NJ. Sid's holding a copy of his new report, "Chasing the Elusive E-Skip on Two Meters."

Here's Sid, WA2FXB, pointing to the QTH of a Wyoming station he's worked on 2 meters. The wall-size homebrew grid-square map also tracks his VHF grids worked for the ARRL VUCC program.

Bear in mind that repeater frequencies *must* be coordinated now, and the coordinating councils and committees have been doing a difficult, thankless job for years. If you really need to have a repeater, check with your local coordinating activity[12] before proceeding with any firm plans.

Personal Interview Department

Sid Lieberman, WA2FXB, of Woodbridge, New Jersey has developed a 54-page report called *Chasing the Elusive E-Skip on Two Meters*. This study is based on Sid's 25 years of VHF DXing and very considerable research (his bibliography reads like the "Who's Who" in the field of meteorology and radio propagation). In his work Sid has found a link between solar activity and Magnetic Sector Boundary Crossings, which in turn link to thunderstorm activity in our troposphere and then to the creation of "E clouds" which allow that elusive mode of long-distance VHF propagation.

WA2FXB has worked all states east of the Rocky Mountains, including Wyoming, on 144 MHz from his home in New Jersey. Using modest equipment (a Yaesu FT-225RD transceiver, Mirage B3016 amplifier, and 14-element Cushcraft "Jr. Boomer" Yagi antenna at 50 feet) from his 50 feet above sea level location just 16 miles southwest of Manhattan, Sid has managed to work as much as 2 meter DX as anyone in the New York metropolitan area possibly could without moonbounce. His equipment is all modified with little "touches" to improve performance, but his station is no rock-crusher by any means. Sid's rules for working VHF DX are very simple:

1. You can't work 'em if you can't hear 'em.

2. You can't hear 'em if you're not listening.

Elaborating on these themes, Sid uses a low-noise FET preamplifier preceded by a single-tuned cavity filter with 150 kHz bandwidth at 144 MHz to eliminate out-of-band interference and sources of desensitization. His secondary 2 meter receiver, a Collins 75A4 with an Advanced Receiver Research converter, is IF-connected to an old, surplus "pan-adapter" oscilloscope with amplitude resolution down to the noise floor of the system, about −140 dBm. Sid says he "sees" a lot of the tiny signals which aren't detectable by ear, and then puts his Autek QF-1 audio filter to work, narrowing up his audio bandwidth to improve the signal-to-noise ratio of very weak signals until they are readable. As a last resort, he'll try CW before giving up on a very weak signal.

To optimize his operating time, Sid predicts band openings with the use of WWV K-index reports, 10 cm flux numbers from NOAA, and national weather maps. Working VHF DX can be mostly a matter of timing, as we all know, and Sid feels he's taken a lot of the guesswork out of predicting the band openings. If you're interested in a copy of his report, contact Sid by writing to him at 146 Grove Avenue, Woodbridge, NJ 07095.

News and Views Dep't

Rich Whiten, WB2OTK, of Piedmont, South Carolina, who we reported in our April column as having been ordered off the 2 meter band by the FCC Field Engineering office in Atlanta, was given notice on March 12 that he may once again resume 144 MHz operations from his home station. Rich, who was off the air for all of February and the first part of March because of the FCC order previously reported, is elated to be back on chasing 2 meter DX. He's so happy, in fact, that he's getting back on 6 meters with a KW and an 8-element Wilson 36 foot long Yagi at 100 feet. We don't know at the time of this writing (mid-March) why the FCC withdrew their order prohibiting Rich's transmission in the 2 meter band; the original order was based on consider-

able pressure by his neighbors who were experiencing severe TVI. If we ever get to the root of this situation, we'll be sure to report all the details.

VHF ops who "roll their own" power amplifiers take note; you can reduce backpressure in many external-anode tube amplifier designs by using high-temperature silicon rubber exhaust chimneys to duct the warm air directly to your cabinet exhaust ports. This approach, popularized by E.T.O. (Canon City, Colorado) in their "Alpha" series of HF amplifiers, can reduce the load on your blowers and allow tubes to "breathe" easier, reducing plate seal temperatures and extending tube life. An added benefit to VHFers is better plate circuit stability resulting from lower tank component temperatures.

I bought four of the "8874"-size silicon rubber chimneys from E.T.O. for $3.00 each plus handling and shipping, and fitted them to the 4CX250R's in my 2 meter KW amplifier. The chimneys duct the anode exhaust air directly to the "outside world," and what a difference in cabinet temperature and thermal stability! The 8874-size chimneys fit 4X150, 4CX250, 4CX300, 4CX350 series, as well as 8874's. The rubber is easily cut and formed with hand scissors and really does a remarkable job. E.T.O. will also sell 8877-size chimneys or sheets of the rubber.

Notes

1. *FM & Repeaters for the Radio Amateur,* c. 1978, ARRL; *Radio Amateur's Handbook,* c. 1985, ARRL: Ch. 9-3, 9-4, 14-1 through 14-20; *Communications Electronics Circuits,* De France, c. 1966, Holt, Reinhart & Winston: pp. 300–345; *ITT Reference Data for Radio Engineers,* c. 1968, H. W. Sams & Co: Ch. 21-7 through 21-12.

2. Yes, FM has sidebands; but unlike AM, where nonlinearity of the RF envelope creates distortion in the detected (received) signal, FM signals are not dependent on this quality to achieve good results.

3. "Quieting" is an expression of FM signal strength; about 20 dB quieting is generally referred to as "full quieting" and is the point at which a listener can detect very little noise on the received signal. High-quality FM receivers are capable of quieting much more than 20 dB, but the casual listener will hear little difference beyond this level.

4. Efficiency is based on a number of factors, but simple VHF whip antennas which are base-fed and installed on the horizontal sheet-metal surface of an automobile roof or trunk lid are remarkably efficient.

5. This factor is based largely on IF bandwidth and the generation of internal noise in the receiver.

6. NBFM = narrow-band FM (e.g., 5 kHz peak deviation related to a center frequency). This is the popular FM mode for amateur service.

7. $dB = 20 \log_{10} E_1/E_2$; a "10 dB stronger signal" is one which has a received voltage level 3.16 times higher than the reference.

8. Approximately $972 \div f$ feet, where f = frequency in MHz. For example, $972 \div 144 = 6.75' = 81'' =$ one wavelength (free space) at 2 meters.

9. This entire paragraph can be ignored for stacked beam systems where the vertical beam antennas are arranged side by side and clamped to a horizontal cross-member.

10. This was discussed at length in this column for April 1985. Reprints available on request (SASE).

11. Reciprocity here means equal transmitting and receiving efficiency.

12. The names and addresses of these organizations are listed in the *ARRL Repeater Directory,* which is an annual publication.

QRP

a monthly feature by
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

QRP FD 1984—Club Reports/Standings

The clubs were out again this year battling for the club plaque, a higher spot on the "Club Standings" list, or just for the fun of it. Two groups did well enough to move to near the top of the list.

The "Harper Air Hawks," led by stalwart **Red Reynolds, K5VOL/9,** opted for the 1 watt ×8 power multiplier in a strategic bid for the top after plugging away with 5 watts for many years. It worked! The gang included **Mike, N9BBM, Randy, KA9HAO, Eugene, KA9HRH, Ken, WB9KET, Steve, K9NG, George, W9OA, Jim, K9PNG (DXCC-QRPp Trophy #63),** and **George, W9ZSJ.** Red reports: "The 'Harper Air Hawks' took to the outdoors for QRP FD for the fourth year in a row. To keep our tradition alive, we again used a different call. I wonder why we have that tradition? But we changed tactics this year also. We had a meeting a month before FD to make plans. We actually carried out the plan to run 1 watt or less—true 'milliwatting.' We ran two Argos with about seven operators.

