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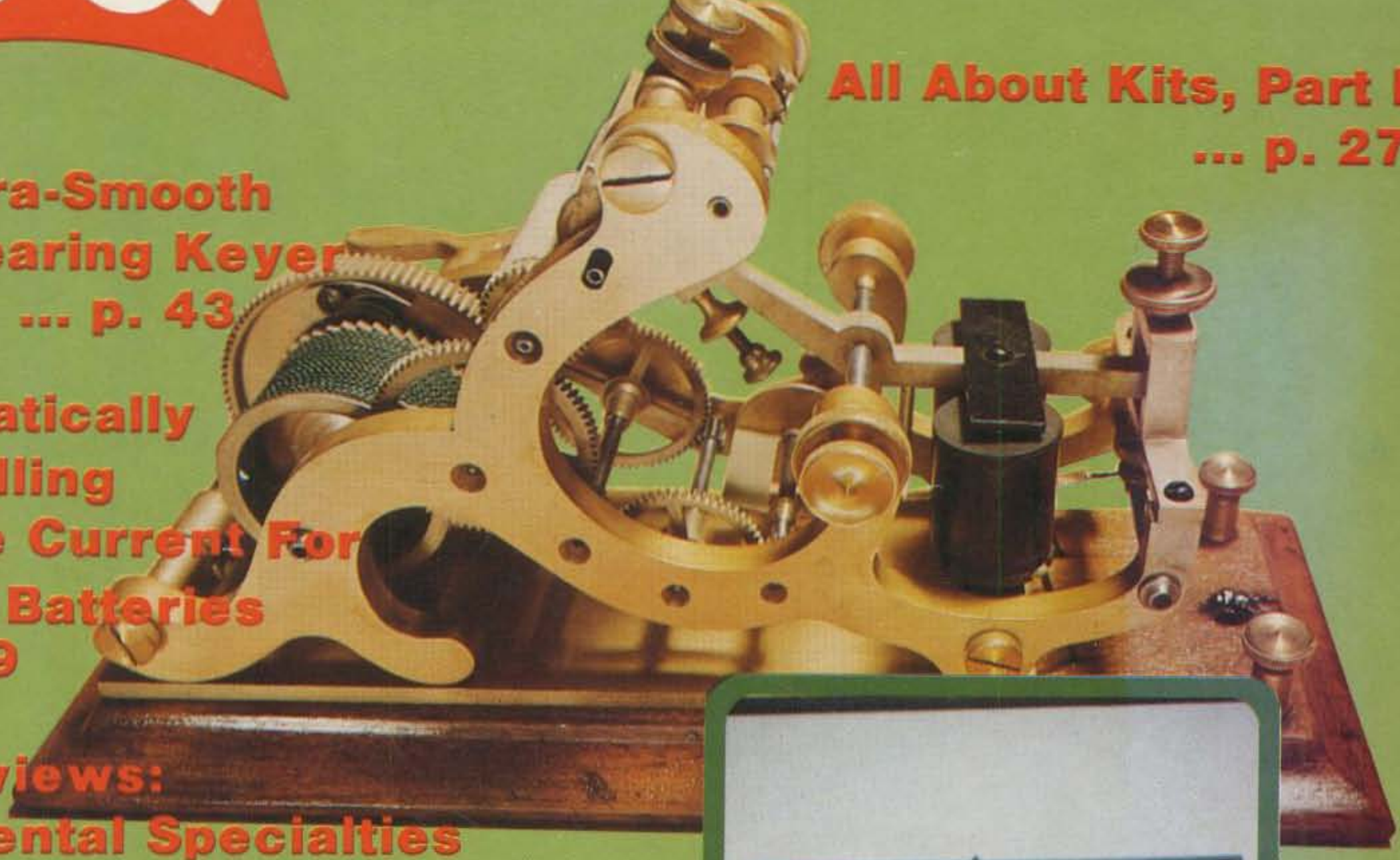

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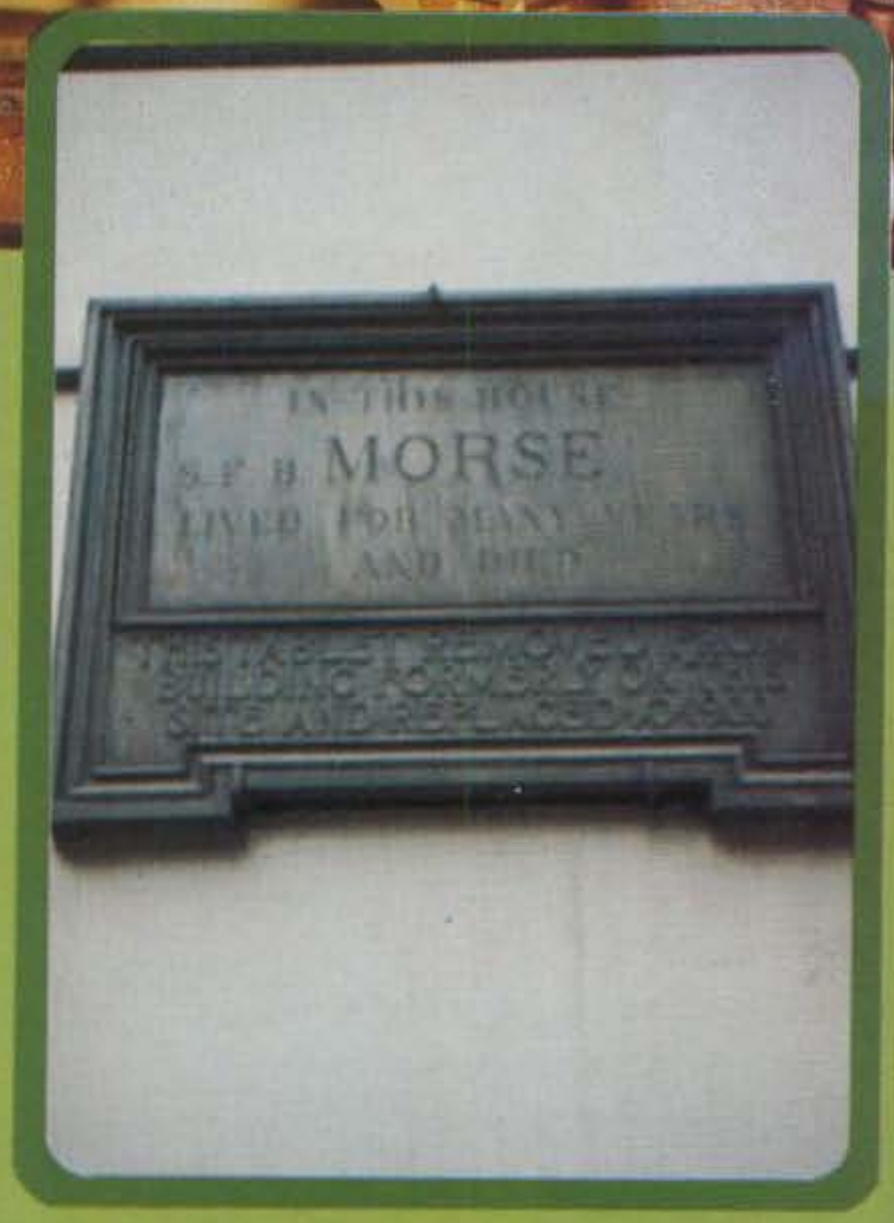

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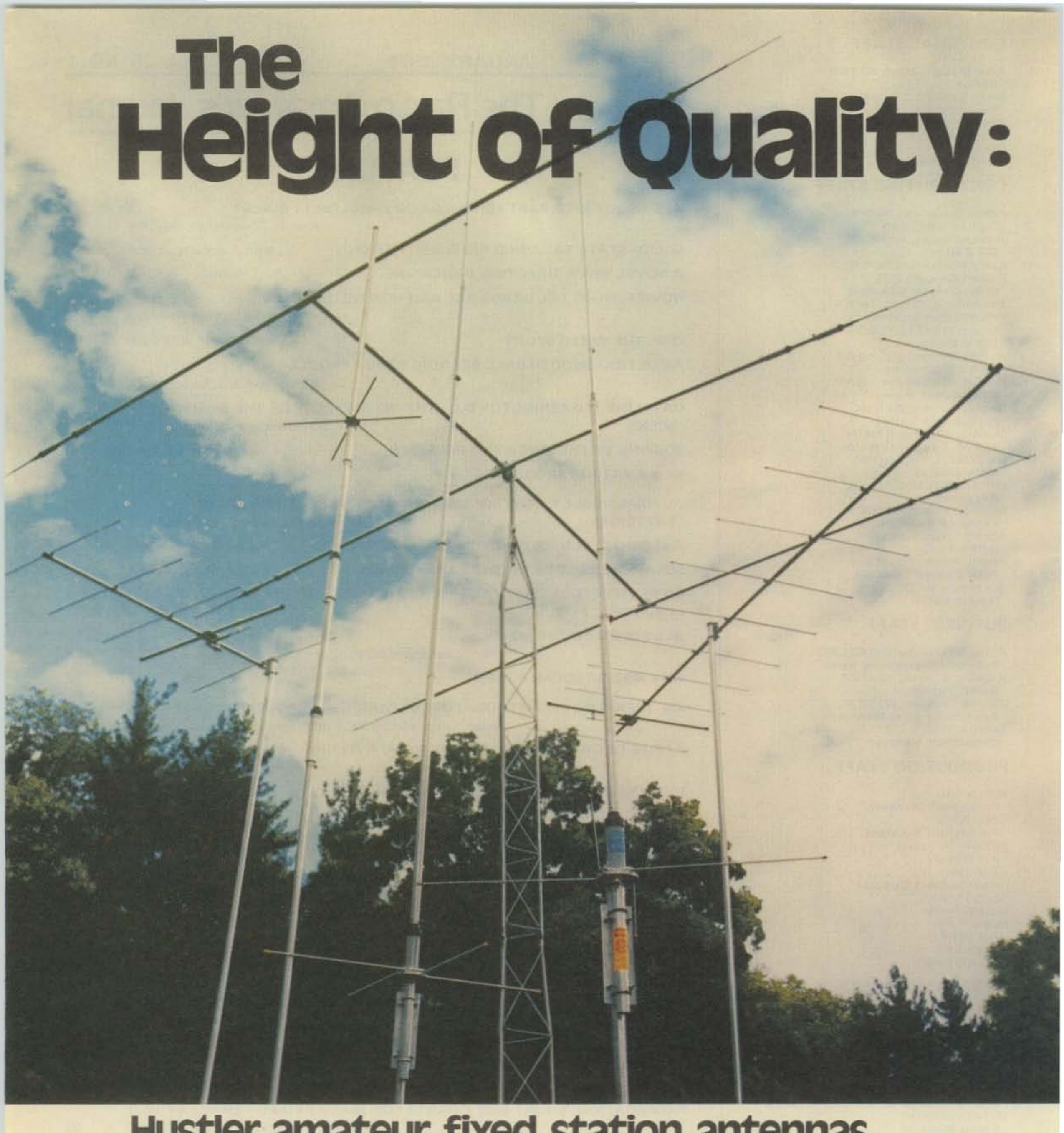
JANUARY, 1979 VOL. 35 NO. 1

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

The Height of Quality:



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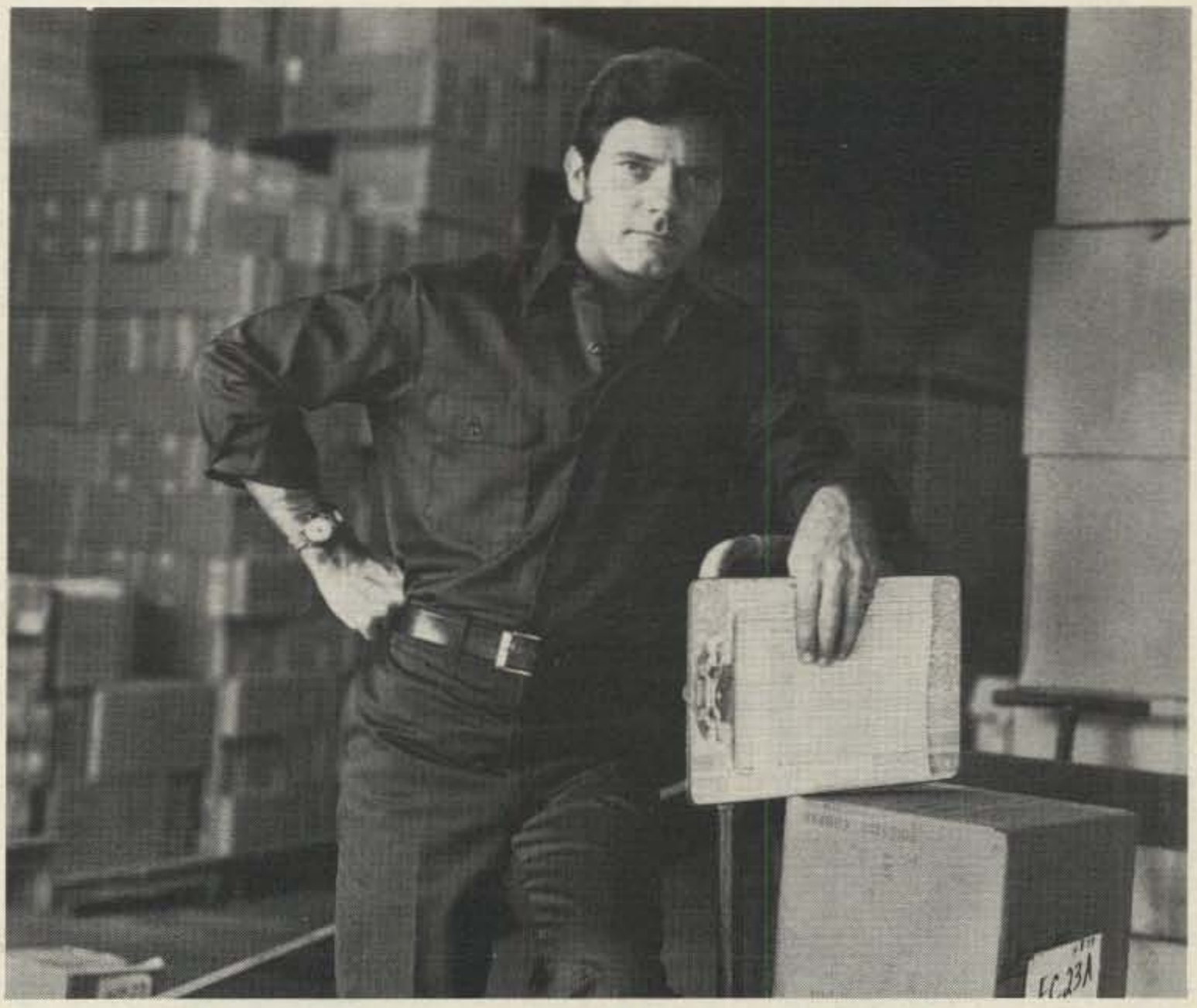

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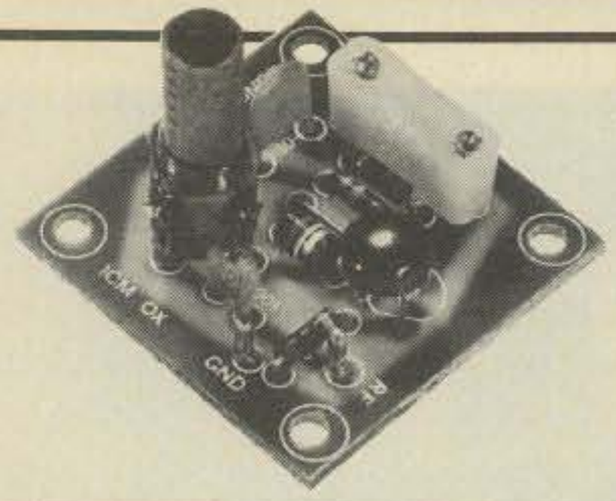

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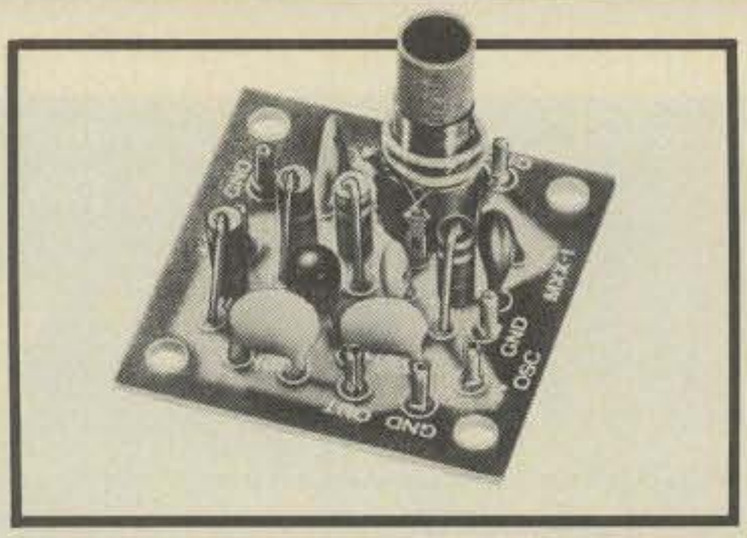

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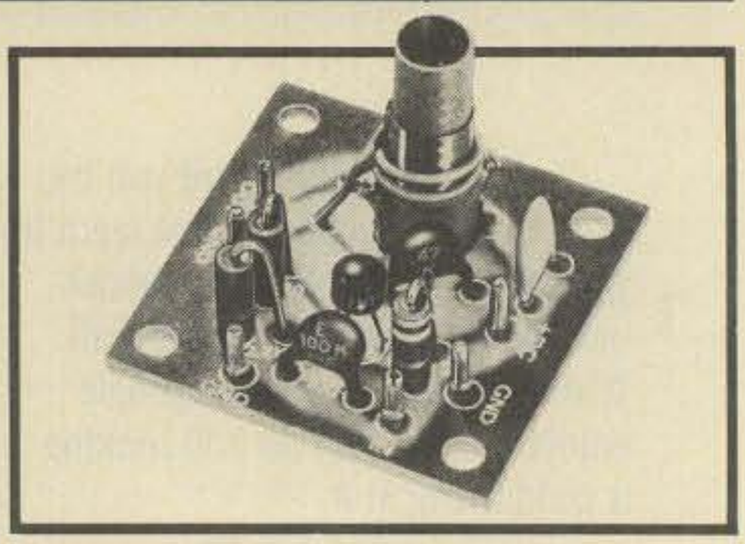

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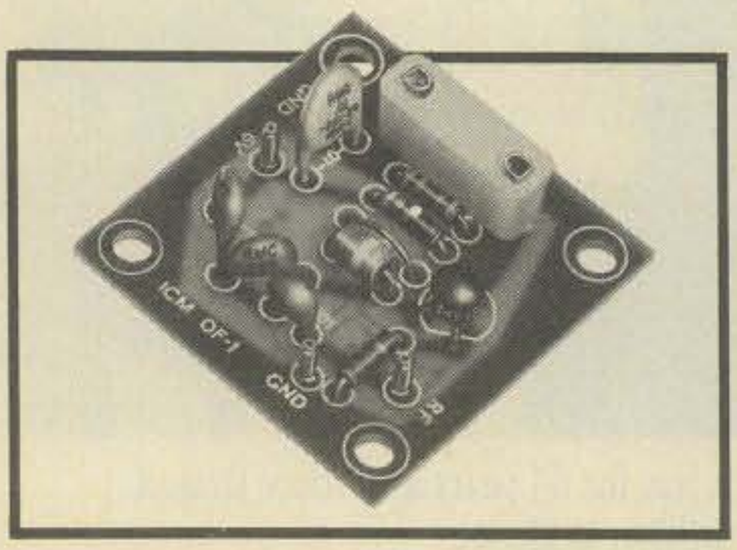

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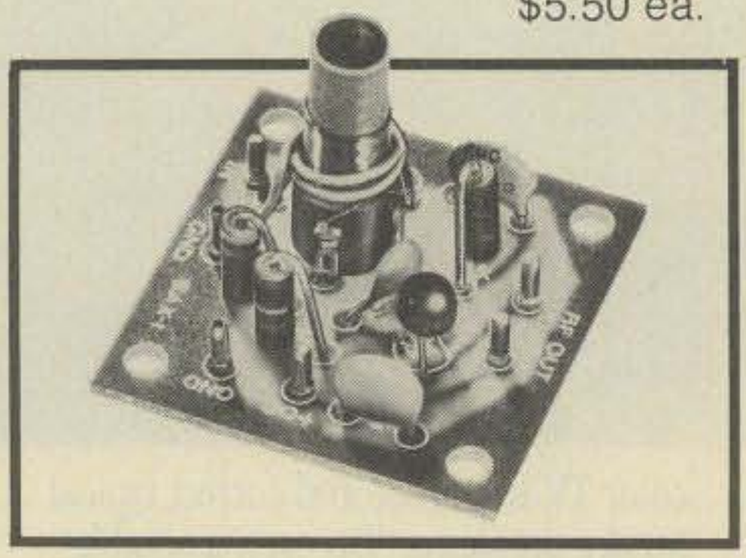

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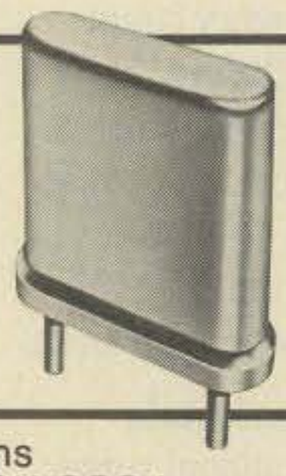

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CIRCLE 30 ON READER SERVICE CARD

Zero Bias

an editorial

Our cover this month features another "Golden Oldy" in the history of communications. This receiver was state-of-the-art in its heyday of 1846 and is still looked on as a work of art today. As we start a new year, hopefully enjoying some new equipment that Santa dropped off, let's look at a rig Bill Orr hasn't described yet.

Long before an accessory speaker was even thought of, Morse telegraph signals were received and recorded on a device such as this called a register. A stylus recoded the signals by perforating a paper tape. The stylus, pointing upwards at about a 45-degree angle, is attached to the lever in the center of the register. The tape was pulled through the two grooved rollers, at which the stylus is pointing, by the clockwork mechanism. A key, partially visable in the upper left hand side, was used to wind up the clockwork. When a current passed through the electromagnet (the black coils), the armature was attracted to the coils, causing the stylus to press against the paper tape. The perforation in the paper stood for a dot or dash depending on its length.

Since Mr. Morse is credited in some way for starting us all off, I thought I would add to our cover a photo of a plaque in his honor. I spotted this plaque during a traffic jam on a trip to New York City. Mr. Morse evidently resided at one time on what is now 22nd Street just off of Fifth Avenue. Mr. Morse and the register are part of our past, either gone or part of a collection. Who will remember where we once lived or create an artifact out of today's synthesized marvel?

Most of us are too taken up with the "now" and its immediate considerations to give much thought to posterity or the distant future. The old cliche used to be "The Big Picture," and overview of how things fit together. Well, we're starting a new year, with new resolutions and some new goals to shoot for, so let's look at a few things that might help create that "Big Picture."

Towards the middle of January, when most of those impossible New Year's resolutions have been forgotten, there might be room in that space devoted to best intentions for another resolution. Resolved: to make some concerted effort to interest and/or aid some fellow human being in amateur radio.

This past year, 1978, we witnessed a substantial growth in the number of individuals who applied for and passed the Novice exam. Although in general terms the numbers by CB terms are not large, for amateur radio it is a significant increase. If we as amateurs took it upon ourselves to directly solicit people to join our ranks then we are talking about a potential doubling in a short time. This of course creates a big "if."

IF we think past the concept of theoretically crowded bands, IF we get past the idea that these new people are going to take away something from us then we may think of all the possible ways an increase in hamdom can help us.

The first obvious benefit from large numbers of amateurs is a stronger political block. When seeking redress or legislation it's numbers that count.

The second consideration, thinking beyond oneself, is that a substantial increase in the number of amateurs creates more business. Hams are not only economic consumers, they also start businesses. Art Collins started up a nice little business some years back based on his "hobby" (that's still going strong) and in more recent times people like Dennis Had of DenTron and Bill Henry of HAL Communications turned their avocations into businesses that employ other amateurs and strengthen the amateur economy.

Just creating a new business and providing employment or paying taxes is reason enough. This new market, seller and buyer, creates competition, which President Carter recently talked at great length about. Competition in a market produces better prices, greater efficiency and most of all new technology.

The complaint of over-crowded bands in the light of history bares little weight. That sort of rationale would still have us using that beautiful brass mechanical marvel on the cover. It served its purpose and when conditions warranted an improvement to handle messages faster and more efficiently a newer device was forthcoming. S.s.b. came in mighty handy a few years ago. Digital communications are in the future.

One of the best reasons of all for enlarging our ranks, and why I urge you to cooperate with all of the training programs plus take that personal interest this year, is the tremendous potential to learn about or experience new people. Our "little club" could very well benefit from a fresh outlook on life and possibly some budding genius will now have the motivation to develop that needed marvel. There are vast opportunities for amateur radio out there and better times are ahead, if only we start to think beyond today.

So, like the part of us that still fights 1979 by writing 1978 on checks and letters, we have to make the conscious effort to move ahead. We should appreciate the past and learn from it. Try to anticipate and welcome the future and always remember that we are constantly in transition and that nothing stays the same.

73, Alan, K2EEK

Photo Credit: Telegraph Register courtesy of In Search, Department of Communications, Ottawa, K1A 0C8 Canada.

Announcing

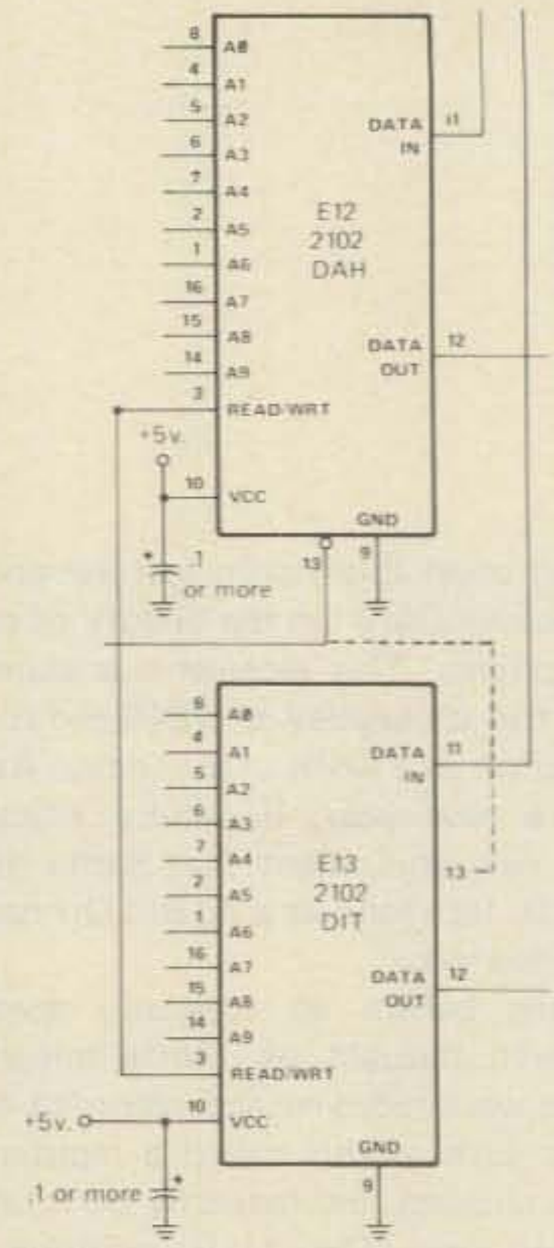
• **Southfield, MI** — The Southfield High School's Amateur Radio Club will be holding its 14th Annual Swap & Shop on Sunday, January 21, 1979, at Southfield School, at 10 Mile & Lasher. (This is one of Michigan's Largest). Admission will be $2.00. For information send SASE to: Mr. Robert Younkers, 24675 Lasher Rd., Southfield, MI 48034 or call (313) 354-8210.

• In order to obtain an Amateur Telecommunications Station License in the British Virgin Islands, under the Reciprocal Licensing Agreement, you must possess a Current General Advanced or Extra Class License. 2) The annual license fee is $15.00 and each license or renewal thereof shall be valid until the 31st day of January in the year next succeeding that in which it was taken out unless it has been previously revoked. 3) Provided that if a license is first granted on or after the 1st day of August in any year the fee payable in respect of such first license shall be fifty percent of the fee specified. 4) Please send a certified copy of your current license, along with a Postal Money Order (plus a five cent stamp to cover "stamp duty", made payable to the "Accountant General" Ministry of Communications, Works & Industry, Government of the British Virgin Islands, Tortola, British Virgin Islands. No personal cheques can be accepted.

Corrections

• In the Nov. '78 issue of *CQ*, figs. 2 and 3 of W3KNG's "Wire All-Band Antennas" article were reversed.

• There were two omissions from the schematic diagram in WA2VYU's "Cheap and Easy Memory Keyer." (November, 1978, *CQ*). First, tie pin 13 of E12 to pin 13 of E13; second, the value of the *speed* resistor should be 5 megohms.



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Time Base TCXO 1PPM 65° to 85°F
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CIRCLE 13 ON READER SERVICE CARD

Our Readers Say

Passing the Buck

Editor, CQ:

CQ does a grave disservice to amateurs all over the world by suggesting, as it did in the July 1978 DX column, that U.S. amateurs send dollar bills to foreign stations when requesting QSL cards.

The unfortunate practice of sending dollar bills (or "green stamps"), is apparently growing. It should be stopped short in its tracks. It reduces the invigorating practice of DXing to a cheap exercise; it accentuates the seldom-appreciated image of Americans as favoring the crude power of the buck over the more subtle powers of quality; and, except for a very few misguided foreign operators, it is entirely unnecessary.

Judging by the expense of QSLing shouldered by active DXers in the United States, the cost facing foreign hams must be staggering. It makes every sense to help foreign stations with this burden. Sending IRCs and mint foreign stamps are well-accepted ways of keeping the foreign station's cost down. There is a world of difference between these practices, which are clearly designed for the specific purpose of paying for postage, and sending money, the clear aim of which is to give the foreign station a little "on the side." Stations that require such tribute, the one or two of them that stick out like sore thumbs, should be shunned. They are like the doorman who accepts a tip for opening the door. He deserves your scorn not your tip.

Do not cheapen an important part of our great hobby by this shoddy propagation of the dollar. Thank goodness all but a tiny minority of foreign stations will answer reasonable requests for QSLs. Do not make that minority larger by raising the promise of payment for what still is a courtesy.

The leading amateur publications should editorially condemn the practice of paying for QSL cards (except in the limited way of defraying postage). It is not too late to retain the balance and reason which must remain a hallmark of Amateur Radio.

Anthony F. Japha, N2UN
New York, NY

Self Regulating?

Editor, CQ:

I just went thru a disgusting experience on 75 meter phone which makes me want to go back to the Novice bands. I listened to a WB3 QSO on 3.923 for several minutes last night, and when he signed, I called him since I had two-way traffic to Maryland.

Shortly after I established contact with the WB3 (on a previously quiet frequency), a Kilowatt W1 Extra Class ham came on frequency and advised me that I was interfering with a Net on 3.920...and asked "for some elbow room...". The extra came on while the WB3 was transmitting and kept calling me by name, "George-George-George" until I finally acknowledged his presence!

I promptly told the Extra that I would end my QSO with the WB3 and would QSY, which I did immediately. The disgusting part of this scenario is what happened next.

I signed with the WB3 who was established on frequency and the WB3 began calling CQ-75...on 3.923. I listened for a few minutes and was appalled to hear the W1 Extra Class ham begin methodical jamming and harassing the WB3! The W1 began calling CQ right on top of the WB3, calling him a "Dummy"...saying he would "call CQ all night if necessary...".

Naturally the WB3 finally gave up and QRTed, even though he had every right to the frequency and could not conceivably interfere with a Net operating 3 KHz away.

We might expect this kind of childish performance from a "Bootlegger", but it is sad to witness such ignorance from a ham with the highest license class. One is tempted to file a complaint with the FCC, but we are "self-regulating", aren't we?

George W. Adkins, WB1HLD
Burlington, CT

QTH?

Editor, CQ:

For many years, I have been thinking of the various Amateur Magazines to purpose my idea to, but kept putting it off. However, I'm finally getting around to it.

I have been on the air about fifty years and during that time, when I called a "CQ", I have always given my location (QTH); since I felt many amateurs wanted to know where the call was coming from. There is always the chance they might have phone-patch traffic for my location.

Back in the old days when someone signed W1, W2, W3, etc., one always had a general idea of their location, but with the complete jumble in call assignments by the FCC recently, one does not know if the call is from their next door neighbor or from Timbuktu.

I would like to suggest that a movement be started by various magazines to have everyone give their QTH as well as their call sign. I'm sure most of the "old timers" feel the same way.

Russell A. Garlin, W5UKA
Albuquerque, NM

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3550W	50HZ-550MHZ	TCXO 1PPM 65° to 85°F	25MV	25MV	75MV	8	.5 inch	115VAC or 8.2-14.5VDC	2⅞"H x 8"W x 5"D
3240HH	2MHZ-250MHZ	3PPM 65° to 85°F	100MV	100MV	NA	7	.4 inch	4AA Batt.	5"H x 3"W x 2"D

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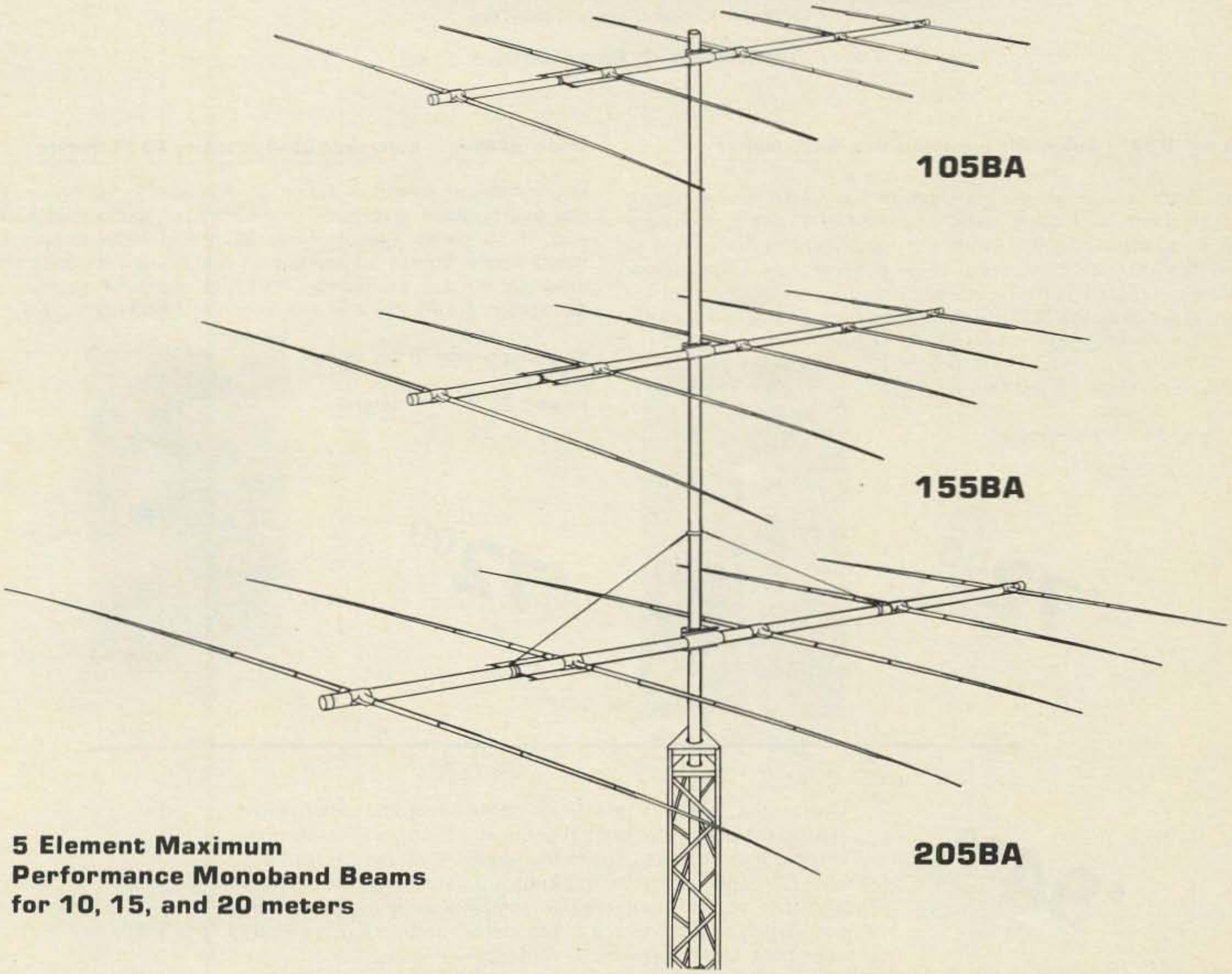

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Specifications:

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Model Number	**205BA**	**115BA**	**105BA**
Gain	11.6 dB	12.0 dB	12.0 dB
Front-to-back ratio	20 dB minimum	20 dB minimum	20 dB minimum
SWR (at resonance)	Less than 1.5:1	Less than 1.5:1	Less than 1.5:1
Impedance	50 ohms	50 ohms	50 ohms
Power rating	Maximum Legal	Maximum Legal	Maximum Legal
2:1 VSWR Bandwidth	400 KHz	500 KHz	1.5 MHz
Longest Element	36½'	24½'	18½'
Boom Length	34'	26'	24'
Boom Diameter	2"	2"	2"
Turning Radius	25'	17½'	15'
Surface Area	9.0 sq. ft.	5.2 sq. ft.	3.9 sq. ft.
Wind Load at 80 mph	230 lbs.	133 lbs.	100 lbs.
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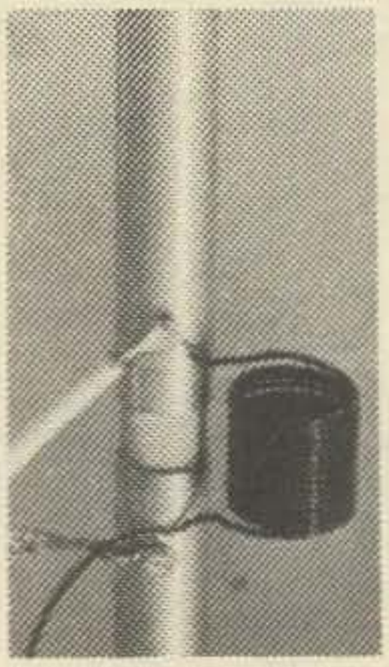
Model HF3V - - Automatic bandswitching 80-20 meters.

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

Shipping weight: 10 lbs./4.5 kg.

Height: 25 ft./7.5 meters

$72.00



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

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

Shipping weight: 9 lbs./4 kg.

Height: 25 ft./7.5 meters.

$72.00

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

ELECTRICAL AND MECHANICAL SPECIFICATIONS:

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

Shipping weight: 9 lbs./4 kg.

Height: 16 ft./4.8 meters

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

Feedpoint impedance: nominal 50 ohm all bands.

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

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

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

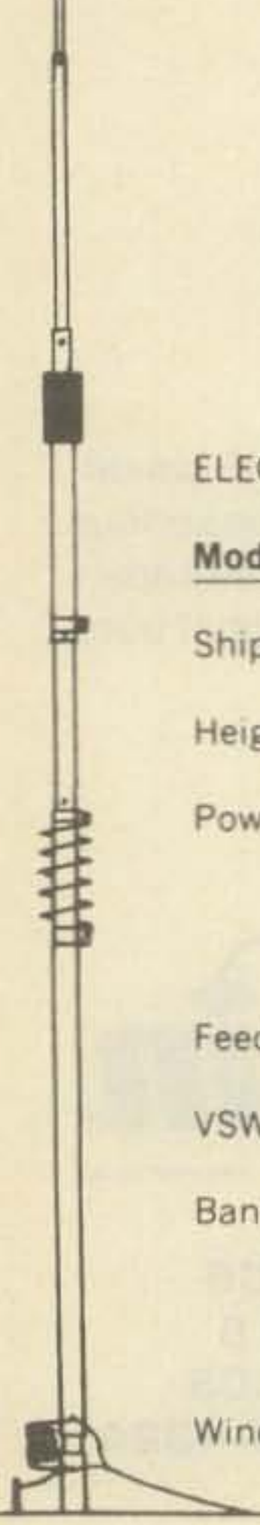
Model HF4V-S - - Automatic bandswitching 40-10 meters.

Shipping weight: 8 lbs/3.6 kg.

Height: 14 ft./4.2 meters

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

$68.00

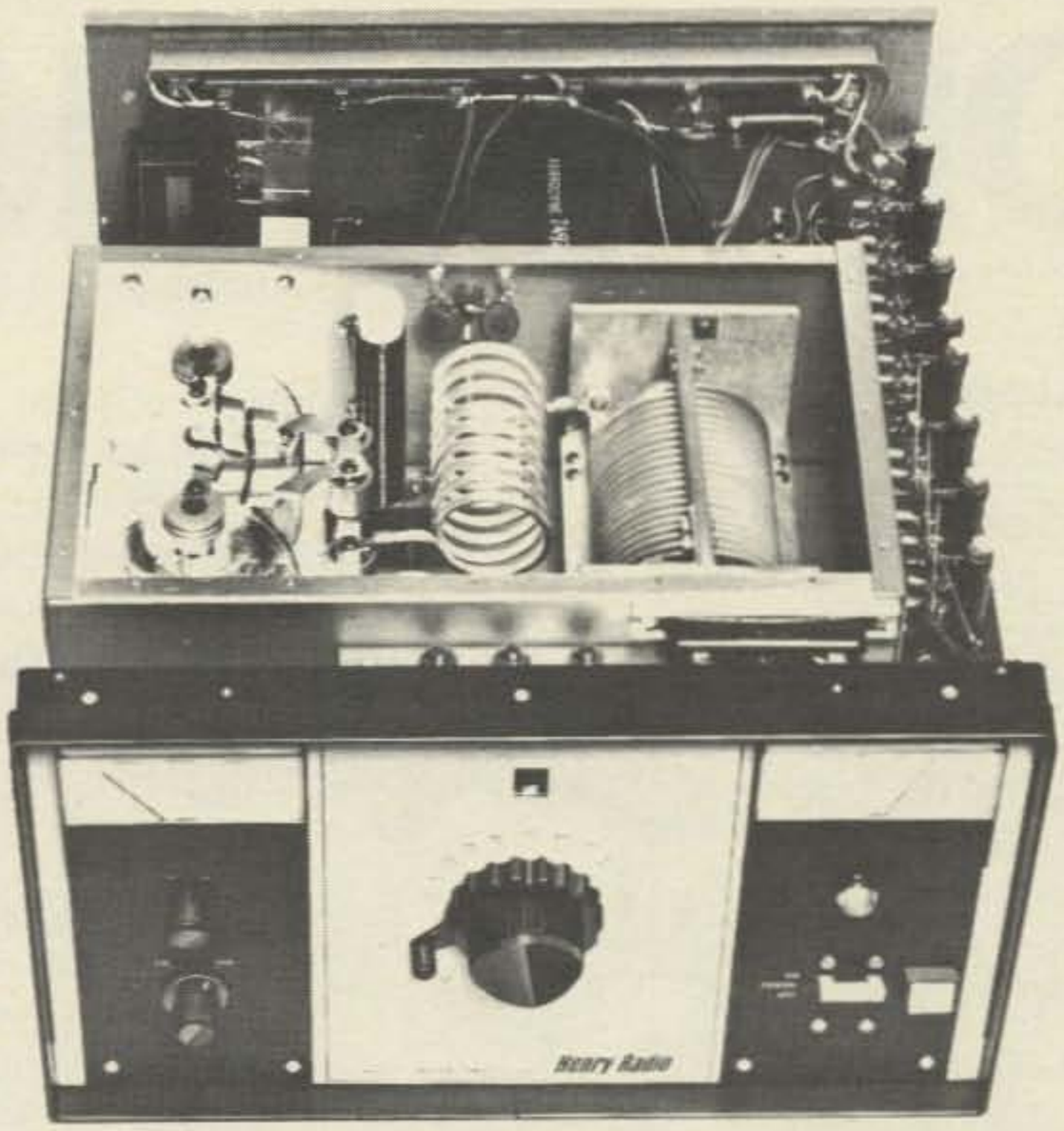


HF5V-S HF3V

CIRCLE 18 ON READER SERVICE CARD

HF4V-II HF4V-S

Before you buy an amplifier



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- ✳ The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20, and 15 meter amateur bands.
- ✳ Two Eimac 3-500Z glass envelope triodes operating in a grounded grid circuit.
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- ✳ 10.5" high x 15" wide x17.5" deep
- ✳ Price...$895.00

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Tempo C100C10	10W	100W	$240.00
Tempo C100C02	2W	100W	$285.00
HIGH BAND VHF AMPLIFIERS (135 to 175 MHz)			
Tempo 130A30	30W	130W	$199.00
Tempo 130A10	10W	130W	$189.00
Tempo 130A02	2W	130W	$209.00
Tempo 80A30	30W	80W	$159.00
Tempo 80A10	10W	80W	$149.00
Tempo 80A02	2W	80W	$169.00
Tempo 50A10	10W	50W	$ 99.00
Tempo 50A02	2W	50W	$129.00
Tempo 30A10	10W	30W	$ 69.00
Tempo 30A02	2W	30W	$ 89.00
UHF AMPLIFIERS (400 to 512 MHz)			
Tempo 70D30	30W	70W	$210.00
Tempo 70D10	10W	70W	$240.00
Tempo 70D02	2W	70W	$270.00
Tempo 40D10	10W	40W	$145.00
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CIRCLE 27 ON READER SERVICE CARD

HO! HO! HO!

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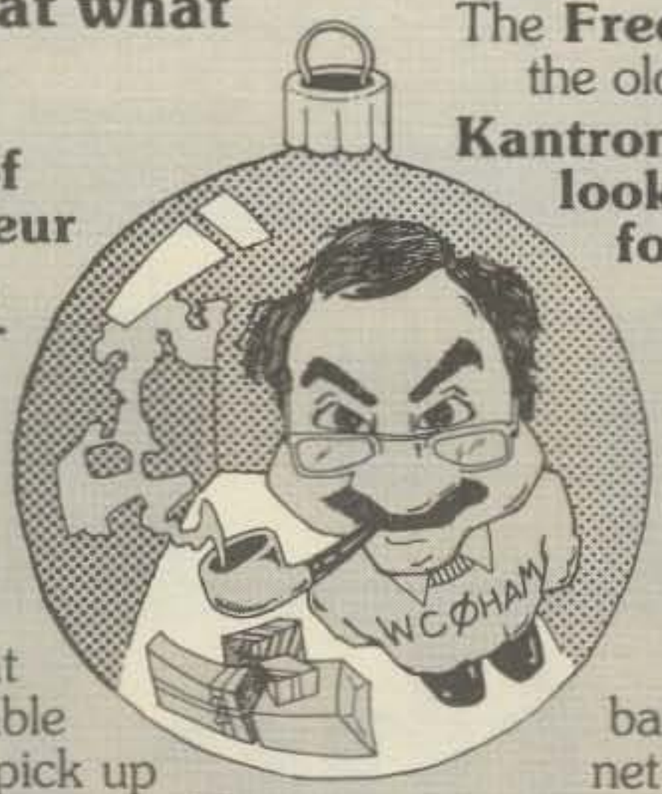

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We've built an 80 and 40 meter CW receiver that's small enough to fit in your briefcase! But even at 24 ounces, the portable 8040-B (79.95) can pick up signals as weak as a microvolt! (Optional headset, 10.95.)