"Antennas this year included our old reliable 300 foot east-west longwire, a 'new' 300 foot north-south longwire laying on top of some 10 foot bushes, and a triband Yagi tied between two trees 15 feet high and usable to the east and west. The Yagi rotor consisted of three people capable of tying and untying knots and turning the Yagi in a maximum of 15 minutes. When the sun was out, solar energy was used to power the Argo and charge the battery. The circuit was constructed by K9PNG so that we wouldn't have to disconnect and reconnect the panel and battery when the energy source changed. We estimate about 100-125 QSOs were made using direct solar power. In the past, weather has consisted of high temperatures, freezing temperatures, total sunlight in the day, and high winds. This year we added rain during the night. Fortunately, we had taken the precaution of erecting our two tents before the rain started, and they were ready for a quick move. We're planning for either snow or tornadoes next year—that's all that's left.

"As this is the first year we operated in the 1 watt class, we noted some differences in our FD procedures. First, operating with 1 watt is entirely different from operating with 5 watts or even 2 watts.

83 Suburban Estates, Vermillion, SD 57069

A shot of the fabled "Harper Air Hawks" (HAH!), winners of the QRP FD Club Plaque for 1984. From left to right, Eugene, KA9HRH, Red, K5VOL/9, George, W9ZSJ, Randy, KA9HAO, Steve, K9NG, and Jim, K9PNG. The group has been steadily climbing toward the top with rankings of #21 as K9BCM in '81, #11 as WB9JVX in '82, #7 as KN9W in '83, and now #3 in '84 as K9NG. I guess they change their call just to throw the competition off or something. However, the real secret to their success is the towerless Yagi seen at the top of the photo. Actually, it is the reason why Red, K5VOL/9, hasn't done so well in the QRP QSO Parties this past year. He was spending all his time developing a secret anti-gravity beam generator to be used in lieu of a real tower. Really, though, the thing didn't work, so they had to hang the Yagi with ropes tied to the trees, since Red sold off the HAH! tower to raise R&D funds for the generator project. Instead of the almost instantaneous rotation and azimuth control Red was hoping for, the HAH! had to settle for one rotation per every 15 minutes of tying and untying ropes. Next year, Red!

We got off to a slow QSO rate on Saturday afternoon and didn't see any great improvement until night. We felt this to be a result of band conditions (not the best we've had), our beginning of FD 'work the loudest guys first' strategy, and our lack of experience in a contest at this milliwatt power level. But by Sunday morning we had changed the strategy and were working other stations at the same rate we had done at the 5 watt level in previous years. We also discovered that to be competitive with 1 watt, gain antennas, preferably rotatable, are a must. We didn't make as many QSOs as last year, but we weren't far behind. We all were surprised that we had as many SSB contacts (418) as we did. No one expected that 1 watt SSB would compete very well. All in all, we had a great time, and running true milliwatt power made it even more fun. Look for us again next year with 1 watt (or even less!)." Congrats on winning the club plaque, gang! Now nobody can use your own club name abbreviation—"HAH!"—against you!

"The Best of Mt. Baldy" group included **Cam Hartford, N6GA, KD6CY, NB6D, KE6ET, WB6FRD, W6GVR, KW6K, KA6PVL, WA6TBH, N6UK,** and **N6UU.** Cam reports: "The Best of Mt. Baldy is a loosely knit group of hams who have come to know each other through the use of a repeater near Mt. Baldy, about 35 miles east of Los Angeles. For us, FD is as much a social/family activity as a radio event. We set up a campground in the Mojave desert near Victorville. Rigs were two IC-730's and a Ten-Tec Omni, powered by auto batteries. We erected four towers in a square pattern (the Mojave is not known for its tall trees!) to support two beams, a vertical, and a full-wave loop for 80 meters. Conditions were poorer than in previous years, but we were able to improve on our QSO total. I guess that means that QRP is still a viable means of communicating, even during the downside of the sunspot cycle." Sure is, Cam! This year's effort produced the third highest total QSOs in the club category. Not bad!

The "Berry Mountain ARC" included **Mike Michael, W3TS, Bob Laugaug, KB3ND, Art Sonnenberg, WB3IDP,** and **Paul Welker, KA3LCU,** for an effort that almost broke the 600 QSO barrier. Strategy was flawed in that only one transmitter was kept going on 80 and 40 during the night after 20 closed. Antennas included an 80 meter dipole fed through a 300 ohm line and a 40 meter dipole, both at 50 feet. The 20 meter 'ZL-Special' at 30 feet worked much better than the 2-element wire Yagi the group tried last year. A sloper dipole at 50 feet on the high end served for 15 meters. Mike notes: "We put more work into our antennas to get them higher this year, and it seemed to help. The 'ZL-Special' for 20 meters (described in *QST*, June 1984) sure worked well, but is still difficult to hang from trees. We set up at the end of my big yard, where a fence row of 60 foot trees about 70 feet wide is. This caused some difficulty because of too many trees. Boy did it rain on Sunday! The tent leaked and KB3ND's camper got stuck and left big ruts in my yard. We had local flooding of the creek down in the

The arrangement at W3TS. The van houses the 20–15 meter station, while 80–40 meter operation occurs in the tent. The trees provided antenna mounts.

Paul, KA3LCU (left), logging, and Bob, KB3ND, operating the Argosy at the 20–15 meter CW position inside the van.

Art, WB3IDP, operating the Omni-C on 80–40 meters inside the W3TS tent.

fence row. W3TS got slightly shocked by a lightning hit."

Tim Fiebig, N2BCF, notes: "With band conditions deteriorating, it took a truly dedicated QRPer like **Norm, K2NH,** to convince me to go at it with QRP again this year. Well, my faith in QRP has once again been restored. We both had an enjoyable time and many thanks to our fellow hams for their patience with our QRP signals."

Stephen McKeown, KU20, lead the Walton Radio Association with 10 participants: "The Walton Radio Association was at it again in the Catskill Mountains for their 34th consecutive year of FD fun. This is the 10th year with QRP. It took us 24 years to see the light! We used two Argo's with an 80 meter dipole at 60 feet. The 3-element collinear array for 40 worked very well. In fact, it worked so well that next we hope to put one up for 80. A TA-33 up 25 feet worked on 20 and 15 meters. We managed to work 5 stations using a military surplus hand-cranked generator to power the Argo."

Paul Seamon, Jr., N2RI, was back again this year with **AI2Q, KQ2G, and KA2CAQ** after winning the club plaque with 699 QSOs last year. Seems this crew changes its name every year—probably a club tradition. This year: "QRP Bayside Bombers." Antennas included (at 25 feet) an extended double-Zepp cut for 40 meters, a 20 meter collinear beam, and a 3-element Bobtail on 15. Paul reports: "Bands seemed to be a bit sluggish this year. Total contacts were down 156 from last year. Site was the Guy Lombardo Marina in Freeport, Long Island, NY. You can't beat the grounding conditions there right next to the Jones Beach inlet, which feeds the Atlantic Ocean. Salt water and damp soil make a good ground! This year we included a Novice position (HW-8) operated by **Walter Paluch, KA2CAQ,** for his first FD outing. With his sharpened CW skills from FD, he upgraded to General a few months later at the ARRL National in NYC. **Alex, AI2Q,** tooks along his lap portable computer/Kantronics UTU and made a few RTTY contacts. This added a little extra excitement!" I wonder if this ocean-side group had as much trouble with European QRM on 20 meters as KK7C/4 did in North Carolina (see below)? If not, foF2 contours probably cut it off.

The Michigan QRP ARCI crowd was out again as K8IF and included **Thom, K8IF, Marty, WD8DWQ,** and **K8BX.** They used an Argosy, 80 meter dipole, 40 meter inverted-Vee, and a 2-element tribander for 568 QSOs, not quite up to par for them.

The "Bass Mt. Skirts and Hats" group included **Jerry Stuart, KX4G, Doug Moon, KF4WX,** and **Judy Moon, KF4ZV,** who report: "This was to be our first QRP FD effort, so planning began early. We notified our local club that we would operate in a different location. Much of our early discussion concerned antennas and sites. KX4G plays bluegrass music, so we were able to secure a spot at a bluegrass festival park located on Bass Mountain, NC.

QRP Field Day Club Standings
Top 20 1979–1984

	Call	Year	QSOs	Score
1	N4BP	'82	1170	7170
2	K8BX	'81	854	5274
3	K9NG	'84	418	5166
4	N6UU	'84	731	4536
5	K8IF	'79	732	4488
6	N2RI	'83	699	4344
7	N5AF	'82	685	4260
8	K8IF	'82	684	4254
9	KN9W	'83	643	4008
10	W2LZ	'83	637	3972
11	AC2U	'81	627	3912
12	N2RI	'82	625	3900
13	W3TS	'84	597	3732
14	WB9JVX	'82	584	3654
15	K8IF	'84	568	3558
16	N2RI	'81	555	3480
17	W2LZ	'84	512	3222
18	K8BX	'80	378	2985
19	KB8GC	'79	437	2772
20	KM8X	'81	407	2595

We decided on Vee beams and ended up with four 400 foot legs with 60 degree apex angles. We threw 50 lb. monofil line over the lower limbs of trees to support the legs at a 25 foot height. By switching between adjacent legs, we had three directional beams with outstanding gain on 80 through 15 meters. We contacted 44 states, 7 Canadian provinces, KH6, West Indies, and Europe. For the most part, we used the 'search and pounce' technique. We were successful with a few 'CQs' during slow periods. The best QSO rate was on CW. The weather was beautiful, and we kept the rig (Argosy) going the full 24 hours, with one person operating and a second duping. The 4-channel memory keyer sure takes the strain out of CW! Judy cooked country ham, eggs, toast, and coffee outside the pop-up camper on a Coleman stove for breakfast. That was outstanding! The greatest disappointment was having to tear down the great antenna system and knowing we didn't have enough real estate back home to enjoy antennas of this size. Our greatest satisfaction was parting as friends after a job well done!"

Ken Miller, N8CGY, XYL Dianne, KA8NCV, and **John Peregord, KA8KSJ,** were among the first-timers: "This was our first time out on QRP FD, since our local club lacked the enthusiasm to enter FD this year. We set up on a local high school lawn with tall oak trees for antenna supports. John tossed the rock with nylon rope over the trees for hanging a 75 meter dipole running east-west and a 40 meter extended double-Zepp north-south, up about 30 feet. We broke to help Dianne set up the tent when a thunderstorm started brewing in the south, but it passed over us without a single drop. We finally completed setup about 1.5 hours after the start of FD. John made the first contact, and as he turned to tell me, I saw it gleaming all over his face. His excitement stirred my confidence, and I finally made my first QSO, and we were on our way to a whirlwind of QSO's that lasted for about two hours. It was incredible! Things did calm down later enough to have a sandwich, but Dianne and I couldn't get John away from the radio long enough to join us! We slept from 0300–0700, and John was up and at it again before I could get the sleep out of my eyes! We are still amazed at how easy it was, since we had expected the QSOs to be harder with QRP. We would have been satisfied with 50 contacts each rather than the 100 each we ended up with. That doesn't sound like much, but remember it was our first time out!"

Bob Spidell, W6SKQ, and **KF8BC** were out again in their eternal search for the perfect antenna setup: "We set up at a campground in the San Gabriel Mountains at 7300 foot altitude using a 509 and 515—one for SSB and the other for CW on separate bands. Antennas were the trusty old ZL-Special beam made twin-lead supported by a lightweight wood structure and fed through 75 ohms coax. The other antennas were (1) a 209 foot longwire cut for 40 meters so that it could be end-fed with 300 ohm twinlead, and (2) a 20 meter Vee beam with 139 foot legs pointed to the east coast and up about 50 feet. Both worked very well. One interesting note about the longwire is that it is very quiet at 7300 feet. I don't know what atmospherics would show up at low altitudes, but they were quiet up there, and when a signal was strong, it was very strong. We found that 20 CW is no problem on FD, but KF6BC operated SSB for a while and found it to be somewhat of an ordeal. One thing I noticed was that operating from a picnic table without back support creates considerable fatigue. Next year I'll take a director's chair like KF6BC used." Comforts of life category. Now, for our closing report, let's have KK7C/4's useful hints.

Reflections on FD 1984

We learned several things from operating at the milliwatt level from the dunes of a North Carolina beach. **(1)** Successful competition at the 1000 mw level is possible. Band congestion is the major enemy and demands an operating strategy of going against the tendencies of the QRO crowd by avoiding a band when it is most congested and switching back to it after the crowd has shifted to another band.

(2) QTH selection: This year we operated from the dunes on the beach at Kitty Hawk, NC. There were two major differences between operating there and in the Utah mountains last year. First was the incredible congestion of the bands, particularly 40 CW after sunset. The second was the unexpected QRM from Europe and South America on 20 CW. At our waterfront QTH, the Europeans (we copied more than 100 of them!) were one to two S-units *stronger* than stateside FD signals, even off the back of our 2-element beam. This was an unexpected peculiarity of our site and we were not prepared to cope with it. Because of it, our "search and pounce" technique was not successful. We found ourselves continually tuning around without making calls because of the difficulty of copying through the European QRM! We should have picked a clear frequency and started calling "CQ FD."

(3) Operating strategy: The band-congestion problem encountered on the east coast called for a different strategy than we had anticipated. We had erected gain antennas to increase our signal strength for the competition, but with only 1000 mw output, we were in second place, even though we could make ourselves heard. When operating from the west, we had sought out the bands with plenty of activity, but the best QRP operating strategy from North Carolina was to anticipate QRO operating instincts and do something different. During the opening hours

on Saturday 40 meters was sparsely populated. Propagation was excellent, though. Two meters was bedlam! So we made QSOs easily on 40 meters until sunset, when the band began to really boil. At that time, 20 was still jammed, but 80 and 15 were uncrowded. Luckily we checked out 15 SSB about 2200 local time and found better propagation and less QRM than on CW. We were able to make SSB QSOs at three times the CW rate for more than an hour. After midnight 20 and 40 thinned out, the Europeans were gone, and we encountered better operating circumstances.

(4) Do not overlook the Novice bands. After 12–14 hours, the Novice stations have all worked each other and are just sitting there waiting for a new station. An hour's excursion to the Novice bands should net 20 QSOs each on 80 and 40 meters with the uncrowded situation at night. Unfortunately, we learned that at about the same time our solar-charged battery died, and we had to give up before we could take advantage of the situation.

(5) Antennas: Last year our zip-cord rhombic in the trees did a great job from Utah. Operating from a sand dune with only driftwood to hold up our wires, we opted for the VK2ABQ "button beam." Although little known in the U.S., this antenna is the most versatile and easily constructed 2-element beam I know of. (*W6SKQ take note—ed.*) It provides good gain in the frontal lobe, and several S-units of front/back and side lobe attenuation. We tested the possibility of mounting several button beams concentrically and found it worked, so three were erected: a 276 foot beam for 80, a 138 foot for 40, and a 69 foot for 20. The latter two were fed through a common 75 ohm cable, while the 80 meter beam was fed through twinlead and used to advantage on 20 meters . . . . Unfortunately, we had an equipment failure that limited operation to under 6 hours, and our batteries gave out sooner than expected. But we're already planning for next year, armed with the knowledge provided by this first experience of competition at the 1000 mw level. We feel confident of a better showing next year!

Good luck to Jim and sons, and a hearty thanks for your observations.

Preparation Notes

As should be clear from the reports, planning definitely helps in having a positive FD experience. The main preparation involves checking equipment and antenna systems to ensure problem-free FD performance.

(1) The rig should be checked on batteries without any grounds such as AC mains and waterpipes, etc. FD conditions should be simulated as much as possible. Cart the Argo out into the car a couple of times and drive around with it, bouncing and bumping it as can happen during travel to the FD site. This should reveal any potential intermittent connections or flaws.

(2) All elements of the antenna system should be thoroughly checked. Use top-quality, relatively new coax. Examine all solder joints at coax connectors, antenna input receptacles, etc., for evidence of corrosion and weakening. FD conditions sometimes put stress on the antenna that is not present at the home installation. If an extra piece of coax is available, take it along. Pick the site ahead of time with the antenna system in mind. The old-timers believed that an antenna should be high, long, and in the clear—the "HCL" formula. However, qualify the "high" part, because FDers are generally working high-radiation-angle signals. Hence, half-wavelength height which provides a major lobe between about 25–35 degrees is most advantageous for working one-hop stuff. Stations on either coast will aim for a greater antenna height and correspondingly lower radiation angle so as to make it to the opposite coast with the minimum number of hops. On 80–40, the half-wavelength height is usually the best that can be had, but here, short skip via high-radiation angles is desirable in populous regions of the country. In short, think the antenna through. Gain is always desirable, but in some cases front/back or front/side rejection is more important, depending upon location. I always advise newcomers to actually set up the antenna system in a "dry-run" outing before FD. This provides valuable insight into possible erection problems, loading difficulties, and performances, and permits modification or rethinking before FD.