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And even when you don't have time to read, you can study for the Novice theory exam with the **Novice Study Cassette** (4.95).

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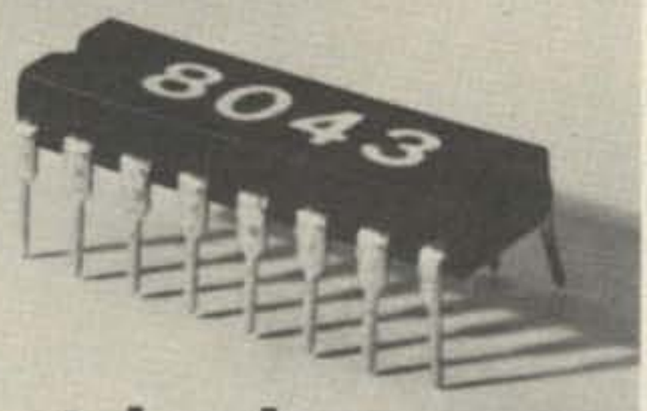

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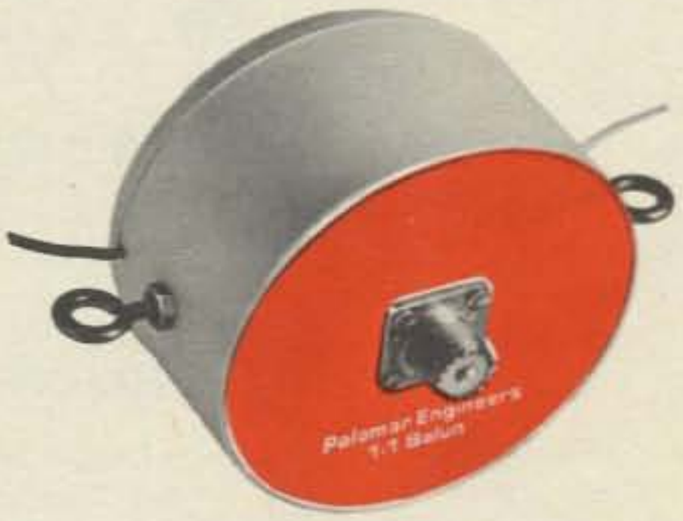

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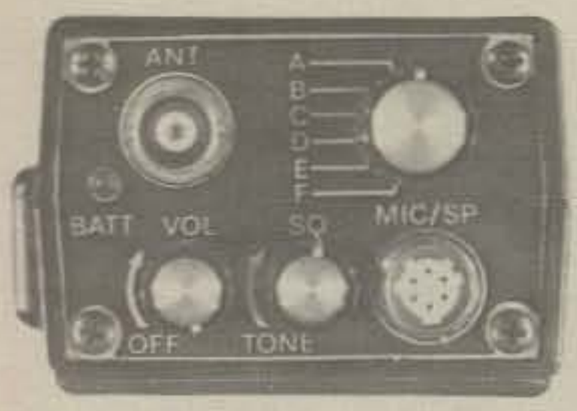

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Semiconductors:	39 diodes, 23 transistors, 11 integrated circuits
Power Requirements:	Nominal 13.8 VDC input at 15 amps, negative ground only
Power Consumption:	Receive — 5.5 watts (includes dial and meter lamps); Transmit — 260 watts
Dimensions:	3-1/4" high x 9" wide x 12-1/2" deep (82.55 mm x 228.6 mm x 317.5 mm)
Weight:	8-1/4 lbs. (3.66 kg)

PERFORMANCE SPECIFICATIONS

Frequency Range:	80 meter band — 3.5 to 4.0 MHz 40 meter band — 7.0 to 7.5 MHz 20 meter band — 14.0 to 14.5 MHz
Modes:	CW; USB; LSB
RF Input Power:	SSB — 250 watts PEP nominal CW — 250 watts DC maximum (adjustable)
Transmitter:	
Antenna Impedance:	50 ohm, unbalanced
Carrier Suppression:	Better than −45 dB
Side-Band Suppression:	Better than −55 dB at 1000 Hz
Distortion Products:	Better than −26 dB
AF Response:	500 to 2500 Hz
Spurious Radiation:	Harmonics better than −45 dB below 30 MHz; better than −60 dB above 30 MHz
Frequency Stability:	Less than 100 Hz drift per hour (from a cold start at room temperature)
Microphone:	High impedance 3000 ohm
Receiver:	
Sensitivity:	Better than 0.5 watts audio output for 0.5 μV input
Signal-to-Noise Ratio:	Better than 10 dB S+N/N for 0.5 μV input
Image Ratio:	Better than −60 dB (typical with respect to 0.5 μV input: 80 meters — −130 dB; 40 meters — −100 dB; 20 meters — −75 dB).
IF Rejection:	Better than -70 dB (typical with respect to 0.5 μV input: 80 meters — 110 dB; 40 meters — 80 dB; 20 meters — 75 dB).
Intermodulation Intercept Point:	Better than 10 dBM
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ALDA 103 is completely manufactured in the U.S.A. CIRCLE 55 ON READER SERVICE CARD

In this comprehensive four-part series, author W8FX brings out almost everything you need to know about building electronic kits.

All About Kits

Part I - Should I Or Shouldn't I?

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

The moment of truth is at hand. You ease the line cord into the socket, turn on the power, and hope for the best. Several minutes later, you decide that, yes, your first kit actually *works*. If it does, you can congratulate yourself for a job well done. If it doesn't, don't despair—chances are that it can be brought back to health without too much trouble. In any case, you've learned a great deal about electronics in the process, even if you *did* have a bit of trouble with your project.

Without a doubt, the fastest and easiest way to develop practical electronic know-how is by building a few kits—whether simple test equipment, or complete transmitters and receivers. And, building is not difficult, provided you purchase kits with good instructions, have the right basic tools, and have some understanding of what it takes to do the job right.

In this article, we'll examine the question of why you'd want to build a kit in the first place take a look at some of the factors involved in selecting one, and suggest some of the basic tools and test equipment you'll need to do the job. We'll also talk about how to go about wiring and soldering the kit, and what to do if it doesn't work.

Why Build A Kit

One of the first questions you must grapple with is, should I build my own equipment, or buy it ready-made? And if I do build, should I homebrew or work from a pre-packaged kit? Answering these questions isn't any easy job.

Many beginners rush out and buy a lot of "gilt-edged" equipment even before their licenses arrive in the mail, thereby arresting the technical development they'd gain from building and experimenting with their own gear. They become little more than dial-twisters. Others run to the nearest parts store sporting a long list of components with which they're going to build a complete transceiver from scratch; this despite having little or no experience. These approaches are not the best ways to break into amateur radio.

Let's take a look at the various approaches, examining their advantages and disadvantages.

Rolling Your Own

There is perhaps no better way to become familiar with the hobby than to home-brew your own gear, starting with the raw components and molding them into first-class equipment. Indeed, it wasn't too many years ago that most amateurs did just that. They scanned the radio magazines for circuits they might duplicate. They patched a few circuit diagrams together and they sometimes designed their *own* hookups if they had the technical know-how. They were anxious to learn and to innovate, and found it a challenge to gather together the parts for a project from surplus houses and by swapping with fellow amateurs. All this has changed, however. We now live in a society where nearly everything comes packaged for quick use. Few people want to go back to the basics of building *anything*, much less complex electronic equipment. Many old-time amateurs muse that much of the feeling of fraternity and accomplishment was lost when amateurs started to buy ready-made gear, and that as a result, the hobby has lost much of its old spark.

On the other side of the coin, there's the case *against* home-brewing. First, not everyone is an electronics specialist, nor should anybody who wants to become an amateur be required to be a technician, too. There are other aspects to the hobby besides building. The electronic parts industry has changed so dramatically over the past two decades that it's almost impossible to gather together all the right parts to build a major project from scratch. It would be almost like building a modern car at home from the tires up! Other good reasons for *not* building are the near-total lack of trade-in or resale value, no warranty, and difficulty in getting repairs if you can't service your gear yourself. Finally, since most of us lead very hectic lives in our own work, why force yourself to build when what you might *really* need is genuine *relaxation*, not more frustration in getting equipment built and working?

Building a receiver kit has introduced many a short wave listener to amateur radio and electronic construction. (Photo courtesy Heath Co.)

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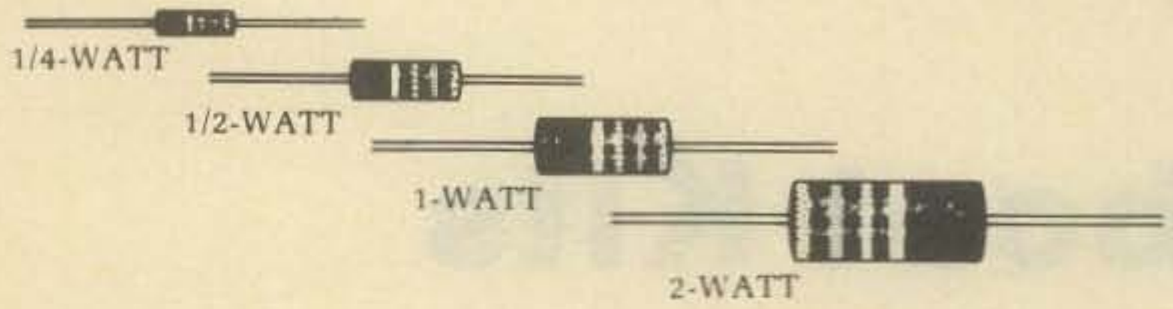
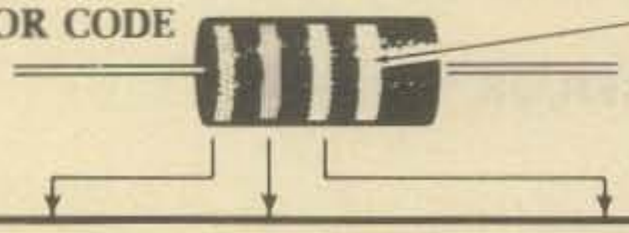
No - 25 - 26

RESISTORS



Resistors come in several sizes and shapes, each one with its color code or value printed on it. The Manual calls out the value, and color code when used, of each resistor at the time it is installed.

RESISTOR COLOR CODE



COLOR	1st DIGIT	2nd DIGIT	MULTIPLY BY
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000
GOLD			.1
SILVER			.01

EXAMPLES:

15 × 1,000 = 15,000 Ω (15,000 OHMS), or "15 k"

30 × 100,000 = 3,000,000 Ω (OR 3 MΩ)
3 MΩ = 3 MEGOHMS

Resistor identification chart. (Courtesy Heath Co.)

Buying Factory-Fresh

There's much to be said for "store-buying" your equipment. Economically, you probably can't duplicate the value of a piece of ready-made, mass-produced gear, particularly if you shop carefully. When you eventually sell or trade in, you'll be able to get some return on your investment if you've taken good care of your equipment. The state of the art is such today that amateurs are just not able to cope with the rapid advances in technology without specialized training and without expensive lab and shop facilities. Also, factory-made equipment carries some kind of warranty, which can be all-important in case of trouble. For the harried professional or businessman, buying ready-made gear makes sense from the standpoint of his time and what pleasures he hopes to derive from the hobby.

On the flip side, recognize that if everyone bought nothing but factory-built equipment, amateurs would ultimately be reduced to button-pushing consumers. With ready-build gear there is little inclination to become familiar with its innards. There's even a *prohibition* against making any modifications if you want to protect the warranty! The recent FCC actions with regard to type acceptance of amateur equipment recognize the trend away from building, with the ultimate implications for the hobby not very favorable. Indeed, it may be a sorry state when the only satisfaction one derives from his equipment is in running to the bank to make the last payment on it!

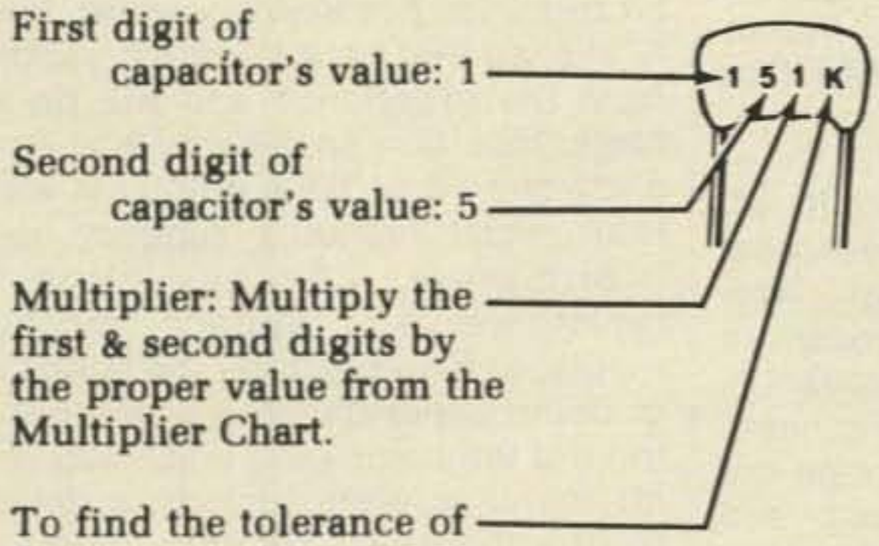
Building From Kits: A Compromise

Building at least *some* of your equipment from kits represents a sort of "hybrid" approach that has much going for it. Today, very attractive kits are available that allow "do-it-yourselfers" to build almost every piece of gear that one might like to have in the shack, including transceivers, transmitters, receivers, and a host of accessories. Building some of your gear from kits—at least for a start—helps you to learn your equipment, its operation and nuances, and to understand and appreciate it. While there may be no real creativity involved, meeting the challenge allows you to take personal satisfaction and pride in the fact that your built your own equipment *yourself*. You'll also feel more at ease in trouble-shooting, should it malfunction. Particularly with complex equipment, there is a *real* cost-savings between a kit and similar factory-made equipment, especially today when labor costs represent a large chunk of the cost of just about everything we buy. The cost gap has steadily widened over the past 20 to 25 years so that savings can be substantial.

Of course, there are some problems with kits. If you go the kit route, you have to choose one that's at your particular *level* of electronic experience. You have to choose one that has good, thorough instructions and which can be fixed by the manufacturer if your best efforts fail. And, you'll need at least a few basic tools and some test instruments, such as a volt-ohm-milliameter (v.o.m.) or vacuum-tube voltmeter (v.t.v.m.). A rather subtle problem with kits, too, is that they are usually just a *shade below* their factory-made cousins in appearance and design features. This is because engineering the *kit* for the home constructor is a lot more difficult than when it is being designed for factory assembly and adjustment. So some performance compromises must be made in the kits you buy. Too, when you trade in a kit, the resale value

CAPACITORS

Capacitors come in many sizes and types. The Manual will tell the type and value of each one, and show what it looks like. This page shows how you can read the code printed on some capacitors.



EXAMPLES:

151K = 15 × 10 = 150 pF
759 = 75 × 0.1 = 7.5 pF

NOTE: The letter "R" may be used at times to signify a decimal point; as in: 2R2 = 2.2 (pF or μF).

pF = picofarads
μF = microfarads

MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER-	MULTIPLY BY:	10pF OR LESS	LETTER	OVER 10pF
0	1	±0.1pF	B	
1	10	±0.25pF	C	
2	100	±0.5pF	D	
3	1000	±1.0pF	F	±1%
4	10,000	±2.0pF	G	±2%
5	100,000		H	±3%
			J	±5%
8	0.01		K	±10%
9	0.1		M	±20%

Capacitor identification chart. (Courtesy Heath Co.)

won't quite equal that of comparable commercial equipment.

Just what balance to strike between these three approaches is up to you. If you've never built any electronic equipment before, and before building any major items in your shack, I'd try my hand at a few *simple but useful* kits that you can use later on.* Such items as a code-practice oscillator or v.o.m. are useful and are usually designed for beginner construction. Heath even offers a soldering iron *kit*, the GH-17A, which can be used to "build itself" by following the directions included in the kit! Don't try a major transmitter or receiver as a first project, as their construction may be overwhelming for the completely inexperienced person. Similarly, building a complicated piece of digital equipment, such as a frequency counter or digital voltmeter, can be very frustrating for the beginner, and more than once has ended in disaster. I'd recommend that the beginner build his first transmitter and receiver combo from a kit, starting with very simple, basic models with good instructions, such as those offered by Heathkit and other major manufacturers. I'd also recommend building as many of my kit *accessories* as possible to get your feet wet in electronics, gradually home-brewing more and more gear as your technical skills increase.

Of course, there are other ways to get on the air, too. You can buy *used* equipment, rather than new, saving a good deal over the cost of buying new gear. Buying used equipment is o.k. if you know the capabilities of the equipment you're buying and whom you're buying it from, and may be as good as new gear *if* you're lucky. Modifying surplus equipment has also long been a favorite of amateurs, at least since World War II. The problem here is that much military gear just isn't useful to the amateur without extensive conversion, and even when converted, you may end up with something that was state-of-the art in 1949 rather than in 1979. Don't invest in a lot of surplus gear unless you know your way around it!

In any case, if you're setting up your station for the first time and are waiting for your license to arrive, get your equipment together and operating before the postman delivers your "ticket" to operate. Remember that no one needs a license to set up and *build* his station—only to *operate*.

Selecting the Kit

Selecting the kit is just as important as building it. The first thing, of course, is not to decide *how* to buy a piece of equipment, but *what* to buy in the first place. When you perceive a need for a new piece of equipment, decide on the *specifications* that are most important to you and balance this against the dollars you have to spend. Make comparisons between competing equipment, giving *equal* consideration to kits and ready-made gear. In some cases, you may even decide that the best thing to do is to home-brew your own, as we discussed earlier. Once you've decided on what you really want, and assuming that you can handle a kit, decide between factory-made equipment and kits strictly on their specs and price. Don't hinge your choice soley on the fact

*For those who want both kit-building experience and formal instruction in amateur radio, the National Radio Institute (CONAR's parent company) offers several amateur and communications-electronics courses that include assembling amateur kits. While aimed mainly at training service technicians and preparing them for commercial FCC licenses, the courses can offer much to the beginner. The NRI courses include a 2-meter sythesized transceiver, regulated power supply, frequency counter, and v.o.m. kits, as well as an antenna "design lab." Write them at 3939 Wisconsin Ave., Washington, D.C. 20016 for information on their radio courses.

that one is ready-made and the other has to be put together. Sometimes the kit is the better choice, while in other cases, it's the factory-made item that you couldn't beat for value. But decide mainly on the specs and features themselves.

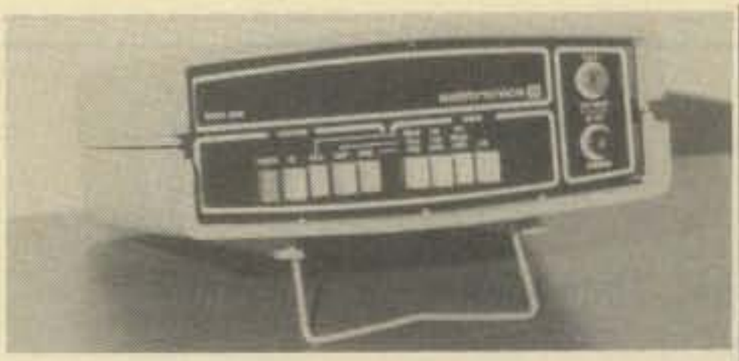
If looking over the specs tells you that you might be better off trying a kit, there are a lot of things to consider in making a final decision to go with a *particular* one. While it is true that most kit manufacturers devote lots of time and money to making their kits of high quality and foolproof to assemble, some kits just don't seem to "cut it." Of course there are some manufacturers whose kits are no better than their wired and tested products.

Evaluate the Manufacturer

It's not easy to evaluate a company, though reliance on the well-known brands such as Heath, Eico, and Conar is some assurance that you won't end up with a kit that has little chance of working despite your best efforts. The major manufacturers pride themselves on intensive engineering, complete and easy-to-follow assembly manuals, free factory consultation, and availability of repair service. Most allow you to buy direct without intervening middlemen. You're able to take advantage of the large-scale component buying only a big manufacturer can afford and, of course, you save the high labor costs of professional factory assembly. Then, too, the major manufacturers may offer some form of credit, something the smaller companies often cannot do.

As we said, the major kit manufacturers spare no effort to insure that a foolproof kit reaches you. They usually employ a staff of product managers and professional design engineers who spend considerable time in

A handy soldering aid is Heath's 3-heat stand-mounted soldering iron kit. Special construction instructions allow the kit to be used to build and solder itself (it doesn't require that you already own a soldering iron to build it). (Photo courtesy Heath Co.)



Sabtronics Model 2000 digital voltmeter is probably the lowest cost full-range digital voltmeter on the market. Although its construction involves complicated circuitry requiring some electronic experience, the instructions are up to Heath and Eico standards.

developing a circuit and proving it out. They can afford a large technical writing and illustration staff, who develop the construction procedure and step-by-step assembly sequence. Here, the tech writers and engineers try to simplify wiring and arrange the components for best operation and ease of construction. The tech writer may actually build the "Prototype" kit, working with the design engineer, as part of the "pre-proofing" process. This tends to bring out major deficiences and any need to improve the wiring sequence. The kit may even be given to other employees to build using the draft assembly manual, to see how much trouble (or lack of trouble) people with various technical skills have in building it. After all this is done, a quality-control or engineering evaluation team may look at the results and see what improvements should be made in the manual, components, and the kit design itself. Conferences are held between the engineering and writing groups and the people who have built the kits to decide on the final changes to it. Usually, differences are resolved and the kit package is "frozen" and the final parts list, diagrams, instructions, and manual are developed. This process may have to be reiterated several times to come up with a quality kit and manual. Procedures may dictate an early pilot production run before the first kit is actually shipped. A pilot sample may actually be built to ensure that what's being shipped is the "real McCoy." Regular inspections and verifications are carried out during the course of production to insure proper parts count, packing, and overall quality—interestingly, Heath says its incidence of "missing parts" is less than 0.2%. During the kit's "product life" (which usually runs about 3 years), improvements are designed into the kit as customer reports come in.

The larger manufacturers have an important reputation for excellence that they strive to maintain. For example, Heath has even been known to recall kits that didn't work out, as happened with the HW-2026 2-meter transceiver. Except for the case of unusually complicated kits, they design the manual to be followed by a person who knows little about electronics and soldering. This is no easy task for the tech writers and design engineers. But they make use of illustrations and photos to make construction and adjustment simpler. They also strive to tell the kitbuilder not only how to *mechanically* put the kit together, but also show him how it works, so that he will *learn* something from the experience and will be in a better position to service the equipment should he have problems with it later. Most manuals suggest useful preliminary checks, such as resistance and voltage measurements, to help preclude the possibility of doing major damage when first trying out the completed unit. Also, most kit manufacturers include a detailed troubleshooting section. Some of Heath's manuals, in fact, represent a short course in applied theory, construction, operation, and servicing under one cover!

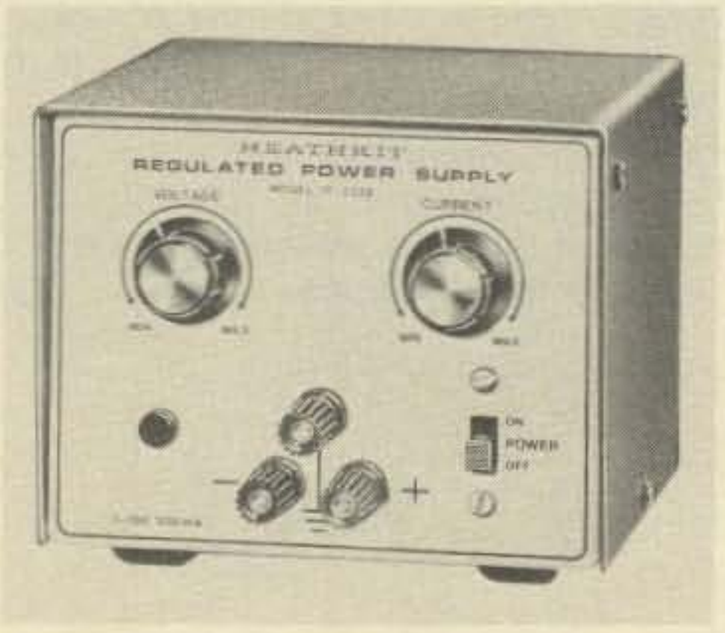
Of course compromises and "trade-off's" are taken by the manufacturer which affect overall character of the kit, its specs, and ease of construction. Some forms take the approach that the kit loses its value if practically *everything* is done for the constructor, like furnishing pre-cut length of hookup wire, pre-wired switches and circuit boards, and overly simplified instructions. They also feel that the cost of spoon-feeding the builder adds too much to the cost of the kit, since it substitues expensive factory labor. Other manufacturers want to ensure success with every means they have. If they believe that pre-wiring a tricky subassembly will make things easier, they

A really first-class soldering tool is this Ungar "controlled soldering station." Available in three preset temperatures *rather than wattage ratings (600, 700 or 800 degrees F), it is particularly suitable for kit-building and project work. A somewhat similar unit in* kit form *is Heath's Model GH-17A. (Photo courtesy Ungar Division of Eldon Industries, Inc.)*

will do this, even if it adds substantially to the cost of the kit. Regardless of what approach a reputable kit manufacturer takes, he takes professional pride in his product. His efforts have made it possible for many amateurs to own and *understand* equipment they might not have ever been able to afford otherwise.

Of course, there's usually a fly in the ointment somewhere. Not all kit manufacturers take the pride in their products that Health, Eico and other well-known companies do. Not all firms are reputable, and not all their instruction manuals and schematics are well written thought out. The advertising pages of most of the amateur magazines are chock full of attractive-looking kits made by companies that may not even have been in business a year or even six months ago. Should you buy a kit from an unknown company?*

The only answer to that question is: *Maybe*. On the "yes" side, there is much to be said for buying the unusual technically attractive kit that appears to be miles ahead of and many dollars cheaper than anything you could buy elsewhere. This is particularly true with new digital solid-state equipment such as clocks, microprocessors, and frequency counters. True, the smaller manufacturer may have on its staff a brilliant engineer striking out on his own whose design is a *real* technological innovation that is well ahead of the market. But, the "breakthrough" may be completely untested and is likely to be unproven as a home construction project. And, the instructions may well reak, in effect: "Here are the parts. Here is the schematic. Put it together." Most importantly, there may be no assurance that you will receive the ordered kit at *all*. There may really not *be* a kit, the manufacturer having been unable to corral his capital and components in order to start production. Or, he may even be an outright mail-order swindler, having no intention of filling *any* orders, rather moving on when the coffers are full.



A small, regulated power supply is useful for bench checkout of d.c.-powered kits and for servicing of low-voltage solid-state equipment. This particular unit can be built from a kit and provides voltages from 1 to 15 v.d.c. at one-half ampere. (Photo courtesy Heath Co.)

Protect Yourself

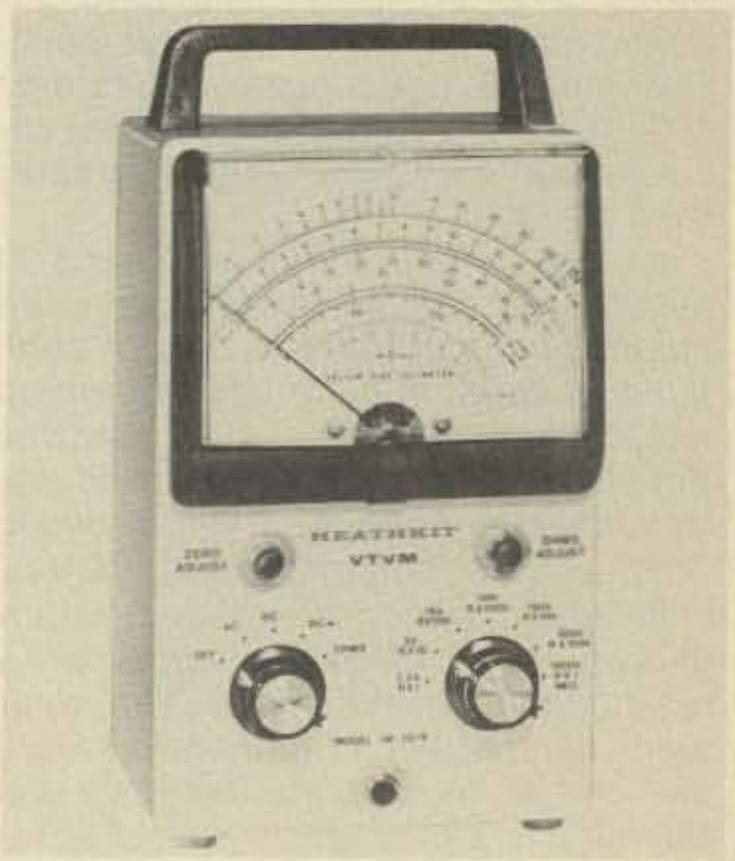
The temptation is great to go ahead and take a chance on a kit from an unknown firm, particularly if it's something offered nowhere else. Here are some precautions you can take to help protect yourself:

1. When you see an ad from a new manufacturer, don't immediately rush in with your check. Write him first, asking some pertinent questions about his kit. Ask for a complete spec sheet, a sample of the instructions, and inquire as to the warranty, if any. Ask what services he will provide if you can't get the kit working, and who will pay for service if you need help. If you get no response to your inquiry, go no further. You probably have a fly-by-nighter.
2. See if his ad appears in more than one publication, and if it runs for more than a single month. Don't hesitate to allow a little time to pass, and then to contact the magazine publisher or editor to see if any complaints have been received.
3. Be cautious about sending your check in, or furnishing him a charge-card number. Instead, ask about a COD if you're at all leary about the firm's standing and if the amount is substantial. Remember, it's hard to verify the reputability of mail-order firms until it's too late to do any good!
4. If you're still in doubt about the firm, look at his address. Is it just a mail-order box? Is there a name or amateur call associated with the firm? You might check the local telephone information and see if there is a phone listing for the company or its principals. If you find nothing think twice before ordering the kit. I've found that you can't count on postal authorities or the local D.A. to bail you out!
5. Ask around locally to see if you can find who has dealt with the firm, what *his* experience has been, and how that "space-age" kit actually works. Don't operate in a vacuum!

While these precautions won't *insure* success in dealing with unknown manufacturers, they'll certainly help to increase your batting average. CQ

*Heath Company. The company was founded by Ed Heath, a barnstorming pilot who in 1926 put an *airplane kit* on the market, which he called the "Parasol." It sold for a mere $199, less only the engine! Heath died in an aircraft accident in 1931, and the Department of Commerce published a regulation against home construction of aircraft. The company then went through some rough times, but was reorganized by Howard Anthony in 1935. He revitalized the company's aircraft and engine business, and began publishing a combination catalogue and magazine in 1941 which was known as *The Heath Beacon*. Shortly after the war, Anthony introduced the Company's first electronic product, a 5-inch oscilloscope which used war-surplus parts and which sold for $39.50 by mail-order. The kit was successful and the firm continued to expand, especially in the amateur radio field. Hams who received their "tickets" in the fifties and sixties were brought up on such "classic" kits as the DX-100 transmitter, AR-2 receiver, AC-1 antenna coupler, the Seneca, Mohawk, and dozens more. While Anthony died in 1954 and the company changed hands (the present parent company is the result of the merger of the Daystrom and Schlumberger companies), the firm continued to introduce successful kits to a hungry market. The current line-up numbers more than 350 different items.

Close behind Heath in popularity is its major competitor, the Electronic Instrument Company (EICO) of Brooklyn, N.Y. EICO introduced its first vacuum-tube-voltmeter kit in 1945 when founder Harry Ashley converted his radio servicing business to electronic kit production. CONAR Instruments has been around since 1962, and grew out of the manufacturing arm of the National Radio Institute in Washington, D.C. It started out supplying the kits used by students completing NRI courses but later expanded into the general market. NRI itself has been in the business for more than 60 years.



A general-purpose test meter is the one basic piece of test gear you'll need for building and repairing your equipment. Either a vacuum-tube-voltmeter (v.t.v.m.), such as the one shown here, or a volt-ohm-milliammeter (v.o.m.) will fill the bill. Consider building one as a first project. (Photo courtesy Heath Co.)

*It's interesting at this point to take a look at the history of some of the kit manufacturers such as the Heath Company. The company was founded by Ed Heath, a barnstorming pilot who in 1926 put an *airplane kit* on the market, which he called the "Parasol." It sold for a mere $199, less only the engine! Heath died in an aircraft accident in 1931, and the Department of Commerce published a regulation against home construction of aircraft. The company then went through some rough times, but was reorganized by Howard Anthony in 1935. He revitalized the company's aircraft and engine business, and began publishing a combination catalogue and magazine in 1941 which was known as *The Heath Beacon*. Shortly after the war, Anthony introduced the Company's first electronic product, a 5-inch oscilloscope which used war-surplus parts and which sold for $39.50 by mail-order. The kit was successful and the firm continued to expand, especially in the amateur radio field. Hams who received their "tickets" in the fifties and sixties were brought up on such "classic" kits as the DX-100 transmitter, AR-2 receiver, AC-1 antenna coupler, the Seneca, Mohawk, and dozens more. While Anthony died in 1954 and the company changed hands (the present parent company is the result of the merger of the Daystrom and Schlumberger companies), the firm continued to introduce successful kits to a hungry market. The current line-up numbers more than 350 different items.

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Idea-wizard John Schultz comes up with another winner! Build his two-in-one substitution box.

Solid-State Tailored R/C Substitution

BY JOHN J. SCHULTZ*, W4FA

Anyone who does a bit of circuit experimentation or trouble-shooting work quickly learns to appreciate the value of resistor and capacitor substitution boxes. Unfortunately, those little boxes are becoming a bit expensive and what is worse very few of the commercially available ones are really tailored for solid-state work. For instance, a relatively simple typical kit type resistor substitution box will cost about $12.00 and have switched resistors ranging from 15 ohms to 10 megohms. A capacitor substitution box will cost the same and have a selection of capacitors ranging from 100 pF to 0.22 μF. If one were to require several boxes of each type, the total expense would be significant. But, the RC values are also not in line with those used in many solid-state circuits. For instance, very few solid-state circuits use resistor values over 100 kΩ. But, many audio transistor circuits use capacitor values greater than .22 μF.

As the need for more R and C substi-tution boxes grew around the shack, it was decided to build a *combined* R and C substitution box which would be as economical as possible but yet have R and C values available which suited solid-state circuit work.

When the "common" and RC terminals are used, the selector switch chooses any value capacitor or a resistor value of 1k or 100 k. The wiper arms of the two potentiometers are brought out to separate terminals and this allows a nice bit of versatility for RC substitution purposes. For instance, by connection to one of the "CT" terminals and the "common" terminal, a variable resistor of either 1 k or 100 k ohm value is available. By connection to one of the "CT" terminals to the "RC" terminal one can form a variety of *parallel* RC circuits.

As shown in the photo, the RC substitution box was constructed in a standard 4 × 2 × 2¾ inch enclosure. The total cost will vary depending upon the parts one has available. But, even if one had to buy all the parts, the cost should be less than half as much than a kit type which is not as versatile. The only part that may require a bit of searching for is the 14 position selector switch. If such a switch cannot be readily found, a very acceptable alternative is to use a Radio Shack # 275-1385 12 position switch at $1.00 and to eliminate two of the mid-range capacitor values. the .005 and .05 μF capacitor values would probably be the ones to eliminate.

Circuit experimentation can become a lot more fun with one or more of these little substitution boxes. Combined as shown with a pair of "mini" test clips, one can also access almost any transistor circuit for component substitution testing.

Any given choice of R and C values cannot satisfy every requirement but those to be described have worked out very well for experimentation with a great variety of linear and digital solid state circuits.

On the capacitor side, it was decided to start with 470 pF. Capacitor values less than this are needed for many r.f. circuits, of course, but for such circuits one can usually not successfully use a substitution box anyway because of stray wiring capacitances. On the other end of the capacitor scale, one frequently needs capacitors in the 1 to 100 μF range for audio and timing circuits, so several values in that range were included. For resistor substitution, two linear potentiometers of 1k and 100 k ohms were used instead of the usual fixed, standard E.I.A. resistor values found in most resistor substitution boxes. It doesn't make much sense to use precision resistors in a substitution box.

Fig. 1 shows the schematic of the RC substitution box. A 14 position switch was used with 12 positions for capacitors and two positions for the potentiometers. The twelve capacitor values chosen were:

470pf, .001μF, .005μF, .01μF, .05μF, .1μF, .22μF, .47μF, 1.μF, 5.μF, 10μF, 100μF

All capacitors below 1 μF are molded paper types rated at 100 volts and those of 1 μF and greater values are 50 volt electrolytic types. CQ

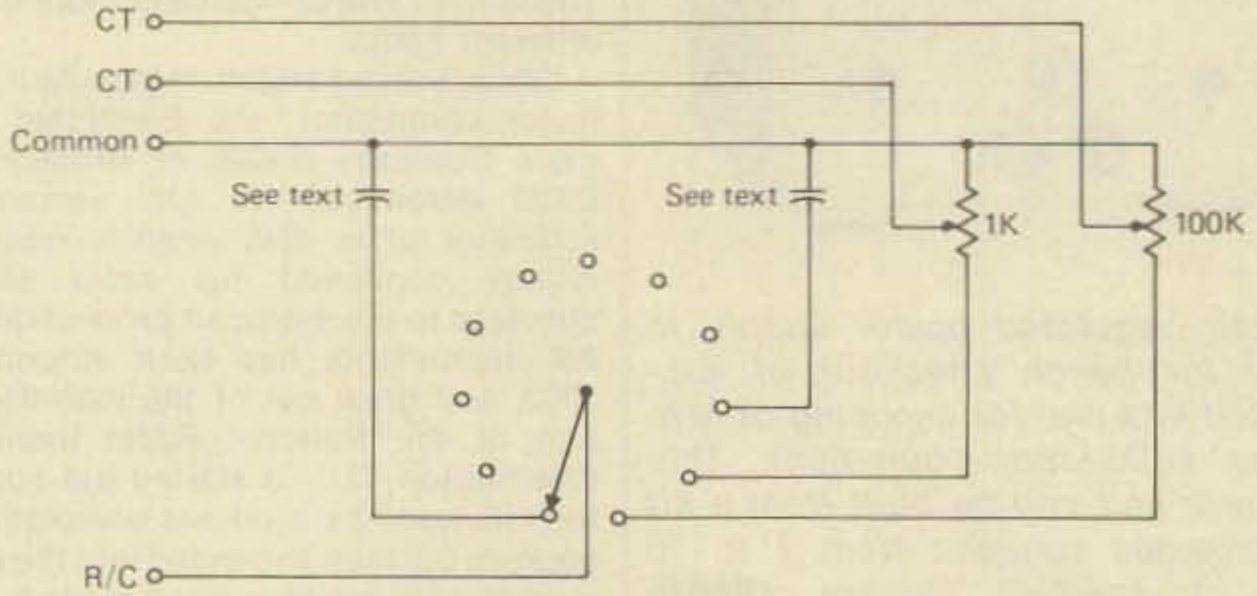


Fig. 1 - Schematic diagram of the W4FA R/C substitution box.

*c/o CQ

Here's an interesting method for accurately turning your beam in the direction of that rare DX. Russ Rennaker describes how to build a different kind of azimuth indicator.

A Novel Beam Direction Indicator

BY RUSS RENNAKER*, W9CRC

How many of you know what direction to point your beam for Australia? For Poland? Well I must confess I didn't. The beam indicators that are marked E W N S did not help much, since my knowledge of directions was based on a flat map—which just isn't made for pointing a beam.

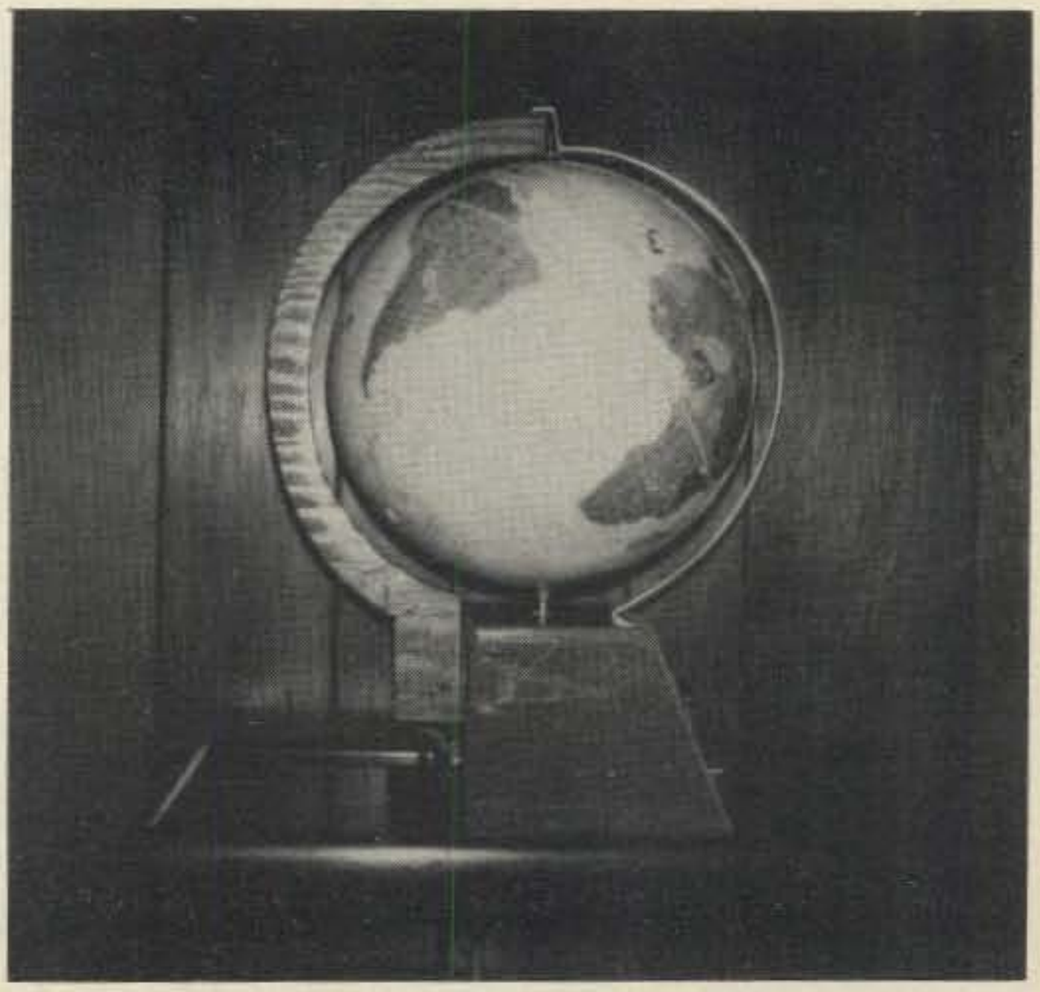
The first thing I did when I got my TA-33 was to buy myself a world globe. I wanted to see just where all those foreign countries were that I intended to work. Well I was amazed to find some of them were not in the direction I had always imagined them to be. My beam indicator was marked with the directions E W N S, so for a while I mentally transfered that information to the globe and turned it to the proper country and then rotated the beam to coincide.

Then I said to myself, "That is ridiculous—there must be a better way to do this!" I went to the old junk box and dug out two old selsyn motors ala WW II. I coupled one to the mast above the rotator motor on the tower and mounted the globe on the other. First I reoriented the globe from the north pole to my QTH location. This posed a small problem in just how to find where to put the hole in the bottom of the globe once I had put the hole at the QTH. It turned out to be easy; I tied a string to a nail and put the nail in the hole at the north pole where the globe had been hung originaly then I ran it down a meridian to the hole on the opposite side of the globe and cut it at that point. Then I changed the nail to the new hole at the QTH location and ran it down the meridian and punched another hole at that point. Now, of course, my globe rotated on an axis based at the QTH instead of the North Pole.

I found I could not use the original globe support since I needed a clear space at the bottom of the globe so it could be mounted on the selsyn, so I made a new support that was fastened to the back of the control box, coming up over the

*1011 Linda Dr., Kokomo IN 46901

The direction indicator, showing the path of the beam from top to bottom.



A side view of the direction indicator, showing the mounting bracket and the wire representing the center of the beam.

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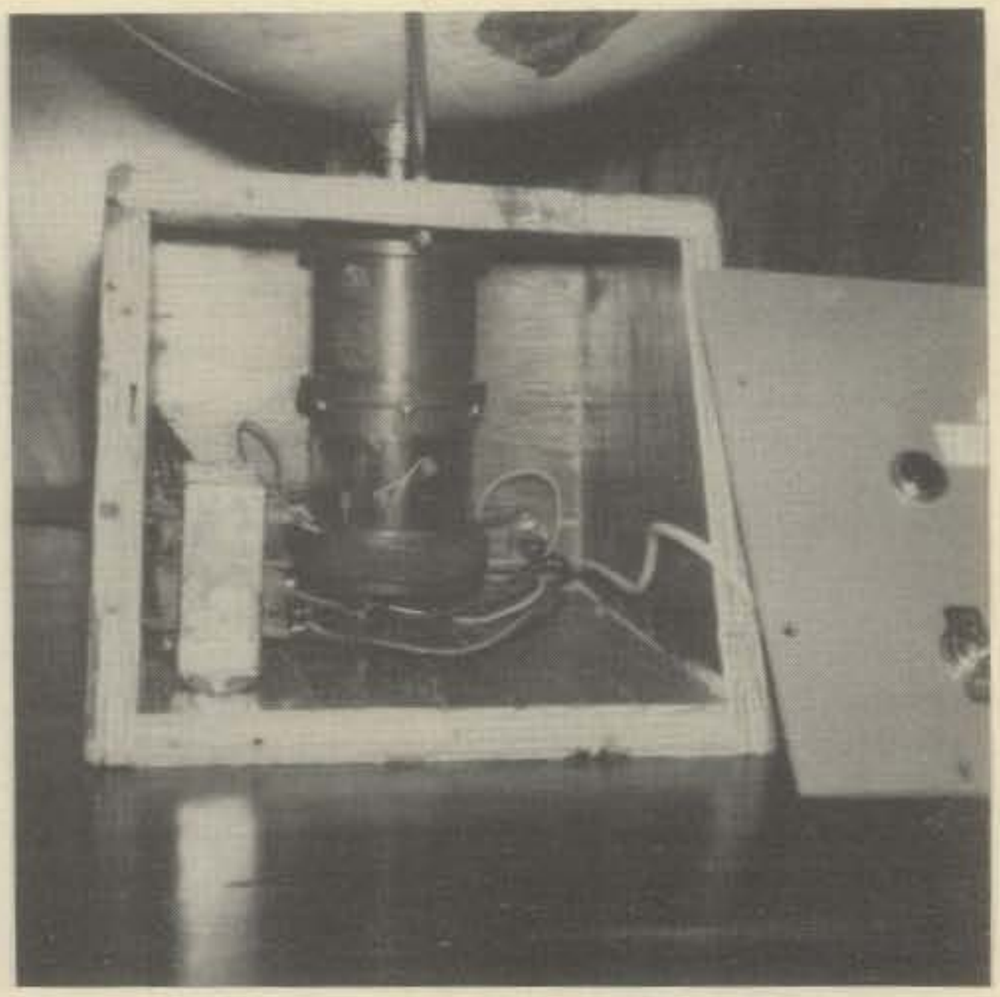
globe, leaving about an inch clearance, and pivoted to the top of the globe at the QTH hole. I then ran a #10 aluminum wire from the top of this support down the front of the globe, clearing the surface of the globe by about an inch. This then would represent the center line of my beam. When the beam turns clockwise the globe turns counterclockwise giving the effect of the aluminum wire sweeping the globe just as the beam does the world.

Getting the globe to move counterclockwise is no trick if you mount the tower selsyn with the shaft up just as the selsyn at the globe is also mounted. Thus when the gear on the beam mast turns clockwise it turns the gear attached to the selsyn in the opposite direction, since the selsyn down in the shack will follow the selsyn on the tower this turns out to be just right to make the globe rotate counterclockwise.

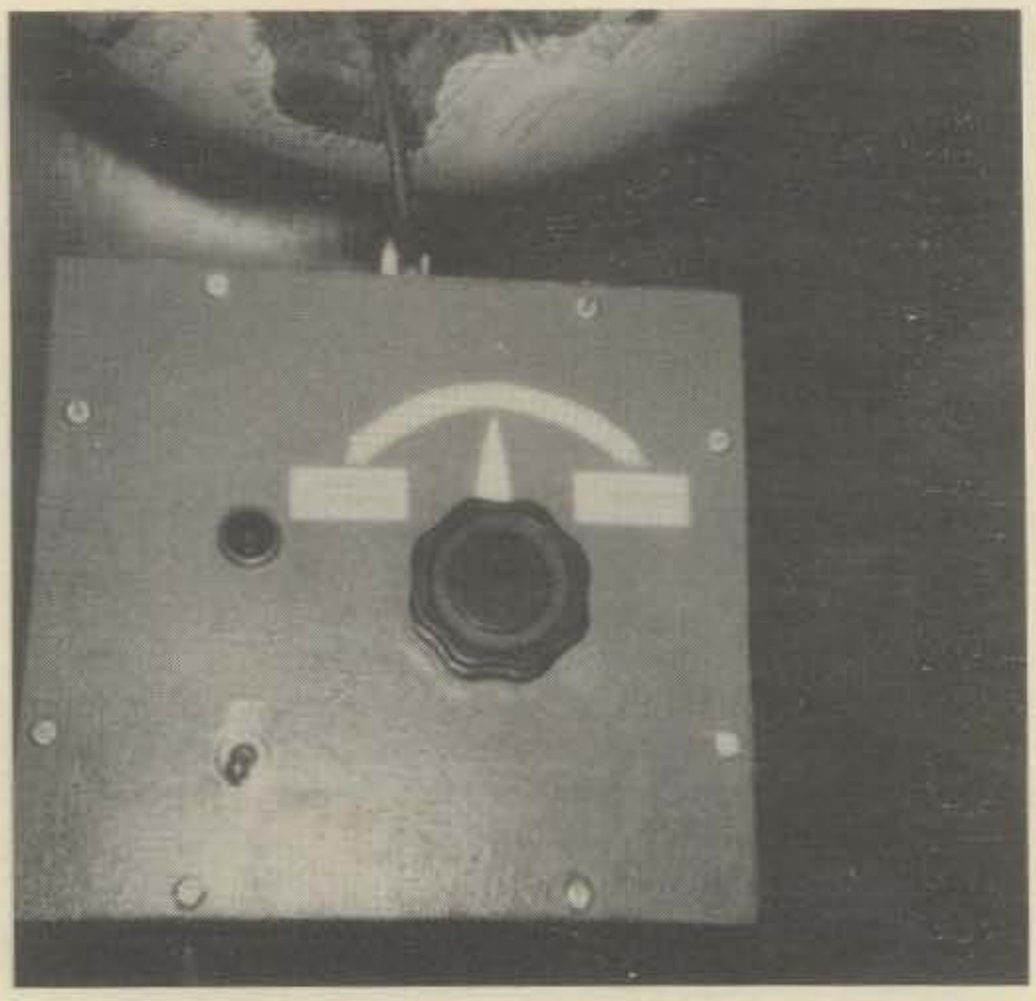
The only problem I had, and probably the one anyone trying to duplicate the globe indicator would run into, was in gearing the tower selysn to the beam mast. When I finally decided how to do this it turned out not to be so difficult at all. Rummaging through an army electronic surplus warehouse one day I came across just the right set of gears that looked like it once had formed a part of some panel tuning device. The two gears I needed were about three inches in diameter—giving me plenty of room to mount on the 1½" rotator pipe. Remember the gear on the pipe and the one on the selsyn must be alike—that is they must each have the same number of teeth so that the globe follows the beam around at exactly the same speed. I put one of the gears on my lathe and cut a center hole just the right diameter to take the 1½" pipe, then I spot welded it in three places to the pipe. For the gear on the selsyn I simply drilled and tapped three 6-32 holes around the center hole and fastened it to the small aluminum disc that was already on the selsyn.

For any of you who do not remember the WW II selsyns, they are designed to run on various voltages but mostly at 400 cycles. I found a simple fifteen volt transformer with 60 cycle current drove them just about right. Very little current is required so the transformer can be quite small. The rotating switch on my control box turned the beam in either direction and stops built into the old prop pitch motor keeps it from rotating a full 360 degrees. If you have a more modern rotator and control it can just as well be used as is and in that case no control would be necessary on the globe box. A switch to turn off the AC to the selsyn transformer would still be necessary.

I used a twelve inch globe but other sizes could be used. I suppose the same principle could be used with a great circle map on the wall with a selsyn mounted back of it but that seemed to pose too many logistical problems for me and anyway the globe seemed more practical. It is quite gratifying when you catch a ZK or ZL calling CQ DX to simply turn your beam until the globe shows New Zealand right under the wire and you know you are really pointed at him. CQ



The interior of the control box, showing the selsyn and the 15 volt transformer that drives it.



The direction control. Turn the knob to the right for clockwise rotation and left for counterclockwise rotation.

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

QSL Cards—Part I of III

This month's column is the first of a three-part article providing basic information about QSL cards. Material is separated into categories for your convenience. Careful attention to details should enable even the newest amateurs to make effective use of QSL cards.

What QSL Cards are and how we use them.

As you should know, we use 3-letter Q-signals to ask questions and to make statements during two-way radio contacts on the amateur bands. QSL? asks whether or not receipt of a message is confirmed by a station. QSL states that message receipt is confirmed. Consequently, it is understandable that the cards used to provide written confirmation of two-way radio contacts are called QSL cards. In addition to being written proof of contacts, QSL cards are often used to prove eligibility when amateurs apply for any one of the hundreds of operating certificates available to us. Most amateurs display their most distinctive received cards on their shack walls as reminders of past contacts. These wall displays are also interesting to visitors, whether or not they are amateurs. An excellent way to display QSLs without damaging your cards or walls is to insert them in clear plastic holders designed to display cards in separate pockets. This system also permits the QSL card display to easily be changed as additional cards are received. These wall displays can enhance the shack if colorful cards are displayed. Your non-amateur visitors usually do not know that the various prefixes on received cards indicate states and countries you have contacted. Consequently, it is good to select display cards that clearly show the states, islands, and countries contacted.

*2814 Empire Ave., Burbank, CA 91520

Storing cards

It is common practice to keep all received cards, whether or not they are known to be needed for a specific purpose. One reason they are retained is that they are often used when one later decides to apply for an operating certificate. It is best to store received cards in the callsign sequence used in the callbooks to list amateurs. This sequence results in cards being stored in alphabetical sequence according to the suffix (letters following the number) of each callsign within each country's group of cards. The prefix (letter and/or number group preceding the suffix) of each callsign indicates the country, of course. Prefix differences within a country are of secondary importance when storing cards, which is also true in the callbook listings. As an example, American cards are separated into ten groups, with one group for each callsign area number. All the first district cards received for contacts with New England stations are together and they are in alphabetical sequence of the callsign suffixes following the number one. Prefix difference such as A, AA, AB, K, KA, KB, N, W, WA, WB, and WR are ignored unless you receive more than one card with the same suffix from the same callsign area. If cards with an identical suffix are received, they are simply filed alphabetically in prefix sequence to maintain uniformity with callbook sequencing. If you have any doubt about the correct sequence for storing received cards, just look in any callbook (old or new) to see how callsigns are listed. It is advisable to store cards in the standard callsign sequence.

Some new amateurs separate cards being saved towards a specific operating award. The trouble with this practice is that most amateurs quickly expand their objectives and simultaneously work towards earning many awards. It is simpler to maintain record lists to track received cards which count towards specific awards than to simply file all cards in the callbook sequence without separating groups of cards needed for particular awards. When a record list shows all required cards have been received, take them out of the storage file and apply for the award. It is common for one card to be needed towards more than one award; this is another reason why it is better to keep all cards filed in a single storage sequence.

Displaying cards

There are many QSL storage and display devices advertised in amateur radio publications. Select the system that best suits your needs and keep received cards in order from the start. Space (or lack of it) usually determines which card display system is most suitable in each individual case. I have seen wall displays which include a map and received cards from each part of the country or state shown on the map. Colored twine can be used to

This is Patti Colvin (WD9FGE) in her shack at Braceville, Illinois. Patti made 64 contacts with amateurs in 28 states during her first 3 weeks on the air, including one with W6DDB. Patti's husband is Jess (WD9FGF) and this couple thank instructor Barry Booth (W9UCW) for helping them get started in amateur radio. Patti hopes to work every amateur with FGE in the suffix of their callsign.

show where each card came from; the twine is just secured between the map location and the associated card. Another popular display is the combination of an operating award and the received cards one used to qualify for the award.

QSL design considerations

Most amateurs prefer to use top quality card stock with a gloss finish (kromecoat) on the pre-pr₃nted front-side and a matte finish on the rear side where reports and addresses are filled in. The variety of designs on received cards emphasizes the possibilities to produce unique cards to suit individual preferences. Some of the cards I have received are so good that it would be a shame not to display them. Some of the cards I value the most are not expensive ones and they are not all from professional card printers.

Getting Ideas

Select and use a card you will be proud to have displayed by other amateurs. A glance through the classified advertisements in the back of this magazine will show that there are many sources of QSL cards. Most of these QSL printers are amateurs and I believe they do their best to provide good cards at reasonable cost. It is helpful to request sample QSL assortments from a few printers, whether you are going to print your own cards or have them printed for you. It costs money to print and mail sample cards so it is not surprising that most printers charge a small fee for an assortment of sample cards. Get a few sets of cards and very carefully evaluate each one to extract each feature you may want to include in your QSL.

Pictures

Photograph cards have remained popular for many years. Most of them show the amateur at the operating position. Others have a picture of some outstanding scene at or near the amateur's location. A relatively inexpensive way to get a top quality photograph card is to select the picture you want from a postcard display in a nearby store. The reverse side of the card will show the name of the printer and their code number for that card. Contact that printer and request a quote for 1000 to 5000 of the specific card style you want. I have found that they will also print the report form on the reverse side at lower cost than our regular QSL printers. They will also add your personal data (name, address, and callsign) as an overprint on the front of the card at reasonable cost. Their workload is seasonal so there are times when it will be cheaper to purchase a quantity lot of their stock cards at reduced cost and have a local QSL printer add your overprint and report form. Photograph type QSL cards are relatively expensive but many amateurs have found them to be worth the extra cost.

Line Drawings

Some amateurs develop cards with extremely interesting line drawings or designs on the facing (front) side. There is an additional cost involved in having plates made the first time such cards are produced. However, you retain these plates and they are used whenever you have more cards printed in the future.

Colors

Some cards are printed in a single color but multicolor cards have become increasingly popular in recent years. This change is understandable since the actual cost of the card has become a smaller part of the overall cost of exchanging cards. As an example, the first cards I bought from a printer cost almost exactly one cent each. At that time, it cost one cent to mail a card to another American or Canadian amateur. Considering the present postage rates, it is obvious that the cost of the QSL itself has not risen as much.

Variety

Card stocks, inks, type styles, type sizes, and other factors must all be considered if you are to produce the most suitable card. Card stocks vary in weight, color, and finish. Combinations of different colors in card stocks and inks produce amazingly different results even with the exact same printed information. Type style and size must also be carefully selected to produce the best possible card.

Homebrew

When amateurs make their own items, it is called homebrewing. This term is extended to cards designed and printed by an amateur for personal use. Some of my very favorite cards are those which were homebrewed by amateurs I have been lucky enough to work on the air. Homebrew cards furnish a personal touch which is very much appreciated by many of us. I have received a few homebrew cards that are far superior to anything that could be produced by the best of printers.

Ordering

When sending a QSL order to a printer, be sure to type or neatly print all information exactly as you want it to appear on your card. It also helps to type or print all related instructions. Do not abbreviate things you want spelled out. As examples, do not write Ave., N., S., or St. if you want Avenue, North, South, or Street, respectively, to appear on your printed card. There are few things of less value than incorrectly printed QSL cards.

Face Side Data

Our two-letter abbreviation for states are confusing to foreign amateurs and this problem can be overcome by spelling out the state name. It is also helpful to have the county and country shown on the card. Some names are very similar for both men and women and it helps to indicate OM (old man, male operator), YF (wife), or YL (young lady, female operator) on your card if you have a name such as Beverly/Beverley, Carol/Carole, Jean/Gene, Marian/Marion, or Sidney/Sydney. The confusion between male and female operators can be worse when nicknames are used. As an example, Pat could be a nickname used by Patricia or Patrick. In addition to simply wanting to know whether the other operator is a male or female, there are many special operating awards available for contacting female operators, making this distinction even more useful. Some female amateurs make it easy on us by using a photograph or an appropriate line drawing on their cards. Even a group affiliation logo such as YLRL (Young Ladies' Radio League) does the job when it appears on a card used by a female operator. Even your fellow Americans are not always sure they have contacted a male or female opereator when one of the questionable names or nicknames are used. Naturally, this problem is much worse for code contacts than for voice contacts. Obviously, the confusion of foreign amateurs is easy to understand. I also admit that I am seldom sure that a received DX card is from a female operator.

Amateur radio operating awards are often related to location, emission mode, frequency, and similar factors related to the two-way radio contacts. You just can't get too much information on your card. In any case, be sure your card shows your callsign, name, and complete mailing

address. Some amateurs list the operating awards they have earned on their cards; it is not unusual to see DXCC, RCC, WAC, WAS, and even an occasional TAD award listed on the face side of received cards. It is also common to show organization affiliations such as amateur radio clubs, ARRL, MARS, nets, OSCAR, QCWA, QRP, RACES, SMIRK, and 10-X. Any of the applicable preceding items can be printed on the face side of your cards. If you move, simply cross through the incorrect address and print the correct address immediately adjacent to the old data. It is usually better to use a soft tip marker to write on the glossy front surface of a QSL.

Multi-Operator Families

When there are two or more amateurs in a family living at the same address, they sometimes use a common card showing each operator's name and callsign. It has been my experience that this common card approach is usually tried on time in multi-operator families and that each operator in the family uses a distinctively separate card after using a single one for everyone. If you use a single card in a multi-amateur family, be sure to indicate which operator was worked. I've often found it necessary to locate a contact in my station log to find out which of the amateurs I just received a card from in such a family. If you use this type of card, you will sometimes receive corresponding cards made out to one of the other operators in your family, rather than the one who made the contact.

Size

Use standard size cards to avoid mailing problems. Our American postal service now charges more money for handling non-standard size mail, including cards. Furthermore, off-size cards are simply not accepted for delivery in many foreign countries. Use the standard postcard size of 3.5 by 5.5 inches to avoid problems. Another point in favor of using standard size cards is that they properly fit into the storage files and displays used by most amateurs.

Cost

The cost of cards can be minimized in many ways but the single most effective way to get good cards at a reasonable cost is to buy a lot of them at a time. I have noticed that most new amateurs greatly underestimate their need for cards and they usually just purchase 100 or 200 cards in their initial order. This is a mistake because they quickly run out of cards as they start to operate, forcing them to order more cards soon after they get started on the air. In addition to the bother of having to order cards again too soon and the probability of running out of cards, this small quantity initial purchase costs much more per card. A simple check of cost data published by printers should convince anyone to avoid small quantity purchases. Orders for 500 or 1000 cards usually result in a good balance between cost and your possible desire to use different cards. A disadvantage to multi-thousand card purchases is the possibility that your address may change.

Summary

This concludes the first part of a three part series on QSL cards. Each part contains information which is useful by itself. However, you are urged to read the entire article to derive maximum benefit.

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

Some of the stations I've recently worked on the novice bands are:
WB1DSN Russ @ Hiram, Maine,
WB2SXP Bill @ Springville, N.Y.
WB3LJM Charley @ Finleyville, Penn.,
WD4HLO Sid @ Gainesville, Florida
WD5JZL Charles @ Gloster, Miss.,
WA6OIE Rob @ Redlands, Calif.
WB7UXO Bruce @ Reno, Nevada
WD8KHA Ed @ Trenton, Michigan
WD9EUT Marvin @ Muncie, Indiana,
WB0MYR Jim @ Nixa, Missouri
KP4FMZ Rafael @ Bayamon, P.R.

Jack Corson (KA6DX) sent a good letter from Okinawa requesting Novices to realize that not all KA6 callsigns indicate California amateurs. Jack points out that any KA1, KA2, KA3, KA5, KA6, or KA8 prefix followed by a two-letter suffix is an American operating from Japan. He states that KA6DX (and other Japanese stations) calling American Novices is a bit further away then "Beautiful Downtown Burbank". Pay close attention and you will recognize that these are DX stations; they are in the Novice bands to give you a contact and a DX card.

73, Bill, W6DDB

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CQ Magazine
14 Vanderventer Ave., Pt. Washington, NY 11050

a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

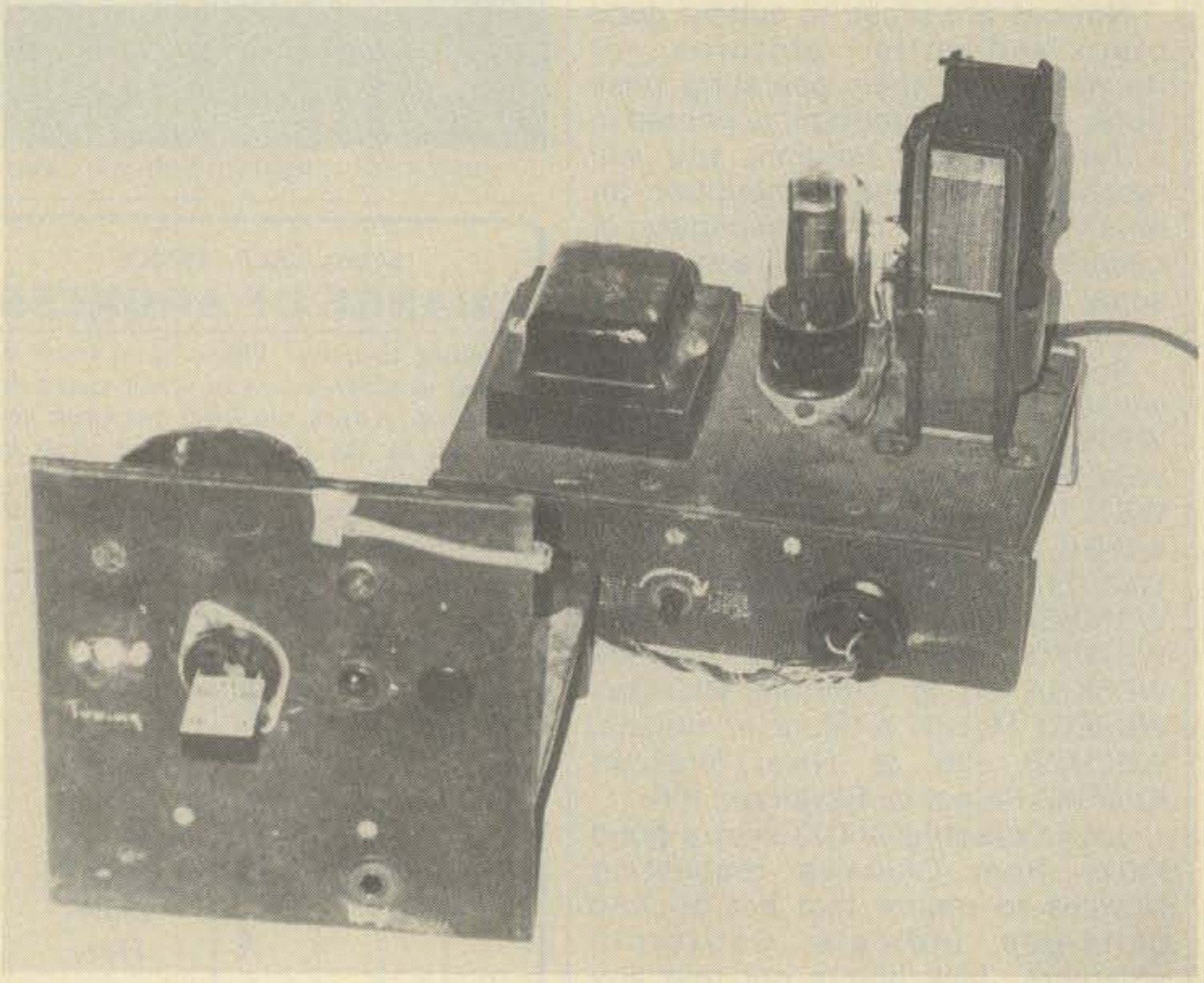
"How It All Started— K8EEG's Story"

This fascination I have for radio started way back when I was a boy of about age 7-8 or thereabouts. My memories are of a dimly lighted living room with my dad sitting beside the old RCA table model shortwave receiver with Classical music fading in and out, and with an announcer interrupting with comments in a language which I did not understand. The darkness and warmth, the presence of my dad, and the erie fading of the beautiful music made an impression on me which has never left me, and which, even at this late date, is evoked whenever my consciousness is focused upon the far-away world which spills through a loudspeaker or earphones. Since then, I have always been driven to seek out that far-away world and to revel in its mysteries.

83 Surburban Estates, Vermillion, S.D. 57069

At first, I was able to appropriate the RCA table model receiver when my dad purchased an elaborate Midwest hi-fi outfit from my uncle. This new receiver occupied the position of prominence in the living room, and although the shiny polished coppertone front panel was impressive, it lacked the warmth of the wood cabinet of the RCA. I found the perfect spot for the RCA for my travels into far-away worlds. Between my parents' bed and the dresser was a space just wide enough for me to lay in length wise, with the receiver on the floor against the back wall. It was like a little cave, and even in the daytime, the light was dim. I stretched a piece of copper wire about 20 ft. along from that corner of the house to a small tree about 8 ft. off the ground, and ran it into the receiver through a window next to the dresser. Seems I couldn't spend enough time huddled on the floor in front of the receiver, looking at the two green dial scalelines while listening. It was almost as if by looking long enough and hard enough at the two glowing green lines, I would be able to actually see where the sound was coming from out there, and of course, my imagination would take over and I would see far-away places in my mind and I would dream of them. I was in a constant state of amazement that I could hear a voice or music that was originating in a place thousands of miles away at that very instant.

One day, while waiting for my dad to buy cigars and a Sunday newspaper at the Westside News Store, I stumbled across a shortwave-listener's magazine on the newsstand and flipped through the pages, discovering lists of stations, with frequencies, times of broadcasting, programs, with short articles on shortwave listening. Needless to say, I was overwhelmed with a wave of excitement and had to have that magazine. It became a focal point of my attention for weeks as I lay in front of the receiver, trying to correlate what I was hearing with the information the magazine provided. I would seek out stations listed in the log, but I rarely had success, since the RCA calibration left much to be desired. But every now-and-then, I'd find what I was looking for and I would be thrilled for

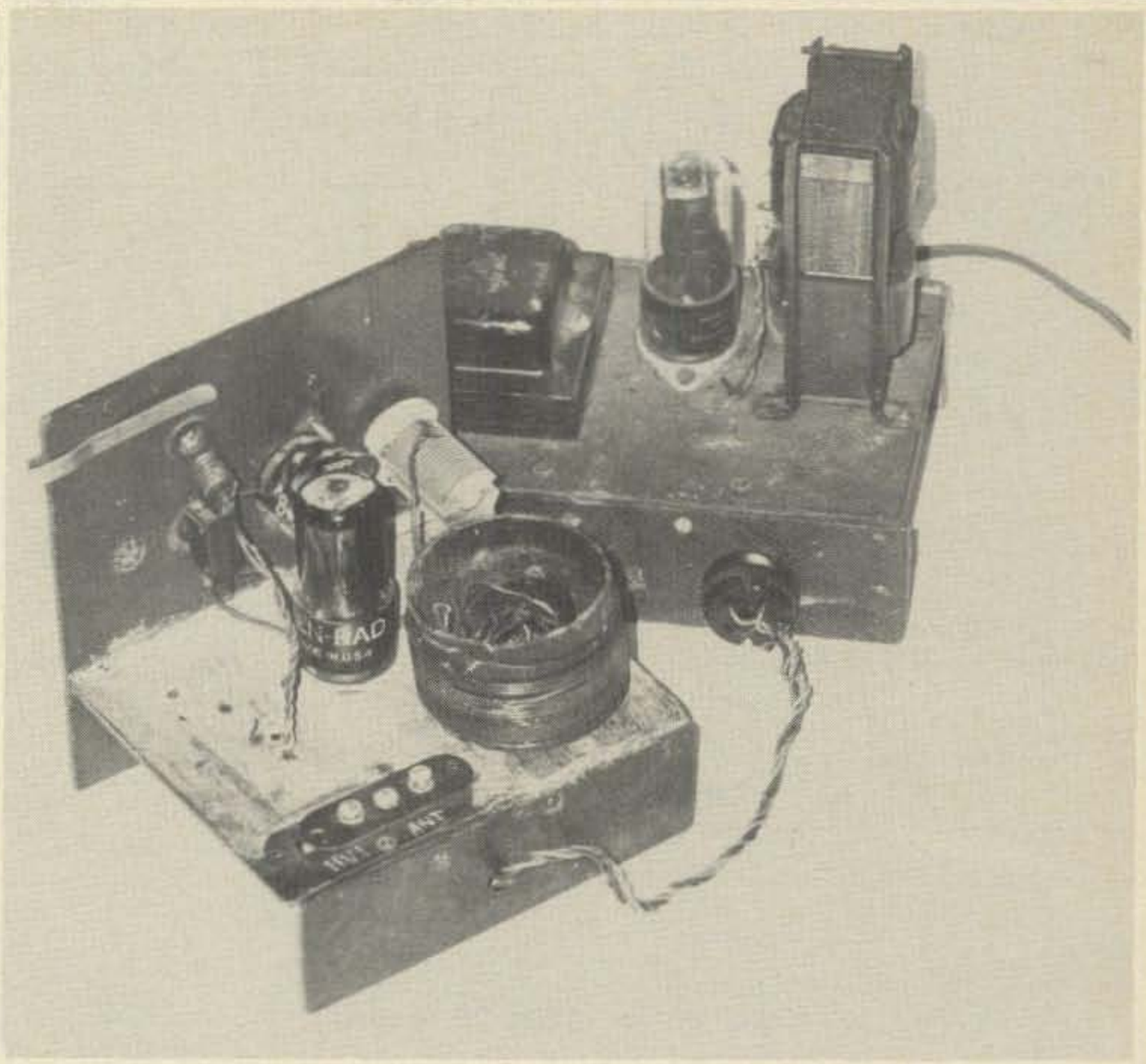


"The WN3COB Special," K8EEG's first Novice transmitter build in 1955. The chassis is constructed of masonite board, with panels and decks held together by pieces of quarter-round screwed and glued. Visible on the power supply at the rear are (l-r) the high voltage transformer, 5Y3 rectifier tube, and filter choke of unknown specs. On-off switch and plug for power connections are located on the front panel. The transmitter unit front panel shows the APC variable tuning capacitor mini-shaft on which the tuning know, long since lost, fit as described in the text. The octal socket and crystal switch are at middle center, with the red plastic geegaw facing of the output indicator bulb right about the crystal switch. The key jack is at lower right. An "axe" design tie-clip was added as ornament, as well as a small U.S. Marine insignia at the upper left corner.

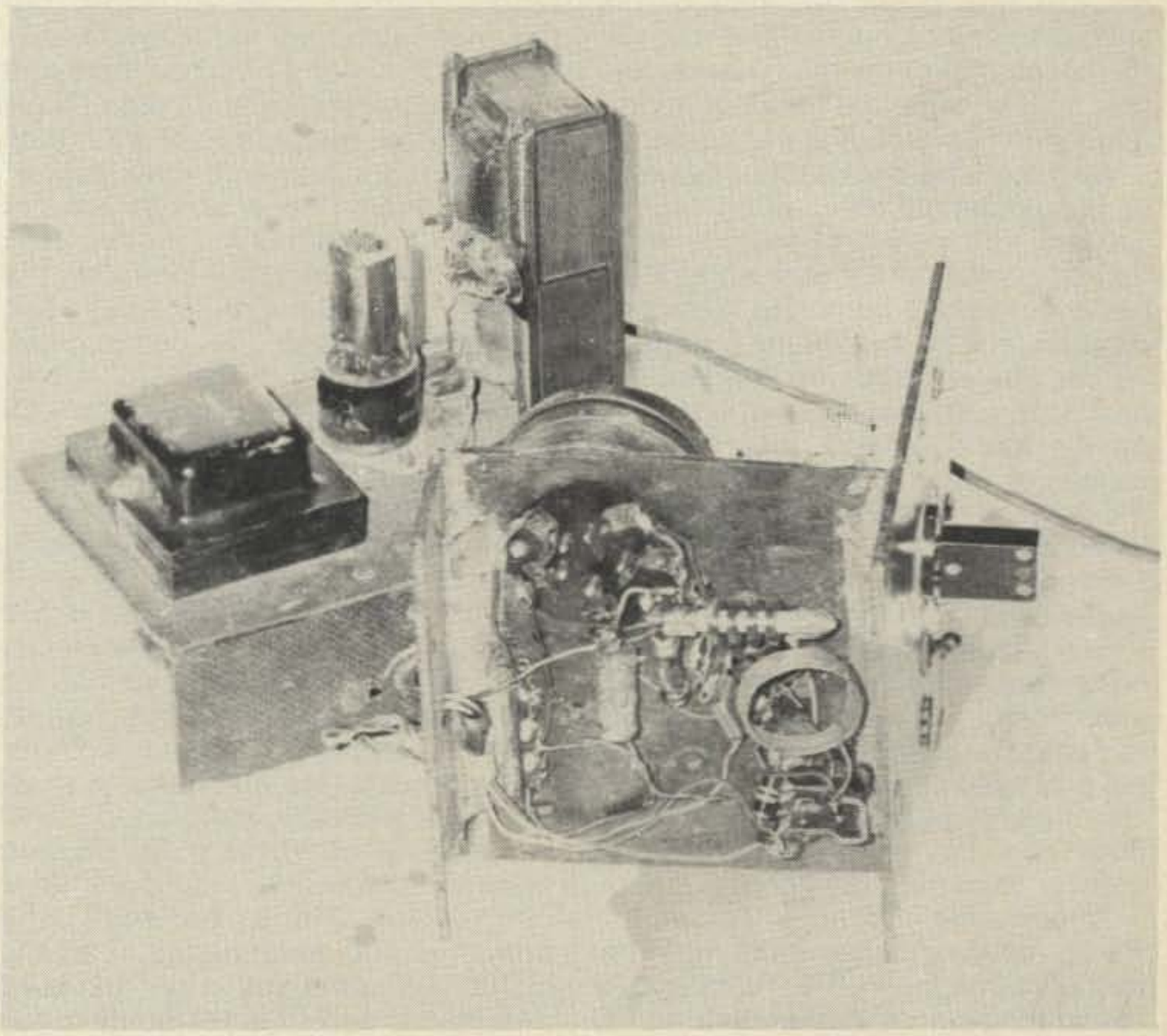
days with the experience of tuning across the vast unknown spaces that the spectrum represented to me and finding something I recognized and knew from reading the magazine.

When I joined the Boy Scouts, another magazine became very influential in regard to my interest in radio—*Boy's Life,* the Scout publication carried a shortwave listening column as well as sponsoring a big shortwave listening contest every winter. That was my first contest in radio, and it was exciting as well as frustrating. I would lay in front of the receiver with log sheet and pencil, waiting—sometimes a half-hour—for the station identification information which would allow me to log that station. Oftentimes the foreign language announcements would make no sense whatsoever, and I'd search the shortwave magazine log listings endlessly for some indication of what I was listening to. By the end of the month-long contest period, I had managed to gather hardly more than two pages of entries, but I sent the log in anyhow, and months later I was delighted to see my score way down in the official results list—not quite at the bottom. I was astounded at the high scores, and couldn't figure out how they managed. But they did it, and so could I, and I made up my mind to make it to the top next year.

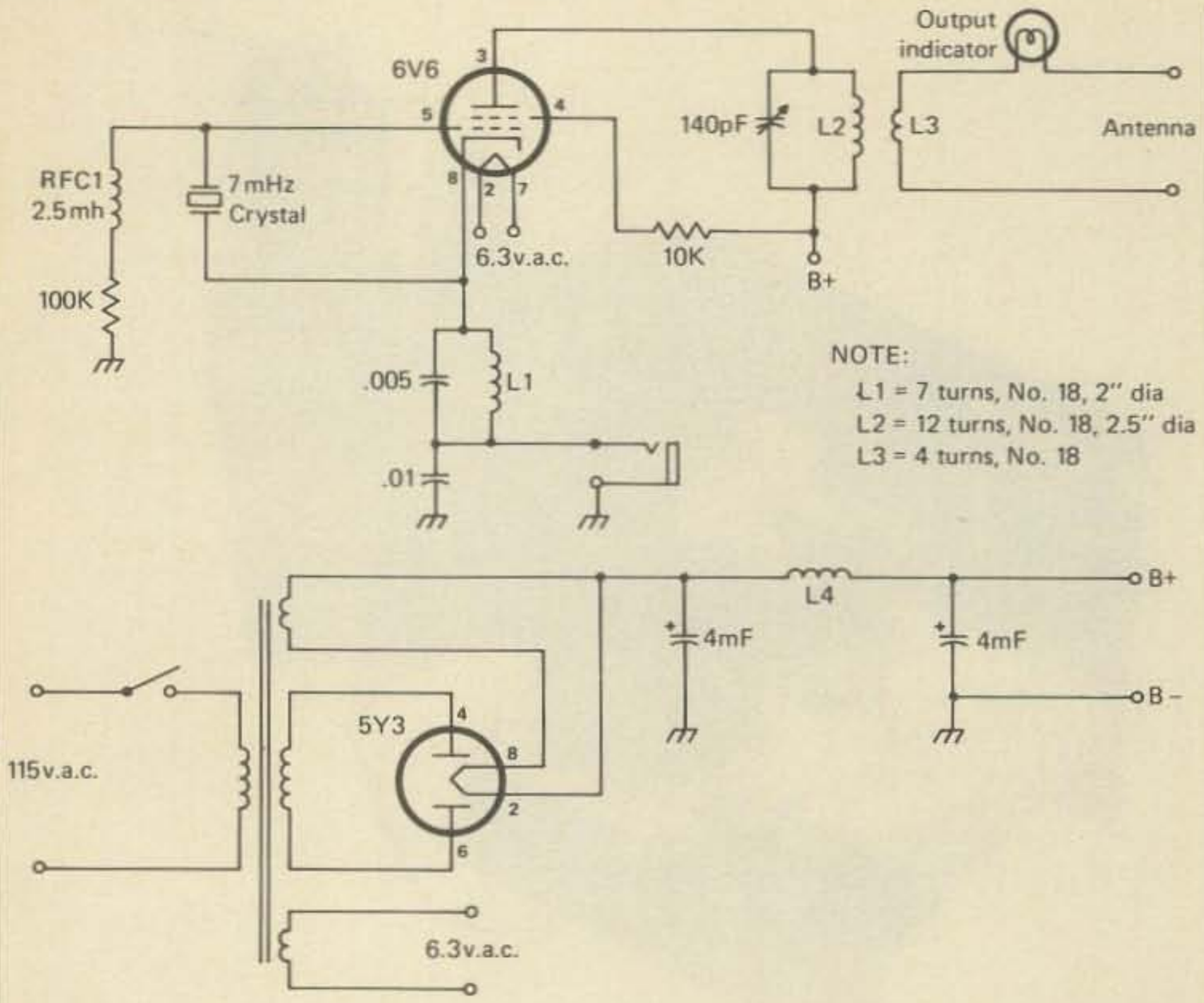
That year was the important one. The Boy Scouts were most helpful. I acquired a straight-key/c.w. buzzer practice unit from the troop, learned the code, and spent endless hours sitting on the floor next to a footstool, which served as a table, practicing the code. It took forever, but finally I had it learned and could recognize all the characters when sent very slowly. Ed Krynock, the young Scoutmaster, would drill me with the "dah-di-dah-dah" routines whenever the chance arose. But as yet I could not practice copying on the air because the old RCA had no b.f.o. My grandmother had a really super shortwave receiver laying around unused, and it had a b.f.o. I had always dreamed of getting the old 1935 Silvertone, and, now that my interest in radio was firmly established in the minds of my parents, I finally cajoled everyone involved into letting me "borrow" it. It was a beauty. The metal cabinet was finished in black crackle—I suppose all of my homebrew cabinets end up with black crackle because of the impression the old Silvertone made on me—and it had a large round dial about eight inches in diameter, with about five separate dial lines of different colors—blue, yellow, green, and red—set in a black dial face. It had two dial pointers, one for the



Rear view of the transmitter deck. Rear left shows the 3 screw terminal strip for antenna output and B+, and the plate tank coil wounded on a salvaged coil form, with a five prong tube-base as plug-in. The 6V6 is at the center of the deck, and on the front panel can be seen the output indicator bulb socket, crystal switch, octal crystal socket, and APC tuning capacitor.



Underside view of the simple transmitter. At top-left can be seen the salvaged five-prong coil plug-in socket salvaged from an old 1930's receiver, with the 6V6 components at the center, and key jack at lower right.



Circuit of the "WN3COB Special."

main tuning, and the other for bandspreading. The b.f.o. had an adjustable frequency, and the bandwidth had several settings. To me, the Silvertone was the real thing! I talked my dad into giving me half of the space on one of his workbenches in the basement for my radio shack, and that spot became the focus of my existence for several years to come.

With the Silvertone's b.f.o. capability, I could set out to learn the code in earnest. At first, what I could hear on the hambands was indecipherable, but eventually I began to catch individual letters, and finally groups of letters. I heard about the W1AW Code practice sessions somewhere, and finally found W1AW after several weeks of searching. That did the trick. It wasn't long before all of my listening time was spent in the c.w. section of 20 meters, and I was astonished at all the foreign stations I was hearing. Needless to say, my desire to talk to them was inflamed, and getting my own license became the passion of my life. It would take several years before I actually established contact with one of them, but it was my goal. So I turned in earnest to getting my license.

A borrowed *How To Become a Radio Amateur* became the most important book in my life. I'd managed to scrounge a couple copies of *CQ* and *QST*, and I'd read and re-read the articles until they began to make some sense. To an eleven-year old boy, "grid-leak" and "bias" and "r.f. choke" conjured up images hardly related to radio theory, and these were mysterious words with a hidden power to me, just like the words of the religious ceremonies in Latin, but they were also keys to the mysterious world of radio, and I learned them and what they meant, even if I didn't have the slightest conception of what they represented in terms of radio theory. When I finally found an old copy of the ARRL Handbook in the local library, I was ecstatic—here was the "bible" of amateur radio and it had everything in it that I needed to know.

But it was very difficult for a boy, working on his own, to grasp how all of this "radio stuff' actually worked. I recall puzzling for days over a receiver circuit front-end tank coil. I understood that, in electric circuits, wires had to be connected, and I couldn't see how the circuit could work if the primary and secondary windings of the tank circuit had no physical connection. At first, I decided that the printer had made an error and left out a line which would show the wire connecting the primaries and secondaries of all the coils. Pleased with my discovery, I dutifully drew connecting lines between the primaries and secondaries of all the coils to correct the printed schematic, and to save the next guy who got the book the trouble of figuring out what I had just corrected, or worse yet, of actually trying to build it the way the schematic showed, and being disappointed when it didn't work. I'd study one section of the *Handbook*, and go back to another, and eventually, each time I'd go back another question would be answered, another aspect of the "radio magic" would make sense. This took a long time and a great deal of puzzling over the secret mysteries I was attempting to master. Ultimately the process would require over two years before I acquired the Novice Class ticket.

By the time the *Boy's Life* contest rolled around the next year, my code speed had crept up to about ten words per minute, and I was ready to assault the top of the score list. My strategy was simple—while the rest of the guys were scrounging stations on the broadcast bands, I'd be sitting on 20 meter c.w. just racking up a big score. In fact, I did a lot better, logging about 260 stations in about 45 countries. It was quite an accomplishment at the time, and the great improvement in score was the result of a lot of determined effort in learning the code. When the results finally appeared in print, I started looking for my name at the top and as my finger traced farther down the page, my spirit was swept with a wave of disappointment—I found it way down around #38 on the list. I couldn't believe that I was that far down, but I was, and after the disappointment passed, a new determination arose for the coming year. It would be the biggest contest ever sponsored by the magazine, with two or three National Radio shortwave receivers as top prizes, and about fifteen other tangible prizes. The ARRL Code Sessions became a moral obligation, just like church on Sunday. I'd keep the receiver tuned to c.w. stations as I studied over the *Handbook* and *License Manual*, as well as looking through *QST's* and *CQ's*. I'd try to get away with doing my lessons while listening, but my mother was an ex-school teacher and figured that my homework efficiency would be lowered considerably in this approach.

In the meantime, I began scrounging around garbage dumps looking for junked radios whenever the occasion arose. Most of the junkers I'd stumble across were total losses due to corrosion and deterioration, but every so often, I'd come up with a real find. For a while, I'd check the parts in them against the parts I could make out in *Handbook* pictures, but this was problemmatic, since most of my finds were so old that the parts no longer corresponded to anything I'd find in a picture. Even so, I'd tear the parts out and save them, figuring I'd

find out what they were later. Once I found a receiver of the late '20's variety, with the tubes that looked like lightbulbs. I actually got this one to work on the local station on the a.m. band, and it was a great triumph for me. It gave rise to a love of tinkering behind the panel that has remained to the present. I still didn't have much of an understanding of what made a radio work in theory though.

Events converged in the spring of my seventh grade year. The big contest rolled around and I was almost ready to take the Novice Exam at the same time, but put it off until the month-long contest period was over. All of my effort went into the listening contest. I had decided that, while the Rules stated that only a one hour listening period could be logged each day, the top-placers used clocks which ran considerably slower than the ordinary variety, and that the only way to compete was to use a similar interpretation of the Rules. I played it too honest though. I only squeezed about two-three hours of listening into one hour's worth of log entries, and I figured this would be stretching the Rules enough to win a brand new receiver. My log was phenomenal. I forget the exact numbers involved, but I logged over a thousand stations in about 148 countries. The log was about fifty sheets long. When I sent it off, I was certain that I'd turned the trick. Who could beat that? So I went ahead on the license exam.

One of the locals, W3PON, who used the phonetics "poor old nelly" on the air—obliged me by administering the exam, and let me know I'd gotten the percentage necessary to pass. He was impressed with my code speed, and told me that, as he watched me easily copying at five w.p.m., he kept speeding up to about 12 w.p.m. until I began to get nervous. He got a good laugh out of my misery! I didn't mind though. I'd be a ham shortly!

My efforts turned toward putting together a transmitter. I finally found a simple circuit that I decided to attempt. But the parts list revealed that my junkbox had a lot of useless material in it, except for a power transformer of unknown output, something that looked like it would pass for a power supply a.c. filter choke, a key jack, some screw-terminal strips, and wire. I checked out what I needed in the Walter Ashe Catalogue, and could put the thing together for about $8.50, not including crystal. This was a considerable sum of money in those days, especially for a kid. My parents didn't consider the investment important enough to back the project. So I was in a quandary, and my frustration grew as the days passed and all I had managed to accomplish was studying the article and circuit till I had memorized it. I was no closer to having a transmitter on May 5, 1955, when my WN3COB call arrived in the mail! I was elated at having my own call, and inscribed it on all my school notebooks and personal belongings, as well as restroom walls and other likely graffitti locations. The world would know that WN3COB was around, but unfortunately, they'd find out by reading the call rather than hearing it on the air.

Out of desperation, I decided that my only approach to getting the transmitter parts was to visit local hams as often as posible and beg, borrow, or steal whatever I could. I got pretty sneaky about it. On the first visit to one of the local hams, I'd pretend great interest in his demonstration of his rig, but my shifty eyes would be scanning his workbench for parts I could use. I'd mentally note what I'd seen and where. Then the next phase was launched, namely, acquiring what I had located. I managed this by going back for another visit, and since the rig demonstration had been taken care of on the first visit, I would pretend that my wandering eyes had just "noticed" the stuff on the workbench, and I'd get very enthusiastically interested—"boy, what's all this stuff. Gee you sure must know a lot about radio stuff to use all these parts." And I'd end up, after the buttering-up phase, just stumbling across the very part I'd noted before and would go on about how this is the very last part I needed to finish my transmitter and get on the air, but I had no money, and so, in a real gloomy tone, I would conclude that I'd just have to wait till I got the money. It is a credit to the typical generosity of the ham population that I never had to ask for one single part—they were all offered to me by the individuals involved, who were very pleased to help out this bright-eyed kid. In this manner, I picked up the 5Y3, 6V6, two new octal sockets, a electrolytic filter capacitor, a 140pf APC variable capacitor, and a 2.5mh r.f. choke, plus a few odds-and-ends. By the time my birthday rolled around in late June, I was hard at work cutting a chassis out of masonite board, screwing it together, mounting all the sockets and jacks and switches. I took painstaking care to do a perfect job so that I could be proud of my first transmitter.

There were several "custom" additions to the basic chassis. Since I couldn't afford a meter to monitor output, I decided to use a flashlight bulb in series with the antenna lead as a tuning indicator. But purchasing a pilot-light socket and red face was out of the question. So I scrounged one of the red plastic geegaws that decorated the gun-belt of one of my friends, glued that to a stand-off washer, and glued that to the front of the panel. I salvaged a pilot light socket from a junk radio, and used a feed-through washer that fit snuggly around the bulb as the means of mounting the bulb behind the red-plastic face. All the pictures in the magazines showed plug-in coils, so I used the base of an old five-prong tube and a socket from a salvaged radio for the plug-in coil hardware. The octal socket that served as a crystal socket could hold two crystals, so I added a switch from an old radio for two-crystal switching capability. One major problem was that the APC variable had no shaft—it was a screwdriver adjusted type. After a lot of searching, I found a knob whose shaft-receptacle extended beyond the front of the knob-body about ¼ inch, and then it was just a matter of fitting it over the a.p.c. variable mini-shaft. I wound the tank coils on a form salvaged from another radio. In a final effort to make the transmitter look like the real thing, I tried painting it with aluminum primer that I found laying around my dad's workbench. I couldn't succeed in gettng the professional metal appearance that I wanted, so I didn't paint the front panel.