(3) Watch for solar flux trend in the two weeks prior to FD. If it bottoms out and starts its 27-day upswing, higher critical frequencies, and hence shorter skip, will be in effect during FD. This affects decisions about antenna height and type. On the other hand, if the flux is dropping toward 90 or even 80, lower critical frequencies will be encountered which will not reflect high radiation angles—lower radiation angles from greater antenna heights will be desirable. Eighty and 40 meters will be productive on one-hop long-haul paths during darkness periods, providing a low radiation angle is used during flux troughs. Think it through!

(4) Prepare for all weather possibilities—clothing for cold nights, rain gear, adequate liquid refreshment for hot days, food, comfortable seating to minimize fatigue, bug-spray, etc. This section reminds me of my Boy Scout days and methodology learned then. Each patrol met before a camping trip and listed everything that would be needed. That's the basic idea!

Milliwatt Achievement Award Winners—1984

Roger Rose, W5LXS, Spring QSO Party, 1st
Roger Rose, W5LXS, Fall QSO Party, 1st
Zachary Lau, KH6CP/3, Spring QSO Party, 2nd
Chris, WB5KFC, Fall QSO Party, 2nd
Chris Page, G4BUE, Spring QSO Party, 3rd
Michael Bryce, WB8VGE, Fall QSO Party, 3rd
Joe, AA4CO, Fall QSO Party, 4th
Dana Michael, W3TS, Spring QSO Party, 5th
John T. Collins, KN1H, Field Day, 2nd

Milliwatt Achievement Certificate

We've finally set up definite rules for awarding the **Milliwatt Achievement Award** certificates to participants in the QRP FD, and Spring and Fall QRP-ARCI QSO Parties. With respect to FD, a certificate will be awarded to the second place 1 watt class entry if less than 12 entries, and to second and third places if 12 or more entries are received. Of course, first place takes the trophy. Also, a certificate will be awarded to any entrant showing 60 or more QSOs while running no more than 100 milliwatts RF output. Any takers? With regard to the QRP-ARCI QSO Parties, certificates will be awarded to either (a) the top milliwatt entry or (b) all milliwatt entries ranking in the top five places overall. The certificate for 60 QSOs at 100 mw or under also will be awarded for operation during the QSO Parties. For 1984 nine **Milliwatt Achievement Award** certificates have been awarded (see listing).

That wraps it up for 1984 FD, except for thinking about the clues that the reports provide for successful FD and getting on with the strategy and preparations. Good luck in QRP FD 1985!

73, Ade, WØRSP

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month as told by Karl is:

Karl Adkins, WA6MAR
All Counties #128, 5-10-75

"I was born in Carrollton, Missouri, and graduated from school there in the midst of the 'Great Depression.' There were very few jobs around in those days, so I left Carrollton and went to work for an electrical contractor building power lines.

"In 1943 I moved to California, where I worked in the shipyards until 1945, when Pacific Gas & Electric became my employer. I retired three years ago.

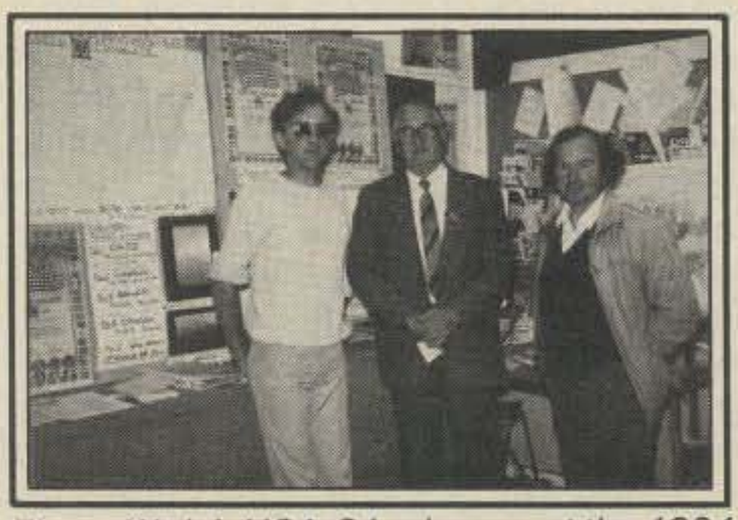
"I became interested in amateur radio in 1959, got my Novice class ticket in June of 1960, and became WA6MAR one year later. When *CQ* initiated the USA-CA program, I started collecting counties, but not on any organized basis.

"I suffered my first heart attack in 1969, and by 1972 I was unable to continue working. In March 1973 I discovered the Independent County Hunter nets on 75 and 20 meters and really began working for USA-CA. After listening for three months to W0SJE (now SK) and other net controllers such as W7SUY (now N7SU), I ventured forth as net control and have been at it ever since. Along the way, I earned USA-CA All Counties #128, MARAC #6, and W6CCM's #6.

"It has been a privilege and a pleasure to be associated with such a great group of mobilers and fixed stations. My thanks to all with whom I have worked over the years, and to my XYL, Betty, for her patience and understanding during the thousands of hours I have spent on the radio. 73, Karl, WA6MAR"

Note: In recognition of Karl's expertise and appreciation for his many hours of work as NCS on the County Hunter Net, the Mobile Amateur Radio Awards Club has named an award in his honor. Details later in this column.—ed.)

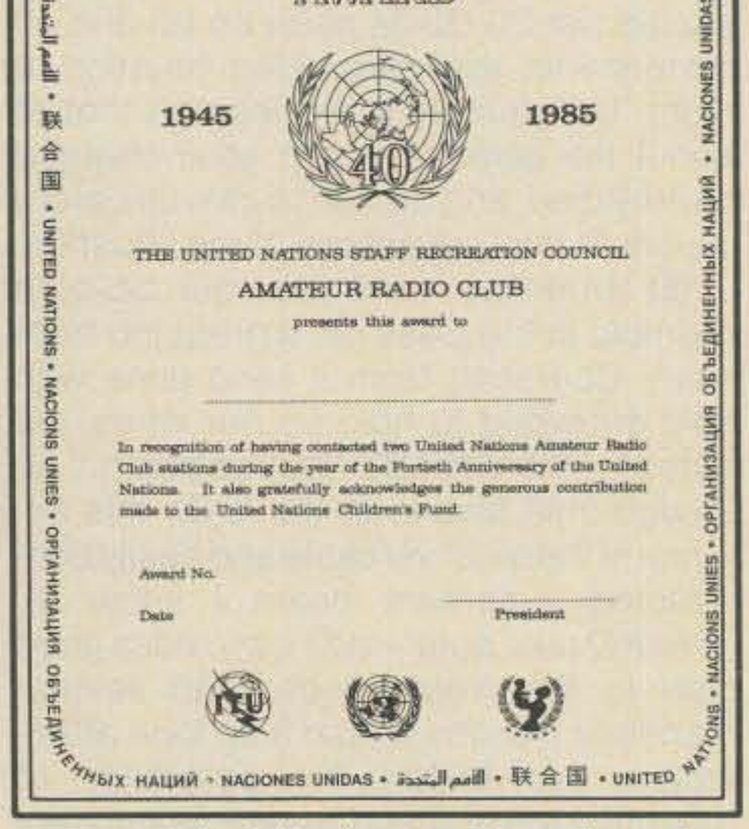
Karl Adkins, WA6MAR, at his station in Richmond, California.



Three Welsh USA-CA winners at the 1984 Welsh Amateur Radio Convention. Left to right are Steve, GW4BLE, Ellis, GW3CDH, and Steve, GW4BKG. Ellis was responsible for the display and presentation on County Hunting.

USA-CA Honor Roll

2500		500	
W5OB	581	SM7KIL	2002
		Y57WJ	2003
1500		OH3UU	2004
W0WYX	707	YU2QK	2005
		AD5F	2006
1000		IT9QDS	2007
W0WYX	872	N0EQN	2008



The United Nations at Forty Award.