When I finished the project, I was really proud of the results, meager though they might seem now. Meanwhile, I'd had talked my dad into paying me for washing the car, and had enough to purchase a crystal, which, after much deliberation, was picked for 7177 kHz, operation—right at the edge of the old Novice allocation. When I finally had it all ready to go, I hooked a Christmas tree bulb across the output terminals as a dummy load, and the red glow of the bulb sent chills up my spine when the realization flooded into my consciousness that all the effort that I had put into radio for the past years was ready to pay off! I picked up about 100 ft. of scrapped 300ohm twin-lead and cit it to length for a 40 meter folded dipole, and mounted it at the dizzy height of 8 ft! But it loaded up and the glow of the output indicator bulb was proof that I was putting a signal on the air. The 6V6 was developing 3 watts r.f. output, according to recent measurements.

But alas, I called stations for a couple weeks without making a single contact until one of the locals came across me on 7177 kHz and gave me a call. That was my first QSO and I was

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3 SO-239 coax chassis connectors. Tunes 52 ohm or 52-300-600* or random wires
1 heavy inductance for 10-15-20-40-80 meters
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1 pkg 12-gauge tinned round wire
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*53 x wire diam. **84 x wire diam. info only — not supplied.

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so nervous that I had to keep correcting mistakes every other letter that I sent. I had decided that I'd waste a lot of time on the air using my full name "Adrian," so I'd use the abbreviation for my middle name "Ben" (Benedict). When Tom came back after my first "RST-QTH-NAME" routine, he solved the name problem by calling me "Ade," short for "Adrian." Later we talked about my failure to get out, and he noted that I had to get my antenna up off the ground. So I scaled the first of many roofs and tied the end of the antenna to the chimney-mounted T.V. mast, with the other end up in a tree at about 30 ft. That turned the trick! I started making contacts regularly after that.

The hassles of getting this whole operation on the air had made me forget about the *Boy's Life* SWL Contest which I had figured I'd won hands-down. But one day a strange five-foot long package was waiting for me when I got home from school, and I was totally baffled as to what it could be as I cut it open. Inside was an FM omnidirectional dipole antenna, and I was even more baffled—until, finally, I realized that I was waiting for a shortwave receiver, and what I had won was an FM antenna! I'd only managed to rank 11th in the SWL Contest—still far away from the top!

But the disappointment quickly passed, for in the late afternoons of chilly, overcast, autumn days, I was hearing WN3COB coming back to me over the speaker from states all over the eastern part of the U.S. And in the wee hours of the night, when my parents were asleep, I'd sneak down to the basement and sit bleary-eyed in front of the old Silvertone, warmed emotionally by the glow of its big dial, and I would stare into it intently as I tried to see where the W5's or W0's were located out in that mysterious radio world from which they were calling me. As autumn dragged on and winter propagation set in, the W6's and W7's started rolling in and I concentrated on calling them. Finally, one night my slow c.w. brought back the long-awaited "QRZ" from a W6, and I strained nervously to put as much intelligibility into my little signal as possible in order to get through to him. He dug me out of the QRM and after about 20 difficult minutes, I had finally successfully spanned the continent. I was ecstatic for days after that contact, and more were forthcoming. I walked in a sense of awe that I had mastered the mysterious radio world. I was finally talking back to those signals from out there, and they were hearing me. That was ever so much more fascinating and exhilarating than just listening!!!

Ade Weiss, K8EEG

C.w. operators are always looking for ways to improve their stations and their fists. In this article, John J. Schultz suggests a method for doing both.

An Ultra-Smooth Ball Bearing Keyer Paddle

BY JOHN J. SCHULTZ*, W4FA

In recent years there has been a proliferation of c.w. keyer circuits of every description. However, there have been relatively few articles on building suitable keys to go along with the keyer electronics. Of course, the electronics is useless without a key and no matter how sophisticated the electronics is, one will not derive much pleasure from using it unless one also has a smooth, responsive key. Perhaps too many amateurs feel that a machinist's skills are needed to home-brew a good key. Certainly one does have to have a bit of mechanical ability to build a good key but no more mechanical ability is really needed than when building up a circuit and housing it in an enclosure. At least, that is true for the key described in this article. One can build the key with the tools one would normally have available for small circuit and enclosure work.

The key is designed for squeeze keying and it will provide the velvet smooth action characteristic of the best of the commercial keys. This is mainly due to the use of four small and inexpensive ball bearing assemblies. The use of the ball bearings eliminates the one problem area where most home-brew keys fall down — a smooth pivoting action for the arms of the key.

The completed key is shown in fig. 1 and the rest of the article describes how various parts of the key are assembled. There is no need to follow the dimensions given exactly. Once the basic method of assembly is understood, one can use materials on hand to construct the key or vary dimensions as desired. The rather strange looking base used is a discarded lead base from a table lamp which has a diameter of 4". Any heavy metal base of approximately this size should provide enough room for construction of the key.

The heart of the key lies in the ball bearing assembly used, shown in fig. 2. The bearing asembly is about ½" in diameter with a center hole of about 3/16". It is a fully enclosed type so it does not require lubrication. There are many suitable bearings that can be used and so there should be no difficulty in obtaining a suitable type locally for around a dollar each. Just to be sure, the following is a complete list of the interchangeable berings that can be used, as manufactured by different companies:

Company	Bearing No.
Fafnir Bearings	33KDD5
Barden Corp.	SR355
FAG Bearings	R3-2Z
Federal Bearings	R3FF
Hoover-NSK Bearings	R3ZZ
Miniature Precision	SR3RHH
New Departure - Hyatt	77R3
New Hampshire Bearings	SR3PP
FAG Bearings	R-3-PP
Reed-NMP (America)	SN12322Z

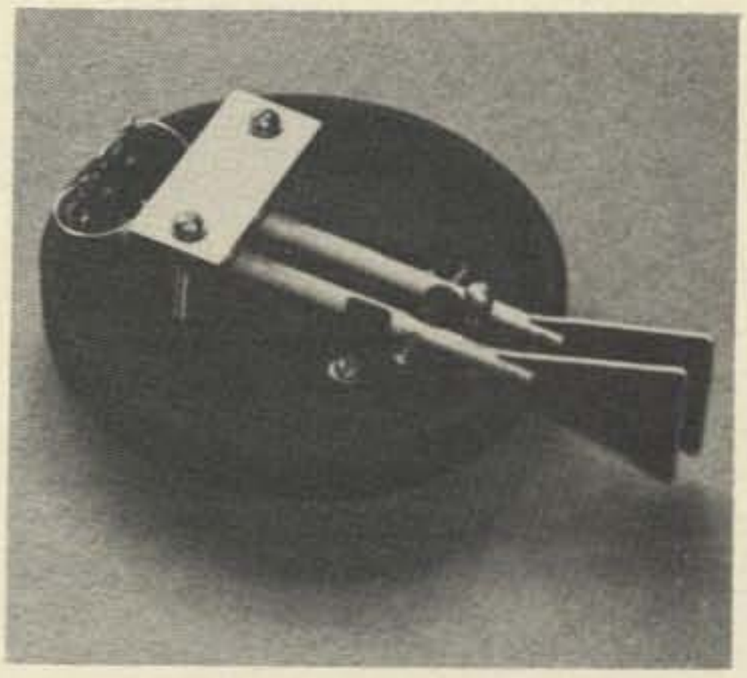

Fig. 1 - The complete key is built up on a discarded lead lamp base. The brass plate at the top holds down the bearing assembly for each arm.

Fig. 3 shows how the bearing assembly is put together for each of the two arms in the key. The shoulder washers on top and bottom keep the center of the ball bearings free to rotate when the whole assembly is compressed between the base of the key and the top plate. The top plate referred to is the ¾" by 1¾" brass plate shown in fig. 1. Not shown in fig. 3 is that this top plate is secured to the base of the key by 1" long bolts on either end of the plate. In the model shown, the metal base was tapped to accept the 8-32 size bolts. However, there is no real need to do this if one wants to avoid tapping holes. Just use a bolt and nut arrangement by drilling suitable holes in the base. There is no

*c/o CQ

particular dimension needed for the spacing of these bolts as long as they clear the ball bearings. The center portion between the bearings shown in fig. 3, which also holds each of the arms, need not be as elaborate as shown. Also, it need not be made out of an insulating material since the two fiber shoulder washers will insulate each arm. For instance, one could form an assembly using just pieces of 3/16" brass tubing between the ball bearings. As shown in fig. 4, a T-joint is formed using pieces of 3/16" tubing and then soldered together with a heavy duty soldering iron. The guide hole and pin shown are not absolutely necessary but are a great help in temporarily holding the pieces together in alignment until they are firmly soldered together. Besides keeping a right angle between the pieces, the pieces for both arms should be carefully dimensioned so they are identical. The center piece is epoxied into the center of the ball bearings after each end penetrates them about half way.

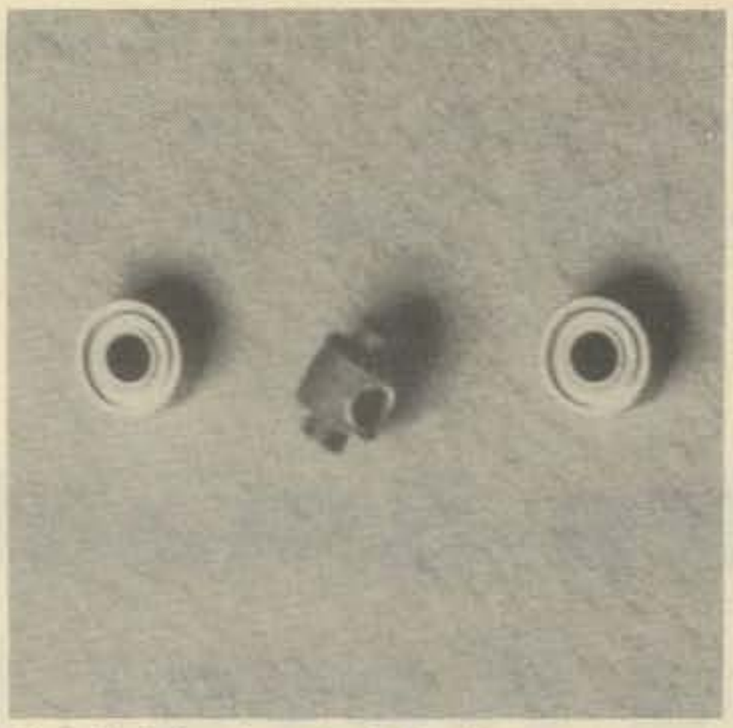

Fig. 2 - The heart of the key are some small ball bearing assemblies. Shown between them is one possibility for a holder for each arm of the key.

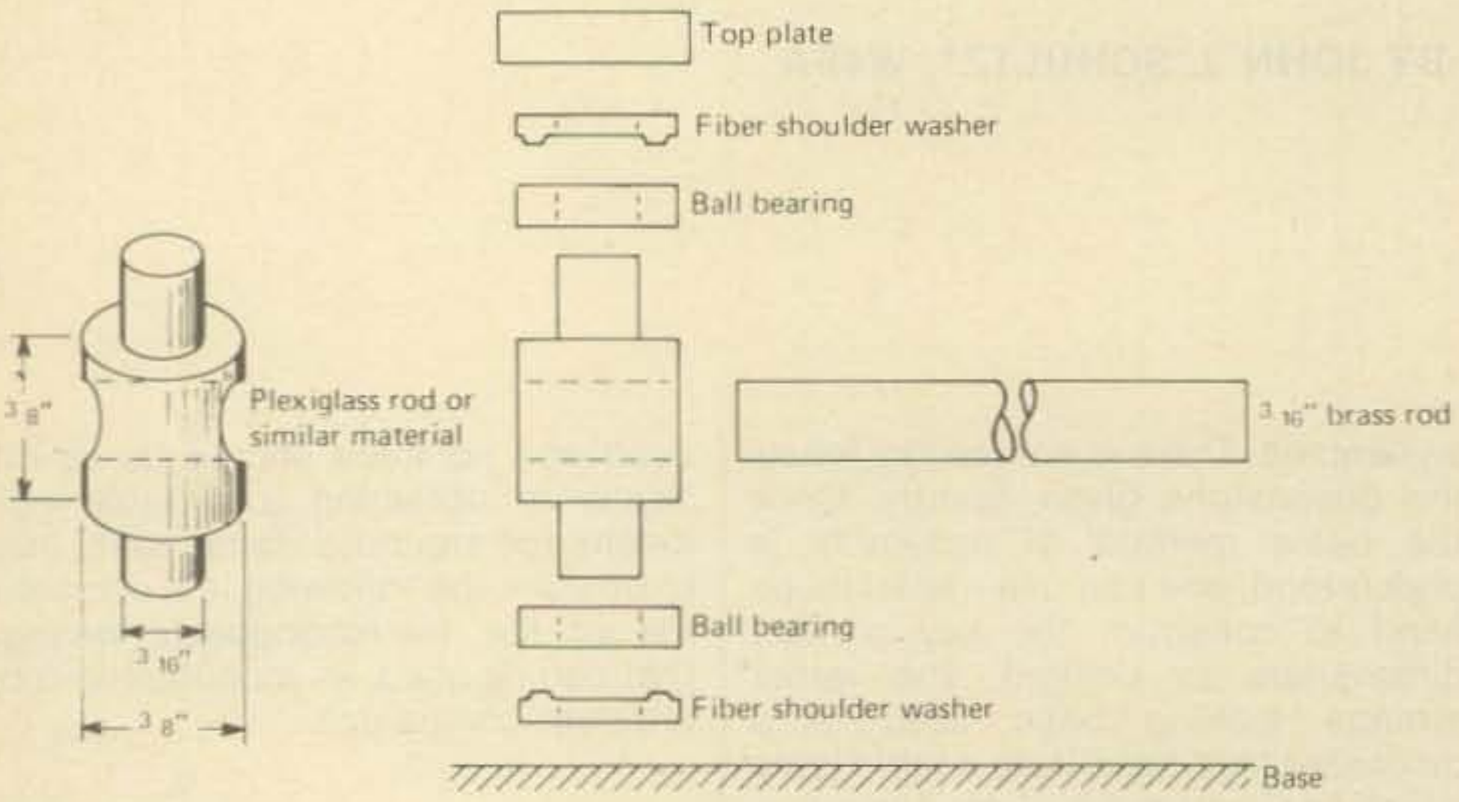

Fig. 3 - Details of the assembly of the bearing assembly for each arm.

Some further detail of each arm of the key is shown in fig. 5. The 3½" overall length of the arms is probably the maximum that should be used. If longer arms are used, there will be a tendency for them to droop. The arms are tensioned by a spring placed between them, as can be seen from fig. 1. The spring must be insulated on either side to prevent it from shorting the arms together. This can be done by any small shoulder washer. The spring itself is determined by experimentation using any available small discarded springs until the key has the right "feel." One could, of course, have a variable tension arrangement by soldering a flat metal washer to one of the screws which penetrates an arm and then use the adjustment of the screw to compress the spring. In this case, a clamping nut would also be necessary on the screw. Two small angle brackets are placed on the base to limit the outward travel of the arms. These can be fabricated, or suitable right angle brackets of the type found in hardware stores for wood shelving will also suffice. The arms are insulated from these stops by plastic tubing or some shrink tubing over the arms as shown in fig. 5. The ground post is placed on the base just between the tension spring and the paddles. It consists of a 1" long bolt which holds down a ¾" length of ¼" brass tubing.

Electrical connections are made to the key at the rear of the bearing assembly shown in fig. 3. Small pieces of stranded wire are soldered to each arm where each arm penetrates the bearing assembly. These are then run to a small insulated terminal strip at the rear of the key.

The construction of the key allows for a number of adjustments to suit any "feel." Besides the spring between the arms, one can adjust the angle brackets to move the arms closer or further away from the ground post and by tightening down the top plate one can produce different tensions on the movement of the arms.

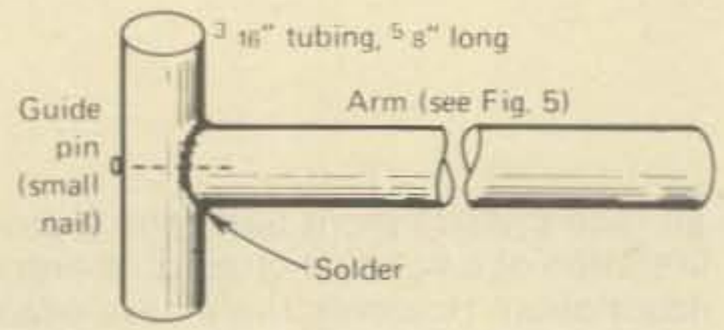

Fig. 4 - A simple alternative holder for the arm holder shown in fig. 3.

If one takes a bit of care in construction of the key, one will end up with a fine performing unit that should last a number of years. Also, with a bit of imagination and scrounging around for parts, the cost in most cases can be held down to only that of the four ball bearings. The key is essentially maintenance free because of the sealed ball bearings. One may want to just occasionally remove the ground post to check that it is clean. This maintains good contact with the arms.

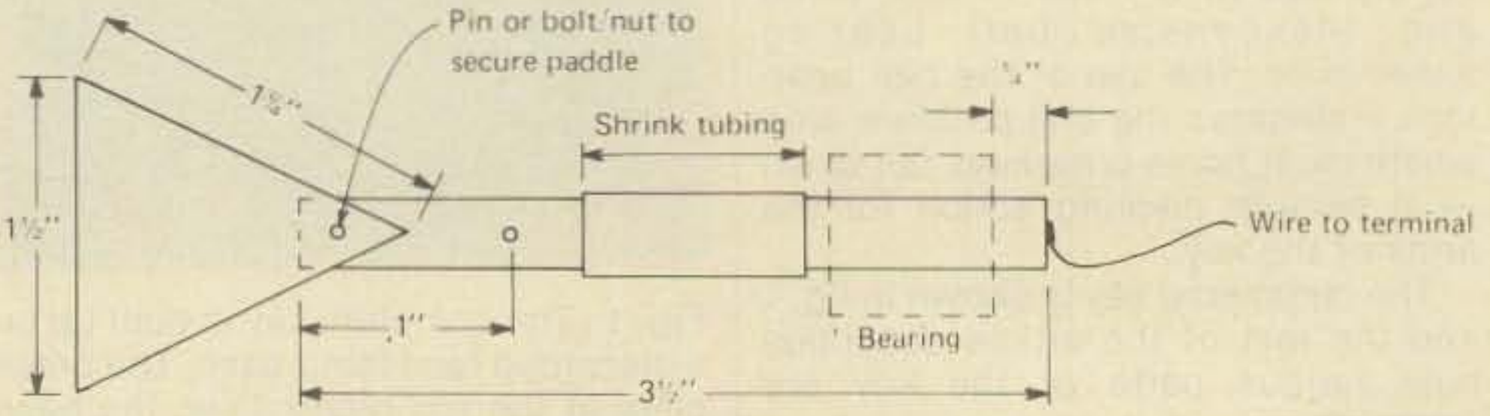

Fig. 5 - Details of the arms made from 3/16" brass rod.

a regular feature by

THEODORE J. COHEN N4XX

dateline... Washington, D.C.

The ins and outs of the Washington scene

Commission proposes new personal radio service allocation near 900 MHz.

On October 12, 1978, FCC commissioners voted to issue a Notice on Inquiry (NOI) in the matter of an allocation to the Personal Radio Service (PRS) near 900 MHz. Informed sources in Washington, D.C., indicate that the new band, if allocated, could be in the vicinity of 930 or 940 MHz., and that this allocation would augment (i.e., not replace) the current PRS allocation at 27 MHz.

Arguments were made that the Commission should issue a Notice of Proposed Rule Making (NPRM) in this matter, instead of an NOI, However, questions were raised as to the need for the new allocation, and as such, an NOI is to be issued.

With this action, the possibility that a new PRS allocation will be made in the 220-225 MHz. band is significantly reduced.

ARRL testifies before Congress on Communications Act Rewrite

Speaking for Harry J. Dannals, and on behalf of the American Radio Relay League, Mr. Harold M. Steinman, K1FHN, the League's Washington Area Coordinator, testified before the House Subcommittee on Communications in the matter of House Resolution H.R. 13015. Sometimes known as "The Communications Act of 1978," H.R. 13015 addresses the desirability and necessity of rewriting the Communications Act of 1934.

In his testimony, on September 22, 1978, Mr. Steinman called attention to a number of matters which require legislative attention. These matters include, but were not limited to, such areas as volunteer assistance to the FCC in conducting Amateur operator examinations; point of sale control of transmitting equipment; and fees to be paid by "all users of the electromagnetic frequency spectrum" based upon "the cost to the Commission of processing the license, and "the scarcity value of the spectrum being assigned."

The imposition of a spectrum fee was of particular concern to the League, and it was argued that the concept of "scarcity value" could not be applied to the frequencies used by the Amateur Service. Mr. Lionel Van Deerlin, Chairman of the Subcommittee, noted that it was not the subcommittee's intent to impose such fees on non-commercial users of there radio spectrum.

Mr. Steinman concluded his testimony by strongly urging that legislation pertaining to the susceptibility of electronic entertainment devices to rf fields from nearby transmitters be incorporated in H.R. 13015.

FCC'S UHF task force investigates spectrum efficient technology

In conjunction with Stanford University, the FCC is conducting a study on the feasibility of using narrow-band, single sideband techniques for u.h.f. voice communications. The techniques being investigated include amplitude and frequency compression, and subsequent expansion at the receiver, to reduce the bandwidth occupied by the transmitted signal.

Three types of tests will eventually be performed during the evaluation of the new narrow-band, SSB techniques: (1) direct comparisons between standard FM radios and narrow-band radios; (2) measurements of adjacent channel performance between FM and narrow-band SSB systems: and (3) operational tests of a stand-alone mobile relay station and mobile units using the narrow-band SSB system.

One of the major questions which has yet to be answered before tests can begin relates to the best channel separation to use with the narrow-band systems under study. There is some indication that it will be possible to achieve better than 60 dB of isolation with 2.5 kHz of channel separation. Another approach is to space channels at 3.2 kHz, with up to 80 or 90 dB of isolation expected in this case.

Given the crowding now experienced in the 2-meter band, Amateurs would do well to follow the FCC's activity in the use of narrow-band, single-sideband techniques. Should the use of these new techniques provide for more efficient use of the radio spectrum, their use by Amateurs in the v.h.f. and u.h.f. bands may be preferred to the use of systems employing FM techniques.

New U.S. amateur callsigns cause confusion

The spate of new U.S. Amateur callsigns (such as AH6I for a Hawaiian station) is causing much confusion at home and abroad. Most affected are the contest and DX operators who rely on the prefix as a quick indicator of a station's location. Since most stations no longer sign a portable indicator (indeed, the FCC no longer requires that this indicator be used), it is difficult to determine whether a KL7 is in Alaska or Texas, or whether a KG2 is in New York or on a Pacific island.

Senator Schmitt critical of U.S. WARC preparations

In remarks prepared for delivery before the 1978 meeting of the Armed Forces Communications & Elec-

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Two digit readout displays SWR measured from 1.0 to 6.3 automatically to within 0.1 for power levels from nominally 20 to 2000 watts even under SSB modulation

Frequency range of 1.8 to 30 MHz

Insertion SWR negligible under 30 MHz

NUMERALS SHOWN ARE SIMULATED

RF POWER METER SPECS

Displays NET PEAK POWER from nominally 20 to 2000 watts in two autoranged scales

Two digit readout displays output power from 20 to 500 watts in 10 watt increments and 500 to 2000 watts in 100 watt increments

Frequency range of 1.8 to 30 MHz

SL-65
Instantaneous Digital
SWR and NET POWER Meter
(3.5X5.5X7.5 inches)

Fully self contained with 115Vac power supply. The Model SL-65 Instantaneous Digital SWR and RF Power Meter may be used with any HF transmitter providing an output power level of 20 watts to beyond the amateur legal limit. The instrument is connected in-line with the transmission co-ax (50 ohms nominal). A display selection switch permits a choice of direct SWR readout (1.8, 2.1, etc.) or NET PEAK ENVELOPE POWER. Display does not flicker in either mode for AM, FM, RTTY, SSTV, normal speech rate in SSB or CW greater than 10 WPM.

Instant and direct SWR readout whenever you modulate independent of power level so that calibration (power set) is not required

Direct readout of actual power accepted by the load, so that you know what the antenna gets.

Displays PEP instantly when you modulate

FULLY WIRED AND TESTED

NET: $189.50 Model SL-65 available in Collins Gray cabinet and dark gray wrinkle panel.

* Patent pending

QRP Model soon. Watch for the SL-65A

The complete receiver audio active filter
YOU CAN DO IT SIMULTANEOUSLY with both NOTCH and BANDPASS filters.

The ERC Model SL-55 Audio Active Filter is designed to improve SSB and CW reception under the most severe cases of QRM. Containing independent and continuously variable bandpass and notch filters, both may be used simultaneously to enhance reception. Both filters are of the biquad design since this filter realization is inherently stable and virtually ring free even when the highest Q's are selected.

NOTCH FILTER SPECS

Notch frequency positioning continuously variable from nominally 300 to 1400 Hz

Notch depth fixed at no less than 30 dB

3 dB notch width 50 Hz low end, 200 Hz high end

May be disabled completely

BANDPASS FILTER SPECS

Center frequency positioning continuously variable from nominally 200 to 1400 Hz

Bandpass continuously variable in width from 14 Hz to greater than 1400 Hz — 3 dB, 140 to greater than 1400 Hz — 20 dB

Bandpass controls are completely independent of notch controls

SL-55
Audio Active Filter
Both filters are cascaded with a fixed lowpass filter (18 dB/octave rolloff above 1400 Hz) for optimum SSB filtering. (3.5x5.5x7.5 inches)

Fully self contained with 115 Vac power supply, the Model SL-55 audio active filter may be used with any communications receiver or tranceiver designed for SSB and/or CW reception providing output to an eight ohm speaker or headphone. The filter requires no modification to any receiver. It is connected in series with the audio output line to the speaker or headphones and will drive nominally one watt to an eight ohm load and headphones from 8 to 2000 ohms.

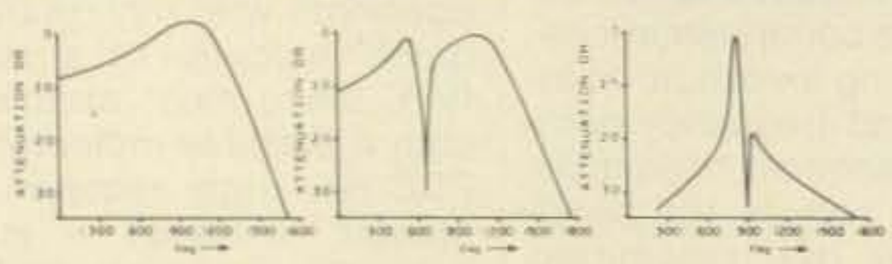
A front panel BYPASS switch restores the receiver (tranceiver) to its original audio configuration.

HERE ARE THE PERFORMANCE CURVES

SSB
Notch off
Bandpass freq at 3 o'clock
Bandpass Q at full CCW

SSB
Notch at 700 Hz
Bandpass freq at 3 o'clock
Bandpass Q at full CCW

CW
Notch at 900 Hz
Bandpass freq at 800 Hz
Bandpass Q at full CW



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tronics Association (AFCEA), Senator Harrison Schmitt stated that the Senate Communications Subcommittee was "deeply disturbed by U.S. preparations, or lack of same, for WARC." The World Administrative Radio Conference (WARC), which will be held in Geneva, Switzerland, in 1979, will determine the development and use of telecommunication systems through the year 2000, and as such, Senator Schmitt was concerned that inadequate preparations will sacrifice future economic development in the U.S., and could jeopardize our national security.

Citing some of his concerns, the senator noted that U.S. contacts with the so-called "Third World" have been few in number, with contacts largely confined to our traditional allies. Further, Sen. Schmitt was critical of Professor Robinson, Head of the U.S. Delegation to the WARC. Said Senator Schmitt: "...I understand now that Professor Robinson is not expected to be working on WARC full-time until mid-1979. If we don't have a man at the top, how can the U.S. Delegation establish policy?"

Senator Schmitt was also critical of the White House, which he accused of being "oblivious" to what was happening.

In concluding his remarks, Senator Schmitt suggested that the U.S. should consider the establishment of an alternative to ITU. In particular, he proposed a user-based organization which would make frequency allocations based on capability, use, and need, rather than on "nationalistic and political considerations."

WARC advisory committee seeks to retain 3950-4000 kHz. for amateur service

In a recent report to the U.S. WARC-1979 Advisory Committee, Mr. Herb T. Blaker (K4KDY), Chairman of Working Group 1 (HF Broadcasting and other HF Allocations), asserted that the Amateur service allocation from 3950 to 4000 kHz. should be retained by this service in ITU Region II. Among other things, Mr. Blaker noted that this band was important to the Red Cross, and specifically, to the Red Cross Amateur service nets operating in Central America.

In this same report, Mr. Blaker proposed that the band 1800 to 1860 kHz.should be restored to the Amateur service. This position was based on his working group's conclusion that there was no viable, technical justification for the FCC's proposal to allocate this band to broadcasting.

Old receivers never die. They collect dust. In this article W9WHM tells how he cleaned up, modified and turned the venerable Hammerlund "Super Pro" into a modern, competitive piece of amateur gear.

Souping Up the Super Pro

BY JOHN R. LEARY*, W9WHM

So you've just bought your new super-duper, ultra-extra-modern, completely solid-state transistorized, up-to-date, best-in-the-world receiver. And you think it's so good that it will last you at least ten years (if WARC '79 allows it!).

Well, guys like me (and I'll bet thousands of other *CQ* readers) were born and bred during an era that you young fellers can never really appreciate. Now I don't mean to talk down to you. The fact is, since you were never there, you didn't live it. You see, I was weaned on vacuum tubes. And I guess that the only time that the younger generation ever sees a tube is at a hamfest.

Anyway, about twenty years ago an electronics company called Hammerlund came out with a general coverage receiver that knocked amateurs and SWLs for a loop. It was called the "Super Pro" and it was a magician of a receiver for its time. It became very popular and, as a result, became the subject of many articles in the amateur journals. *CQ* probably published more information on the "Super Pro" than all the others combined. Names like Geisler, Reed, Lee and others are the fellows who helped to turn the original "Super Pro" into a receiver that will make some of the newcomers say "uncle!"

What I did was incorporate the best features of each article I found. It wasn't an easy job. Certainly not a weekend project. It took me twenty** years to complete. Painstaking, deliberate, careful and judicious work. But it was a labor of love.

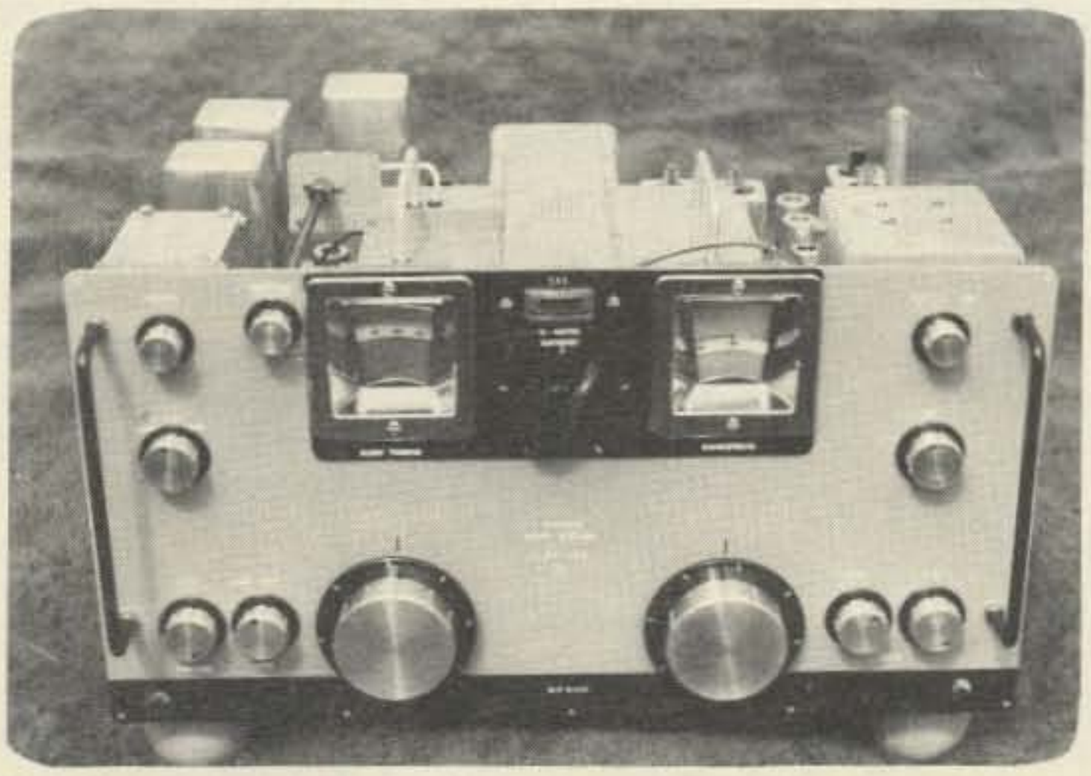
I added an antenna trimmer circuit, 6AB6 r.f. stages, fast and slow a.g.c. circuits, a product detector and an outboard Q5-er (85 kHz i.f. from a BC-453), among other things. All of the original components were removed, cleaned and remounted on a new 17 × 5 × 15 inch chassis. The photos tell a more graphic story than I can write, so I refer you to them.

If you are interested in information on the "Super Pro" or my modifications, drop me a line. No SASE is necessary.*** I'd be happy and proud to share my "secrets." CQ

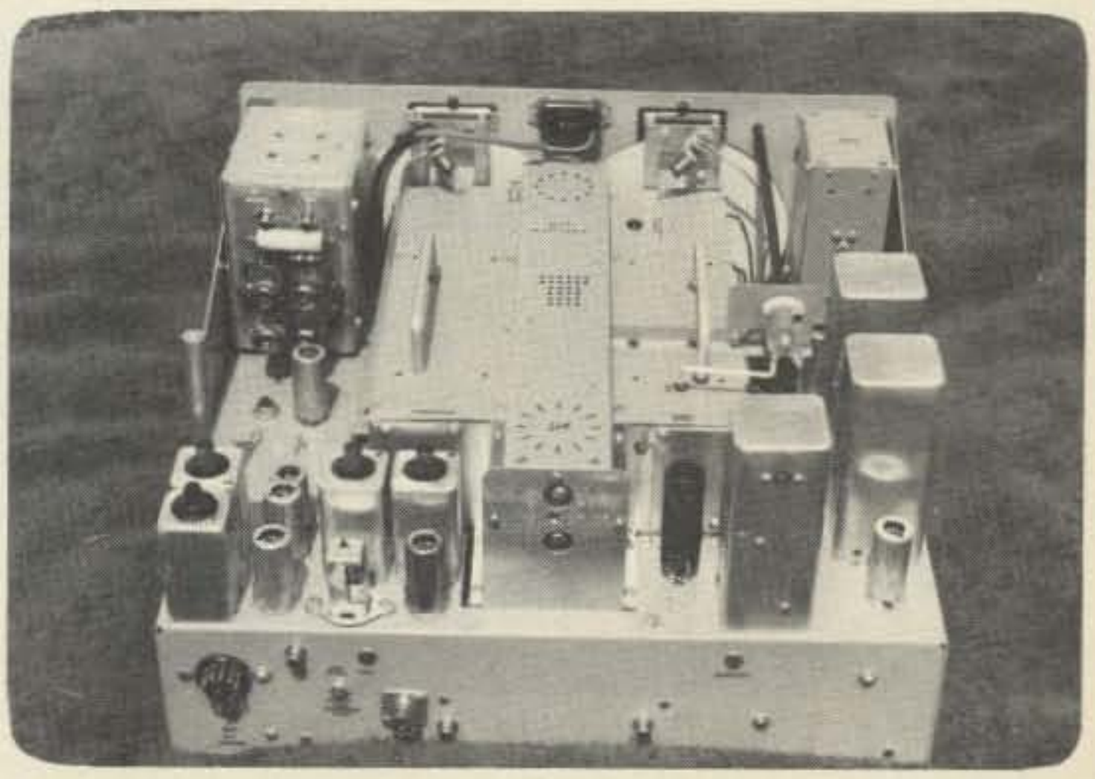
*438 Hamilton, Fortville IN 46040

**sic—Ed.

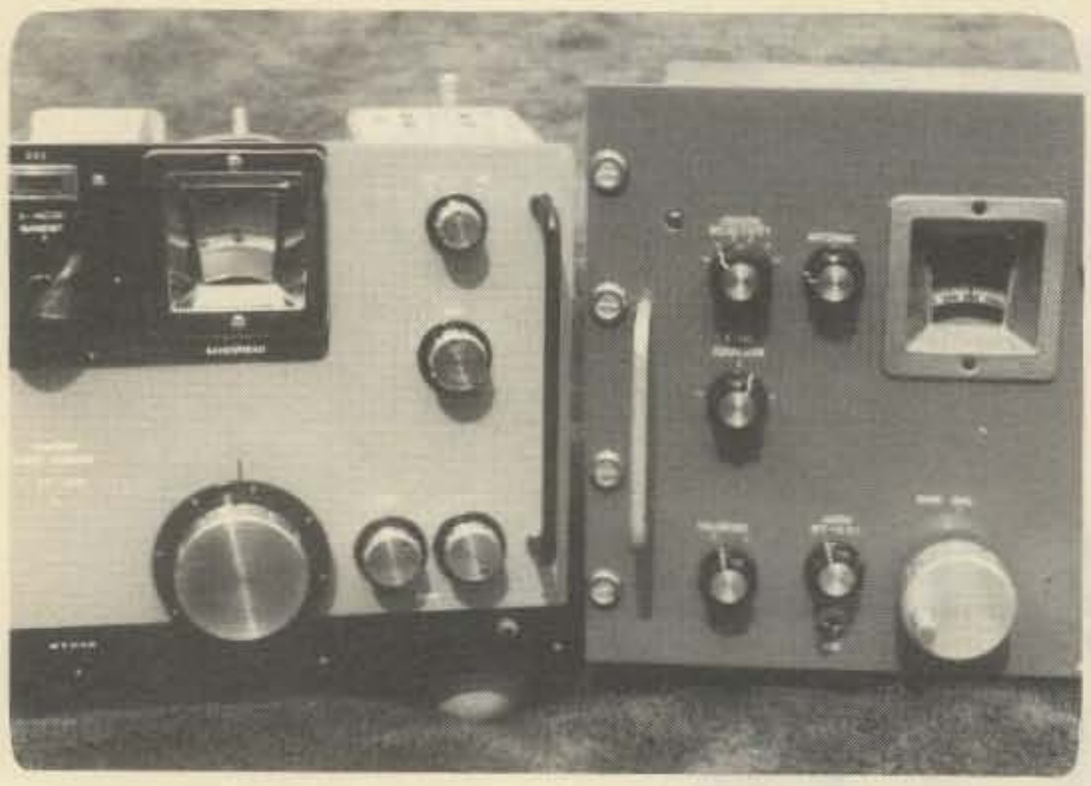
***It would be nice to include one.—Ed.



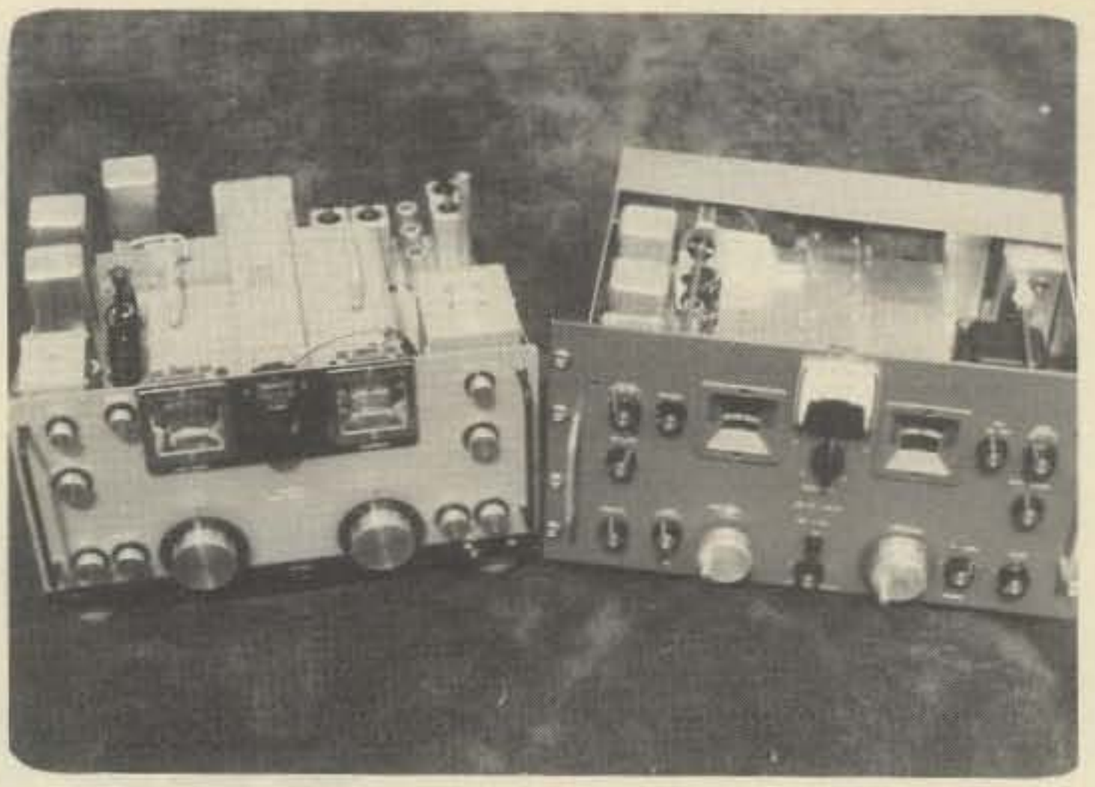
Front view of a restored Super Pro *SP-400X.*



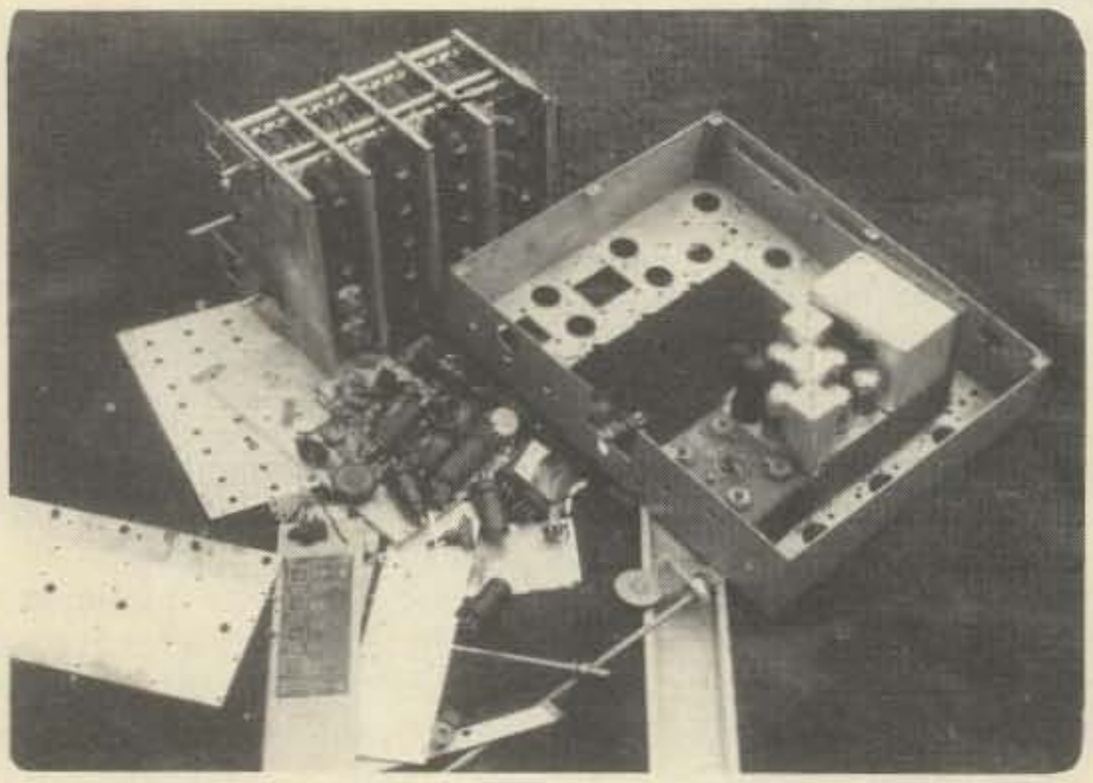
Top rear view of a "Souped-up Super Pro."



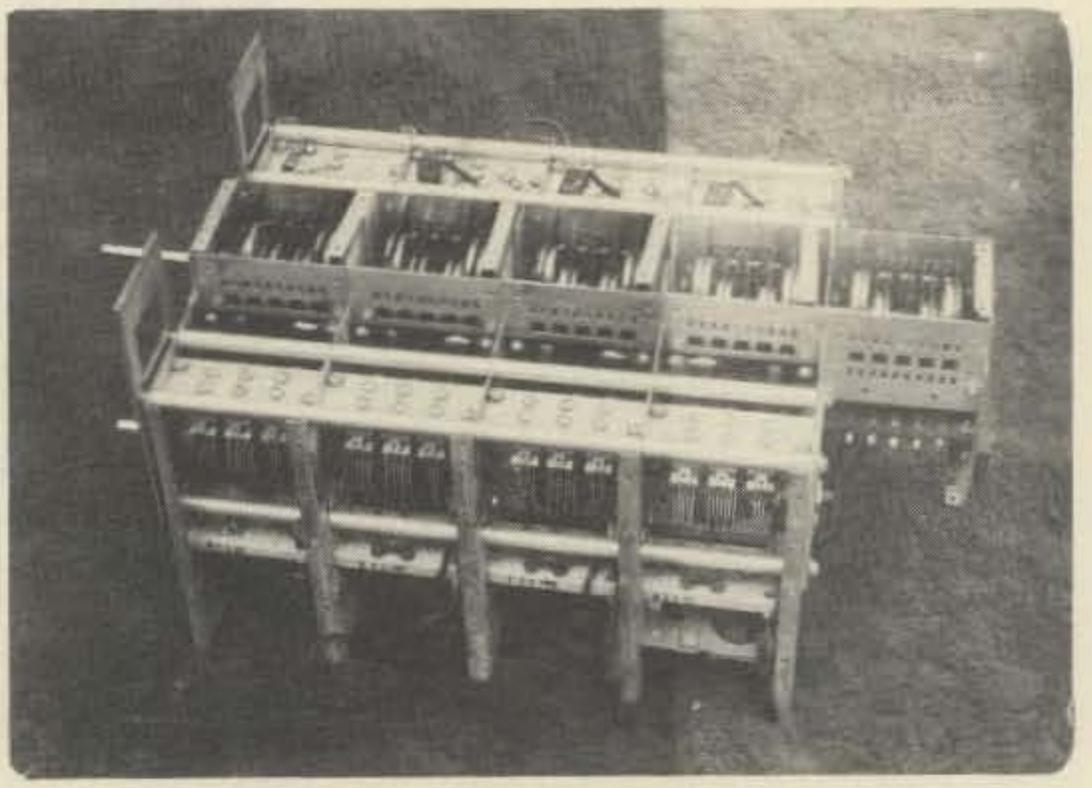
Detailed look at the front panels of two restored units.



Left: A restored SP-400X (540 kHz to 30 MHz).
Right: Restored SP-400SX (1240 kHz to 40 MHz).



Parts used to build the "Souped-up Super Pro."



The famous Super Pro *tuning unit.*

Showcase

Bird Electronics Corp.'s HAM-MATE Directional Wattmeters

Bird Electronics Corp. has introduced two new wattmeters for the radio amateur. The models 4360 and 4362 HAM-MATE (registered trademark) directional wattmeters are designed specifically for the amateur radio service.

The 4350 covers the 1.8 to 30 MHz. range (200 watt and 2000 watt) and the 4362 is for use in the 140 to 180 MHz. band of frequencies (this, of course, covers two meters). The 4362 has 25 watt and 250 watt ranges.

The directivity feature of the Bird HAM-MATE is well-known in the amateur community. With this feature the user can correctly measure low reflected power without interference from the high forward power in the transmission line.

The new HAM-MATE directional wattmeters are available from Bird Electronics Corp., 30303 Aurora Rd., Cleveland (Solon) OH 44139. The price is $94 and delivery is immediate.

CIRCLE 60 ON READER SERVICE CARD

Nicad (nickel-cadmium) batteries have become regular supporters of amateur radio stations. One trip to a Radio Shack *store can get you all the parts needed for building this simple circuit for a controlled-current nicad battery charger.*

Automatically Controlling Charge Current for Nicad Batteries

BY THOMAS BIDDLE PERERA, Ph.D, K2DGY

The charging of nicad batteries must be performed with considerable care in order to avoid building up internal temperatures and pressures which could destroy the cells. The usual technique is to limit the charging current to 1/10 of the amp-hour capacity of the battery. For instance, a 1 amp-hour capacity battery could be safely charged at 100 milliamps (.1 amp) indefinitely without damaging the battery. The problem with this approach is that it requires 14 to 16 hours to achieve a full charge and this means that unless you can take the battery pack out of the equipment and charge it separately, you lose the usefulness of the equipment for that period of time.

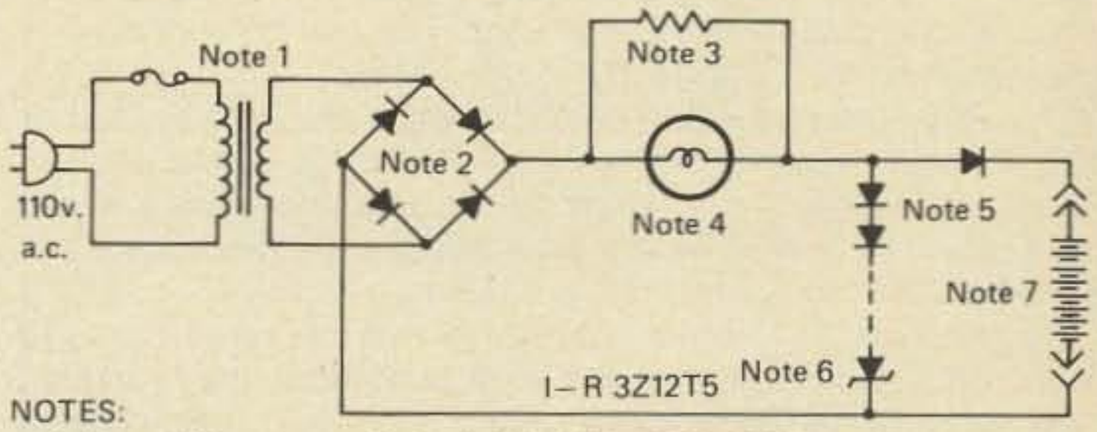
Nicad batteries are capable of accepting higher charging currents than 1/10 of their amp-hour capacity as long as these higher currents do not continue throughout the entire charge cycle. That is, if there were some way to reduce the charging current after the battery was 75% charged, there would be no damage to the cells. Some commercial battery chargers attempt to do this by including temperature or pressure sensors within the battery which signal to the charger whenever temperatures or internal pressures exceed safe limits. This causes the battery charger to switch from the rapid charge mode to the safe 1/10 amp-hour capacity rate.

Since the voltage of a nicad battery increases as it is charged, voltage also may be used as a rough indicator of the level of charge in the battery. Although this increase in battery voltage varies slightly with temperature, if we assume that the battery will usually be charged at or near "room temperature" we can use the voltage across the battery as an indicator of the state of charge of the battery. When a nicad is fully charged, the voltage of each cell is 1.25 volts which means that a fully charged 10 cell battery would show a voltage of 12.5 volts.

Now let's say that we would like to charge our nicad battery at a rate of ¼ of its amp-hour capacity when it is fully discharged (1.0 volt per cell or less) until we bring it up to say 12.5 volts at which time we want its charging current to be reduced in a rapid, non-linear mode to the 1/10 of amp-hour capacity rate. An extremely simple way to do this is to use a power zener diode to shunt the undesired current to ground when the voltage reaches a level near full charge.

The voltage-current curve of a zener diode shows virtually no current being drawn by the diode until the zener point is reached. As the voltage across the diode increases beyond that point, the current increases in a rapid, non-linear mode.

A practical charger using this principle could be constructed as follows: First we need a transformer and diode rectifier capable of producing at least twice the battery voltage. A 24 volt transformer, rated at .250 A or more and four 1A - 200 PIV diodes will be fine. Then we need a series current limiting resistor which will limit the charging current to ¼ of the amp-hour capacity of the battery. This resistor can be replaced with an incandescent lamp if desired to give a visual indication of charging. The value of the resistor is calculated using Ohm's law as follows: Resistance = Voltage drop (from transformer voltage to battery voltage) divided by desired charging current. For instance, say we want to charge a .450 amp-hour



NOTES:

1. 24v., 250 or more mA. Radio Shach No. 273–1356.
2. 1N4002 diodes. Radio Shack No. 276–1103.
3. Alternate current limiting resistor. 100–150Ω, 5w.
4. Current limiting lamp, type 53. Radio Shack No. 272–1117.
5. 1N4002 diodes for "trimming". Radio Shack No. 276–1103.
6. 12v., 5–10w. Zener diode.
7. Nicad battery.

Fig. 1—Schematic diagram of the controlled current nicad battery charger.

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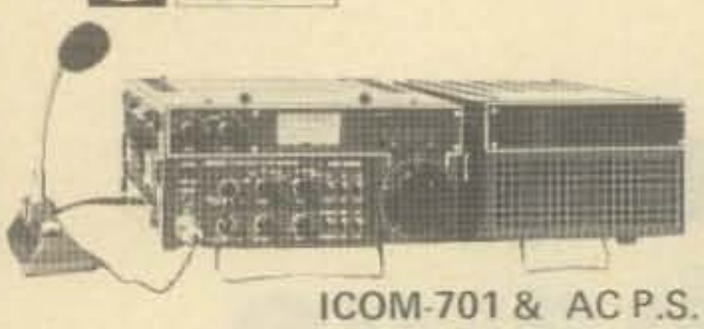

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CIRCLE 5 ON READER SERVICE CARD

capacity at ¼ of its capacity. That would be .1125 A or 112.5 milliamps. The voltage drop from 24 volts to 10 volts (assuming a discharged battery) is 14 volts. The resistor therefore is calculated by dividing 14 by .1125 to give a value of 124.4 ohms. Any standard value near this value will do, i.e., 120 or 130 ohms. The power rating of the resistor is calculated by: Power (watts) = current × voltage drop. In this case it would be .1125 × 14 or 1.575 watts. Be a big spender and use a 2 or 5 watt resistor so it won't get too warm.

Now comes the problem of how to use the zener diode to limit charging current when the voltage of the battery reaches 12.5 volts. Since zener diodes vary slightly in their precise zener voltages and voltage-current curves, a trial and error technique will permit the safest conditions for the battery to be established. Since zener diodes with the required 5 to 10 watt rating only cost a few dollars, try a 12 v. zener placed across your battery as indicated in the schematic. If the 12 v. diode cuts in too soon and shunts too much of the charging current to ground use the following technique to "trim" or adjust the voltage-current curve of the zener so that it gives you 1/10 of the amp-hour capacity charge rates when the voltage reaches 12.5 - 12.7 volts.

The "trimming" technique involves simply adding one or more diodes such as 1N4002 in series with the zener diode. Each of these diodes has an internal voltage drop of about .6 volts before it starts to conduct current in the forward direction. Simply choose a zener diode and add "trimming" diodes in series with it until your charging current with the battery fully charged is below 1/10 of the amp-hour capacity rating of the battery. If you cannot achieve this reduction in charge current with a 12 v. zener diode, use one or two more diodes in series with the diode which prevents the battery from discharging through the zener in case the power to the charger is interrupted. The voltage drop across these diodes will allow the charger voltage to remain .6 or 1.2 volts above the battery voltage and cause the zener diode to cut in earlier.

When adjusted as suggested, this charge limiter will allow you to safely charge your nicad batteries in 4 to 5 hours and to leave them on the charger for as long as you wish without danger of overcharging.

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

It was very quiet outside as the falling snow masked the distant sounds of an occasional atuomobile crunching along the street. Inside the house, the three friends sat around the fire, nursing their drinks. The clock had just struck two in the morning.

Twenty meters had been excellent up to sunset and forty meters had been very good; there were plenty of Asian signals coming in very strong in spite of the annoying broadcast signals and jammers that infested the band. About midnight the activity dropped off and by one o'clock the station had been secured. The lure of the log fire and conversation, however, precluded anybody from leaving soon.

After the long pause, during which each was occupied with his own thoughts, one of the amateurs, Dr. Livingston I. Presume, spoke, "Well, 1979 is only a few days away. How do you think DX conditions will be during the coming year?"

Pendergast shifted comfortably in his chair. "From what I read and hear it seems as if things are going to be pretty good. The sunspot cycle is predicted to hit a maximum of about 115 or 120, probably during the end of 1979 or the beginning of 1980. And 10 meters had been excellent this fall. I'm looking forward to a great DX season this coming spring."

Doctor Livingston turned to me. "What do you think?", he asked as he sipped his drink. I reached behind me and picked up a piece of paper from the operating table.

"Look at this", I replied. "Here's an article I saved from the September, 1978 issue of *Sky and Telescope* magazine. It was in the "News Notes" section. It is entitled, "Forecasting the Next Sunspot Maximum" and reports on the forecast made by R.P. Kane, who is at the World Data Center-A for Solar-Terrestrial Physics, Boulder, Colorado. He bases his forecasts and predictions upon the fact that the amount of disturbance of the geomagnetic field is a good indicator of the properties of the following sunspot maximum.

"The earth's magnetic field is constantly undergoing slight changes which are described in terms of the index number, *K*, in three hour intervals.

"A short time ago, the French geophysicist Mayaud had the clever idea of combining K numbers obtained simultaneously by observers at opposite points on the earth's surface to derive a new index number called *aa*. The number *aa* has the advantage of cancelling out the diurnal and annual changes in *K*. And, when the yearly mean values of *aa* are taken, the correlation is very good with respect to the sunspot cycle over the past 100 years.

"Dr. Kane has run this correlation and he predicts that the maximum annual sunspot number will be about 206. Taking into account the spread in the correlation, he predicts there is a 66-percent chance that the actual value will range between 160 and 250. Further, he predicts the maximum will fall near the end of this year: 1979. He wrote of his summaries in *Nature* magazine".

"A sunspot maximum of about *two hundred and fifty!*", exclaimed Pendergast excitedly, as he nearly upset his drink. "Think what that will mean! The last great sunspot cycle peak in 1958 only hit about two hundred. I remember that one! The MUF was above the six meter band. six meters sounded like twenty meters! I had a little four element Yagi and worked all continents on six meters except Asia. And plenty of the six meter DXers on the West Coast worked into Japan. Many of the DX signals were so loud that they completely blocked my receiver!"

Dr. Livingston turned to me. "That was before my time", he said. "Was it really like that?"

"It was", I replied. "I remember I had a war-surplus *Hammarlund SP-600JX* receiver on the bench for alignment. I had a clip-lead connected to it for an antenna so I could hear my signal generator. I started to line up the six meter range when I experienced interference that blocked out the signal generator. When the interfering signal signed, it was an amateur in Argen-

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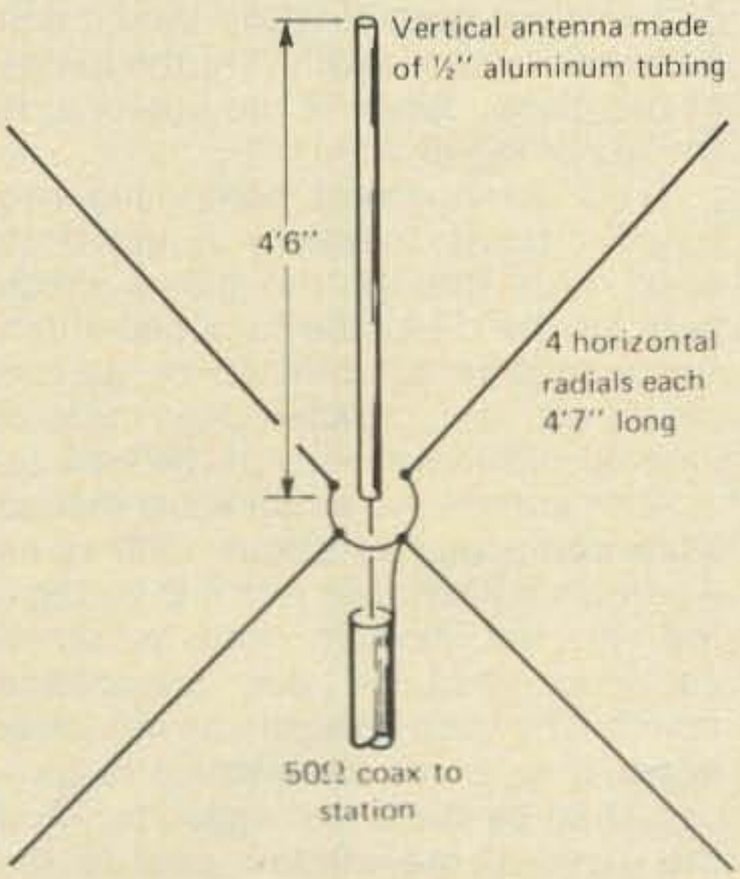

Fig. 1 - Six meter ground plane connect radial wires to braid of coax. Connect vertical antenna to center conductor of coax. Radials lie in horizontal plane. Radials may be made of insulated wire, or of light aluminum tubing or rod.

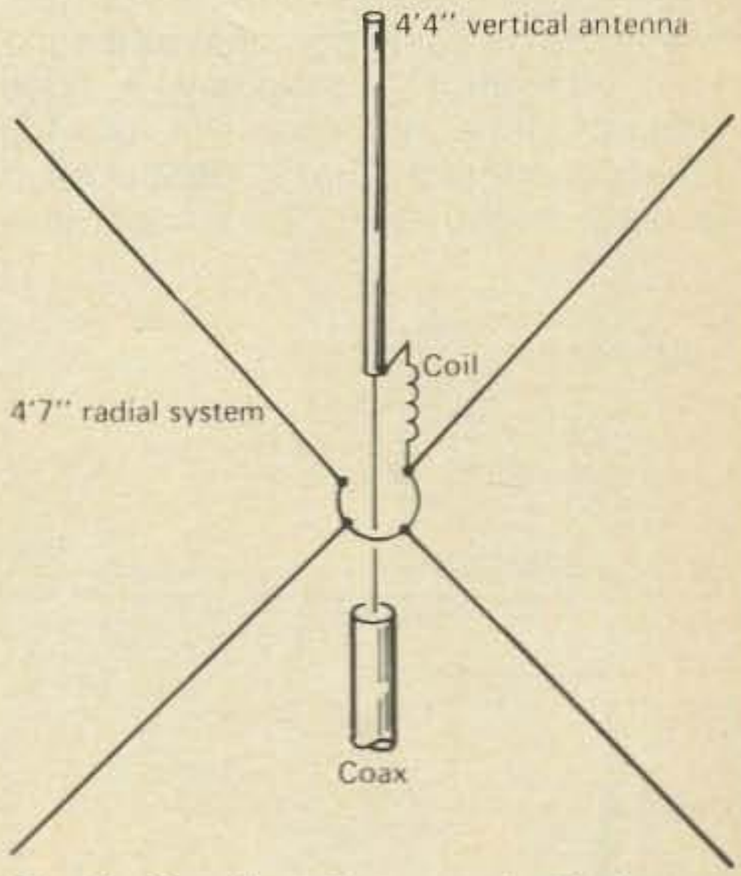

Fig. 2 - Small coil connected between base of vertical antenna and radial system provides simple matching device to achieve very low s.w.r. on coax transmission line. Start with six turns, one inch in diameter and two inches long. Monitor s.w.r. on line and reduce coil turns to achieve lowest s.w.r.

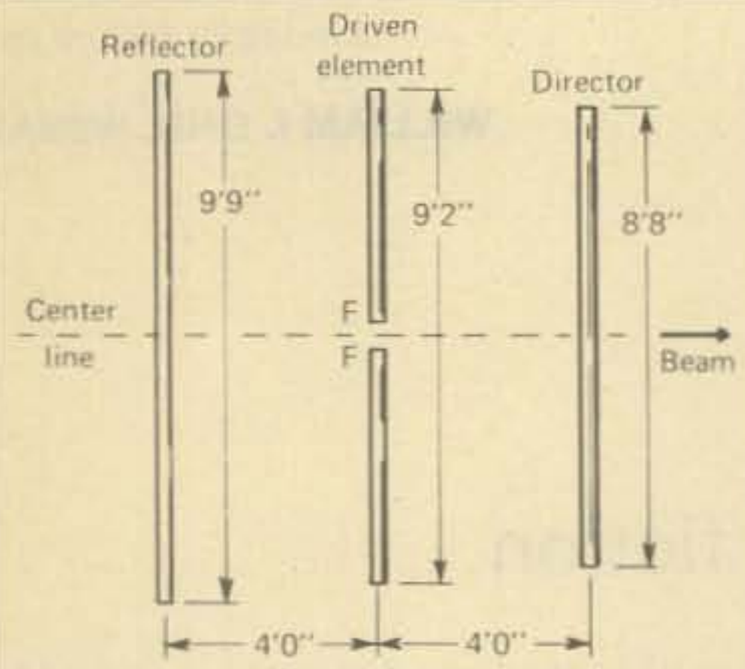

Fig. 3 – Top view of 6 meter beam as built from parts of CB Yagi antenna. Mechanical details not shown because of differences in purchased antennas. Some CB antennas are fed at F-F if driven element is split and insulated from boom. See various antenna handbooks for other feed systems. If CB antenna has a gamma match system, for example. dimentions may be reduced by 40% to allow adjustment to six meters. The match is tuned for lowest s.w.r. value on transmission line at 50.1 MHz.

tina! He was louder than my own signal generator.

"Last spring and fall the six meter band was full of double-hop, sporadic-E DX signals. Plenty of cross-continental DX, plus openings to Hawaii and the Central American area. And now, with the support of the rising sunspot cycle, six meters is going to be even more of a DX band".

"Well, how about an antenna. What do you recommend?", asked Doctor Livingston as he opened his notebook to a blank page.

Pendergast spoke up. "If you just want to have some good fun and don't take yourself too seriously, a good ground plane antenna will provide plenty of contacts (fig. 1). Best of all, it is quite unobtrusive. The easiest way to build one is to buy a cheap CB ground plane for 11 meters and cut it down to size. The vertical radiator should be only 4'6" high. And each radial is only 4'7" long.

"The feed-point of the ground plane is about 35 ohms. You can feed it directly with a 50 ohm line if you don't mind a slight s.w.r. on the line. It will be about 1.4-to-1 resonance, rising gradually off-resonance to about 2-to-1 at 52 MHz. Lowest s.w.r. will be close to 50.0 MHz. as this antenna is cut for the low end of the band".

"There are several ways you can lower the s.w.r., if you wish", I remarked. "You can reduce the length of the radiator to 4'4" and then place a small coil across the feedpoint, in parallel with the coaxial line. Watch the s.w.r. on the line and then adjust the number of turns in the coil for the lowest value of s.w.r. at your pet frequency. This is very easy to do".

"An easier scheme is merely to droop the radials downward", exclaimed Pendergast. "If the radials droop down at about a 45 degree angle, they tend to radiate a bit. This raises the feed point impedance of the antenna to close to 50 ohms. And you don't have to fiddle with a matching coil".

"Either idea is OK", I said. "But if you *really* want to have a good signal on six meters, I recommend a beam antenna. And the simplest beam to get working is a Yagi. Again, I recommend that you buy a CB Yagi antenna. They are very inexpensive. Mount the beam horizontally instead of vertically. Since the spacing is quite wide, the antenna dimensions will be relatively noncritical and the beam will provide you with good gain. Cut the director to 8'8", the driven element to 9'2" and the reflector to 9'9". That will give you good gain and good front-to-back ratio".

"How about a matching system?", asked Doctor Livingston as he drew a graceful picture of the beam antenna in his notebook.

"Well, I'd use the same technique that we discussed for the ground antenna. That is, reduce the overall length of the driven element about two inches (an inch shorter at each tip) and place a matching coil across the feedpoint. The 50 ohm coaxial line is connected directly across the feedpoint".

"No balun?", asked Doctor Livingston, arching his eyebrows.

"I'd use a compromise balun", I replied. "Just wrap the coaxial line into a coil. About three turns, eight to ten inches in diameter will do the job. It is not wise to make the coil too small in diameter or else the inner coax conductor might cold flow and short out to the outer braid. Wrap the coil with a bit of tape and suspend it parallel to the boom. This simple inductor will choke off any antenna current flowing on the outside of the coaxial line. Don't forget to drop the line down vertically beneath the beam. A lot of fellows get into trouble because their transmission line runs parallel to the antenna elements. This produces coupling between the antenna and the outside shield of the coaxial line and cancels out the isolating effect of the balun. Best to run the line down the mast to the ground level and then bring it across to the station.

"To improve the match, measure the s.w.r. at your favorite operating frequency and adjust the number of turns in the antenna matching coil for the lowest value of s.w.r. The antenna is cut to 50.1 MHz., so tests should be run at, or near, that frequency".

Pendergast looked at his watch and executed a jaw-splitting yawn.

"After two a.m.", he said. "Anything else of interest before I run along?"

"One more item", I replied. "Look at this diagram of a new and interesting mobile antenna by Avanti. It should be of great interest to amateurs. In fact, I hope the manufacturer will make a 10 meter version of it.

"You'll note the antenna is mounted to the glass window of the vehicle. There's no physical connection between the antenna on the *outside* of the car and the transmission line on the *inside* of the car. No cable passes through the body of the car.

"The antenna is attached to the glass with a special epoxy. And it can be removed very easily. On the inside of the glass, opposite the antenna, is the matching unit.

"This arrangement comprises two tuned circuits, capacity coupled to each other through the glass, which acts as the dielectric in a capacitor. Resonance is established by adjustment of the parallel-tuned circuit located within the body of the vehicle.

"The antenna is a half-wave loaded whip composed of about 1000 turns wound in a fiberglass rod. It is voltage-fed at the bottom and a small capacitor adjusts the impedance match. The whip presents an inductive impedance at the base which is compensated by the small capacitor. And the glass of the window acts as the coupling capacitor".

"That's pretty classy", observed Doctor Livingston as he studied the sketch. I'd bet that the CB antenna could be jiggered up into the 10 meter band. And I like the idea of mounting the antenna to the window!

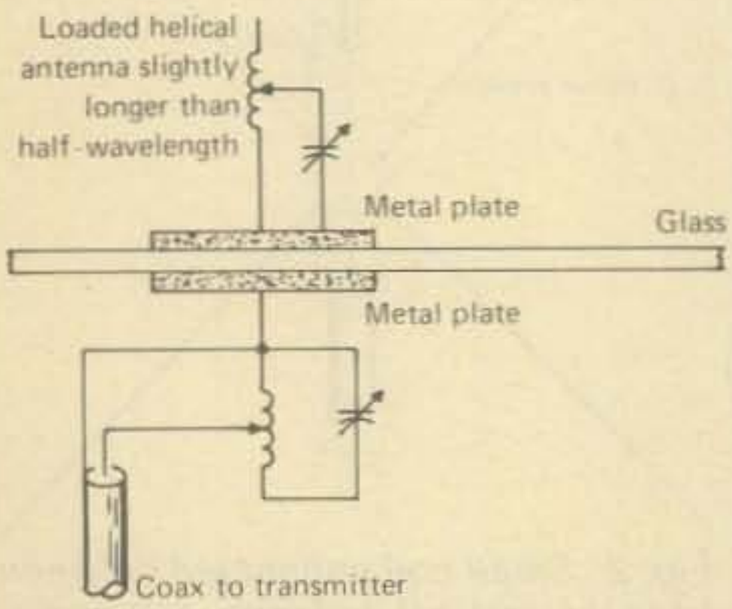

Fig. 4 – AVANTI mobile whip antenna makes use of window glass as dielectric of capacitor which couples two tuned circuits. No holes need be drilled in body of vehicle when this unique antenna is used.

The success of amateur radio communications is very often directly affected by activity on the surface of the sun. Although sunspots have been observed and recorded since the eighteenth century, many questions about them and their relationship to radio waves still remain unanswered. In this article Dr. Cohen adds some interesting information on the subject and discusses the sunspot cycle we are now in.

Solar Cycle Update

The Early Years

BY DR. THEODORE J. COHEN*, N4XX

At DXPO 78, a DX convention sponsored by the National Capitol DX Association (NCDXA), Dr. Cohen, N4XX, reviewed the current state of the solar cycle and the conditions on the h.f. and lower v.h.f. bands. The material below is excerpted from his presentation for the benefit of our readers. —K2EEK

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With the current solar cycle, Cycle 21, now in its third year of activity, it is reasonable to pause, and review the activity of the first two years. This is done with the hope that the cycle's behavior to date may provide an indication of its future behavior.

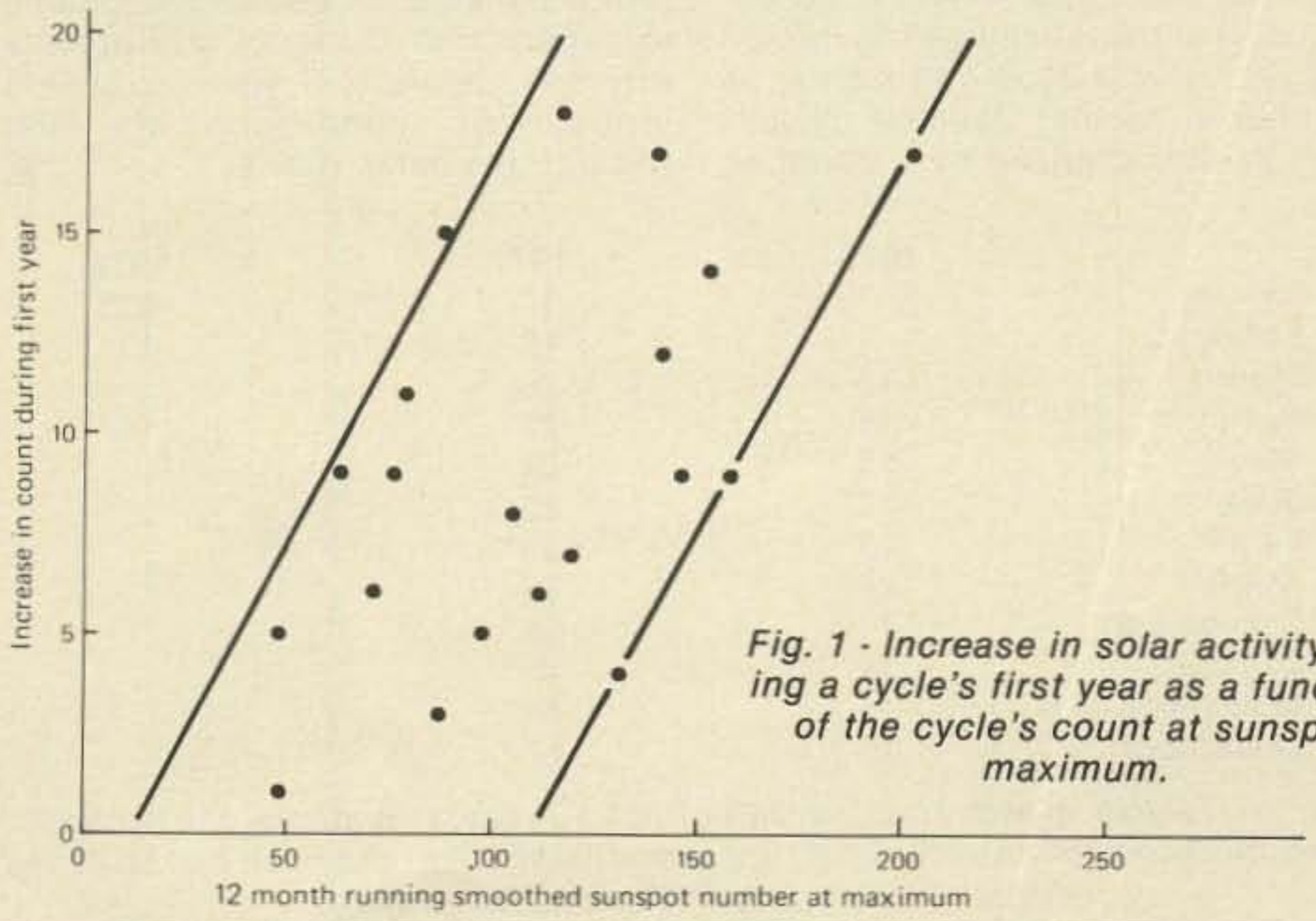

Fig. 1 - Increase in solar activity during a cycle's first year as a function of the cycle's count at sunspot maximum.

The state of a solar cycle is measured in terms of a quantity known as the 12-month running *smoothed sunspot number*. These numbers are computed in such a manner as to eliminate short-term variations in solar activity; as such, they permit scientists and engineers to observe long-term trends in the general state of the sun's behavior. For convenience, the minimum in the 12-month running smoothed sunspot numbers is used to mark the start of a new cycle and the end of the previous cycle.

A minimum count of 12 was observed for the 12-month running smoothed sunspot numbers in March, 1976, thus marking the official start of Cycle 21. This minimum was the highest ever observed since the Swiss Federal Observatory in Zurich, Switzerland, began keeping records in 1749, and so,

Cycle	Smoothed Sunspot Number At Minimum	Smoothed Sunspot Number At Maximum	Increase In Smoothed Sunspot Number During First Year
1	8	87	3
2	11	116	18
3	7	159	9
4	10	141	12
5	3	49	5
6	0	49	1
7	0	71	6
8	7	147	9
9	11	132	4
10	3	98	5
11	5	140	17
12	2	75	9
13	5	88	15
14	3	64	9
15	1	105	8
16	6	78	11
17	4	119	7
18	8	152	14
19	3	201	17
20	10	111	6
21	12	?	6

Table 1 - Solar cycle characteristics of cycles 1 through 21.

it was thought by some that Cycle 21 should exhibit significantly higher activity than did Cycle 20 (maximum count: 111). However, experience has shown that the sunspot count at the solar minimum is no indicator of future activity.

To see this, consider the minima associated with the start of two cycles, Cycles 5 and 19. As seen in Table 1, Cycle 5 one of the lowest cycles in recorded history, began with a count of 3 and only reached a maximum count of 49. On the other hand, Cycle 19 also began with a count of 3, but it reached the highest level of activity ever recorded at a solar maximum...201 counts. Obviously, the value of the 12-month running smoothed sunspot number at the beginning of a new cycle is not a reliable indicator of future activity.

In an attempt to determine whether the early activity of a cycle can provide any indication of the cycle's future behavior, we are next led to examine the cycle's activity during its first year of existence. Using the data of Table 1, let us first display the increase in activity observed during the first year of each cycle observed since 1749 as a function of the 12-month running smoothed sunspot number at the solar maximum (fig. 1). As seen, the trend of the data is such as to suggest that the more active a cycle is in its first year of activity, the higher will be the 12-month running smoothed sunspot number at the maximum. For Cycle 21, a review of Table 2 shows that for the first 12 months of this cycle, the 12-month running smoothed sunspot number increased by six (6) counts. Using this value, and with reference to fig. 1, the data suggests that Cycle 21 should exhibit a maximum count in the range from 45 to 140 counts.

Perverse as Nature is, however, it should come as no surprise that during its second year of existence, Cycle 21 exhibited a spurt in activity. From a count of 20 in March 1977, the cycle jumped to a count of 63 in February 1978, an increase of over 40 counts in the 12-month running smoothed sunspot number (see Table 2). Further, from activity observed during September 1978, the continued growth of the cycle seems assured. Yet, for all of its activity during the second year, Cycle 21 is still similar in its behavior to the "average cycle," which is characterized by a count at

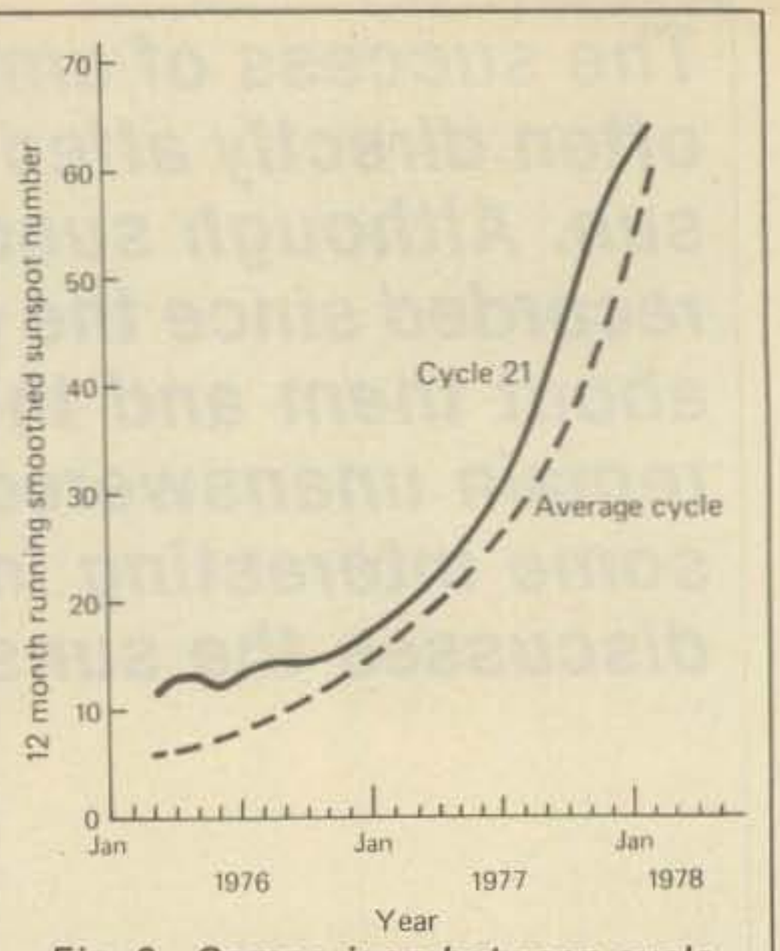

Fig. 2 - Comparison between cycle 21 and the average cycle.

the end of the second year on the order of 60 (see fig. 2). Finally, as an examination of Table 2 and fig. 2 reveals, the rate of increase of the current cycle's count towards the end of its second year is slowing. Put another way, the cycle appears to be leveling off.

What does all of this mean? Is Cycle 21 beginning to "top out," with the activity during the next few years to lie in the range from 70 to 100 counts? Or is this pause in the cycle's growth just that...a pause...with significantly higher activity to be observed in the months ahead?

No one knows the answers to these questions. Regardless, conditions on the 20, 15, 10, and even the 6 meter bands are the best observed since 1972, and they are improving all the time. Thus, while the activity of Cycle 21, to date, gives little indication of its future behavior, it seems reasonable to expect that Cycle 21 will provide Amateur operators with excellent ionospheric conditions at least through the early 1980's.

	1976	1977	1978
January		17	60*
February		18	63*
March	12	20	
April	13	22	
May	13	24	
June	12	26	
July	13	29*	
August	14	33*	
September	14	39*	
October	14	45*	
November	14	51*	
December	15	55*	

Table 2 - Twelve month running smoothed sunspots numbers for cycle 21. Values marked with an asterisk (*) are provisional. (Data provided by the Swiss Federal Observatory in Zurich, Switzerland).

CQ Reviews: Continental Specialties *MINI-MAX* 50 MHz Frequency Counter

BY IRWIN SCHWARTZ*, K2VG

The Continental Specialities Corp's *MINI-MAX* is a six-digit frequency counter with a range from 100 Hz to 50 MHz.

Specifications

FREQUENCY CHARACTERISTICS

Range	100 Hz to 50 MHz, guaranteed
Gatetime	0.1 second, providing 100 Hz resolution throughout the frequency range

INPUT CHARACTERISTICS

Impedance	greater than one megohm, diode protected
Connector	miniature phone jack
Coupling	a.c.
Sine Wave Sensitivity	30 mV r.m.s. (100 Hz - 30 MHz) 100 mV r.m.s. (30 MHz - 50 MHz)
Maximum Input	100 V peak (100 Hz - 1 kHz) 75 V peak (1 kHz - 10 MHz) 50 V peak (10 MHz - 50 MHz)

INTERNAL TIME BASE CHARACTERISTICS

Frequency	3.58 MHz crystal oscillator
Accuracy	±3 p.p.m. @ 25°C
Trimmer Adjustment	±40 p.p.m.
Temperature Stability	better than 0.2 p.p.m./°C, 0 to 50°C
Maximum Aging Rate	10 p.p.m./year

DISPLAY CHARACTERISTICS

Display	six 0.1" magnified LED digits, with anti-glare window
Lead-zero Blanking	all zeros to the left of the first non-zero digit are blanked. kHz and MHz decimal points automatically light up when the unit is turned on
Display Update	six per second

GENERAL

Power Requirement	one 9 V alkaline battery
External	110 or 220 v.a.c. battery eliminator
Battery Life	alkaline, 2 hrs. continuous use; 8 hrs. intermittent use
Size	3" x 6" x 1.5" (HWD)
Weight	8 ounces

Any serious practitioner of an electronics hobby knows the value of a versatile and functional test bench. Certainly no hobbyist would be without some kind of volt-ohmmeter. A more sophisticated bench might include various kinds of signal generators (both a.f. and r.f.), an oscilloscope and a frequency counter.

Of course, all of these luxuries cost hard-earned money and the discriminating buyer would want to make sure that he gets the best possible trade-off between the quality of the equipment and the price paid for it.

In that regard, Continental Specialties Corp. has recently marketed a new gadget designed for the serious electronics hobbyist and within an easily affordable price range. CSC's *MINI-MAX* is a flexible piece of gear at a reasonable price.

It costs $89.95.

The unit can be used in audio, ultrasonic and radio frequency applications in two different ways. It can be hooked up to a frequency generating device either directly or by indirect coupling. For example, if you want to measure the frequency of an i.f. oscillator (455 kHz, say) either clip the input of the meter to the output of the oscillator or screw in the accessory antenna (supplied with the meter), place it near the oscillator and look at the readout.

The *MINI-MAX* has a high-sensitivity pre-amplifier what allows readouts from signals as low as 30 mV. The unit is diode protected for input voltages of up to 100 V peaks.

The frequency counter has no range switch. This allows for easy and immediate measurement of a frequency source.

The MINI-MAX can be purchased with several accessories. These include the model NMA4 antenna ($3.95), the model MMC5 carrying case ($5.95), the model MM-IPC cable with clip leads ($3.95) and the model MMAC2 110 volt a.c. adapter of the model MMAC3 220 volt a.c. adapter ($9.95).

Send all orders and inquiries to Continental Specialties Corp., 70 Fulton Terrace, Box 1942, New Haven CT 06509 (or to 351 California St., San Francisco CA 94104).

*Technical Editor, *CQ*

Recently CQ published an article describing the physical and mechanical properties of waves reflected along a transmission line. In this paper W7VDQ and WA7TAS present the mathematics.

All Power To The Load

BY TOM LINDSTROM*, W7VDQ AND C.R. HENDERSON**, WA7TAS

This short article is designed for those amateurs who are interested in transmission lines primarily as a means to an end; namely, to deliver as many watts to the load as is physically realizable under reasonable circumstances. We are in no way attempting to critique or review all the hundreds of well written and informative articles as well as the thousands of short notes which have appeared on this subject over the past fifty years in the various scientific and technical journals, e.g., I.R.E. (I.E.E.E.) ***Proceedings, Journal of Applied Physics,*** etc. However, we will be concerning ourselves mainly with the development of several basic formulas for the steady state transmission of power along a transmission line to an absorbtive load. In particular we are keenly interested in the form and predictive utility of a formula for the power absorbed by the load in either a lossless line or a lossy line terminated in either a matched load or a mismatched load. Essentially then, we will be discussing more of just one topic of what Walt Maxwell[1-7] was discussing in his set of very fine papers. It is assumed that the reader will obtain copies of his papers and read them. Other foundational works we would recommend the interested reader to obtain include the papers by Ron King[8], the ARRL ***Antenna Handbook***[9] (first few chapters), and the well known transmission line primer by Phil Magnusson[10]. At this point it is assumed that the reader is somewhat familiar with the principles of wave mechanics, i.e., discontinuities or reflections which arise when electromagnetic energy propagating in one medium impinges on a second medium of different optical properties from the first.

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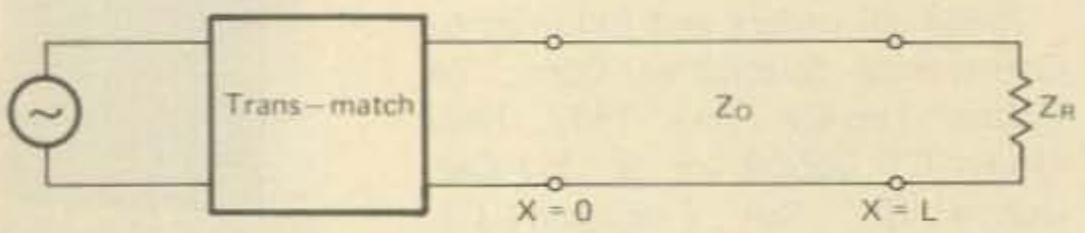

Fig. 1 - Schematic diagram of the transmission system.

Development of the Power Formulas

Let it be supposed that a section of transmission line length L whose attenuation coefficient is α is terminated in the load Z_R. Let a "transmatch" (a lossless conjugate match-impedance transformer network) be connected in the generator-transmatch-line-load system at x = 0. This set up is shown diagramatically in fig. 1.

As is customary define the complex reflection coefficient as

$$K = \frac{Z_R - Z_o}{Z_R + Z_o} \; ; \; K = |K| e^{j\theta_K} \qquad (1)$$

Let the traveling wave power initially sent toward the load from the transmatch be P_o. Upon reaching the load end, X = L,

$$(1-|K|^2)e^{-2\alpha L}P_o \qquad (2)$$

is absorbed and

$$|K|^2 e^{-2\alpha L}P_o \qquad (3)$$

is reflected back toward the transmatch. This reflected power returns to the transmatch end with amplitude

$$(|K|^2 e^{-2\alpha L}P_o)e^{-2\alpha L} = |K|^2 e^{-4\alpha L}P_o. \qquad (4)$$

Assuming that the transmatch is tuned properly, i.e., it presents a perfect (lossless) reflection (proper phase angle adjustment for both the voltage and current vectors at this point) surface, this once reflected wave is re-reflected toward the load. It reaches the load with a power

$$|K|^2 e^{-6\alpha L}P_o \qquad (5)$$

Of this much power

$$(1-|K|^2)\, K^2 e^{-6\alpha L}P_o \qquad (6)$$

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is absorbed by the load and

$$|K|^4e^{-6\alpha L}P_o \quad (7)$$

is reflected. Continuing in like fashion obtains for the third transit

$$(1-|K|^2)|K|^4e^{-10\alpha L}P_o \quad (8)$$

as the power absorbed and

$$|K|^6e^{-10\alpha L}P_o \quad (9)$$

as the power reflected. This process continues on ad infinitum.

Since many many power waves and transits of the line occur in just a few microseconds, the steady state (long time solution when viewed from the EM wave frame) power is obtained quickly. It is found by superposition to be

$$P_F = P_o + P_o|K|^2e^{-4\alpha L} + P_o|K|^4e^{-8\alpha L} + \ldots$$

$$= \frac{P_o}{1-|K|^2e^{-4\alpha L}}, \quad (10)$$

for the power flowing forward when measured at the line end of the transmatch (X = 0 end). At the load end

$$P_{FL} = P_oe^{-2\alpha L} + |K|^2e^{-6\alpha L}P_o + |K|^4e^{-10\alpha L}P_o + \ldots$$

$$= \frac{P_oe^{-2\alpha L}}{1-|K|^2e^{-4\alpha L}}, \quad (11)$$

for the power flowing forward. The power absorbed by the load is

$$P_{ABL} = (1-|K|^2)e^{-2\alpha L}P_o + (1-|K|^2)|K|^2e^{-6\alpha L}P_o$$

$$+ (1-|K|^2)K^4e^{-10\alpha L}P_o + \ldots$$

$$= \frac{(1-|K|^2)e^{-2\alpha L}P_o}{1-|K|^2e^{-4\alpha L}}. \quad (12)$$

This is the most important formula for us in this article. The total power reflected at the load end of the line is

$$P_{REFL} = |K|^2e^{2\alpha L}P_o + |K|^4e^{-6\alpha L}P_o + |K|^6e^{-10\alpha L}P_o + \ldots$$

$$= \frac{|K|^2)e^{-2\alpha L}P_o}{1-|K|^2e^{-4\alpha L}}. \quad (13)$$

A quick glance at equations (11), (12), and (13) reveals that $P_{FL} = P_{REFL} + P_{ABL}$, which only demonstrates that we have done our arithmetic correctly.