Awards Issued

John L. Robertson, W5OB, claimed USA-CA 2500 #581, Mixed, 2-26-85. John began county hunting in 1962 as W5BUK and has USA-CA 500 #91, 5-12-62.

Bob Swanlund, W0WYX, continues to organize his cards and now has USA-CA 1000 #872, Mixed, 2-2-85, and USA-CA 1500 #707, Mixed, 2-11-85.

USA-CA 500 certificates went to:

Bosse Kilaker, SM7KIL, #2002, Mixed, 2-2-85.

Sven-Hendrick Steinweg, Y57WJ, #2003, All SSB, 2-2-85.

Risto Lund, OH3UU, #2004, Mixed, 2-2-85.

Milenko Milinovic, YU2QK, #2005, 2-4-85, Mixed.

John H. Ferguson, Jr., AD5F, #2006, 2-14-85, All 2×CW.

Sebastian Piazza, IT9QDS, #2007, 2-14-85, All 2×CW.

Le Roy Bah, N0EQN, #2008, 2-26-85, Mixed.

Awards Available

The Karl Adkins, WA6MAR, Net Control Award—A MARAC Award. This award is issued to any station for operating as NCS or assistant on the Mobile Emergency and County Hunter Net for 200 hours. Sticker endorsements are available for 400, 600, and 800 hours. A plaque is available for 1000 hours of service. Time spent on an alternate frequency will count providing the alternate frequency was in operation for one hour or more.

Make application for the award by submitting a signed statement of dates and times spent for each control session and a total of the hours claimed. This award is retroactive.

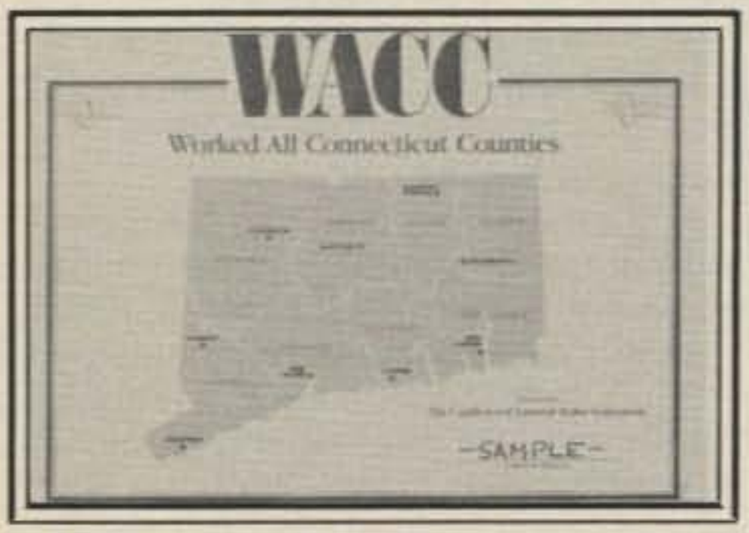
The MARAC awards chairman reserves the right to request that the station log be submitted for checking should this be deemed necessary. Cost of the award is $1.25 for basic certificate. Endorsement seals are free for an SASE. Cost of the special plaque is $30.00.

The UN AT 40 Award. On 24 October 1985 the United Nations will celebrate the 40th anniversary of the coming into force of the United Nations Charter, which was signed in San Francisco in 1945. To celebrate this event, and in the spirit of developing friendly relations among nations, the United Nations Staff Recreation Council/Amateur Radio Club is sponsoring the UN AT 40 Award. This award is available to any amateur radio station (or SWL) that has contacted two of the three amateur radio stations operating with the United Nations prefix during the United Nations 40th anniversary celebration year from 1 January to 31 December 1985. Contacts can be made on any band or mode. The three stations are 4U1UN at the United Nations Headquarters in New York, U.S.A.; 4U1ITU at the International Telecommunications Head-

333 South Lincoln Ave., Mundelein, IL 60060

quarters in Geneva, Switzerland; and 4U1VIC at the Vienna International Centre in Austria.

Applicants must send a list of the stations worked, including date, time, mode, report, and band. This list must contain a signed statement vouching for the accuracy of the application. The cost of the award is US $5.00, or 15 IRCs, of which US $4.00 will be donated to the United Nations Children's Fund (UNICEF). The application must be sent before 1 February 1986 to: United Nations Staff Recreation Council, Amateur Radio Club, United Nations, Room DC1-0724, Box 20, New York, NY 10017.



WACC—Worked All Connecticut Counties Award.

Worked All Connecticut Counties Award (WACC). This award is available to all amateur radio operators who have been able to contact all eight Connecticut counties. The counties are Fairfield, Litchfield, New Haven, Hartford, Middlesex, Tolland, New London, and Windham. Contacts may be on any amateur band using any mode. Repeater contacts are not allowed. Send a copy of your log information (dates, calls, counties, etc.) and $1.00 US (W., VE, XE), or 3 IRC's (DX), to: WACC Manager, Candlewood ARA, P.O. Box 143, Bethel, CT 06801.

Diplom Slovensko, a colorful award issued by the Amateur Radio Union of Slovakia.

Diplom Slovensko—Slovakia Award. The Diplom Slovensko is available to licensed amateurs for contacts with the okreses (counties) of the Slovak Republic (OK3). In the slovak language, county is *okres.* There are 38 counties in Slovakia.

This award is sponsored by the Amateur Radio Union of Slovakia and OK3-DX Club. The Diploma Slovensko is issued for contacts all on HF (1.8–30 MHz) and VHF (50 MHz and up) bands, or via satellite, regardless of mode of operation. Award dimensions are 450 x 330 mm. Do not send QSL cards. Send application, GCR, and 5 IRC's to: Award Manager, Jaromir Slezak, OK3CAU, 925 09 Kosuty 27, Slovak Socialist Republic, Csecho Slovakia.

"Sab," JA8ZO, at his fine station in Hokkiado. Sab has just received USA-CA 1500 #706.

Dick, G2AFQ, taking a rest from mobile operating. Dick is often heard operating mobile from England and Scotland.

Requirements: HF Award—Stations in HA, OE, SP, and UB must contact 35 counties; stations in other European countries must contact 20 counties; stations outside EU need 10 counties. VHF Award—European stations located up to 500 km from Slovak borders must contact 10 counties; other EU stations need 5 counties; stations outside EU need any 2 Slovak stations regardless of county. Satellite Award—EU stations must contact 10 Slovak stations; stations outside EU need 3 Slovak stations.

The names of the counties in the Slovak Republic are named after their respective county towns: Banska Bystrica, Bardejov, Bratislava MC (mesto), Bratislava MC (vidiek), Cadca, Dolny Kubin, Dunaska streda, Galanta, Humenne, Komarno, Kosice MC (mesto), Kosice DC (vidiek), Levice, Liptovsky Mikulas, Lucenec, Martin, Michalovce, Nitra, Nove Zamky, Poprad, Provazska Bystrica, Presov, Prievidza, Rimavska sobota, Roznava, Senica, Spisska Nova Ves, Stara Lubovna, Svidnik, Topolcany, Treboisov, Trencin, Trnava, Velky Krtis, Vranov, Zvolen, Ziar nod Hronom, Zilina. MC = Metropolitan county. DC = District County. OK Callsign identification: OK3 xx all counties; OK3 Cxx all counties; OK3 Kxx, Oxx, Rxx, and some OK5 and OK7 are club stations, all counties; OK3 Txx, OL8 West Slovakia; OK3 Yxx OL9 Central Slovakia; OK3 Yxx, OL0 East Slovakia.

Finnish Radio Amateur League—The OHA Award. Applicants in Denmark, Norway, and Sweden need contact with at least 50

The OHA Award sponsored by the Finnish Radio Amateur League, SRAL.

different OH stations, including 8 OH call areas on one band plus 8 different OH call areas together on other band(s). Other European applicants need contact with at least 20 different OH stations, including at least 7 OH call areas. Maximum number of contacts per band is 15, so at least two different bands must be used. Non-European applicants need contact with at least 5 OH call areas. Contacts made on 3.5 MHz will count double "points" for DX applicants. CW, phone, or mixed contacts count. Contacts with Finnish Maritime Mobile stations do not count.