Clearly it can be seen that if $\alpha = 0$, the case of a lossless line,

$$P_{FL} = \frac{P_o}{1-|K|^2}$$

$$P_{ABL} = P_o$$

$$P_{REFL} = \frac{|K|^2P_o}{1-|K|^2}$$

a result seemingly inconsistant with intuition, yet, perfectly as it should be. This is the reason ($\alpha \cong 0$) why 600 ohm open wire feeders were so efficient (and still are) years ago when many amateurs used voltage fed antennas with voltage standing wave ratios in the order of 10 or

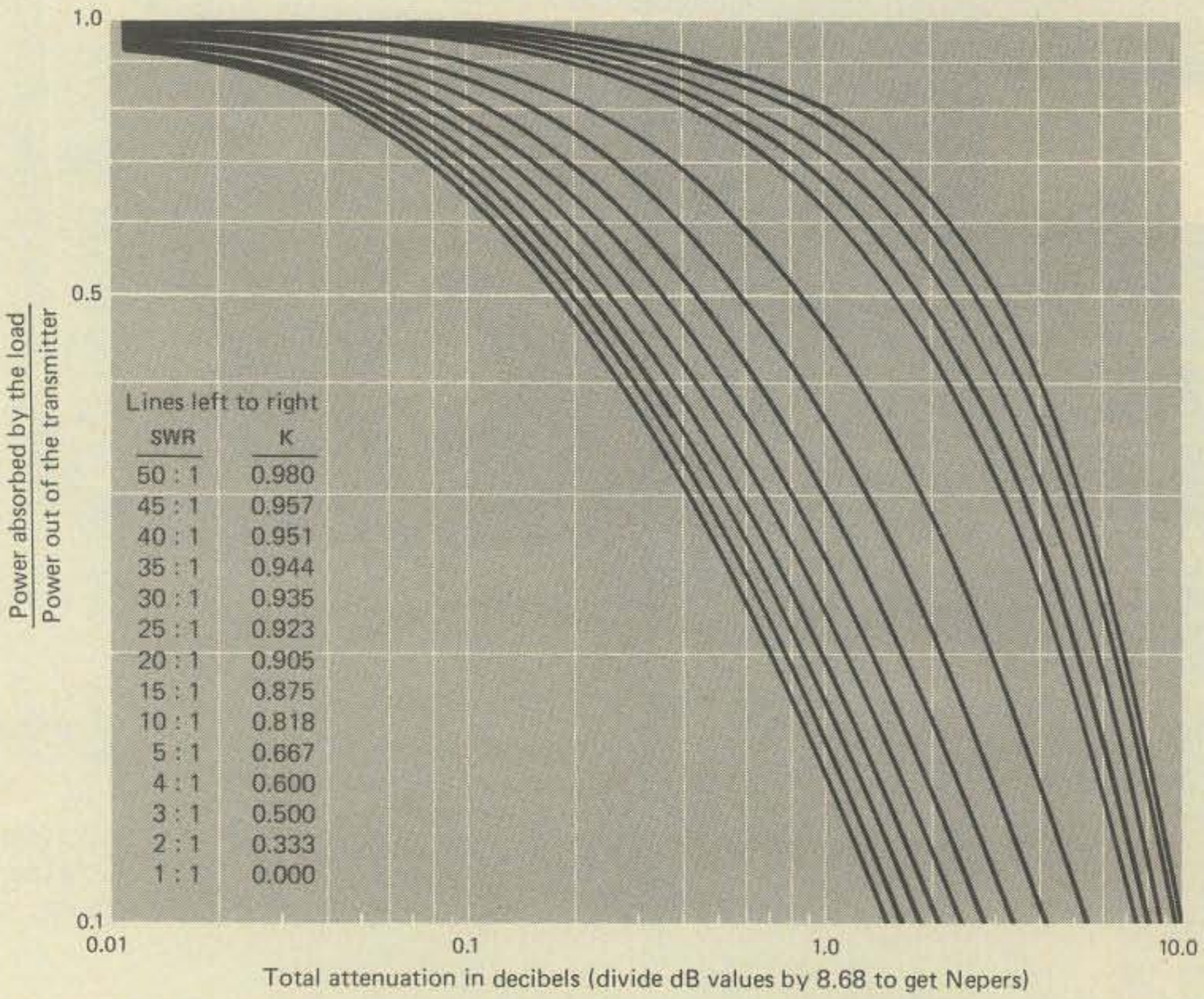

Fig. 2 - Power absorbed by the load vs total cable attenuation. Power out of the transmitter

20 to 1. More will be said about this fact later. Now let us turn our attention to some examples of typical amateur installations.

Example 1

Let Z_o = 600 Ω open wire line. Let L = 200 feet, the frequency of operation be 80 meters, $\alpha = 3.75 - 10^{-5}$ nepers/foot, and Z_R the load impedance be 3,000 Ω.

Since

$$\text{v.s.w.r.} = \frac{|V_{max}|}{|V_{min}|} = \frac{1+|K|}{1-|K|}$$

the voltage standing wave ratio is then 5/1 for K = 2/3. Now since α is so small (note this α value is close to that taken from the ARRL *Antenna Handbook* value; Table 3-I, page 84), $e^{-2\alpha L} = 0.985$, $e^{-4\alpha L} \cong 0.97$, then the power absorbed by the load under the 5/1 v.s.w.r. (equation (12)) is $P_{ABL} = 0.965P_o$. Now we begin to get a feeling of why those lines of yesteryear worked so well even under high (by today's amateur standards) v.s.w.r.

Example 2

Let Z_o = 52 Ω, RG8/U coax. For the sake of illustration let L = 100 feet and the frequency be 7 MHz. This gives us an α value of $\alpha = 5 \times 10^{-4}$ nepers/foot. The attenuation factor $e^{-2\alpha L} = 0.905$ and $e^{-4\alpha L} = 0.819$. Thus if we assume a reflection coefficient of modulus K = 0.5, a v.s.w.r. of 3/1, we have for the power absorbed by the load $P_{ABL} = 0.854P_o$. If the load and line were matched so that K = 0, but the lossy line condition remains then we obtain $P_{ABL} = 0.905P_o$.

Forming

$$10 \text{ Log} \left(\frac{0.854}{0.905}\right) = -0.26 \text{ dB},$$

is the addition power loss on the line due to the presence of the 3/1 v.s.w.r. This calculation agrees well with that of the ARRL *Antenna Handbook;* page 77, fig. 3-18. For with a 100 foot line of RG8/U, $\alpha = 5 \times 10^{-4}$nepers/foot, we have the perfectly matched line loss equal to 0.45 dB, which under an additional 3/1 v.w.s.r. increases the power loss by 0.26 dB.

Conclusion

In Table 1 we list the relative power absorbed by the load P_{ABL}/P_o for various values of $2\alpha L$ and K. We also include, for the reader's benefit, (fig. 2) a log-log plot of the relative power absorbed by the load versus total cable attenuation.

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Table 1. Relative power absorbed by the load $P_{ABL}/P_o = \frac{(1-|K|^2e^{-2\alpha L}}{1-|K|^2e^{-4\alpha L}}$*

$2\alpha L$ Nepers**	K = 0 SWR = 1/1	K = 0.1 SWR = 1.22/1	K = 0.25 SWR = 1.67/1	K = 0.5 SWR = 3/1	K = 0.75 SWR = 7/1	K ≐ 0.9 SWR = 19/1
0.01	0.990	0.990	0.989	0.983	0.965	0.913
0.05	0.951	0.950	0.945	0.922	0.847	0.676
0.10	0.905	0.903	0.894	0.854	0.734	0.511
0.25	0.779	0.776	0.759	0.689	0.517	0.291
0.50	0.607	0.604	0.582	0.501	0.335	0.164
0.75	0.472	0.470	0.449	0.375	0.236	0.109
1.00	0.368	0.365	0.348	0.286	0.174	0.079
2.50	0.082	0.081	0.077	0.062	0.036	0.016
5.00	0.007	0.007	0.006	0.005	0.003	0.001

*All calculations in Table 1 were made on a Hewlett-Packard model 9810A mini computer.

**Note: For dB attenuation (total)

$$\text{dB} = +8.68\,(\alpha L) - 10 \log \left(\frac{1-|K|^2}{1-|K|^2e^{-4\alpha L}} \right)$$

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- Highly accurate S-meter.
- Function switch selects standby mode, monitor (for listening to transmitter audio), AGC (slow, fast, and off), and 25-kHz crystal calibrator.
- Mode switch allows reception of CW, sideband, upper sideband, AM lower and FM (useful on high end of 10 meters and with VHF converters, especially with R-599D's squelch control).
- Headphone jack.
- Effective noise blanker is built in.
- AF gain control. Audio output is more than 1 watt into 8-ohm load.
- Squelch works on all modes
- VFO selector provides independent frequency control with R-599D and T-599D, transceive frequency control with either R-599D or T-599D, and control of R-599D frequency with T-599D VFO and T-599D frequency with R-599D VFO.
- Selectivity switch allows selection of 0.5-kHz, 2.5-kHz, 5-kHz, and 25-kHz bandpass, including automatic selection with mode switch. An 8-pole SSB, an 8-pole CW, and a 6-pole AM filter are built in. A 6-pole FM filter is available.
- RF gain control (and RIT switch) allows operation in presence of unusually strong signals.
- RIT (receiver incremental tuning) allows tuning off frequency without affecting transceive VFO frequency.
- Preselector provides added sensitivity and selectivity.
- Converter switch selects normal HF operation and lower and upper 2-MHz ranges on 6 meters and 2 meters (with optional converters).
- Band switch. Receiver covers 160 through all of 10 meters, WWV (10 MHz), and an auxiliary band.
- Power on/off switch. Operates on 100/117/200/240 VAC, 50/60 Hz, and 12-15 VDC.

- Combination meter.
- Meter switch selects ALC, final plate current, relative RF output and high voltage.
- Mode switch selects tune position and operation on CW, lower sideband, upper sideband, and AM (an increasingly popular mode on 10 meters).
- Microphone connector.
- Function switch selects push-to-talk or VOX operation, or provides "spot" signal for zero-beating with R-599D receiver. Transmitter also features anti-VOX, semi break-in CW, and sidetone.
- Band switch. Transmitter covers 80 through all of 10 meters.
- Power on/off switch. Operates on 100/117/200/240 VAC, 50/60 Hz, with built-in power supply.
- Highly stable VFO features easy-to-read 1-kHz readout and four-way flexibility including transceive operation with R-599D receiver.
- Drive control.
- Plate tuning control for final amplifier. Driver and final are only tubes in otherwise all-solid-state transmitter.
- Carrier level control
- Antenna load control (efficient pi network).
- Microphone gain control.
- Send/standby switch.

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- Reset scan to 144 MHz
- Stop scan (with HOLD button)
- Cancel scan (for transmitting)
- Automatically stop scan on first busy or open channel
- Operate on MARS (143.95 MHz, simplex only)
- Select repeater mode (simplex, plus transmit frequency offset, minus offset, or one memory transmit offset)
- Select transmit offset (1 MHz/600 kHz)

The RM-76's display indicates frequency (even while scanning) and functions (such as autoscan, lower scan frequency limit, upper scan limit, error, and call channel).

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Ol' Sol can give you more than a sunburn. It can power your amateur radio station! To find out how, read K3CHP's article.

Why Not Go Solar Power?

BY JOSEPH MIKUCKIS*, K3CHP

We hear a lot these days about the "energy crisis." We also hear more and more about using the sun's rays to generate electricity. Whether the energy crisis is real or concocted by special interests is difficult to say with certainty. However, sun-generated electricity is an established fact.

The device that converts sunlight into electric power is known as the **solar cell.** Almost all solar cells manufactured are the silicon type. The cell is basically a silicon semiconductor which becomes a conductor of electricity when its active surface is exposed to sunlight. Sunlight generates units of energy called **photons.** The photons, when striking the surface of the cell, cause electrons to flow across the cell junction, thereby creating a negative and positive charge. By connecting leads to the solar cell, a circuit is completed allowing direct current to flow to the load.

Solar cells have been commercially available for a number of years. For various voltage and current requirements the cells are mounted on panels and connected in series/parallel combinations. In addition, such solar panels are usually encapsulated in clear plastic for protection against moisture and corrosion.

The conversion efficiency of today's cells is relatively low, in the order of 9%, although the maximum theoretical limit is 27%. The highest efficiency attained to date is 21.9% from a single-crystal experimental cell. Unfortunately, single crystals are very expensive to make.

The author's solar cell array consists of three 12-volt panels connected in parallel to produce an output current of 0.9 ampere. The panels have been mounted on a rigid aluminum frame and the whole assembly is illustrated in the photograph.

For a complete solar-powered amateur station, the author uses the 5-watt Ten-Tec Argonaut transceiver with a Vomax SBP-3 speech processor.

The no-load to full-load panel output voltages are 17 and 12 volts, respectively. A simple voltage regulator was constructed to keep the voltage at 12 volts to protect transceiver components against excessive voltage during receive periods. The regulator consists of one LM340-12 chip having an output current rating of 1 ampere. The regulator is shown in the photograph. Its schematic is shown in fig. 1.

This solar-powered amateur station has been in operation for over two years. Of course, activity is limited to periods of bright sunshine! So far 20 countries and 44 states have been confirmed toward DXCC and WAS awards.

Each contact is confirmed by a special "QRPp Solar Power" QSL card.

The use of direct solar energy need not be restricted to QRP operation—provided one's pocketbook can stand the strain. The present cost of solar cells is approximately $40/watt. Other rigs such as Heathkit HW-8 and MFJ-40T (as well as CB rigs) can be powered by solar cells with a modest expenditure. With proper care, solar cells will last a lifetime.

So why not go solar power?

Several solar panel suppliers are listed below.

*6913 Furman Pkwy, Riverdale MD 20840

The complete QRPp solar-powered amateur station. The regulator is on top of the Argonaut; the small unit to the right is the Vomax SBP-3 speech processor.

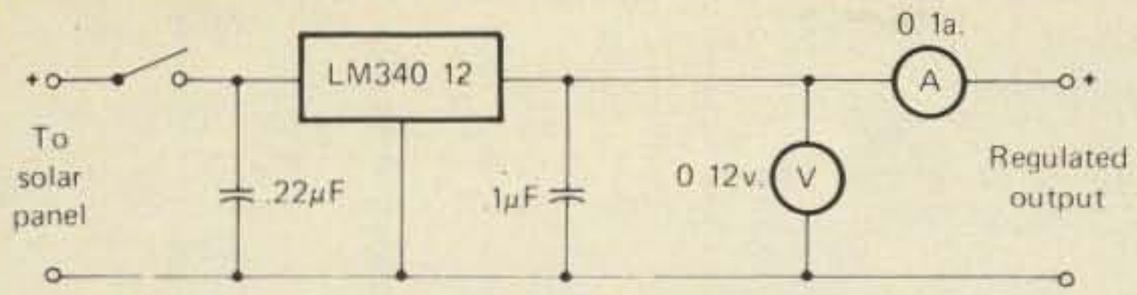

Fig. 1—Basic regular schematic.

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300 Edscorp Building
Barrington NJ 08007

Solar Energy Company
P.O. Box 649
Gloucester Point VA 23062

Solar Systems, Inc.
Division of Silicon Sensors, Inc.
Highway 18 East
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The author with his 12-volt, 0.9 ampere solar panel array.

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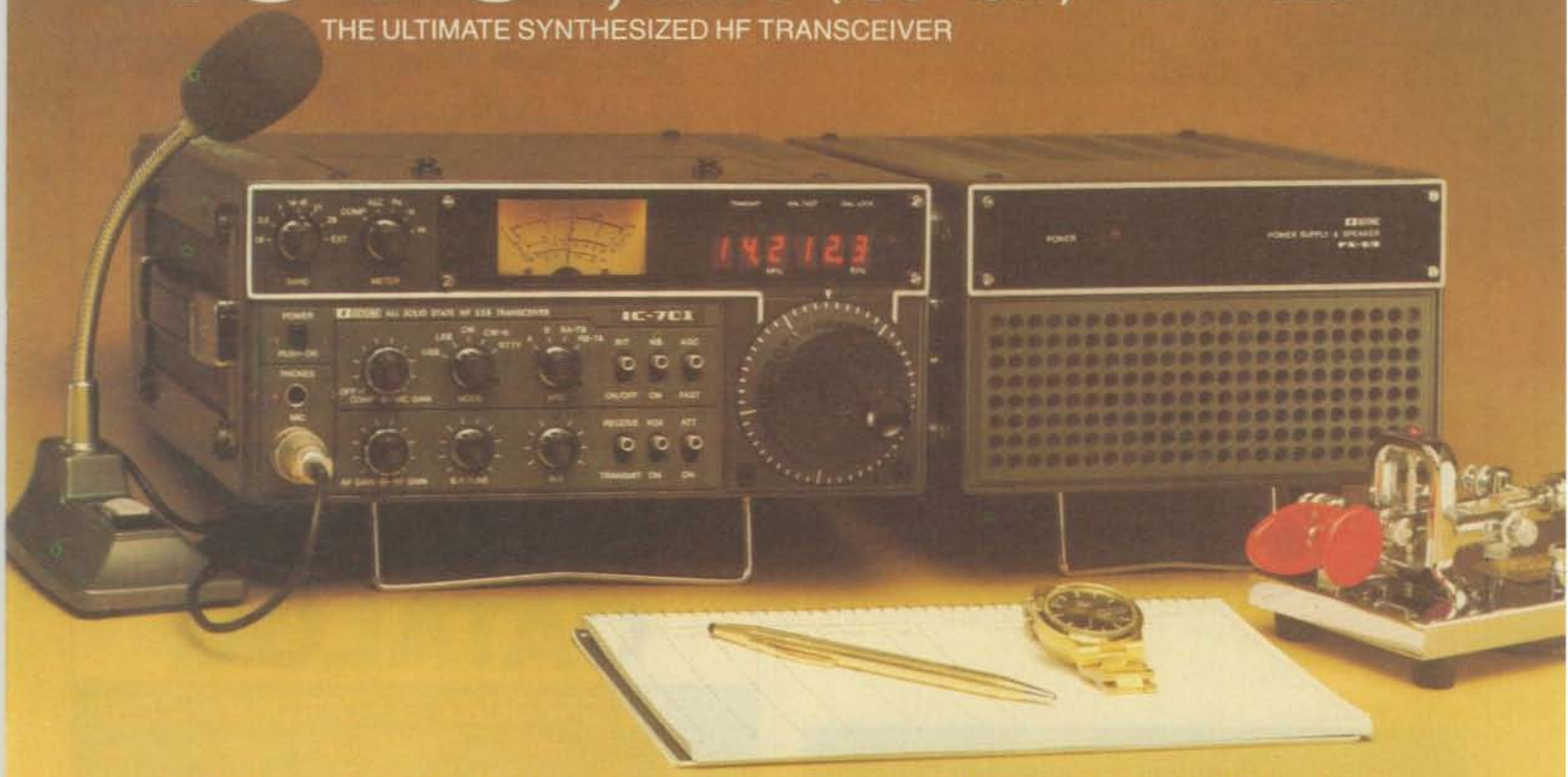

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CIRCLE 22 ON READER SERVICE CARD

For those amateurs who own the Heath HW-22A, here's a neat method for expanding its frequency coverage. The procedure is also applicable to other transceivers.

An Inexpensive Method For Expanding Frequency Coverage

BY JAMES SOLTYS*, WA3WNY/4 AND NORM SZYDLOWSKI, N9JS/0**

Amateurs are ever-fervent in their efforts to get the most from their equipment, whether it be by expanding capacity or by improving efficiency. This article describes a method for expanding the frequency coverage of the Heath HW-22A transceiver and presents a guideline for modifying other similar equipment. In most cases, the modificaitons can be made at a very low cost (under $9 for the HW-22A) and with a minimum amount of effort.

Circuit Analysis

The HW-22A is a 40-meter single-sideband transceiver with a frequency coverage of 7200 - 7300 kHz. The objective is to expand the coverage by 50 kHz to 7150 - 7300 kHz in order to utilize the entire frequency allocation. Since the oscillator is essentially responsible for frequency control, this stage will have to be modified. The first step is to analyze the block diagram of the unit in order to determine how much to increase or decrease the oscillator frequency.

Refer to fig. 1. Because the output circuit contains no frequency multipliers, changing the frequency of the v.f.o. by 50 kHz will produce a corresponding 50kHz shift in the output. Had a frequency doubler followed the transmitter mixer stage, a v.f.o. frequency change of 25 kHz would be necessary to shift the output by 50 kHz. It has been established then, in the case of the HW-22A, that the v.f.o. frequency should be changed by 50 kHz—but in which direction?

Whenever two signals of different frequencies are combined or "mixed," the result is two signals. One signal is the *sum* of the two input frequencies and the other is the *difference* of the two input frequencies. Typically, only one of these output signals is desired and the other is rejected. In this situation, the output frequency of the heterodyne mixer is the difference between the v.f.o. and the heterodyne oscillator frequencies. The output of the transmitter mixer (which is the operating frequency) is the frequency difference between the i.f. stages (2.3033 MHz) and the output of the heterodyne mixer (9.5033 - 9.6067 MHz). Since the heterodyne mixer frequency is the higher of the two, *lowering* the heterodyne mixer frequency will *lower* the operating frequency.

The heterodyne mixer frequency is the difference between the v.f.o. and heterodyne oscillator frequencies; and because the v.f.o. frequency is the *lower* of the two, the output frequency of the heterodyne mixer can be *lowered* by *increasing* the v.f.o. frequency. Expressing these relationships mathematically:

$$f_A = f_{ho} - f_{vfo} \quad (1)$$

$$f_B = f_A - f_{if} \quad (2)$$

$$f_B = f_{ho} - f_{vfo} - f_{if} - \quad (3)$$

where f_A = the frequency at point A (heterodyne mixer output)

f_B = the frequency at point B (operating frequency)

f_{vfo} = the frequency of the v.f.o.

f_{ho} = the frequency of the heterodyne oscillator

f_{if} = the frequency of the i.f. stages.

From equation (3), with f_{ho} and f_{if} constant, f_B changes inversely with changes in f_{vfo}. Therefore, in order to *lower* the operating frequency (f_B), f_{vfo} must be *increased*.

Note that by shifting the v.f.o. frequency (f_{vfo}) range downward by 50 kHz, the band coverage will be 7150 - 7250 kHz. The complete band, 7150 - 7300 kHz, could be covered using two separate segments: 7200 - 7300 kHz and 7150 - 7250 kHz.

Changing the Circuit Parameters

Changing the frequency of the v.f.o. is simply a matter of changing the net capacitance of net inductance of the circuit. Since

$$f = \frac{1}{2\sqrt{LC}} \quad (4)$$

f_{vfo} can be increased by decreasing either L or C. From a practical standpoint, it will be easier to "switch-in" a parallel

*2302 South Wallen Drive, Lake Park FL 33410
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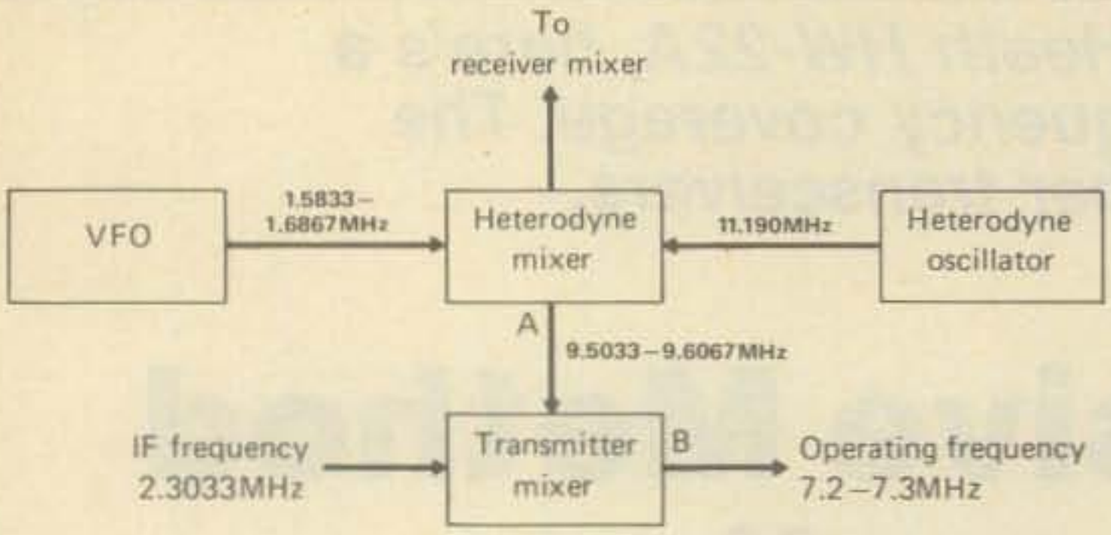

Fig. 1—Block diagram for initial circuit analysis.

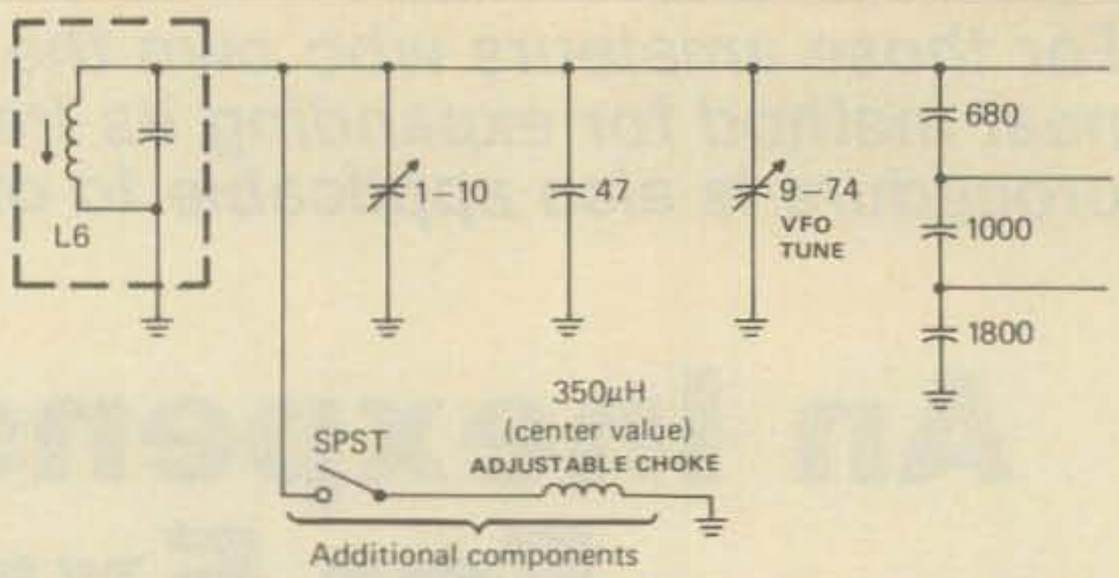

Fig. 2—Wiring the additional s.p.s.t. switch and inductor.

inductance rather than a series capacitance. Therefore, the value of L will be changed rather than the value of C. To determine the change in L that will be necessary, the original inductance and capacitance of the circuit must first be calculated. Assume that the unit is operating at the lower end of the band (7200 kHz). In this case, the capacitance of the oscillator circuit if 396 pF (f_{vfo} = 1.6867 MHz) and from equation (4) the original inductance is 22.5 μH.

The next step is to calculate the value of L which corresponds to an operating frequency of 7150 kHz. At 7150 kHz, f_{vfo} = 1.7367 MHz (from equation (3)). The desired value of L can be calculated by using the formula

$$L = \frac{1}{4\pi^2 f^2 C}$$

In this case, f = 1.7367×10^6 Hz and C = 39×10^{-12} F. Using the formula, L = 21.2×10^{-6} H, which is the total circuit inductance.

Since an inductance of 22.5 μH already exists in the circuit, a parallel inductance of 366.9 μH must be added in order to achieve a total inductance of 21.2 μH. This was determined by using the formula for parallel inductance, i.e.,

$$L_{total} = \frac{L_1 L_2}{L_1 + L_2}$$

where, L_{total} = 21.2×10^6 H and L_1 = 22.5×10^6 H.

The frequency shift of 50 kHz can now be obtained as shown in fig. 2. Note that if it is desirable to *lower* the v.f.o. frequency, the circuit capacitance should be increased by "switching-in" a parallel capacitance.

The result of these calculations will not be an exact value. This is due to circuit parameters such as vacuum tube capacitance, etc., not having been considered. Therefore, it is advisable to obtain a variable inductor (or capacitor) with a center value near that of the calculated value.

Installation

Actual modification of the HW-22A was accomplished in less than an hour. No drilling was required and only two new components were necessary. Following the diagram of fig. 2., a Miller miniature adjustable choke with a center inductance value near 350 μH was installed. See the photo for the location of the choke on the chassis. It was mounted as close as possible to the v.f.o. coil, L6, which is the inductor that it is switched in parallel with. The connecting wire between the two inductors was chosen to be heavy enough to hold the choke rigid against the chassis, eliminating the need for any mounting hardware.

Immediately below the choke is the "Mic Gain" control which provides a convenient switch location. Shown in figs. 4 and 5, the one-megohm "Mic Gain" control was replaced with a control having a push-pull switch feature.

Alignment

Dial calibration may be altered without the additional inductance switched into the circuit; a result of capacitance acquired from the connecting wires. The oscillator should be recalibrated and aligned for its normal frequency range first, then switch in the new choke and align it to obtain 7150 kHz at the 7200 dial position.

No noticeable difference in performance was experienced with the expanded coverage HW-22A. However, incorporating this technique for greater differences in frequency may necessitate modifying the tank circuit as well.

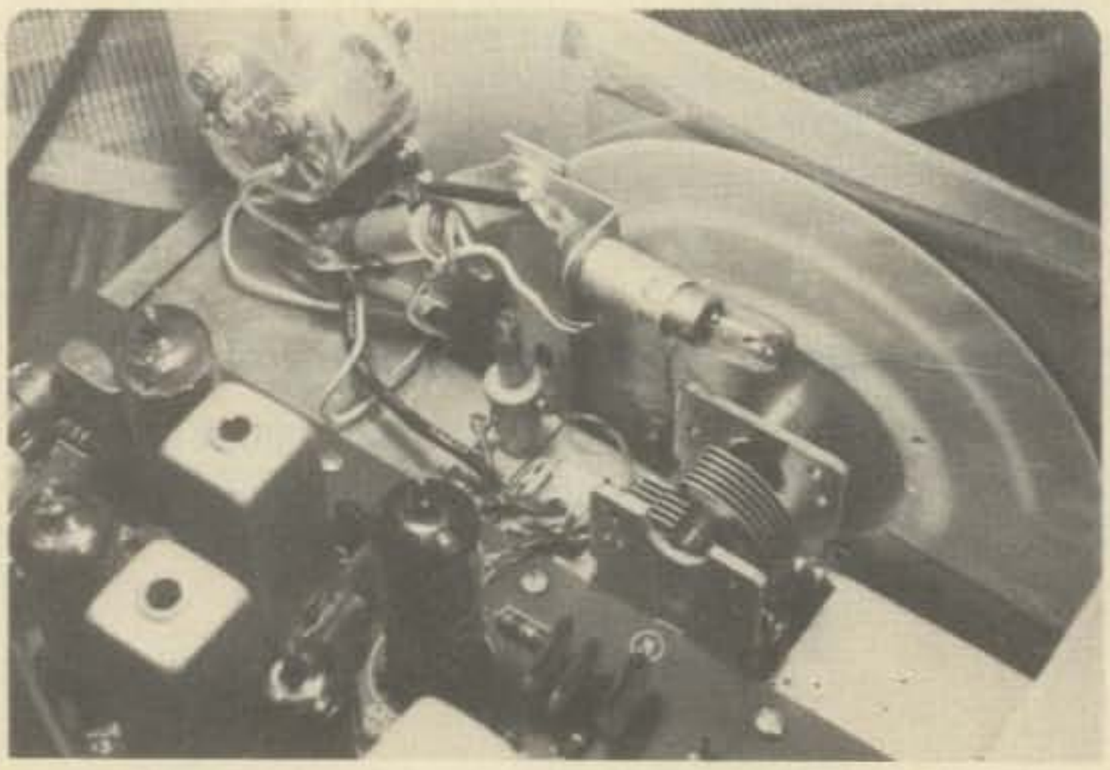

Fig. 3 - View of the r.f. choke from the top of the chassis.

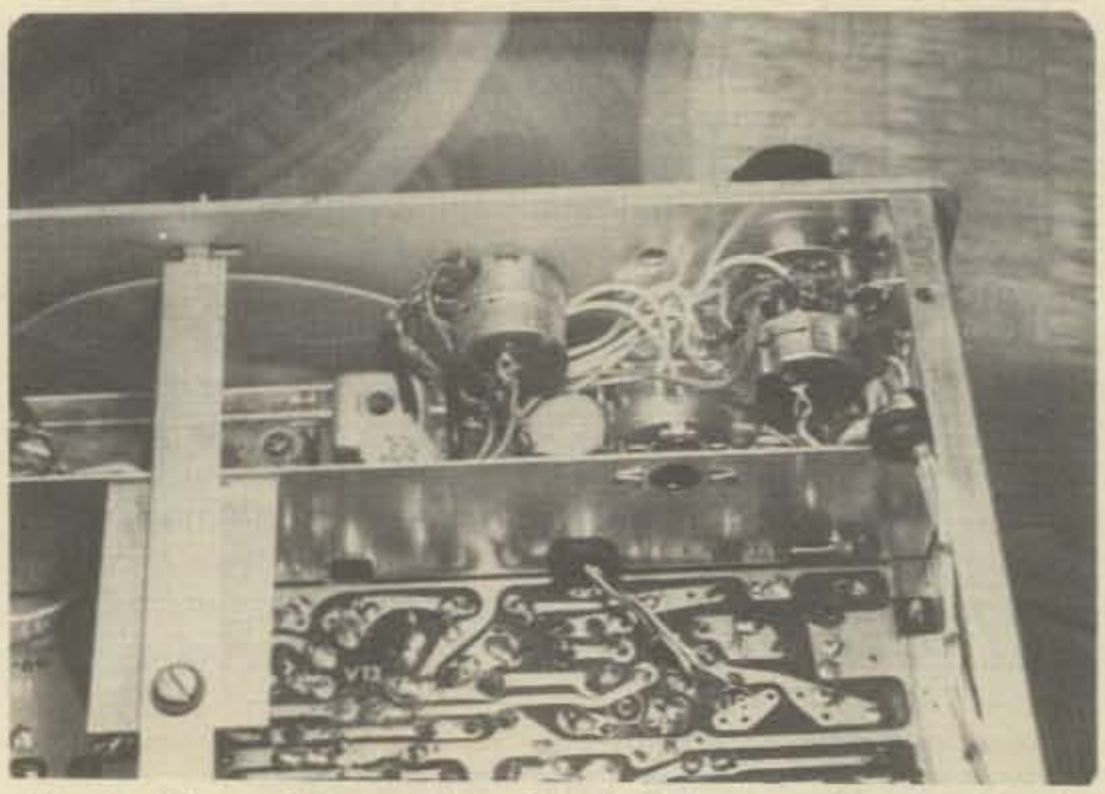

Fig. 4 - View of the push-pull switch from under the chassis.

Fig. 5 - View of the 'MIC GAIN' control from the front panel.

Appendix

ORIGINAL CALCULATIONS AND CAPACITANCE OF THE CIRCUIT FROM THE SCHEMATIC OF THE HW-22A.

$$C = 396 \text{ pF}$$

$$f = \frac{1}{2\pi \sqrt{LC}}$$

At 7200 kHz output frequency, $f_{vfo} = 1686.7$ kHz Solving for circuit inductance L:

$$L = \frac{1}{4\pi^2 f^2 C}$$

$$= \frac{1}{4\pi^2 \times 1.6867^2 \times 10^{12} \times 396 \times 10^{-12}}$$

$$= 44.46 \times 10^{-6}$$
$$= 22.5\ \mu H \text{ (appx.)}$$

INDUCTANCE CORRESPONDING TO AN OPERATING FREQUENCY OF 7150 kHz.

$$f_B = f_{ho} - f_{vfo} - f_{if}$$

Solving for f_{vfo} when $f_B = 7150$ kHz we have

$$f_{vfo} = f_{ho} - f_{if} - f_B$$
$$= 11190 - 2303.3 - 7150 \text{ kHz}$$
$$= 1736.7 \text{ kHz}$$

and, as done above,

$$L = 21.2\ \mu H.$$

INDUCTANCE REQUIRED IN PARALLEL WITH THE ORIGINAL CIRCUIT INDUCTANCE TO ACHIEVE 7150 kHz

$$L_{total} = \frac{L_1 L_2}{L_1 + L_2}$$

$$21.2 \times 10^{-6} = \frac{22.5 \times 10^{-6} \times L_2}{22.5 \times 10^{-6} + L_2}$$

from which $L_2 = 366.9\ \mu H.$

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CIRCLE 23 ON READER SERVICE CARD

Having little space for an antenna can get you down. Here's a multiband antenna that will help you small lot owners enjoy your hobby a bit more. Read about it in W9CRC's article.

A "Pipe Organ" Multiband Vertical Antenna

BY RUSS RENNAKER*, W9CRC

*1011 Linda Dr., Kokom IN 46901

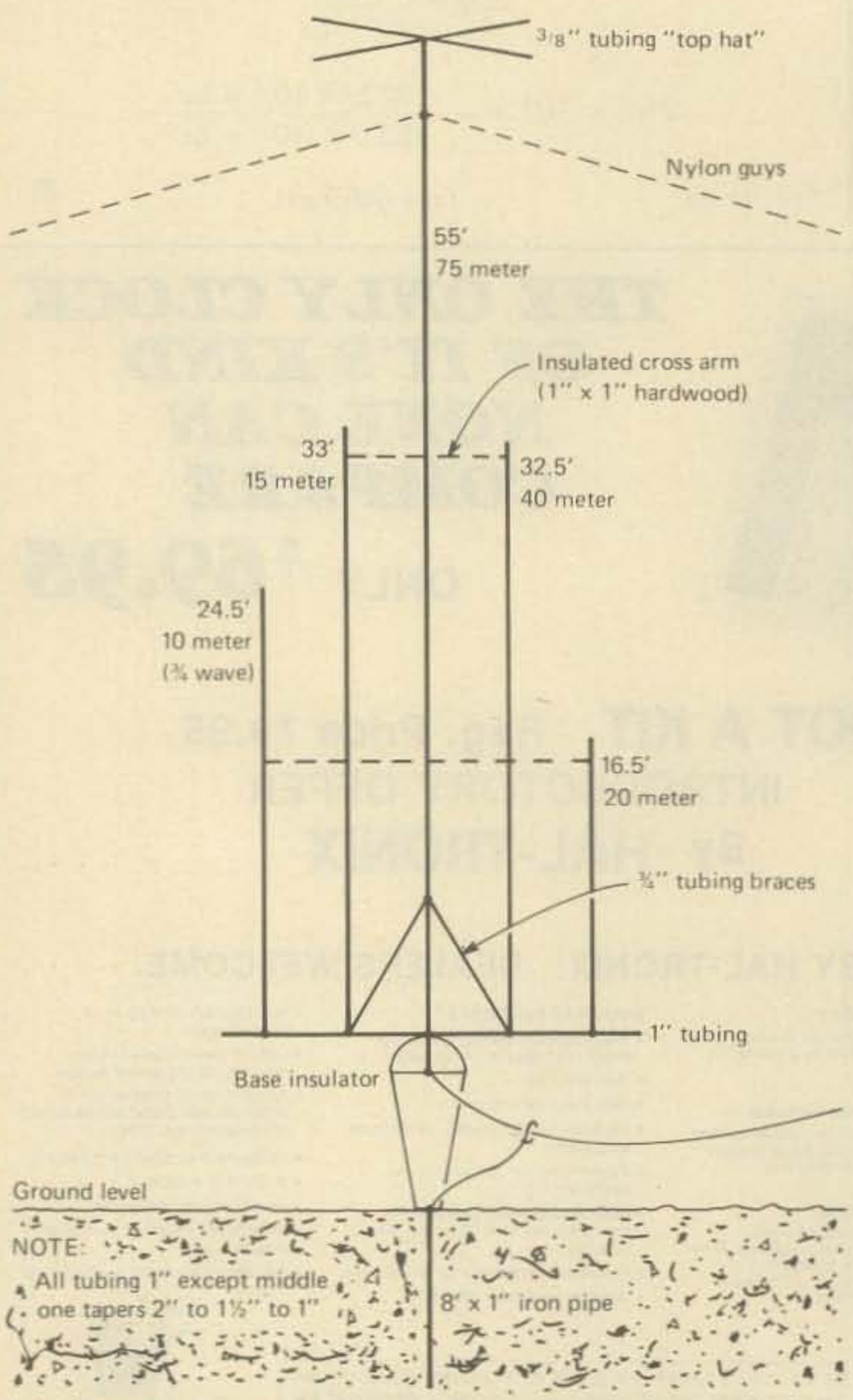

Fig. 1—W9CRC's "pipe organ" multiband vertical antenna.

I have had so many requests from QSOs for more information on this rather unique antenna that I felt some description was due, and perhaps others with limited aerial space, can take advantage of the idea.

There really is nothing mysterious about it but somehow my verbal descriptions over the air always seems inadequate. It's the old multi-frequency half-wave dipole fed in the center with a single coax lead, except I have used vertical quarter-wave elements and the ground reflecting the other quarter-wave.

The center antenna (75 meter) is the tubing from an old 14 AV trapped vertical. All antennas are quarter-wave except the ten meter and it is three-quarter wave. The dotted lines on the drawing represent insulated support cross arms and the tubing is held to the cross arms through hose clamps, left just loose enough to enable the tubes to slide up or down in the final resonant adjustment. The cross arm at the bottom of the system is 1-inch aluminum tubing and here again the verticals are fastened to it through hose clamps which may be loosened for adjusting up or down and then fastened securely when the antenna is in resonance. The little "inverted V" at the base is simply braces to support the cross arm and has nothing to do with the electrical characteristics of the system. The verticals are all eight inches apart but this figure is not critical. The cross arm is about eight inches from the ground level, and this is somewhat critical.

All antennas have excellent s.w.r. over the entire band with the possible exception of 75 meters and it was cut for 3.9 MHz. The s.w.r. rises slightly in the c.w. end of the band. The measurements on the drawing are arbitrary but may run slightly different in other systems depending on what point in the band you want resonance, adjacent objects, etc. I have about 100 buried radials running out from the base and they are of random lengths, depending where the curb is located. I also have a #6 copper wire from the ground system to the copper pipes in the basement. The antenna stands just at the end of the house gable and is supported at the apex (12' from ground) with an insulated bracket to the house. If no house is available I suggest a second set of nylon guys.

Advantages of the "Pipe Organ" . . . well besides the obvious one of space requirements, ease of adjustment to resonance, no traps to blow out or hold rainwater, almost a perfect 50 ohm match and wide s.w.r. range across all bands. All that plus the advantage of angle of propagation.

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In Focus

Television on the Amateur bands

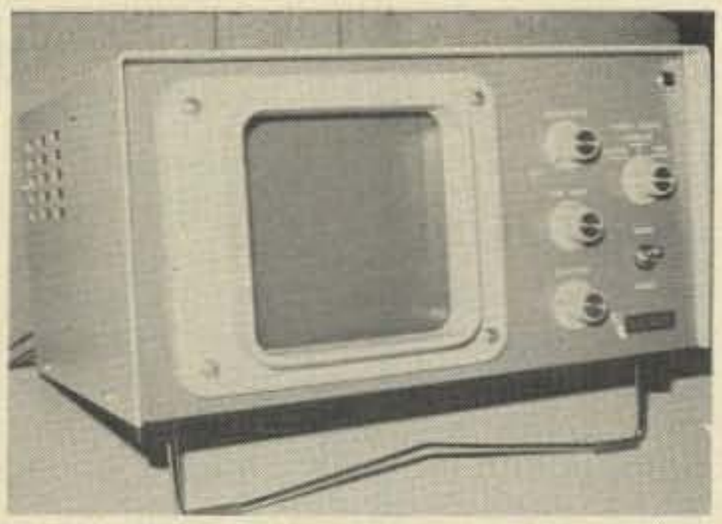

Fig. 1 - The Robot Research Model 70 Monitor offers an inexpensive approach to viewing SSTV pictures. These monitors are no longer manufactured but look for them at hamfests of your favorite dealer's used gear counter.

Fig. 2 - Dexter Phibbs, W4IPA, built this neat and compact P-7 monitor. "No frills", but it does a good job!

Fig. 3 - Decay of the scan brighteness is well demonstrated in this photograph.

Video Display - Perspective, 1979

Twenty years ago, when Capthorne Macdonald invented amateur slow scan television, the use of a video display to provide visual communication was indeed unusual. Amateur fast scan (UHF) television of that period was limited to mainly metropolitan areas. Slow scan television with its narrow bandwidth opened the door to long distance HF picture transmission. Even so, SSTV tended to be a slow-grower. Today, with the advent of such esoteric devices as TV games, computer games, home/hobby computers themselves, and the gamut of commercial scanners and displays, a large portion of the world's population has become accustomed to video-*everything!*

The availability of video-displayed RTTY has 'roused new interest in that mode. There are just so many amateurs who can "relate to" the clankety-clank of an RTTY printer (or all that yellow paper that spews out of them!). But video display spawns new interest.

High speed keyboard c.w. with video display is another burgeoning phase of amateur radio. (Video displayed c.w. is a marvelous teaching device too!)

So, paradoxically, it is these latter-day entries into the field of amateur video display that seem to be generating a new and broader interest in slow scan television. For this reason I think it's time for a "thumbnail" review of SSTV hardware and operating methods.

SSTV—How it Works

Only still pictures can be transmitted and received by Macdonald's SSTV system. (See *CQ*, August 1978 for details of W9NTP's medium scan system.)

As in broadcast TV, slow scan pictures are composed of lines. It takes eight seconds to transmit each picture of frame. (120 lines transmitted at a rate of 15 lines per second.)

Synchronizing signals are sent at

2112 Turk Hill Rd., Fairport, NY 14450

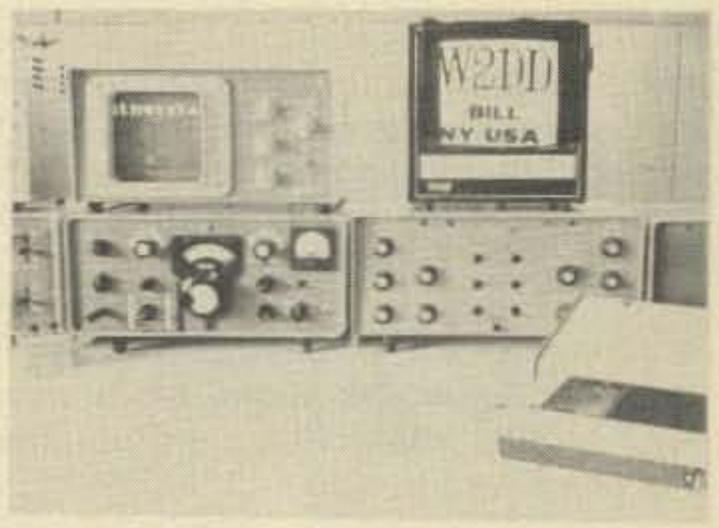

Fig. 4 - A side by side comparison further illustrates the difference between viewing an SSTV picture via a P-7 monitor (on the left) versus the scan converted image show on the conventional monitor (at the right). The scan converter in this picture (under the monitor) is no longer manufactured Robot Research Model 300 scan converter which uses a cathode ray storage tube.

the end of each line and each frame.

Slow scan video signals are converted to variable frequency audio tones. A pure white in the subject being televised becomes 2300 Hz. Black is 1200 Hz. and synch signals are at 1500 Hz. These variable frequency

Fig. 5 - The compact gray box under the TV monitor displaying W2DD's CQ is the current Model 400 Digital Scan Converter by Robot Research Inc.

Fig. 6 - This slow scan "keyboard" can be used to produce alpha-numeric characters as needed for reports or name swapping. The unit shown here was made by the James Thomas Industries. In addition to the characters, it can generate a gray scale of four steps.

audio tones are received and transmitted just like voice audio. No special receivers or transmitters are required for this kind of video.

SSTV Reception—What's a P-7 Monitor?

To see slow scan pictures you need a monitor or viewing device.

Macdonald's approach to viewing pictures transmitted at the line rate mentioned was to use a cathode ray display tube having a long persistence phosphor similar to a radar set. The phosphor used in these tubes is called a P-7 type. P-7 monitors generally include the circuitry needed to convert the variable audio tones into c.r.t. beam brightness variations as well as synch circuits to maintain the picture structure. Fig. 1 shows a Robot Research Model 70 monitor. A neat home-brewed monitor built by W4IPA is shown in fig. 2.

Smile You're on Radar! (Not Really.)

SSTV pictures displayed on a P-7 monitor are not seen in complete form with a given brightness range

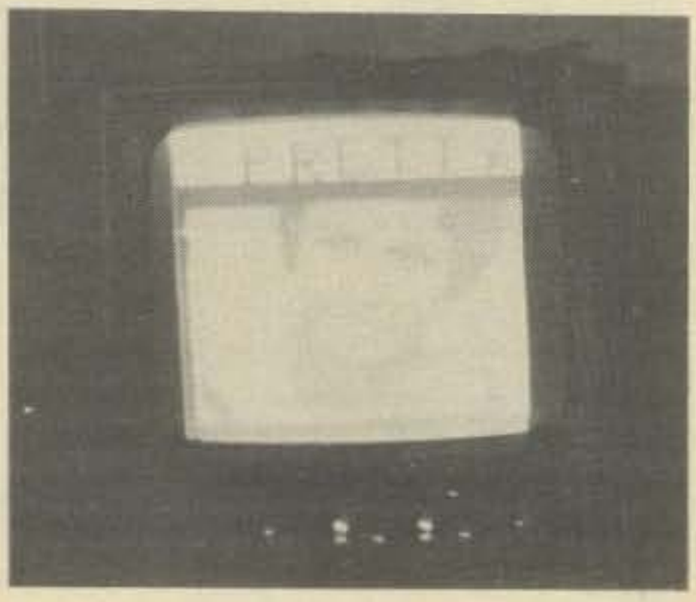

Fig. 7 - The title at the top of the picture was added by using an SSTV keyboard.

throughout the picture. The picture is produced at the rate of 15 lines per second starting from the top of the screen. Like a radar sweep, the screen brightness is very high at the line being scanned, but drops off at each scanned line as the c.r.t. beam proceeds down the face of the tube. This point is illustrated by figs. 3 and 4. An operator viewing a received picture mentally integrates the picture quality. Although this system has its limitations, it is still a rewarding means of seeing pictures of friends and other lands. I believe that the P-7 monitor will be around for quite a while since it is the simplest means of viewing SSTV pictures.

Scan Conversion—Conventional TV Monitors.

A far more appealing form of SSTV display can be obtained by the use of a scan converter and a conventional TV set/monitor as shown in figs. 4 and 5.

Scan conversion makes it possible to see not only the incremental line build-up of the picture as it is received—but also to "freeze" or hold a frame for viewing as long as desired. (The received frame can also be retransmitted back to the sender.)

Scan converters store the slow scan "picture information" in either a cathode ray storage tube or in a digital memory. The picture information goes into the memory at the slow scan rate but is then "played back" at regular broadcast TV rates to the conventional TV monitor. Thus a bright, complete, black and white image is displayed on the monitor screen.

Camera and Other Video.

The most prevalent methods of creating slow scan pictures or graphics are by the use of a conventional TV camera and converting its video output to the 120 line format of SSTV—or by the use of an alpha numeric character generator keyboard device. (Generally referred to simply as an SSTV keyboard.) See figs. 6 and 7. Most scan converters have provision for converting both fast-to-slow, and slow-to-fast, so "broadcast TV" from a camera is easily converted to SSTV for transmission. The SSTV keyboard output is at slow scan rates.

Computers in the Picture?

Some computer oriented amateurs are now using computer generated graphics for station identification and QSO/report purposes. One manufacturer (The Digital Group) currently offers a package that includes video display of c.w., RTTY, and received slow scan. It can also provide keyboard generated c.w., RTTY, and SSTV graphics.

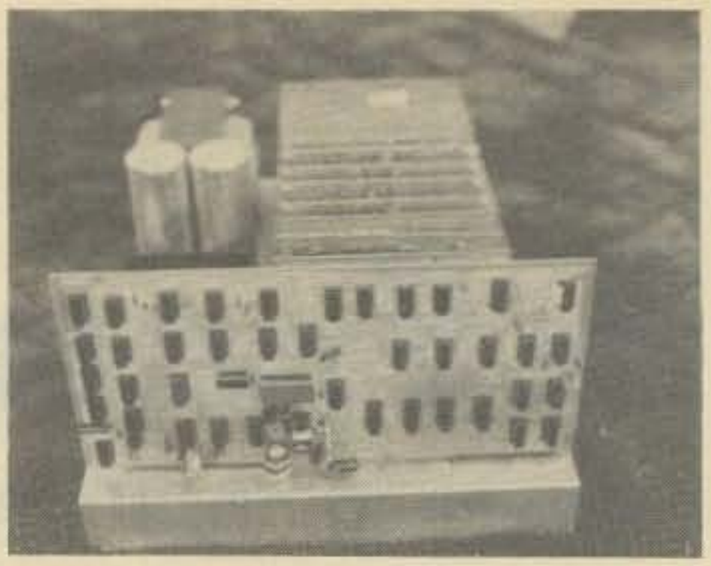

Fig. 8 - Norris Sapp, W7FV, built this beautifully constructed version of the WB9LVI—designed scan converter. This is "homebrew par elegance"!

Where it's At.

Early-on SSTV buffs built their own gear and there are probably thousands of amateurs who are still doing just that. Those who want to go the scan conversion route have a complex building and debugging job ahead of them. See figs. 8 & 9 and for a look at some home-brewed scan converters.

Homebrew and used commercial P-7 monitors for sale are "where you find them"! Hamfests and the used equipment departments of big dealers are good "looking places". However, I would urge anyone considering getting into SSTV to see some scan converted pictures before deciding "yes" or "no" on SSTV. The prevalence of so many conventional video displays in our daily lives is bound to affect one's opinion of the P-7 display (with its variable brightness picture etc.).

Where it's Going.

My guess is that within four or five years at the most, the impact of computers on SSTV will be so great that the number of operators in this phase of amateur radio will have tripled.

As more and more amateurs acquire computers, the hardware and software needed for scan conversion, graphics,

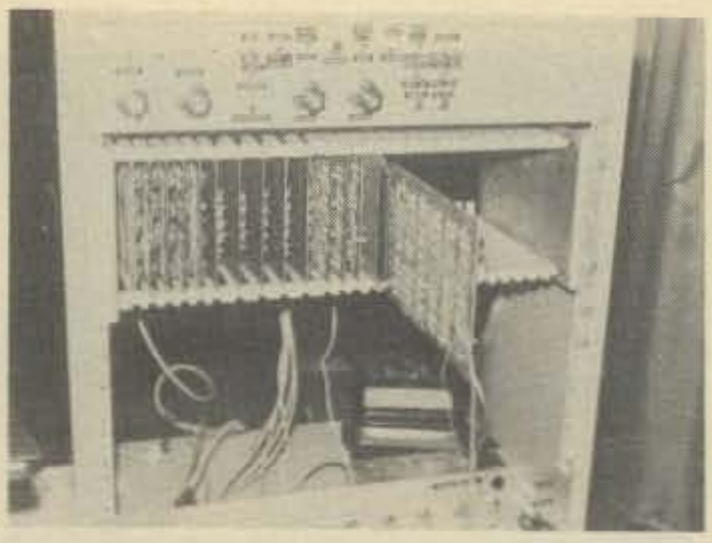

Fig. 9 - John Vanden Berg, VE3DVV delights in adding new capabilities to his scan converter on almost a daily basis—hence the hand-wired boards!

Fig. 10 - Reaching satellites requires getting a good start. Here's WB6APP and his compadre, WA6WTN truckin' toward Oscar 8 from Mt. Gleason!

Fig. 11 - Clarence Munsey, K6IV, of Robot fame pictured with his pipe-smoking friend Warren Weldon, better known as W5DFU!

Fig. 12 - Russ Sievert, W8OZA, is really a good-natured fellow. That squint is caused by the early morning sun at Dayton.

camera video, and image processing will be developed for the leading lines of hobby/home/amateur computers.

In my opinion, picture transmission via slow scan television is about to enter a new plateau both in numbers and in quality. To stimulate the growth of this means of communication and its potential usefulness I strongly urge that slow scan privileges be extended to the Technician and General Class licensees within their sub-band allocations in all bands.

New Year—New Interests!

As we go into 1979, why not give some thought to trying another phase of amateur radio? If you have never operated SSTV, give it some thought. Why not visit a friend who operates SSTV and see what he's doing with it? If your opinion of SSTV is based on what you saw ten years ago I think you'll be surprised at the change. Swapping pictures with other amateurs around the globe offers much more than just swapping names and reports.

It's a new year, time for another look at SSTV!

More about OSCAR 8 SSTV.

Last August In Focus reported SSTV contacts between Earl Mathison, WB6APP and Ted Jenson, WA6WTN during Oscar 8 orbits #244 and #258. These contacts still appear to be the first two-way SSTV QSOs via Oscar 8 although a letter from good friend Dave Ingram, K4TWJ reports that he pumped SSTV through the satellite and back to his station on March 14, 1978 during orbit #118. That round trip appears to be the first SSTV circuit through Oscar 8! How do you describe a satellite QSO with your own station?

Meanwhile, WB6APP and WA6WTN are still busy making contacts via Oscar 8 as shown in fig. 10. That truckload of beams and gear visited Mt. Gleason in California for a day of high elevation QSOs! Unfortunately, a hurried note from WB6APP neglected to give the calls of stations worked on this mini-expedition!

Echoes of Dayton '78!

As a reminder of the fact that you should be getting your reservations made for Dayton, In Focus brings you a "rogues gallery" of SSTVers attending last year's Hamvention! See some of your favorite slow scan friends in figs. 11, 12, 13, 14, 15, and 16.

Final—Final.

Please remember that In Focus needs your help in keeping others informed about you and what you are

Fig. 13 - Ever hear of a W6MXV monitor? Well, here's Mike Tallent, ol' 6MXV himself.

doing with SSTV. Address your letters to that same old address, 2112 Turk Hill Road, Fairport, N.Y. 14450. Best wishes for '79 to all!

73, Bill, W2DD

Fig. 14 - Dave Smith, Robot's roving sales honcho had just returned from a honeymoon trip and SOME incidental business in Europe when Dayton happened to him last year. He doesn't look worn-out but he said he was!

Fig. 15 - Jim Young, K4TGC, was ready to put the finger on the Digital Group's nifty keyboard when In Focus' photographer caught him in the act.

Movement of current through a transistor can sometimes be difficult to understand. Edwin P. Fuller explains the process in this article.

The D.C. Analysis of a Transistor Amplifier

BY EDWIN P. FULLER*, W4EDM

The purpose of this article is to present the d.c. (no-signal) analysis of a transistor audio amplifier. The **no-signal** condition is also referred to as the **static** or **quiescent** condition. These several ways of referring to the same thing lie in contrast to **signal** or **dynamic** analysis where the concern is circuit behavior while handling (amplifying, in this case) the human voice, music or other form of audio signal. In most cases a sinusoidal audio voltage would be used to simulate the input signal.

D.c. analysis of a circuit finds its importance in establishing the **operating point,** or **Q-point** of the amplifier, i.e., its class of operation. This discussion will be limited to the case of a Class A amplifier.

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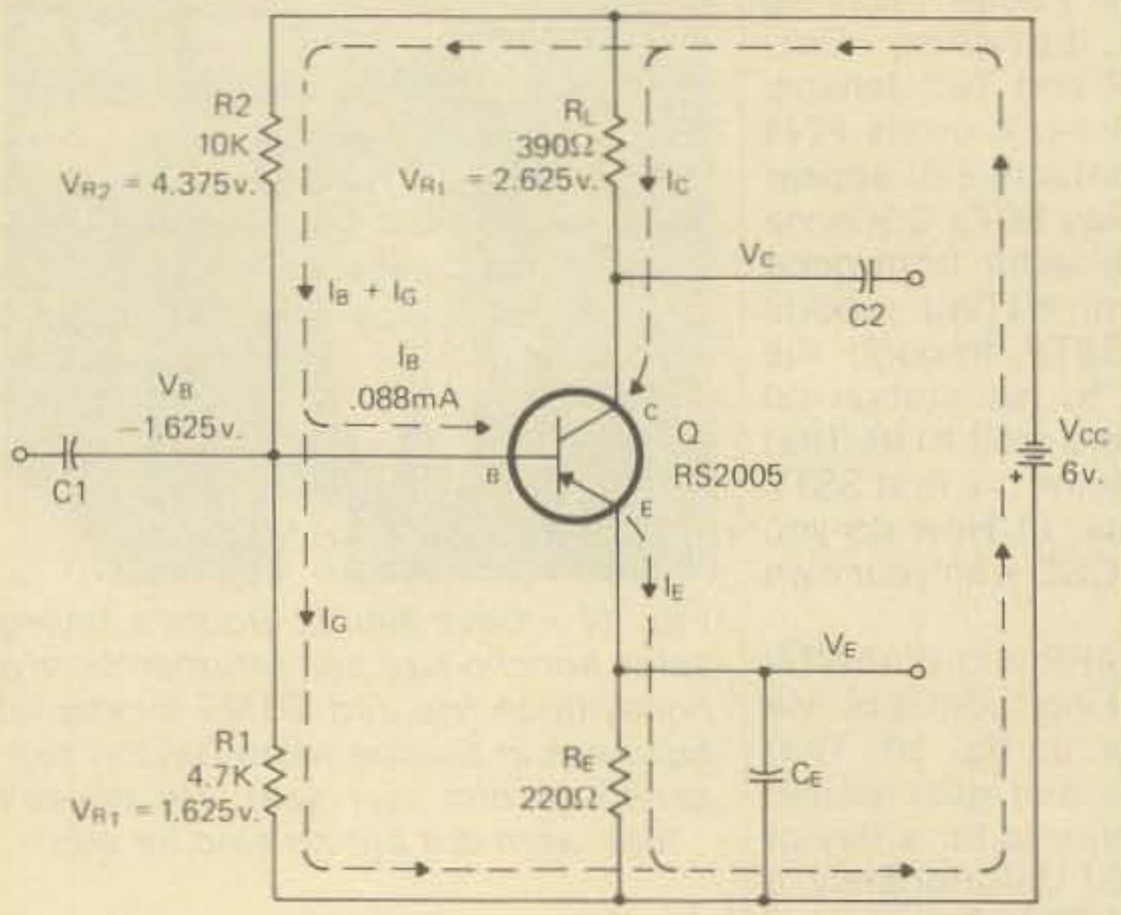

Fig. 1—The circuit being analyzed. RS-2005 is a PNP transistor in common-emitter configuration.

1) V_{CE}-axis intercept: Assume transistor cutoff. There is no current flow in either R_E or R_L. Therefore, there are no voltage drops across these resistors. V_{CE} is 6 volts.
2) I_C-axis intercept: Assume the collector is shorted to the emitter. The resistance in the circuit is now the sum of R_E and R_L or 610 ohms. The I_C-axis intercept is $V_{CC}/R = 6/610 = 9.836$ mA. (Note that in many circuits R_E is less than 10 percent of the total R in which case only R_L is used as the divisor).
3) A straight line is drawn between the V_{CE} and I_C intercepts.
4) A line perpendicular to the I_C-axis from the point of intersection of the load line and the I_B curve. 6.73 mA is read on the I_C-axis. A line perpendicular to the V_{CE}-axis is drawn to the intersection of the load line and the I_B curve. -1.875 is read on the V_{CE}-axis.
It should be noted that although both R_E and R_L are used in the above analysis, useful output voltage appears only across R_L.

Fig. 1 indicates transistor Q to be an RS-2005. The 2005 is a PNP germanium audio frequency device. The circuit configuration is that of a common-emitter where the input signal is applied to the base B and the output is taken from the collector C. The emitter is the common element, grounded through resistor R_E.

The body of the analysis presented will involve a straightforward application of Ohm's Law.

The common-emitter configuration is the solid-state equivalent of the grounded-cathode (common cathode) tube circuit. Like its tube counterpart, the common-emitter is the most frequently used transistor configuration.

The circuit components are identified and have functions as follows:

(1) R_1 and R_2 together establish the base voltage V_B.
(2) R_L is the load resistor across which the useful output voltage is developed.
(3) R_E is the emitter resistor which contributes to bias stabilization.
(4) C_1 is a coupling capacitor from the preceding stage.
(5) C_2 is the output coupling capacitor to the following stage.
(6) C_E is a bypass capacitor, across R_E which effectively connects the emitter to ground under signal conditions.

The three capacitors are of particular importance during signal conditions.

The three voltage and one current value given are measured values. These values enable the computation of other voltages and currents in the circuit. The three given voltages are:

(1) V_{R1}, the voltage across R_1. $V_{R1} = 1.625$ V
(2) V_{R2}, the voltage across R_2. $V_{R2} = 4.375$ V

(3) V_{RL}, the voltage across the load resistor R_L. V_{RL} = 2.625 V

The one current value given, the base current, is 0.088 mA or 88 μA. The base current is designated by I_B.

The base voltage V_B is of importance in establishing the d.c. conditions of the transistor. V_B is shown to be -1.625 volts with respect to ground. It is, of course, the drop across resistor R_1. Note that R_1 and R_2 constitute a voltage divider. When the emitter voltage V_E and the voltage across R_E are determined it will be possible to show how V_B and V_E together establish the emitter-base junction forward bias. Likewise, when V_C, the collector-to-ground voltage is determined, it will be possible to show how V_C and V_B together establish the collector-base junction reverse bias.

Attention should be directed to the electron (current) flow paths. Observe that all paths start from battery minus and return to battery plus. I_C, and collector current, moves from battery minus, through R_L and into the collector. I_B, the base current, moves from battery minus, through R_2 and finally to the base of Q.

An interesting action takes place inside the transistor. I_C and I_B combine to exit from the transistor through the emitter lead as I_E. It is important to see, that for all practical purposes, I_E is the sum of I_C and I_B. I_S in the load current for the voltage divider consisting of R_1 and R_2.

The current designated I_G also flows through R_2; I_G can be considered as a **bleeder current.** Bleeder current flows through both resistors in the voltage divider. The bleeder current is called I_G to avoid confusion with I_B, the base current. No transistor current flows through R_1. I_E is the total transistor current.

V_{CC} is the designation often used in transistor circuits for the d.c. supply voltage.

As given earlier, one of the most important formulas in transistor work is $I_E = I_B + I_C$. This is a *practical* formula and does not consider the reverse current flow of minority carriers through a given device. In normally working circuits the reverse current flow is very minute.

Being armed with the foregoing information and with an application of Ohm's Law, solutions can be obtained for I_E, I_C, V_{EB} (the forward bias in the emitter-base junction), V_{CB} (the reverse bias in the collector-base junction) and V_{CE} (the collector-to-emitter voltage).

In solving for the indicated currents and voltages it will be helpful to have the circuit in fig. 1 available. Bear in mind that all given values are d.c., as are the values of the voltages and currents yet to be determined.

It should be noted that the numerical values for some of the voltages and currents have not been inserted in fig. 1. Also, V_{EB}, V_{CB} and V_{CE} are not indicated in the schematic.

Following is a procedure for finding the current and voltage values in question.

First: Set down the base current, I_B = 0.088 mA.

Second: With I_B established, two of the transistor currents, I_E and I_C, are still unknown. From Ohm's Law, if the voltage drop across any resistor is known and the value of the resistor is also known, the current through the resistor can be determined. From fig. 1 there are only three resistors through which transistor current is flowing. One of these is R_2 which was earlier determined to have base current flowing through it.

But the base current is already known so attention is directed to another resistor with transistor current flowing through it. R_E is eliminated since the information presented in fig. 1 does not include the voltage across it, making it impossible to find the current I_E flowing through it.

Consider, then, the load resistor, R_L, with one end connected to the collector of Q and with the other end connected to battery minus. It was established earlier that only collector current flows from battery minus through R_L into the collector. Furthermore, the voltage across R_L (V_{RL}) was given as 2.625 volts; R_L itself has a resistance of 390 ohms. Hence, the voltage across R_L and the resistance of R_L are known.

Ohm's Law states that I = V/R. In this case I is I_C, V is V_{RL}, and R is R_L. Specifically, then, $I_C = V_{RL}/R_L$. Substituting the known values shows that I_C = 2.625/390 = 0.00673 A = 6.73 mA.

Third: With the collector and base currents known (and in the same units, mA) the prescription given earlier to determine the third transistor current, I_E, can be applied.

Since $I_E = I_B + I_C$ it follows that I_E = 0.088 + 6.73 = 6.818 mA.

Summarizing to this point it was shown that

I_B = 0.088 mA I_C = 6.73 mA I_E = 6.818 mA

Fourth: Here a solution will be given for V_{EB}, the voltage at the emitter with respect to the base. This is the forward bias in the emitter-base junction. Since Q is a PNP transistor, the emitter must be positive with respect to the base. The base is used as the reference element in establishing transistor junction biases.

To determine the value of V_{EB} it is necessary to know the voltage at each of these elements (emitter and base) with respect to ground. In short V_B and V_E must be found. V_{R1} is given to be 1.625 volts. Note that the top end of R_1 is connected to chassis ground as is the positive terminal of the battery. Quite clearly, then, the 1.625 volt drop across R_1 is also V_B. The polarity is negative because the base is less positive than ground. Chassis ground, in this circuit, is the most positive point because it is connected to the positive terminal of the battery. Measurement with d.c. volt-meter would require that the positive lead of the meter be connected to ground and the negative lead would be connected to the base of Q.

Attention is now directed to solving for the emitter voltage, V_E, with respect to ground. Here the concern is with the emitter resistor R_E. Obviously, V_{RE}, the voltage across R_E, will also supply the value of V_E. In this case, V is V_{RE} (and, incidentally, also V_E) while I is I_E and R is R_E.

So, $V_{RE} = V_E = I_E R_E$. From the previous step in this procedure I_E was found to be 6.818 mA (0.00618 A). Substituting in $V_E = I_E R_E$ it is seen that V_E = 0.00618 × 220 = 1.49996 volts. V_E, then, is effectively 1.5 volts.

Note that V_E is 1.5 volts less positive than ground; therefore, the emitter of Q is -1.5 volts with respect to ground.

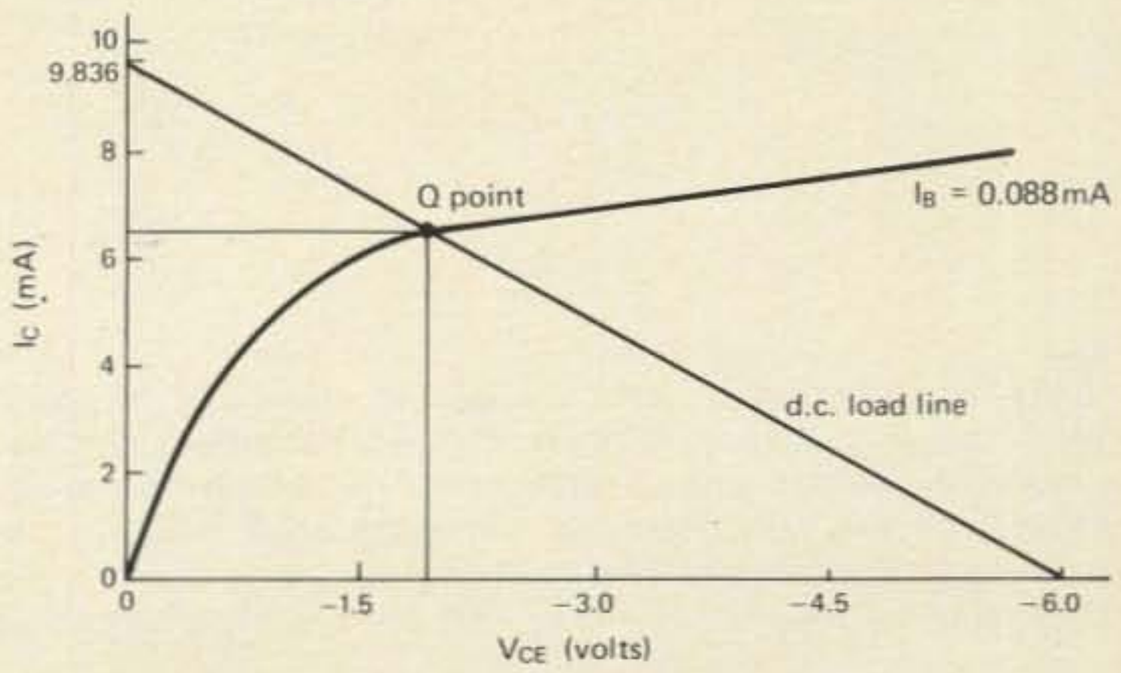

Fig. 2—D.C. Load Line Superimposed on Average Collector Characteristic Curves.

In summary, then,

(1) V_B is -1.625 volts with respect to ground and V_E is -1.5 volts with respect to ground. Thus, V_E is less negative than V_B making V_E positive with respect to V_B.

(2) The emitter is positive with respect to the base and this is proper forward bias in the emitter-base junction of a PNP transistor. The magnitude of the bias is simply the potential difference between V_B and V_E, i.e., $V_{EB} = 0.125$ volts.

Fifth: The discussion now turns to determining the collector-base junction bias, V_{CB}. To do this V_B (previously determined) and V_C must be used. V_C is the collector voltage measured with respect to ground. $V_B = -1.625$ volts. To determine V_C subtract V_{RL} (the voltage drop across R_L) from V_{CC}. V_C, then, is -3.375 volts with respect to ground.

In summary, V_B is -1.625 volts with respect to ground whereas V_C is negative with respect to V_B, that is, the collector is negative with respect to the base and this is proper bias in the collector-base junction of a PNP transistor. The magnitude of the bias is simply the potential difference between V_C and V_B or -1.75 volts. This is the collector-base reverse bias in the circuit.

Sixth: Since the voltages needed were determined in previous steps, solving for V_{CE}, the collector-to-emitter voltage, is short work. V_C and V_E are used to find V_{CE}. From the previous step, V_E was found to be -1.5 volts. The potential difference of V_C with respect to V_E is -1.875 volts. This indicates that V_C is 1.875 volts more negative than V_E. Therefore, $V_{CE} = -1.875$ volts.

Recapitulation

Transistor currents:
$I_B = 0.088$ mA
$I_C = 6.73$ mA
$I_E = 6.818$ mA

Transistor element voltages with respect to chassis ground:
$V_B = -1.625$ volts
$V_E = -1.5$ volts
$V_C = -3.375$ volts

Transistor Junction Bias Voltages With Respect To The Base:
$V_{EB} = 0.125$ volts (emitter-base junction forward bias)
$V_{CB} = -1.75$ volts (collector-base junction reverse bias)

And, finally, it was determined that the voltage at the collector, with respect to the emitter, V_{CE}, is -1.875 volts.

Of the recapped items, the three that establish the d.c. operating point (Q-point) of a transistor amplifier are I_B, I_C and V_{CE}. Refer to fig. 2 for a graphic illustration.

An incidental offshoot of the analysis is that the **beta** β of a transistor can also be determined. The beta of a transistor is the ratio which indicates how effective a device is in developing a large collector current as a result of a small base current. The formula is $\beta = I_C/I_B$. Thus, in the example in fig. 1, $\beta = 6.73/0.88 = 76.47$. There is 76.47 times more collector current than there is base current.

This article has offered a detailed mathematical d.c. analysis of a common-emitter, R-C coupled Class A voltage amplifier. The principle necessary tools for such an analysis are a proper application of basic Ohm's Law and an appreciation of voltage drops and potential differences between two points.

A d.c. load line, with the d.c. Q-point, was drawn on an abbreviated average collector characteristic curve (fig. 2). The expectation here is that the reader could see the three factors that set the operating point on the load line.

All computed values were confirmed with a 33,000 ohms per volt v.o.m. CQ

Does bigger mean better? Sometimes, thinks K5DUT, especially when it comes to quads. Read about his six-element giant in this article.

The Monster Quad

BY DON WINDFIELD*, K5DUT

The cubical quad antenna has gained popularity in recent years due to its excellent performance. The larger ones are growing in number. It has been said that quads will not stay up in adverse weather, especially the large ones. With proper material and construction they will stay up. Large quads have been in use at this QTH for over four years with no problems but make no mistake about it, to build a large quad that stays up, takes proper planning, materials and workmanship.

In the Fort Worth area, large quads are popular and a backlog of information has been gained from constructing and tuning them. Many things have been tried and tested with some definite conclusions about what will work well and what will not.

One of the hardest parts of a "Monster Quad" construction project is to figure out what material will last in the wind and ice.

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This is most important if the antenna is expected to stay up a number of years without problems. Many readily available quad spreaders are not suitable for use in heavy icing conditions and 70+ mph winds. It is too easy to compromise, for suitable spreader sources are few in number. There are three weak points that give the most trouble in a quads survivability: the spreaders, the wire, and the method of attaching the wire to the spreaders.

Pole vaulting poles or strong material is recommended. Do not use aluminum tubing or other conducting material for spreaders. The element wire can be small gauge aircraft trim cable (stainless steel or copper plated). Regular six strand galvanized guy wire makes a rugged element wire and is cheap. It will stay up many years without failure. Although its conductivity is less than copper, there is no noticeable loss of performance with it. In areas of light icing, solid strand #12 copper motor rewinding wire works well. Be sure to pre-stretch it. I have used it here for several years without a single broken wire.

To attach the wire to a spreader, use about eight inches of Teflon® tubing, four pieces per element. Slip these over the element wire. They attach to the spreaders with small aluminum clamps (called Adel clamps), one around the Teflon® tubing and the other around the spreader. These clamps are used in the aircraft industry and are available as surplus.

Another method that works well and is used by many of the local quad builders, is to use Tye Wraps to attach the Teflon® to the spreader. Tye Wraps are used in the electrical industry and are very strong. Use only the black ones. Two or three are used at each attach point. They are much quicker and easier to use than the clamp method but not as strong.

As far as the spiders, the standard homebrew T-6 aluminum angle and muffler clamp construction works well and needs no further improvement. Use thick angle and plate the clamps for long life.

The boom needs to be designed for the wind load of the antenna and builders of some of the larger quads have gotten into trouble here. Attempts to use the popular and cheap three inch irrigation tubing on long Monster Quad booms have met with disaster. It will not hold up in high winds without reinforcement. Two inch thick wall tubing guyed at four points along a fifty foot boom also failed to stay up in the Texas winds and ice. Yes, we get ice here; some winters it's quite heavy and with winds in excess of 70 mph. A successful 50 foot boom design with only one cable to take out the vertical sag has been in use here for four years. It is pictured in this article. It is as follows: Center piece, three inch o.d., .250" wall tubing, twelve foot long. Two and one quarter inch tubing press fit into each end of the three inch piece, 12 feet each side. The end pieces are .125" wall two inch O.D. tubing eight foot long, press fit into the two and one quarter pieces. All are T-6 aluminum round tubing. The material was purchased locally at the scrap yards. The same material is quite expensive when purchased new.

This covers the most troublesome areas of reliability when building a Monster Quad. The rest is more or less good quad building practice. Be sure to use good strong terminal ends at the driven element wire attach points. Silver solder them if you use steel wire. Use good strong Teflon® terminal blocks and brass screws and hardware. Number 10 hardware is used here. Be careful to provide mechanical strength to the feedline attach points to remove strain from the feedline.

As far as the electrical design of the Monster Quad, good information is available. Some of the things that work well here are: use one feedline for each driven element on multi band Quads; one feedline up the tower to a relay bank is good. For superior front to back ratio, use dual reflectors. Clarence Moore, the inventor of the quad antenna, speaks highly of this design. Forty dB+ front-to-back and sixty dB front-to-side ratio is possible with dual reflectors. Do not use aluminum tubing for spreaders. The popular 1:1 baluns do little for quad performance and after trying them it is felt that they are not necessary for quad antennas.

Some tri-band quads came up with peculiar tuning problems that at first were baffling. The problems were traced to such things as the 20 meter driven element being detuned by the 10 meter feedline, which was coupled to the 20 meter element by the 10 meter element.

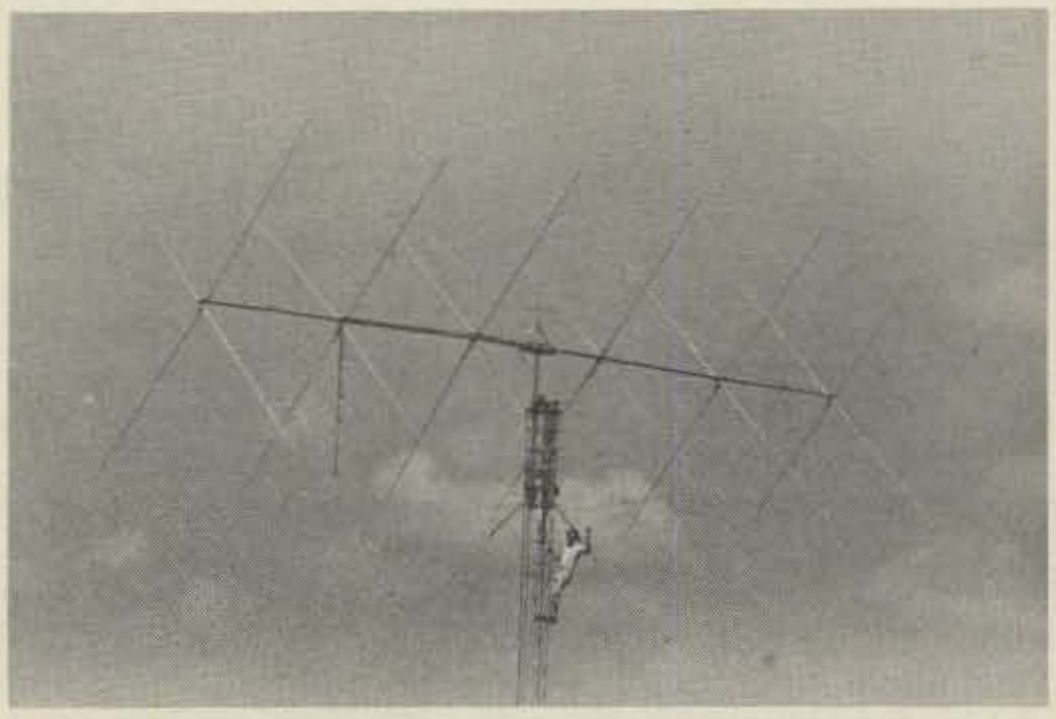
A feed system that eliminates this type of problem is discussed in Bill Orr's "Quad Antenna Handbook" (page 50, paragraph 1). That system is in use here and works well. With a tri-band quad on a fifty foot boom and six frames at equal ten foot spacing, the 15 meter and particularly 10 meter element spacing is a bit wide by accepted formula. The performance on the air is excellent however and one wonders if the performance is down at all.

Collectively many hours have been spent by the local Quad "tuners" with the usual antenna experimenters tools and instrumentation. It is generally agreed among us that once the antenna is in the "ballpark," additional hours of fine tuning are not worth the effort. Usually, the results amount to "peanuts" as far as forward gain increases are concerned. Front-to-back tuning is fairly critical and takes some fine "tweaking" for maximum performance. Monster Quads are forgiving as far as loss in forward gain with mildly mistuned elements.

There are no so called "secret dimensions" that perform magic with quads and good quad information is readily available. An excellent article is in *QST*, May 1968, called "Quads & Yagis" by Jim Lindsey, now W7ZQ. Also an excellent article on tuning is published in *73* magazine called "Easy Tuning of Multielement Quads," by W4AZK.

It is felt from measurements here that the maximum gain of a Monster Quad occurs with the elements tuned within 1.5 to 2% different in frequency from the driven element. The reflector is longer and the directors are shorter, of course. Several quad suppliers recommend 5% detuning and while more bandwidth and easier tuning is achieved, somewhat less gain is the result.

A method of tuning that works well here is as follows: with a reasonable match to the driven element, (2:1 or less), tune the reflector and the driven element for desired resonant frequency. Check the front-to-back ratio. Use a grid-dip meter and a calibrated receiver to check the frequency of the grid dipper



Note how the Monster Quad dwarfs the author.

and tune all the directors 1.5 to 2% higher in frequency than the driven element. On 20 meters with the driven element at 14.200 MHz, careful field strength measurements have shown maximum forward gain occurs with all directors tuned to about 14.375 MHz.

Check each element several times to get the average frequency with the grid dipper. With each adjustment there is interaction and everything must be checked and rechecked. No tuning stubs are used. Direct element length variation is used. The tuning of directors is quite broad and only small changes occur on a field strength reading when everything is getting close. In fact, it is quite difficult to tune the directors with a field strength meter and once the proper point is found, the grid-dip method is faster and provides a repeatable set of figures that can be duplicated quickly on another antenna of like design at another site.

During one of the tuning sessions an interesting thing was tried, with the antenna tuned for maximum forward gain, the reflector was peaked for best front-to-back-ratio. The measured forward gain dropped little with this change.

Pick a calm day to tune the antenna. On windy days the meters dance all over the place. Lots of on-the-air tests to DX stations have been made with Monster Quads tuned various ways. They were compared to a standard antenna that did not change. Single tests are unreliable and only a lengthy series of tests, with the results averaged, gives good indication of performance differences. Tests were made with a two element quad as the standard and a four element quad was tested against it. Then a four element quad was used as a standard and a six element Monster Quad was tested against it. The test periods ran for about one year each. Results were averaged and were interesting. Because every S-meter is different, I will not quote exact dB figures, but in general the difference was about one and one half to two S units in favor of the four element quad over the two element quad. With the four and six element quads, the difference was closer and ran about one-half to one S unit in favor of the six element quad. These figures were taken from the DX stations S-meters and were made up of reported signal strength transmitted from the quads under test.

Some of the things learned while using the same antennas and making receive comparisons were interesting. After many tests it seems that the smaller quad antennas receive much better than they transmit when they are compared with a larger quad. For instance, a two element quad at times would receive almost as well as a four element quad. Never did it transmit as loud a signal as the Monster Quad. It appears that the differences show more readily in transmitted signal strength than in receiving ability when comparing large and small quad antennas. These tests were done with the antenna height from 60 to 80 feet.

Later, tests were made with a two element quad on 20 meters mounted on a 120 foot tower. On a separate tower 300 feet away, a four element 20 meter quad was mounted at 120 feet. The test period was brief but much of the same results were noticed at 120 feet as those at the lower levels.

When comparing the Monster Quads to large monoband Yagis, the quads seem to be better receiving antennas. They are quieter under normal conditions and during periods of precipitation static, the quads will usually copy Q5 while with the Yagis static was many dB over S9, covering up stations on frequency. A problem that occurs with quads can be quite serious for those of you that have icing conditions. When the quad is covered with ice, it is severely detuned and almost useless as a transmit antenna. The yagis are detuned a bit but work fine.

Another problem for city dwellers is that a Monster Quad is ugly. Most neighbors hate the sight of them. One local ham here however has a neighbor lady that thinks his six element Quad is the most beautiful thing in the neighborhood! It's a diamond shaped one. (Maybe she likes diamonds).

To properly tune a large quad, easy access to the antenna results in a better job and a crank-up or lay-over tower is almost a necessity. Monster Quads on fixed towers usually turn out to be monstrous tuning problems. On a fixed tower, the proper way to do it is to assemble the quad and tune it at a lower height where it can be easily reached. Strangely, few hams do this. Maybe it's because building the thing is so much more work than anticipated, they just want to get it up and over with. Most times it is then discovered that the results are not what was expected and the antenna is used as-is.

I have talked with several hams that were displeased with their quad antennas but most of them did little or no tuning, yet top performance was expected.

Large quads take heavy duty towers and heavy duty rotaters. "Prop Pitch" rotators are used by all the local Monster Quad owners here. The popular Ham-M rotator has been tried and is not up to the job.

As far as which is better, square-shaped loops or diamond, the square loops allow a shorter distance from the Quad boom to the bottom wire. This permits the top set of guy wires on the tower to be closer to the boom. This distance can become critical with a large quad on a mast. A diamond shape offers somewhat better ice resistance and the feedlines can be tied to the bottom spreader. The electrical difference appears to be very little. An article by W7KAR, March 1977 *QST*, ("Evolution of a Quad Array"), shows that the two different shaped loops can be intermixed with no deterioration of performance.

A well built Monster Quad is expensive to build and usually takes much more time and effort than the builder imagined. Any corner cutting can result in a broken mess on the roof in mid-winter. One DXer here found that out the hard way. Needless to say, that kind of quad works very poorly.

After all the hard work, is a Monster Quad worth the effort? Many DXers here think so. At this writing, six Monster Quads are up in Fort Worth and more are going up. For the amateur that is limited to one tower and boom at a modest height, a multi-band Monster Quad along with the usual DXers tools, a k.w. amplifier, good location, etc., gives DX performance that rivals the long boom monoband yagis perched on cloud scraping towers. The quads will do it at a lower height, (about two-thirds as high). As high performance DX antennas, the tri-band Monster Quads in this area are installed at sixty five to eighty feet and put their owners in the top few that dominate in DX pileup performance. The multiband Monster Quads are the only antennas here that seriously challenge the dominance of the large mono-band yagis on tall separate towers.

After several years of using quad antennas, it has become obvious that with all other things equal, the multi-band quad will equal and most times exceed the performance of a mono band yagi of a like number of elements and offer this performance from a lower height than the yagi. In the area are some forty through ten meter quads. To equal their performance with yagis, much more hardware and expense would be necessary and this is where the real advantage of a large multi-band quad becomes apparent. It is possible to have an all band antenna farm with one tower and boom with a multi-band quad. A full size eighty through ten meter quad is on paper here and will be going up some time in the future in the area. As a closing note, some of the local DXers with monoband yagis have replaced them with multi-band Monster Quads and are well pleased with an increase in DX performance. CQ

If a sudden flood or calamity of nature befalls your community, what should or could you do? If disaster strikes, is your radio club prepared to step in to assist with or handle emergency communications? The answer to these questions could very well effect the lives of your family, friends and neighbors.

An Interface Concept for the Emergency Broadcast System and the Amateur Radio Service

BY CHRIS PAYNE*, W3IRC

The following article was presented recently at a meeting I attended of the amateur Radio Subcommittee, which is part of the National Industry Advisory Committee (NIAC), to the FCC. The function of the Subcommittee is to coordinate facilities between commercial broadcasting and the amateur radio service during times of emergency. Commercial broadcasting relies on the Emergency Broadcasting System (EBS) for dealing with emergencies or disasters and this system would be greatly enhanced by use of amateur radio during troubled times.

Though RACES and MARS do an admirable job, there are many areas that do not have a program set up or a clear definition of who is responsible to whom. Chris Payne, W3IRC, a member of the Subcommittee prepared this paper to first define the problem and then to offer possible solutions. I would suggest that readers with first-hand experience contact Chris and let him know what has been working or not working in their communities. - *K2EEK*

A concept of utilizing the Amateur Radio Service as a backup to the national system of alerting broadcasting stations of an emergency was presented previously to the NIAC

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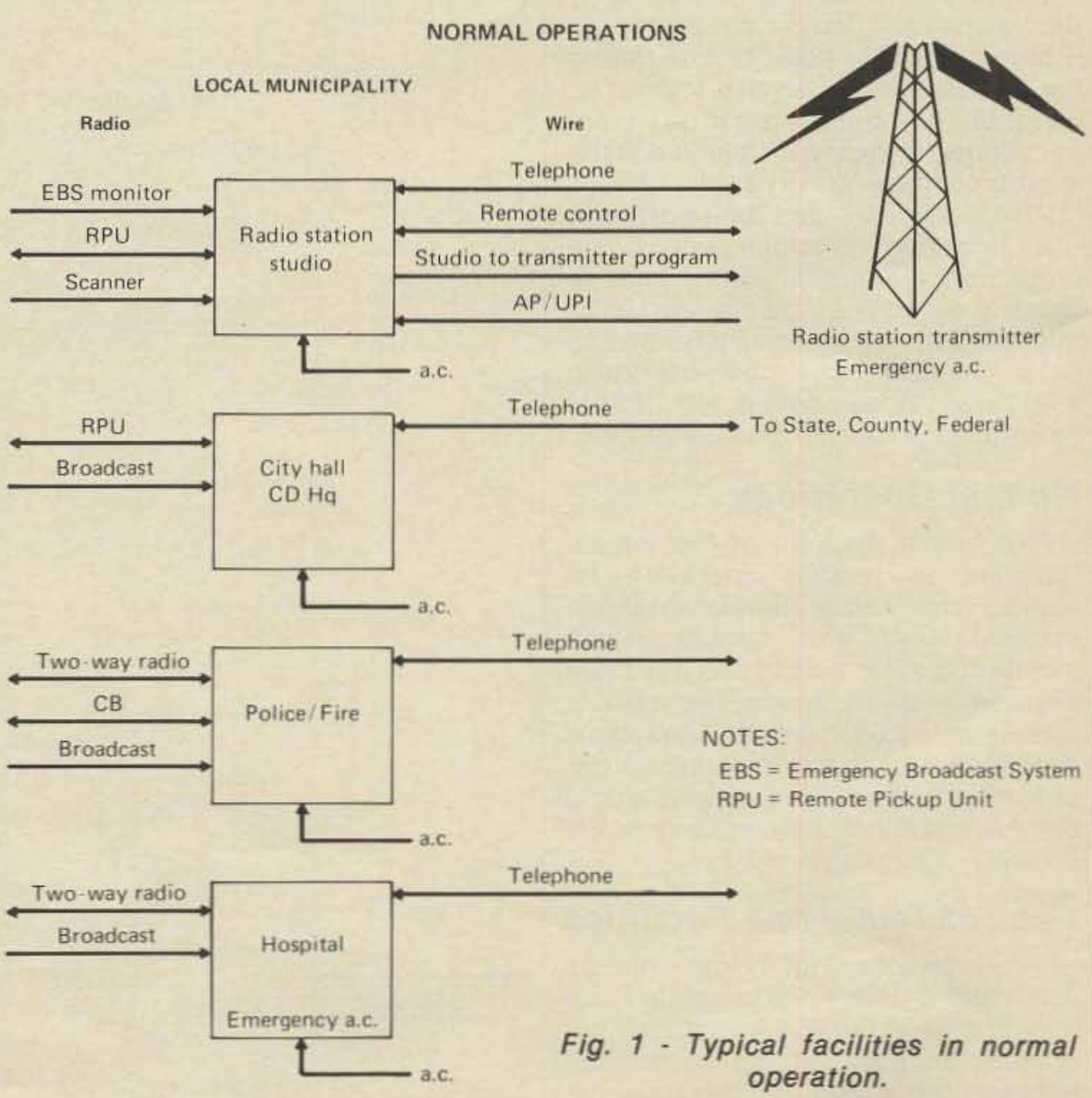

Fig. 1 - Typical facilities in normal operation.