A fee of 5 IRC's should be sent with the application. The OH8 stations ND, NJ, NS, NV, NX, OA, OB, OC, OG, OI, ON, OP, OQ, OR, OU, OX, OZ, PA, PB, PD, PF, PL, PM and PQ are counted as OH9 stations if contacted before June 1, 1954 (OH district was split into two areas on that date). Address application to: SRAL Awards Manager, P.O. Box 10306, Helsinki 10, Finland.

News of the Great Texas Armadillo Run. In 1983 the Texas DX Society, as a group, dismantled their stations, hung "bug catchers" and Hustlers on the family autos, went onto the highways and byways of the Great State of Texas, and, in one weekend, put all 254 Texas counties on the air. Scores of amateurs followed the TDXS mobiles from county to county, following the intricate route that was six months in the planning. In 1984 the TDXS again mobilized and in one weekend activated all counties in Louisiana, Arkansas, and Mississippi.

Next year will be the 150th anniversary of the State of Texas and there will be a gala celebration in the Lone Star State. The Texas DX Society would like to share the Sesquicentennial Celebration with other amateurs and would like to commemorate the event in the true spirit of amateur radio. To that end, they are planning to activate every county in the continguous 48 states! This will be the largest demonstration of ham radio's fraternal determination and ability to mobilize. TDXS will provide the coordination, logistics, planning data, and motivational tools to any club or amateur radio organization willing to provide manpower, local coordination, willingness, determination, and the amateur spirit.

The run will be during the two weekends of the County Hunters CW and SSB contests 1986. There will also be Armadillo Run contests with appropriate awards for most counties contacted, most counties activated (safely), etc. The TDXS would like to hear from your group with suggestions. They can make available their logistics planning data, slide shows, and speakers to help with gathering support for the project.

The Texas DX Society will schedule these activities to complement the County Hunters operating events and for all amateurs to enjoy and benefit from the "run." However, the TDXS has no other affiliation with the County Hunters, CW County Hunters Net, or the Mobile Amateur Radio Awards Club.

Any amateur radio society, club, or individual is welcome to join in this endeavor. Please write to Tom Tåorima, K5RC, 1986 Armadillo Run Coordinator, Route 1, Box 307, Manvel, Texas, 77378 for further information. New developments will be announced in this column.

Notes

In this part of the world June brings roses, school graduations, weddings. I hope everything is going well where you are. 73, Dorothy, WB9RCY

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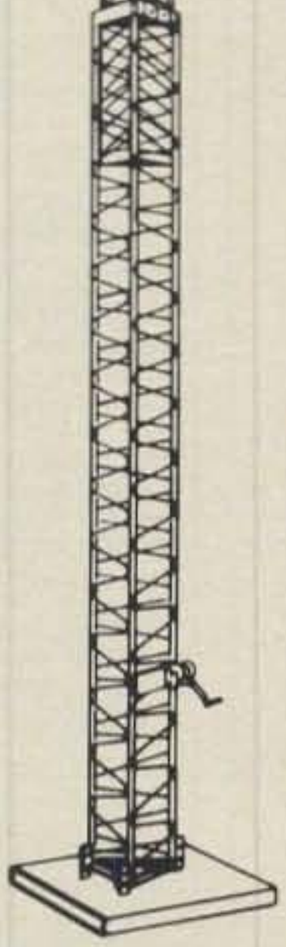

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RG-8/U foam	0.35/ft
RG-8X	0.18/ft
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WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, Rt. 11, Box 499 #1201 South, Birmingham, AL 35210.

FLEA MARKET & FCC EXAMINATIONS. April 13, May 11, June 8, July 13, August 10 & September 14. Novice thru Extra Exams given. Information call (408) 255-9000. Foothill College, Los Altos, CA. 73, Gordon, W6NLG

ATLAS 350XL OWNERS GROUP. Free newsletter. Send QSL with rig s/n and SASE. Know people who repair them? Information to share? Questions? Rod Sharp, N5NM, Box 2169A, Santa Fe, NM 87504.

QUADS * QUADS * 2, 3 & 4 Element Kits. Also components, Fiberglass Spreaders, Spiders, Wire, etc. (3) $.20 stamps for complete brochure. db + ENTERPRISES, Box 24, Pine Valley, NY 14872, phone 607-739-8480.

JUNE is here but SEPTEMBER is just around the corner. Help us get off to a super start with the incoming rookies at Junior High School 22 on Manhattan's Lower East Side. We need your unwanted ham equipment. Contact WB2JKJ.

ROSS $$$$ USED June SPECIALS: (OVER 200 USED ITEMS IN STOCK) KENWOOD TS-130S $469.00, TR-2400 $169.90, TS-180S $429.00, TR-9500 $459.00. DRAKE TR-7A $769.00. ROBOT 800 $299.00. YAESU FT-301D $339.90, FT-101ZD $459.00, FT-620B $279.00. ICOM IC-245 $169.00, IC-551D/WFM $579.90, IC-701 $389.90. If this month's special is not what you are looking for, send SASE, Call letter, name & phone # for used list. Over 6,500 NEW ham-related items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263, phone (208) 852-0830.

FREE SHIPPING, Continental USA, MINI-PRODUCTS HQ-1's $139.95, BUTTERNUT HF6V's and HF2V's $106.50, MOSLEY TA33's $239.95, AMP-SUPPLY LA-1000A's $379.95, NYE MB-V-A TUNERS $468.00. QUALITY DIPOLE KITS you can't beat. Stamp for flyer. Don, HART EASTERN COMMUNICATIONS, 1444 Darlington Drive, Derby, NY 14047 (near Buffalo), phone 716-947-4840.

AWARDS DIRECTORY: $1.00 brings information. Refundable. Updated monthly. Computerized. Worldwide. List your Awards free. Over 1000 now in files. KB@ZP, RR #1C, Cumming, IA 50061.

C-64 HAM SOFTWARE: Headings, MUF, Morse Trainer/Practice. Send SASE for information. ULTRA HAM SOFTWARE, Box 119, Macedonia, OH 44056.

WANTED: Like-new 810 and 4-1000A transmitting tubes. Description, history, and price to Charles Frodsham, K@AYS, P.O. Box 7, Beloit, Kansas 67420.

SOFTWARE for IBM-PC, PCjr. and compatibles. "FIELDDAY," fast dupe checking and checksheets, $19.95. "PC-CONTEST," all-purpose contest dupe checking and checksheets, $19.95. "PC-LOCATE," antenna headings and distances from any location to over 400 locations worldwide, $15.95. SPECIAL, all three programs $45.00. J.R. Hendricks, KF4KS, 1204 Oxford Place, Cary, NC 27511.

QSL's $12.95 up. WA4PRE, Jim's Printing Service, 2155 Young, Memphis, TN 38104 SASE.

SELL HEATH STATION: SB303 Receiver, SB401 Transmitter, SB600 SPKR, All $300. SB630 Console $70. SB620 Scan $80. SB220 Amplifier $475. Filters for SB/HW: Heath 3.75 kHz $15. Heath 500 Hz $20. Fox-Tango 250 Hz $35. Viking KW Matchbox with SWR $80. 10-Day money back gty. W4UKU, Jerry, 803-278-0984 or Callbook.

TRANSCEIVERS: TICC-I Solid-state Transceiver, 10 to 80 meters, SSB, 100 Watts Output. All-American Telephone Supply Company, 18968 NE 5th Ave, Miami, FL 33179. Tel: 305-653-7505.

ANTENNAS: 3-Element Beams, Cubical Quads, Multi-band Verticals. All-American Telephone Supply Company, 18968 NE 5th Ave, Miami, FL 33179. Tel: 305-653-7505.

WANTED: Kenwood 6 meter and 2 meter converters, and aux. coil sets, for R-599 or R-499 receivers. State price, condition, and shipping. W8QXB via Callbook.

CASA MARCINI, INC. Pre-owned communication equipment. We buy and sell. 7189 S.W. 8 St., Miami, FL 33144, phone 305-264-8443.

RUGGED CANADIAN TOWER—COMMERCIAL: Tower manufacturer is offering a heavy-duty self-support tower direct to Hams. Save big on direct order—save even more with exchange rate. Tower is capable of supporting up to 60 square feet of antenna. Don't miss the opportunity to buy a well-constructed tower at a super low price. Dealer inquiries invited. Trylon Towers, P.O. Box 186, 21 Howard Avenue, Elmira, Ontario, Canada, N3B 2Z6. Phone Number (519) 669-5421.

ROSS $$$$ NEW June SPECIALS: If this month's special is not what your are looking for, send Call letters name & phone # for personal price quote. Over 6500 ham-related items in stock. ICOM # IC-735 $PHONE, IC-45A $299.90, IC-745 $768.90, IC-04AT $309.90, IC-O2AT $284.90. KENWOOD #TS-940S/WAT $1699.90, TH-21AT $194.90 + PB-21 $0.10, TR-8400 $379.90, TR-7950 $356.90, TS-430S $667.90, TR-2600A $286.90 + PB-26 $0.10, VFO-240 $139.90, TW-4000A $489.00, TS-780 $759.90, YAESU #FT-208R $219.90, FT-757GX $779.90, FT-708R $219.90, FRG-7700 $369.90, FRG-8800 $589.90, FRG-7 $239.90. All major lines stocked. L.T.O. mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263, phone (208) 852-0830.

WIND YOUR OWN COILS: Formulas and simple instructions send $2.00 and SASE to Coils, 144 Delray Ct., King, NC 27021.

WANTED: Early mono and stereo tube Hi Fi equipment. Any condition. Jack Smith, 59 Millpond, North Andover, MA 01845.

1985 REVISED RADIO AMATEUR AWARDS DIRECTORY OF THE WORLD $8 US to USA, or $10 US to DX from VE3XN, Garry Hammond, 5 McLaren Avenue, Listowel, Ontario, Canada, N4W 3K1.

BEAM HEADINGS! THE BEST! DX (including longpath) and USA headings customized for your QTH. Show mileage to target area. $6.00. Tom Fleming, 1634 Baywinds Lane, Sarasota, FL 33581.

HAMMARLUND OWNERS and collectors: Factory original parts, manuals, literature, etc. Send $2.00 plus SASE for lists. Hammarlund Receiver Service by former factory service manager. Wayne Cordell, K4HCS, BLUE RIDGE COMMUNICATIONS, 770 New Stock Rd., Weaverville, NC 28787, phone (704) 645-7070.

FOR SALE: National NCX5MK II, PS/Spkr, External VFO. USA made. John Guthrie, W3GJ, Virginia Road, St. Marys, PA 15857.

FOR SALE: Old German hand Morse keys as used during WW II by the German army. Forty years old and in very good shape. Screws for adjustments in brass and silver contacts. Cord line with 2-pole plug, black plastic case with hinged cover. Old National emblem on the main base. Weight: 0.8 lbs. Measurements: 3.1" × 1.6" × 5.8". Price each incl. seamail $30. Hand keys from GDR. New! Type K40. Case in black plastic. Screws in nickel-plated steel. Without cord line. Built-in steel plate for stability. Weight: 0.88 lbs (2.5" × 1.9" × 5.3"). Price each incl. seamail $16. Old Headphone as used in WW II. Made by TELEFUNKEN. Imp. 2000 Ohm. Used but OK. Only some pieces for sale. Price each incl. seamail $20. Ask for pictures. Payments via bank check. Klaus Gramowski, DL7NS, Kaiserin-Augusta-Allee 91, D-1000 Berlin 10, West Germany.

SALE: Swan 500CX XMTR, 117XC Power Supply, 14C Converter, Mobile Antenna, Complete Two Mikes meters and cables, excellent condition. XMTR recently checked and retubed. $500.00 OBO. Phone (213) 387-3293 Los Angeles.

WANTED: AEA contest keyer. Rod, W7OM, 5632 47th Avenue SW, Seattle, WA 98136.

COMPUTER PROGRAMS for C-64. Menu driven logs for BCL/SWL. Update formats, QSL records, other. Disk or tape. Screen/printer. Send SASE for info & sample. W3GMG, P.O. Box 5624, Baltimore, MD 21210.

FOR SALE: HAM IV ANTENNA ROTOR, CDE, NEVER USED! In original carton with control unit and handbook. You pay shipping. US $199 or nearest offer. VE7EHD, 604-265-3175.

WANTED: KENWOOD VOX-3 and TS-600 service manual and YAESU TC-2 converter. C.T. Huth, 130 Hunter St., Tiffin, OH 44883.

AZDEN PCS 300, case, AC and mobile chargers, speaker mike, and service manual, $200. W8IIT, 414 Rolling Green Lane, Fairfield Glade, TN 38555.

LU3ZI SOUTH SHETLAND ISLAND QSL, send SASE to GRUPO ARGENTINO DE CW, Carlos Diehl 2025, 1854 Longchamps, Bs. As., ARGENTINA.

VACUUM Capacitors, Vacuum Relays—WANTED. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

SELL: Collins 32V-2, ser. #1401, 75A-1, serv. #114, Central Electronics sideband slicer-Q multiplier, ser. #6029. All manuals. A.D. Breneman, KA7JOJ, 7940 Wallace Rd, Salem, OR 97304.

DRAKE 7000E terminal, Epson MX-80, cables, covers, $695. Azden 3000, $175. In-Line 105 "wireless" antenna relay, $30. ICOM HM-10, EX-203, $25. K1LEC (802) 886-8121.

WANTED: USED SKYLANE QUAD PARTS. Cliff Smith, KF8K, 5615 Starr, Oregon, OH 43616.

FOR SALE: Yaesu FT-102, with cascaded CW filters, brand new with warranty card, $700. Yaesu FT-901 with memory, CW filter, and FV-101 remote VFO, mint condition, $700. Kenwood TS-430S, CW filter, brand new, $700. K4XG, Tom Neill, 1525 Crockett Hills, Brentwood, TN 37027, phone (615) 790-2610.

FOR SALE: Heath HP-13 DC Power Supply and Mobile Mounting Bracket for SB and HW series transceivers, $50. WA7GVT, River Road, Glendive, MT 59330, phone 406-365-2261.

SELL: GONSET G-76 transceiver and AC power supply, 6–80 meters, AM and CW, manual, good condition. Reasonable offers invited. R. Wartburg, 1425 N. Harwood, Orange, CA 92677.

WPX SYSTEM: A program disk for TRS-80 Mod III & IV to dupe, sort, and print prefixes into the format required for the WPX Award. Send $15 to B. Madsen, VE5ADA, 739 Washington Dr., Weyburn, Sk. S4H 3C7 Canada.

WANTED: Your used microwave equipment. Sweepers, waveguide, pads, adapters, etc. K8UR, D. Mitchell, Upton, MA 01568, phone (617) 529-4638.

WANTED: Military radio sets types PRC-25, PRC-77, PRC-74, paying $100, $200, $200 respectively. Michael P. Murphy, 11621 Valle Vista Rd., Lakeside, CA 92040, phone (619) 561-2726.

ICOM 4AT w/programmable tone, $159. Don Bishop, 5625 S. Sycamore #102, Littleton, CO 80120.

FOR SALE: KENWOOD R-1000 Communications Receiver like new. Bob Vitarelli, 301-299-4848.

HEWLETT-PACKARD Model 606A Signal Generator, 50kHz–65MHz, for communication equip. servicing, $165 or trade. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

WANTED: KENWOOD VOX-3 and YAESU FR-101 (SD) or D receiver. C.T. Huth, 130 Hunter St., Tiffin, OH 44883.

CQ COLLECTORS: Back issues of CQ available 1952 thru current, $2.00 ea. postpaid, USA or SASE for list of what's left. Bill Nash, 1348 Pinewood Dr., Woodbury, MN 55125.

DRAKE TR4, AC4, all new tubes plus spare new finals and mike, recently factory serviced, $330 postage paid. Dave, WD4NSF, 904-268-2953 after 10pm EST.

TRADE a complete set of RADIO BOY BOOKS by Breckenridge for a working vertical Vibroplex. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

KENWOOD TS-530S transceiver with YK-88C and YK-88CN CW filters, $500. Kenwood external speaker SP-230 with active filter added, $45. Call (206) 362-2933.

KENWOOD R-600: Mint condition, no modifications, moving up. $259 includes UPS shipping. Call 1-601-6639 for details.

Please send all reader inquiries directly.

CLANDESTINE CONFIDENTIAL NEWSLETTER: Latest info on secret broadcasters. Six issues $10 US, $13 foreign, U.S. funds. RR4 Box 110, Lake Geneva, WI 53147.

WANTED: Mod xfmr & meter for Ranger, 3 sections Rohn 25G, Heath Dummy Load. Con Helber, Star Rte. 1 Box 96, Middle Brook, MO 63656.

SELL: 120' guyed steel super-strong tower. 20' sections, $150, whole tower, $700. Heath U-matic keyer $70. Heath 2020 tuner $100. SC-146A, NI-Cads, case, mike, duckie, drop-in charger, $100. T. N. Colbert, Burton, OH 44021.

RADIO ARCHIVES Novice newsletter. Nostalgia, passive es regen rcvrs. Sample $1. Write to 2308 Garfield #304, Mpls., MN 55405.

KENWOOD TS-820 with CW filter, dig. readout and ext VFO, $550. K8FJ (313) 485-0715.

FOR SALE: Dentron MT2000A antenna tuner, mint, $125. Janel QSA-5 2 meter preamp, new, $20. Dr. Jack Robinson, WØRJZ, Box 323, Creston, IA 50801, phone 515-782-2111.

WANTED: LP109RN/AY and LP124YD/AJU typing units with LMU-21 motors. C. T. Huth, 130 Hunter St., Tiffin, OH 44883.

RTTY INTERFACE: Microlog AIR-1, complete hardware/software (latest ROM update) for VIC-20. Exc. cond, $150. Dan, K1FEV, 28 Downing Road, Peabody, MA 01960.

WANTED: E. F. Johnson Type E single-section 150E30, 154 mFd with .075" spacing. Send price including UPS costs. Ernest Olson, WØUIV, 1916 6th Ave. North, Moorhead, MN 56560.

WANTED: Audio driver transformer to match four 2A3's in pushpull-parallel to class-B grids. UTC LS-49, Chicago BD-2 or similar. K4KYV, RR1 B281, Woodlawn, TN 37191.

WANTED: Private collector wants Cathedral radios, any condition. WB9RAD, Alan Piorek, 1050 N. Pauline St., Chicago, IL 60622.

WANTED: IC-271A, Ten-Tec 229, Drake WH-7, WV-4. Sell/Trade: IC-211, TR-2400, RF Maxi-Tuner, Bird Ham-mate 4350. KØMK 218-865-6541.

FOR SALE: ATLAS 210X w/PS-Console and Crystal Oscillator all EC $335. ICOM R-70 as new $445. WB2OMO (609) 235-5354.

WANTED: Drake R-2C or R-4 rec. use w/Drake T-4XB. State condx. and price. Wayne Skiba, WD9HKP, 8550 So. Sayre, Burbank, IL 60459.

WANTED: ICOM IC-2A, ICOM accessories, COLLINS 75S-1 rcvr, any condx. SELL: antique SUPREME tube tester, model 35. Mike Ludkiewicz, 143 Richmond Road, Ludlow, MA 01056.

SWAN: 350 Digital, with Electro-Voice 727 mic, manual. Very good condition $300. George Mitzel, KA2VHX, P.O. Box 153, Deptford, NJ 08096. Phone: 1-609-848-3206.

WANTED: COLLINS 75S-1 rcvr, any condx. ICOM IC-2A and ICOM accessories. SELL: Antique SUPREME tube tester model 35. Mike Ludkiewicz, 143 Richmond Road, Ludlow, MA 01056.

ALPHA OWNERS: New Eimac 8874's, $145. Schaaf, 807 Sunbeam, Oneida, WI 54155, phone 1-414-434-2938.

WANTED: Collins KW-1 and any pre-WWII amateur gear. Parker, W1YG, RFD Box 274, Lyme, CT 06371.

AFTER 3 Yaesu's, 2 Kenwoods, and an ICOM, don't you wish you had your old C-Line back? FOR SALE: One fantastic C-line, late serial #'s, absolutely *mint, no modifications*, and *everything works* (i.e., no time or money need be spent in fixing anything). T-4XC, R-4C, AC-4, MS-4, FL-250, FL-500, FL-1500, Calibrator. $825.00. Send SASE for other used gear that works as new, all in excellent to mint appearance. I'm cleaning out the shack for cash. Write THE MINT MAN, Rt. 7, Box 168, Lexington, SC 29072, phone (803) 359-3418.

WANTED: Swan Cubic Astro 103, mint condition, Alpha late-model amplifier. Bob, KE4SI, 4814 Presidential St., Seffner, FL 33584, phone 813-685-0733.

WANTED: Power Supply for HW-7 Hammarlund HQ-145 receiver. Donald Trayes, WB4CVH/IT9, Box 127, FPO NY NY 09523.

FORTY YEAR COLLECTION Vacuum Tubes from dollar on. Send list of needs for availability and quotes. M. Levy, 4141 Krupp Drive, Apt. One, El Paso, TX 79902.

WANTED: Any information on updating the R390 series communications receivers. Clair W. Stahler, Star Route, Richlandtown, PA 18955.

WANTED: KENWOOD VOX-3, ICOM SP-2 speaker, Yaesu TC-2 converter, and M28 Stunt Box. C. T. Huth, 130 Hunter St., Tiffin, OH 44883.

SELL: Microwave Modules MMT432/435-28S transverter $185. Two Cushcraft Jr. Boomers, 214B's $40 each. Yaesu FT-227R "Memorizer" 2 meter FM $185. Autek QF1 $25. K5WE 918-665-2671.

SELL: (3) MRF454 $50, B&K Sig. Generator $80, Bearcat 160 $90, Wilson Shooting Star $150, 150 watt 10m mobil Biamp $150. Lyn, 969 Nelson Rd., Bozeman, MT 59715, phone 406-587-0508.

Please send all reader inquiries directly.

Advertiser's Index

We'd like to see your company listed here too. Contact Jack Gutzeit, W2LZX, or Arnie Sposato, KA2TYA, at 516-681-2922 to work out an advertising program tailored to suit your needs.

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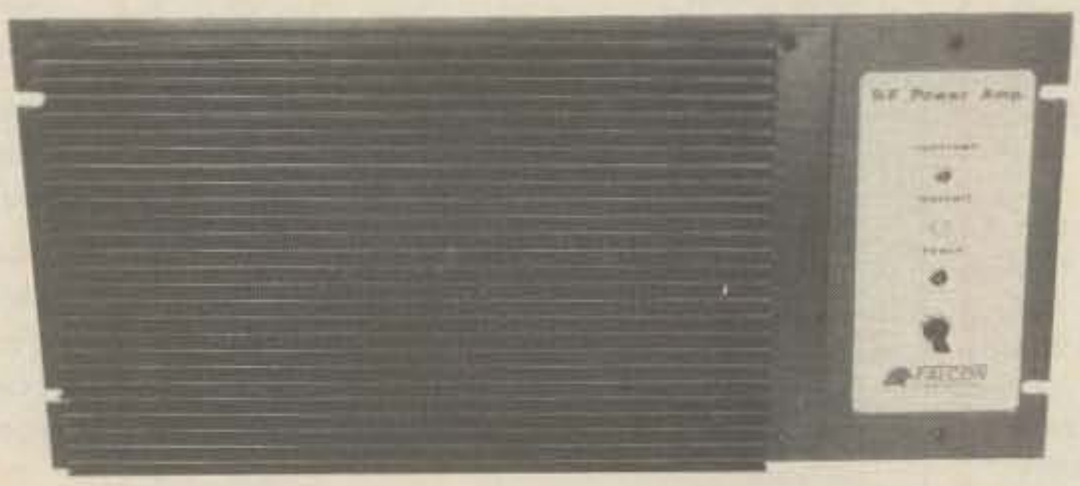

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5142 100 Watt 70 Cm Amplifier. 30 Watts in = 100 out; 10 in = 40 out. Bipolar, not MOSFET. **NEW** **List $375**

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