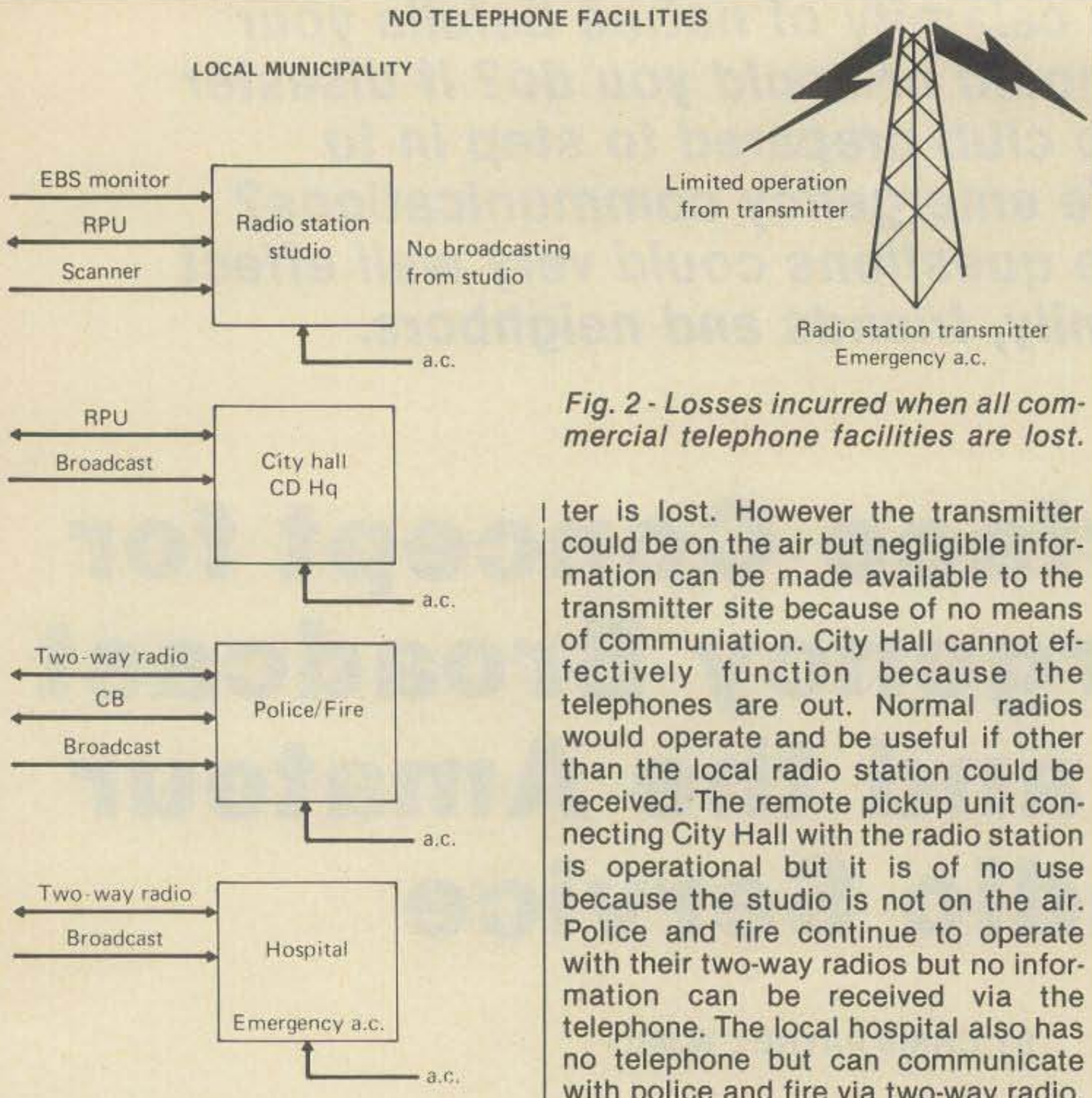

Fig. 2 - Losses incurred when all commercial telephone facilities are lost.

Amateur Radio Subcommittee. It is the purpose of this document to review a possible plan for integrating the Amateur Radio Service into an individual community's total communication system which includes the local broadcasting service.

Amateur radio can be extremely useful during emergencies if appropriately planned ahead of time. In order to determine how the amateurs might assist, it might be instructive to determine how the communications in a typical small community might breakdown under adverse conditions.

Normal Operations

Fig. 1 is a diagram of the typical facilities in normal operation including the conventional telephone system, fixed wire circuits, radio monitoring systems and two way radio systems such as police, fire, remote pickup units (RPU) and CB. The typical dependence of these facilities on a.c. power is shown as well as what might be the instances of emergency a.c. power.

Loss of Telephone Facilities

Fig. 2 depicts what is lost when all commercial telephone facilities are lost. The local radio is essentially not operational because the connection between the studio and the transmitter is lost. However the transmitter could be on the air but negligible information can be made available to the transmitter site because of no means of communiation. City Hall cannot effectively function because the telephones are out. Normal radios would operate and be useful if other than the local radio station could be received. The remote pickup unit connecting City Hall with the radio station is operational but it is of no use because the studio is not on the air. Police and fire continue to operate with their two-way radios but no information can be received via the telephone. The local hospital also has no telephone but can communicate with police and fire via two-way radio. They also can listen to the broadcast radio.

No Telephone or Power

Fig. 3 shows the isolation due to the loss of both telephone and power. Basically there is no communication except for the hosptial having emergency power and two way radio and the local radio station transmitter on the air but transmitting little valuable information.

Amateur Radio

If ahead of time, two meter amateur radio equipment was set up in the critical locations and if this equipment had sufficient battery power, then the community's essential public service communications would have continued. In addition, via portable and mobile equipment, information could be obtained from throughout the community and routed to the appropriate officials.

The local radio station is the only means of direct communication with the public having either automobile radios or battery operated portable radios. Official emergency information for the public can be relayed from city hall to the radio station's transmitter and announced on the air. Appeals for assistance can be made over the station and other essential health and welfare information can be made communicated immediately.

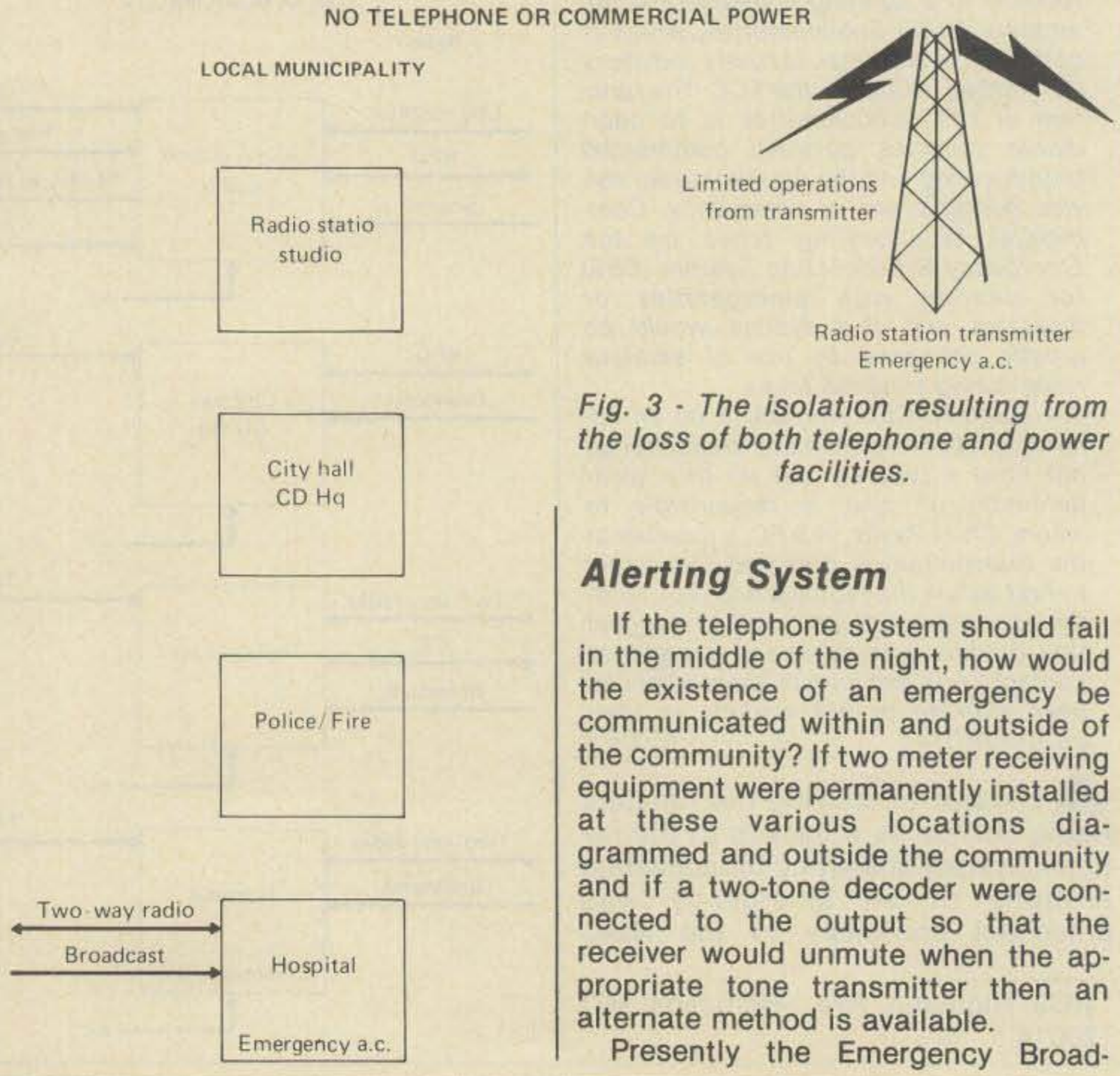

Fig. 3 - The isolation resulting from the loss of both telephone and power facilities.

Alerting System

If the telephone system should fail in the middle of the night, how would the existence of an emergency be communicated within and outside of the community? If two meter receiving equipment were permanently installed at these various locations diagrammed and outside the community and if a two-tone decoder were connected to the output so that the receiver would unmute when the appropriate tone transmitter then an alternate method is available.

Presently the Emergency Broad-

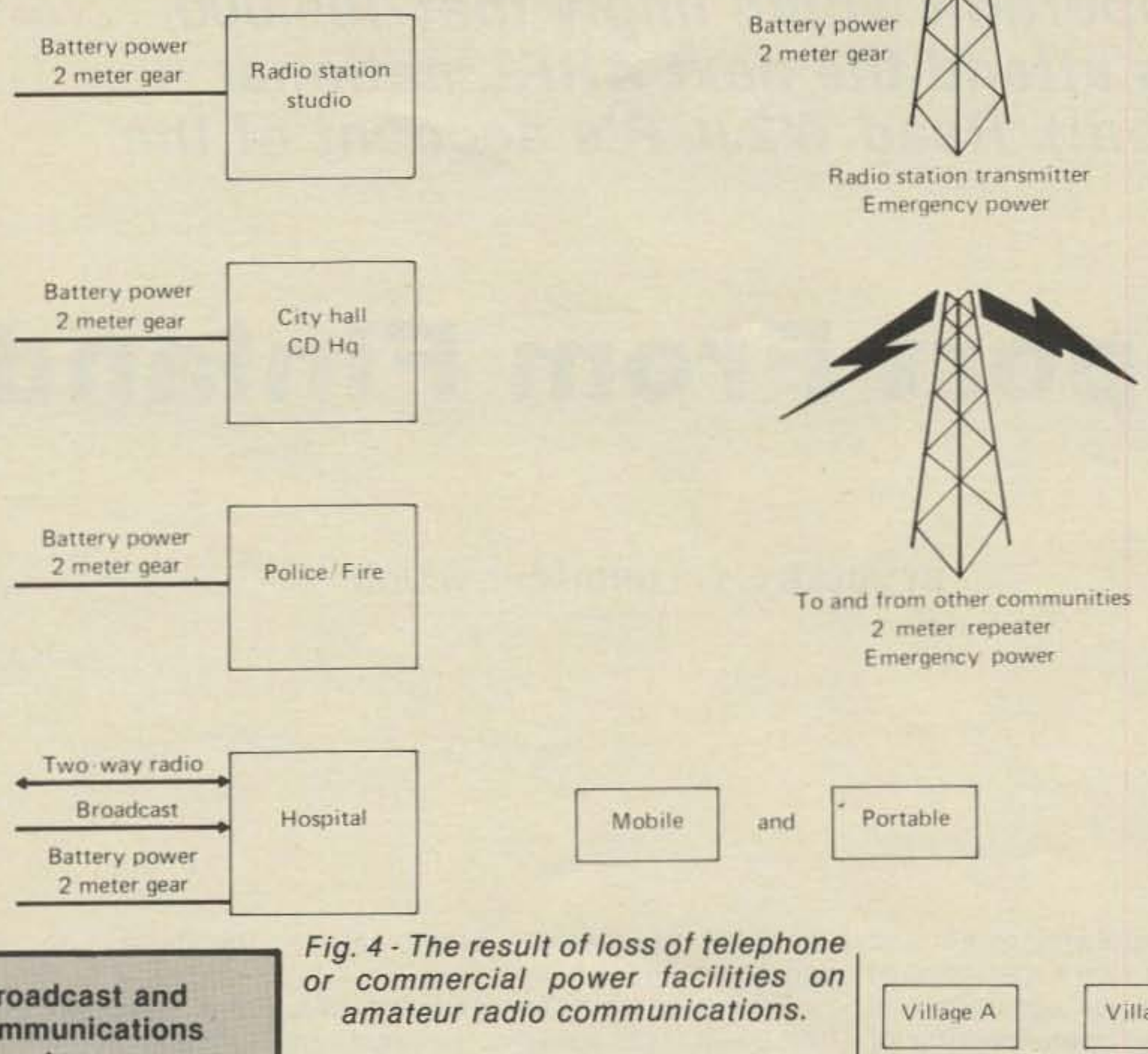

Fig. 4 - The result of loss of telephone or commercial power facilities on amateur radio communications.

Emergency Broadcast and Emergency Communications Concept

2 Meter Communications and Alterting System

- Two meter receiving and transmitting equipment permanently installed where a licensed amateur is normally employed as well as authorized official locations where licensed amateurs can be summoned to operate quickly.
  - -CD Headquarters
  - -City Hall
  - -Police and Fire Dispatcher
  - -Hospital
  - -Local Radio Stations
- Other locations not necessarily having licensed amateurs available for transmission to install two meter receiving equipment or scanners covering two meters.
- Receiving equipment equipped with EBS two tone decoder which would only unmute when offical two tone transmission is made
- EBS two tone encoder installed only at official control locations such as CD headquarters or City Hall
- Two meter repeater monitored in other communities in similar way to provide means of getting emergency warning from community out to state authorities.

casting System has no provision for relaying an over-the-air alert from a small community out. Therefore, *amateur radio might be the only method of notifying the outside world of an emergency within a small community.*

Fig. 5 shows a possible system of two meter repeaters and monitoring which could inexpensively and easily monitor for emergencies. At a location within listening range of the repeaters, a scanning receiver continually scans, listening for the transmission of the two-tone alerting signal. When the signal is heard, the scanner stops and unmutes making the message audible. On the transmitting end the original transmission might be from the civil defense center which is being manned by a licensed amateur and the two-tone alert transmitted by authority of the local Mayor.

The system of monitoring the repeaters would have to be worked out in accordance with the coverage of the available repeaters.

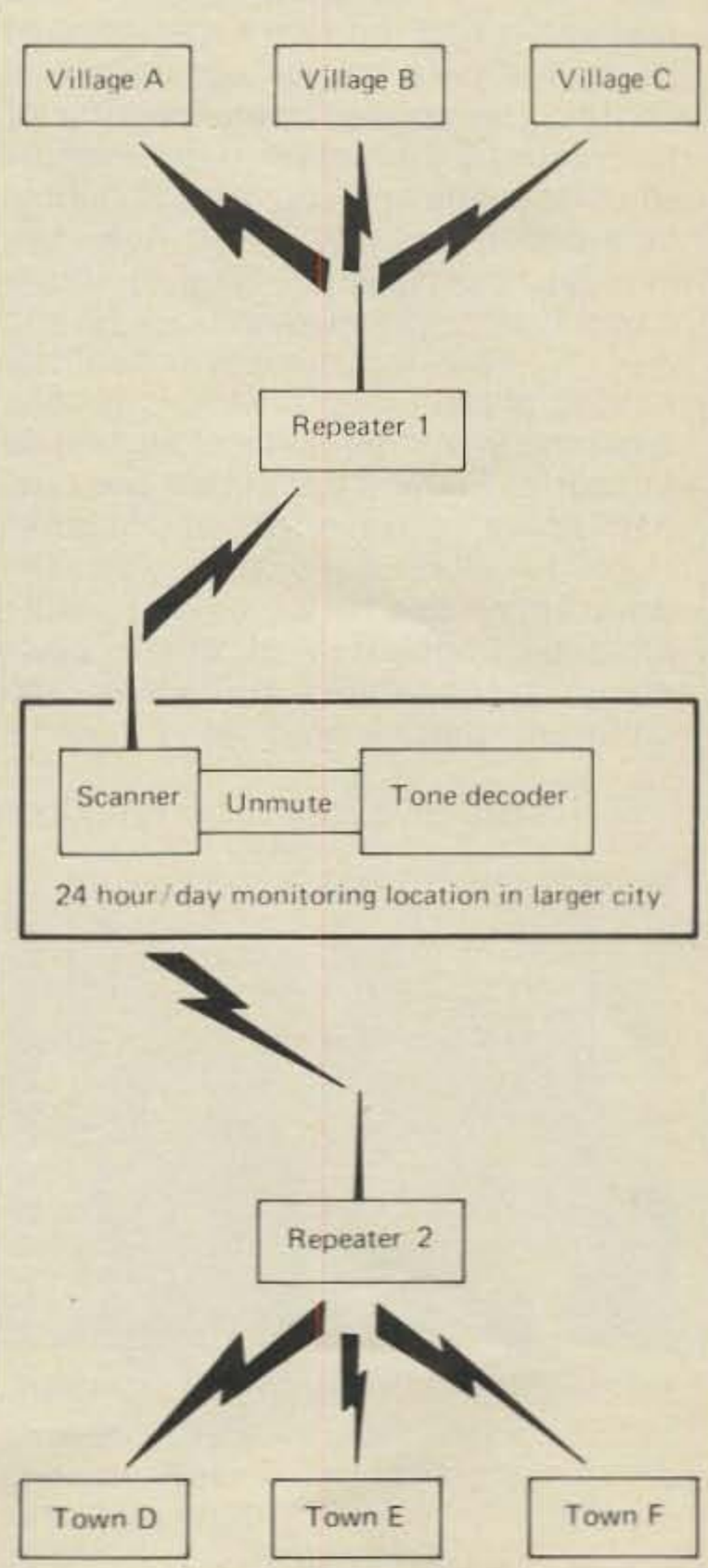

Fig. 5 - A possible system of two meter repeaters and monitoring which could inexpensively and easily monitor for emergencies.

Recently in Finland 30% of that country's licensed amateurs attended the annual SARL meeting. (The same proportion would imply that 105,000 amateurs attend the next ARRL national convention!). Read W2JGR's account of the meeting.

Report From Finland

BY JULES L. FREUNDLICH* W2JGR

During my biennial visit to Finland last year I had the rare experience of being the only foreign amateur present at the annual open meeting of that country's amateur radio league, the SRAL. The open meeting is held in connection with the SRAL Kesäleiri, or "summer camp." The summer camp was held between July 13 and July 17, 1978 in a beautiful pastoral setting of tall evergreens and birches amid the sparkling lakes of Padasjoki in central Finland about two and one-half hours' drive north of Helsinki. Here for five days over 750 OH amateurs (from a country-wide amateur population of about 2400) many accompanied by wives and children, participated in Finland's most important amateur radio gathering of the year.

Each year a different club sponsers the event. This year the Hämeenlinna club played host, with the club station commemerative call OF3AA as the official station of the event. Operation of a Drake TR4C feeding a four element monoband yagi on 20 meters provided thousands of stations around the world with a new prefix. In addition, dozens of individual stations operating in tents and cabins worked all bands and modes depending on propagation conditions. OH3MA even had a 10 GHz station in operation.

Radio operating was mixed with camping, swimming, sauna, eating and general good fellowship. No wonder approximately a record 30% of the licensed amateurs in Finland took part.

Each year the SRAL takes advantage of the high attendance at the affair to hold an open meeting of the league. On July 16 between 200 and 300 attended a lively two hour session which covered a host of subjects of both international and local interest. Following are the highlights of the meeting.

Axel Tigerstedt, OH5NW, president of SRAL opened by emphasizing the concern which SRAL views the forthcoming World Administrative Radio Conference (WARC). He publicly thanked the Americans for the efforts they are expending to preserve the present bands and to secure additional frequencies. In view of the "one country, one vote" situation SRAL hopes that amateur requests can be coordinated on a world-wide basis prior to WARC-79. The Finnish delegation (which will include OH2KH) is expected to support the SRAL position which is essectially identical to that proposed by ARRL. In addition, the Finnish amateurs are requesting the return of 50-54 MHz which they lost in 1957. They feel that the increasing sunspot activity of Cycle 21 will make that band unsuitable for its present point-to-point allocation in that part of the world. Also in the 70 cm band they are seeking a 10 MHz allocation for a.t.v. as being required for adequate video and audio separation. Axel

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Miika, OH2BAD and Jukka, OH2BR, pause with W2JGR/OH2 before entering the summer camp commerative station. (Photo by Roger Freundlich)

Harri, OH2BPN, took time out from his military service to attend the SRAL summer camp and pose with Anssi, OH2QV, Martti, OH2BH, Risto, OH2BCV, and Tim, OH6NU. (W2JGR photo)

cited problems experienced elsewhere where only 6 MHz is allocated. The SRAL is placing great emphasis on preparations for WARC-79 and it was fortunate so many attended the meeting for the update.

Interest in amateur radio appears to be at an all time high in Finland and SRAL is intensifying its efforts to train new amateurs. Some financial help is being received from the Ministry of Education with state assistance concentrating on the teaching of radio theory. However, code instruction must still be accomplished through club efforts.

SRAL gives out club awards each year which are made on the basis of combined club activities such as contest participation, meetings, sponsering of field events, training of new amateurs, etc. This year's recipients for first, second and third prizes, respectively, were OH2AA, OH1AA and OH6AH.

Two meter f.m. activity between 144 and 146 MHz is growing. Two years ago only one repeater existed in the dountry. As of mid-July there were seven, and by the end of 1978 it is expected that ten repeaters will be in operation giving fairly good country-wide coverage. The SRAL encourages repeater activity by contributing the equivalent of $200 toward the initial installment cost of each new repeater.

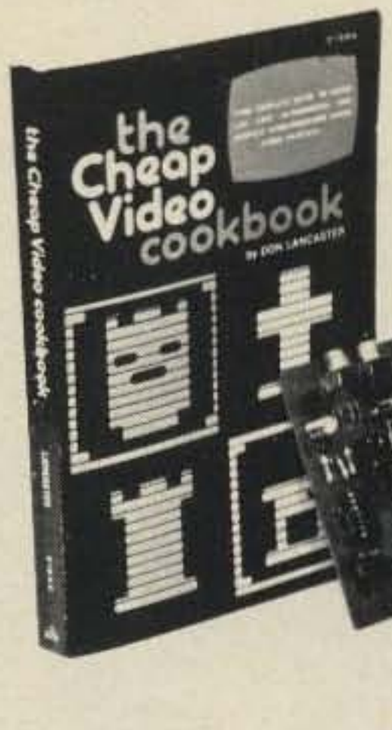
Following a very spirited discussion on operating procedures, it was agreed that 145.50 MHz will be used exclusively as a calling frequency.

Homage was paid to Sigurd "Sigge" Mansnerus, OH0NI, who lost his life with his son Björn, OH0-920 in a boating accident early in the year. An OH0NI memorial fund has been set up for the training and equipping handicapped amateurs. The fund consolidates resources provided by Sigge's widow and SRAL's own memorial fund.

The meeting was conducted completely in the Finnish language, a tongue which your reporter does not understand. Periodically the president interrupted the proceedings to explain in English, to this sole foreign observer, the nature of what was being said. Without this act of extreme courtesy and consideration we would not have been able to submit this report from Finland.

Reino, OH3MA (left) and W2JGR/OH2 (right) try a QSO on the 10 GHz link built by OH3MA and OH3GV. (Photos by Roger Freundlich)

There's no question as to the nationality of OF3AA's 20 meter monobander. (W2JGR photo)



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CIRCLE 48 ON READER SERVICE CARD

The 23rd Annual CQ World Wide WPX Contest

SSB: March 24-25, 1979
& C.W.: May 26-27, 1979

I Contest Period: Starts 0000 GMT Saturday. Ends: 2400 GMT Sunday. Only 30 hours of the 48 hour contest period permitted for Single Operator stations. The 18 hours of non-operating time may be taken in up to 5 periods anytime during the contest, and must be clearly indicated on the log. Multi-operator stations may operate the full 48 hours.

II Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III Bands: All bands, 1.8 thru 28 MHz. may be used.

IV Type of Competition: 1. Single Operator (a) All Band, (b) Single Band. 2. Multi-operator, All Band **only**. (a) Single Transmitter, (only one singal permitted), (b) Multi-Transmitter, (one signal per band permitted).

V Exchange: SSB: RS report plus a progressive three digit contact number starting with 001 for the first contact (i.e. 59001). C.W.: RST report plus a progressive three digit contact number starting with 001 (i.e. 599001). Continue to four digits if past 1000) Multi-transmitter stations use separate numbers for each band.

VI Points: 1. Contacts between stations on different continents; count 3 points on the 14, 21, and 28 MHz. bands, and 6 points on the 7, 3.5 and 1.8 MHz. bands.

2. Contacts between stations in the same continent but not in the same country; count 1 point on 14, 21 and 28 MHz. (Exception: Contacts between different North American countries count 2 point on 14, 21 and 28 MHz. and 4 points on 7, 3.5 and 1.8 MHz. This applies to North American countries **only**).

3. Contacts are permitted between stations in the same country for the purpose of obtaining a Prefix multiplier, but have no QSO point value.

4. A Station in a call area different than that indicated by its call sign is required to sign portable. The portable Prefix would be the multiplier as indicated in Section VII (below).

VII Multiplier: The multiplier is determined by the number of different prefixes worked. A **"PREFIX"** is counted once during the entire contest regardless of how many times the same prefix is worked.

A **"PREFIX"** is considered to be the three letter/number combination which forms the first part of an amateur radio call. (N1, W2, WB3, K4, AA6, WD8, 4X4, DL7, G3, IT9, KH2, AL7, NP2, WP4, 9M2, CT9, 4J9, PY7, VK4, JE3, VE3, etc.). See the WPX Awards Program information if additional clarification is necessary. It is available from K6XP.

Special event, commemorative and other unique prefix stations are also encouraged to participate.

VIII Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on that band multiplied by the number of different Prefixes worked. See VII.

2. Multi-Operated stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

3. A station may be worked once on each band for QSO point credit. However, prefix credit can be taken only **once** regardless of the band.

IX QRPp SECTION: (Single Operator Only). Power must not exceed 5 watts output to qualify for QRPp section competition. You must denote QRPp on the summary sheet and state the actual maximum power output used for all claimed contacts. Results will be listed in a separate QRPp section and certificates will be awarded to each top scoring QRPp station in the order indicated in Section X. These certificates will be marked QRPp and show your power output. QRPp stations will be competing only with other QRPp stations for awards. All other information contained in these rules is applicable to this section.

X Awards: Certificates will be awarded to the highest scoring station in each category listed under Sec. IV.

1. In every participating country.

2. In each call area of the United States, Canada, Australia, and Asiatic USSR.

All scores will be published. However, to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single award **only.** If a log contains more than one band it will be judged as an all band entry, unless specified otherwise. However, a 12 hour minimum is required on the single band.

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

XI Trophies & Plaques: *(Donors)*

SSB

1. WORLD—Single Operator, Single Band *(Jack Reichert, W3ZKH)*

2. WORLD—Single Operator All Band. *(North Florida DX Assn.)*

3. WORLD—Multi-operator Single transmitter. The Ted Thorpe, ZL2AWJ Memorial. *(Don Miller, W9WNV)*

4. WORLD—Multi-operator, Multi-transmitter. The Chuck Swain, K7LMU Memorial.

Year 1979

CQ World Wide WPX SSB Contest CQ

Last Full Weekend of March

Call Sign: W8IMZ | Country: U.S.A

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

	QSO's (minus duplicates)		QSO Points		Prefix		Score	
1.8 mc	21	→	29	X	9	=		1.8 mc
3.5 mc	24	→	48	X	13	=		3.5 mc
7.0 mc	32	→	69	X	16	=		7.0 mc
14 mc	133	→	301	X	81	=		14 mc
21 mc	56	→	157	X	29	=		21 mc
28 mc	54	→	104	X	24	=		28 mc
All Bands	320	→	708	X	172	=	121,776	All Bands

Rest Periods (Single Operator Stations Only)

0300 - 0500	
0630 - 1100	
2230 - 0530	
0700 - 1000	
2230 - 2400	
Total:	18 hrs

How to score: QSO Points x Prefixes = FINAL SCORE.
A Prefix is counted only once. Score bottom line for All Band Score. (Do not add scores from each Band).

Station Description: _____

Antenna(s): _____

Operators: _____

Remarks (Biggest Thrill in Contest, Equipment, story arrangements, etc.):

CLUB COMPETITION: DAYTON AMATEUR RADIO ASSN.

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

(Signature) Bernie Welch

Type or Print
Name: BERNIE WELCH Call: W8IMZ
Address: 7735 REDBANK LANE
City: DAYTON
State or Country: OHIO Zip: 45424

Logs must be postmarked no later than May 10.
Note: Duplicate QSO's can mean disqualification

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

CQ Form 1979 eff. 1977

EXAMPLE-1

1979 WORLD-WIDE WPX SSB CONTEST

CALL PA2TMS Log For 21 MHz Band COUNTRY NETHERLANDS

(MULTI-OP: Use Separate log for each band.)

Page 4 of 8 Pages

← 24 MARCH

DATE / Time GMT	STATION	SERIAL NUMBER Sent	SERIAL NUMBER Received	Fill in only when QSO is mult. PREFIX	Points
0849	CT3BD	59121	59272	CT3	3
51	VU2SK	" 122	" 271	VU2	
0900	VP5BER	" 123	" 143	VP5	
02	VP5WW	" 124	" 273		
04	N4KE	" 125	" 266	N4	
05	WB4YDO	57 126	57033	WB4	
06	W8IMZ	58 127	59067	W8	
11	KØCS	59 128	" 259	KØ	
15	KØDW/5	57 129	57052	K5	
16	AEØK	59 130	59140	AEØ	↓
20	WB4YDO	44 131	55044		0 Dup.
21	WD8CRY	59 132	59222	WD8	3
30	K6XX	" 133	" 199	K6	↓
REST	OFF	0930		1230 = 3 HOURS	

EXAMPLE-2.

1979 WORLD-WIDE WPX C.W. CONTEST

CALL W1WY Log For 14 MHz Band COUNTRY U.S.A.

(MULTI-OP: Use Separate log for each band.)

Page 2 of 10 Pages

← 26 MAY

DATE / Time GMT	STATION	SERIAL NUMBER Sent	SERIAL NUMBER Received	Fill in only when QSO is mult. PREFIX	Points
0444	W1PM	599041	599015	W1	0
45	VE3BMV	" 042	" 083	VE3	2
50	KP4RF	" 043	" 083	KP4	2
52	HH2KQ	" 044	579032	HH2	2
0500	PP5CJT	579045	" 029	PP5	3
03	DA1GF	569046	" 051	DA1	3
04	DA1GR	" 047	" 050		3
12	UK9AAN	599048	569101	UK9	3
14	4W1B	569049	" 016	4W1	3
16	JA2DT	" 050	" 021	JA2	3
18	KL7HR	599051	599100	KL7	2
19	KH6IJ	" 052	" 088	KH6	3
26	W9LT	" 053	" 053	W9	0
30	K7RI	" 054	579049	K7	0
				TOTAL POINTS THIS SHEET	32 / 106

CQ Form 1069 eff. Nov. 1977

(Don Miller, W9WNV)

5. USA–Single Operator, Single Band. The Joe Johnson, W5QBM Memorial. *(Richardson Wireless Klub)*

6. USA–Single Operator, All Band. *(Bob Epstein, K8IA)*

7. CANADA–Single Operator, Single Band. *(Gene Krehbiel, VE7KB)*

8. CANADA–Single Operator, All Band. *(Garth Hamilton, VE2VY)*

9. WORLD–Club Competition. The Bud Abraham, VE1VR Memorial. *(Canadian DX Assn.)–SSB & C.W. logs.*

10. WORLD–QRPp. Single Operator only. *(Dayton Amateur Radio Assn.)*

11. WORLD–Contest Director's Plaque. To the Expedition especially organized and operated in the WPX/ SSB Contest that the Committee considers the most worthy. A minimum of three logs must be received in this category. *(Bernie Welch, W8IMZ)*

12. WORLD–Single Operator, 21 MHz., *(Lee Wical, KH6BZF)*

C.W.

1. WORLD–Single Operator, Single Band. *(Pedro Piza Jr., KP4RF)*

2. WORLD–Single Operator, All Band. *(Canadian DX Assn.)*

3. WORLD–Multi-operator, Single transmitter. *(Ron Blake, N4KE)*

4. WORLD–Multi-operator, Multi-transmitter. *(North Florida DX Assn.)*

5. USA–Single Operator, All Band. The Charles Rhines, W7VIU Memorial. *(Corker A. Rhines, W8EAO)*

6. CANADA–Multi-operator, Single transmitter. *(Tehrahedral Contest Circle)*

7. WORLD–Contest Director's Plaque. Expedition. Requirements same as for SSB. *(Bernie Welch, W8IMZ)* (Except for Contest Director's Plaques, the awards are for high score). WORLD Trophy & Plaque winners may win the same award only **once** within a two year period. This does not apply to any USA, Canada, or CQ Special Awards. (Watch W1WY's **Contest Calendar** for announcements of additional Trophy donors).

XII Club Competition: A trophy will be awarded each year to the club or group that has the highest aggregate score from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area. *(Exception: DXpeditions especially organized for operation in the contest and manned by members.)* Indicate your club affiliation. To be listed, a minimum of three logs must be received form a club.

XIII Log Instructions: 1. All times must be in GMT. The 18 hour non-operating periods must be clearly shown.

2. Prefix multipliers should be entered only the FIRST TIME they are contacted.

3. Logs must be checked for duplicate contacts and prefix multipliers. Recopied logs must be in their original form, with corrections clearly indicated.

4. A Prefix check list is not only desirable but a **must** for proper contest operation. (It is recommended that you also send it along with your contest log.)

5. Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition and the contestant's name and mailing address in BLOCK LETTERS.

Also a signed declaration that all contest rules and regulations for amateur radio in the country of the contestant, have been observed.

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

If official forms are not available you can make your own with 40 contacts to the page.

XIV Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts; unverifiable QSO's or multipliers will be deemed sufficient cause for disqualification. Actions and decisions of the **CQ** WPX Contest Committee are official and final.

XV Deadline: All entries must be postmarked no later than May 10, 1979 for the SSB section and July 10, 1979 for the C.W. section. Indicate SSB or C.W. on envelope. From rare isolated areas the deadline will be made more flexible. Your support is appreciated.

Logs go to: **CQ** WPX Contest Committee, 14 Vanderventer Ave., Port Washington, NY 11050 USA.

Please remember to send in early for the 1979 WPX Contest Logs and Summary Sheets.

This month by
ROD LINKOUS, W7OM

DX

News of communications around the world

MERRY CHRISTMAS AND A HAPPY NEW YEAR! *FELIZ NAVIDAD! FROHLICHE WEIHNACHTEN! JOYEUS NOEL! BUON NATALE! KELLEMES KARACSONYT ES BOLDOG UJEVET KIVANUNK! HAUSKAA JOULUA! S ROZHDESTVOM KHRISTOVYM! SHINNEN OMEDETO! GLAEDELIG JUL! NODLAIG MHAITH CHUGHAT! KULL AM WA ANTUM BEKHIR! WESOLYCH SWIONT! CHANUAKH LESINCHAH! ST'ASTNE VANOCE! CH'ING CHU YEH SU SHENG TAN!*

to DXers the world over from the staff of *CQ* DX Department.

5-Band WAZ

Last month's (December, 1978) DX column listed the rules for *CQ*'s new 5-Band WAZ. The starting date for this award is Jan. 1, 1979. If you don't have a copy of the December, 1978 issue, rush a self-addressed, stamped envelope to WAZ Award Manager Leo Haijsman, W4KA, for an application blank and a copy of the rules. Leo's address is 1044 Southeast 43rd. St., Cape Coral, FL 33904.

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

These 2 gentlemen, Julio Badin, CX6CW, and Andres Cervievi, CX1CU (left to right), manage the Uruguayan QSL Bureau. Any card sent to P.O. Box 37 in Montevideo reaches its destination through them. (Photo via CX2AQ)

DX Bulletins - We Need Them And So Do You!

The first issue of the new year is an appropriate place to express our appreciation to those who edit and publish the weekly and monthly DX publications which are so useful to us in preparing our column. A monthly DX column is no better than the information it receives, and we rely heavily on the DX bulletins.

It is also important for you, the individual DXer, to have a steady, reliable source of current information. The monthly magazines, such as *CQ*, go to press over 2 months prior to delivery to subscribers and the newsstands. Therefore, the monthly columnists cannot keep you up to date with the latest events in the world of DX and DXpeditions. All active DXers should subscribe to a bulletin which can provide timely DX news. At the present time, we receive the following, listed alphabetically with address and name of editor:

DX'Press - A.J. Dijkshoorn, PAØTO, Jan van Gelderdreft 11, 2253 VH Voorschoten, The Netherlands. Published by V.E.R.O.N., but DX portion is in English.

Grupo Argentino De C.W. - Alberto U. Silva, LU1DZ, Bolivar 1266, 1854-Longchamps, Buenos Aires, Argentina. (In Spanish.)

Long Island DX Association Bulletin - J. Harvey McCoy, W2IYX, P.O. Box 173, Huntington, NY 11743.

Long Skip - Alan Leith, VE3FRA, 53 Aquadale Drive, St. Catharines, Ontario L2N 3R9. Published by the Canadian DX Association.

Mail-A-Prop - George Jacobs, W3ASK, 11307 Clara Street, Silver Springs, Md. 20902.

North Florida DX Association News - Billy F. Williams, Jr., N4UF, 911 Rio St. Johns Drive, Jacksonville, FL 32211.

Eric Rogers, 9H4G, is Manager of the 9H4 QSL Bureau and Vice-Chairman of the Gozo Amateur Radio Society. Eric is retired, age 68, ex-G3HGX and holds Single Band WAZ, S.S.B. WAZ, S.S.B. WPX with 1000 prefixes confirmed plus the CQ S.S.B. DX Award with 275 countries confirmed. He has earned over 100 separate DX awards while running less than 200 watts.

160 Meter DX Bulletin - Stewart S. Perry, W1BB, 36 Pleasant Street, Winthrop, MA 02152

The DXer - Published by the Northern California DX Club for its members only. The address is withheld at the club's request.

The DXers Magazine - Gus Browning, W4BPD, P.O. Drawer DX, Cordova, SC 29039.

The Totem Tabloid—A1 Clark, K7UR, Western Washington DX Club, 6792 Beach Drive, S.W. Seattle, WA 98136.

West Coast DX Bulletin - Publisher Hugh Cassidy asks that the address not be printed at this time as the subscription list is full. Borrow a copy from a neighboring DXer.

DXpedition "Caribe 78"

"Caribe 78" by Alex, W1CDC, and Mac, WA1ZSW, went off on schedule in July and August using the calls PJ8USA from Sint Maarten and VP2MBC from Montserrat. The first contacts were made via the Oscar 7 modes A and B, all using high speed c.w. Over 105 contacts were logged via Oscar with stations in Europe and the Americas. Operations on 10, 15, 20, and 40 meters tallied 3200 contacts, mostly on c.w. A special effort was made to work stations in the far east. Planned operations to Anguilla and Guadeloupe were cancelled due to a menacing tropical depression. See accompanying photograph.

LU3ZY - South Sandwich Island

A scientific base has been established on rare South Sandwich by an Argentine Navy group. An amateur station, LU3ZY, is a component of the expedition and is reported to be active on c.w. (Tks LU1DZ)

Here and There

New Canadian Checkpoint - The DX Department is pleased to announce that Howard Martin, VE7AFY, has joined the CQ DX Awards Advisory Committee as representative of the Fraser Valley DX Club in British Columbia. Marty has been an active DXer for 7 years, is president of the club and has been the VE7 QSL Bureau Manager for the past 2½ years. He will be able to verify cards for Canadians in the western provinces who wish to apply for WAZ and the *CQ* DX Awards. His address is #45-9960 Wilson Road, Ruskin, British Columbia V0M 1R0 Canada.

Allen R. Friedman, K6YRA - Is the first W/K amateur to qualify for Single Band WAZ on 15 meters. He qualified for certificate #7 on Sept. 26, 1978. Al was first licensed in 1957. He is ex-W9YRA on the *CQ* Honor Roll and also earned Single Band WAZ on 20 meter s.s.b. He has worked all the countries except VS9K and has 316 confirmed on the *CQ* S.S.B. Honor Roll. He uses Drake equipment to a 3-element, 15 meter beam up 62 feet.

Al is a member of the Southern California DX Club and is employed as Store Manager for Ham Radio Outlet in Van Nuys, California.

SM0GMZ, QSL Manager for VU2TS - Reports that he has been unable to get logs from Ganesh for several months and cannot send any more QSLs until the logs are received. Be patient please.

WAZ Manager, Leo Haijsman, W4KA- Was on a trip to Singapore, Hong Kong, Japan, Manila, Nepal, India and Thailand during the period Oct. 25 -Nov. 25. As a result Leo may be a tad behind on checking WAZ applications. If so, hang in there because he'll catch up soon. Leo is a real workhorse.

Jorge Vrasalovich, LU7XP, age 50, is the active DXer from Tierra del Fuego at the southern tip of South America. Jorge uses a Yaesu FT-101B and an FL-2000B linear to a 3-element beam and has confirmed over 200 countries on c.w.

VR6TC - Dr. Charles M. Moser, W6HS, is now QSL Manager for Tom Christian and will make skeds for those who need Pitcairn. Small contributions for the fund which supplies gasoline for the generator will be greatly appreciated. W6HS has a new QTH. You can reach him at 10861 Langdon Ave., Mission Hills, California 91345. As always, include a self-addressed, stamped envelope with your QSL.

7Q7BC - Malawi has been off the air for some time due to political reasons. However, if you worked 7Q7BC before the blackout he will be happy to supply you with a QSL. Send your card to Peter A. Conway, P.O. Box 5595, Limbe, Malawi, Africa, with a self-addressed envelope and IRC's. *Do Not Put His Call Letters or Your Call Letters On The Envelope* as amateurs are off the air in Malawi by government decree.

The QSL Manager

Several interested readers have recently asked for more information on the duties and responsibilities of a QSL Manager, and on the route to follow in becoming a QSL Manager. The following info was provided by *CQ*'s WAZ Manager, Leo Haijsman, W4KA, who is himself an outstanding QSL Manager and a good all-round DXer.

"The D.X. Fraternity has been blessed for many years by the availability of excellent QSL Managers for many rare D.X. stations. There is no better way to insure receiving a D.X. QSL card than through one of the many QSL Managers, in the United States and

The "CARIBE '78" DXpedition shown at Spanish Point, Montserrat, location of VP2MBC. Right to left are Alex, W1CDC; Joseph Skerritt, Telecommunications Officer; his assistant, Errol Martin, VP2MO; and Mac, WA1ZSW. The VP2MBC operation was visited by these officials from the Ministry of Communications and Works which is the department of government which issues licenses on Montserrat.

If you worked rare Fernando de Noronha Island in May, 1978 it was this man, Carlos A.T. Albuquerque, PY7OD, of Recife, Brazil who was operating from the island at that time. The QSL Manager for the operation is Frank Rogers, WA4MDS, 2835 Woodland Park Drive, NE, Atlanta, GA 30345.

overseas. The number of QSL Managers worldwide exceeds 2500, of which about 1500 are U.S. amateurs who put in many hours of time serving the D.X. cause.

"Let us begin by stating that the monetary compensation received by a QSL Manager is absolutely nil. However the big compensation to all QSL Managers is the realization that they are performing a very special type of work to a select group of amateurs, although if you listen to the language used in some of the pile up's you may wonder where this select group left their courtesy and regard for their fellow amateurs. Even with this unique characteristic, we find that these same amateurs are human and that once the D.X. bug bites it sometimes implants in one booth a zeal and zest that is somewhat hard to control, when a rare D.X. station is on the air.

"If you would like to join the QSL Managers group, where hard work and often long hours produce only the sense of being of service, we could recommend that you contact one or more of the following organizations:

Pat, KV4CI, plans to discontinue QSL-ing in the near future. After 50 years he is becoming weary of signing cards and says it is time to retire. After Jan. 1, 1979, he will only QSL his 160 meter contacts.

1. C.Q. Magazine—14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050
2. West Coast D.X. Bulletin—77 Coleman Drive, San Rafael, CA. Zip: 94901
3. American Radio Relay League—225 Main Street, Newington, Conn. Zip: 06111
4. Geoff Watts (D.X. Bulletin)—62 Belmore Road, Norwich, NR-7 OPU England
5. Long Island D.X. Association—P.O. Box 173, Huntington, N.Y. Zip: 11743
6. J.A.R.L. (Japan)—P.O. Box 377, Tokyo, Japan.

"The D.X. column written by John Attaway, K4IIF, *CQ* D.X. Editor, has a section in his column devoted to QSL Managers, and QSL'ing in general. K4IIF pioneered the idea of a printed register for those interested in becoming QSL Managers. The July issue of *QST* page 57 is a good example of, stations who want to be QSL Managers, this information is under the heading "Potential QSL Mangers" ".

"While waiting for a D.X. station to request your services, it is recommended that you carefully consider the manner in which you will perform the QSL service and establish a fixed pattern of operation.

"After being contacted by a D.X. station, I have found that in my reply accepting his request I should include information on the following items:

1. A discussion of my personal amateur activites.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of current countries on the DXCC list as of this listing is 319*. Honor Roll listing is automatic when submitting application or endorsement for 275 countries. To remain on the *CQ* DX Honor Roll, annual updates are required. Honor Roll updates may be submitted any time, in any number. Updates indicating "no change" will be accepted.

C.W.

W6PT	317	DL7AA	311	W2GT	305	K9MM	296	K4CEB	287
K6EC	315	W8KPL	309	N6AV	303	DL3RK	295	N6CW	281
ON4QX	315	K6JG	306	W4BQY	301	WA8DXA	290	DJ7CX	280
W6ID	314	W9DWQ	306						

S.S.B.

K2FL	317	W4SSU	312	SM5SB	307	WD6DXU	299	W8ILG	285
WA2RAU	317	I0ZV	311	W6YMV	307	N4MM	297	N6AW	284
K6YRA	316	W6EUF	311	OE2EGL	306	W9SS	297	W7OM	284
W2TP	316	W9QLD	311	VE2WY	306	F9MS	295	I3LLD	283
I0AMU	315	K6EC	310	ZS6LW	306	N6AV	295	JH1VRQ	282
W9DWQ	315	SM6CKS	310	W0SD	303	DK6KG	293	K3EH	282
W9JT	315	W4UG	310	YV1KZ	303	JH1EIG	293	OK1MP	281
G3FKM	314	K6JG	309	ZL1AGO	303	DJ9ZB	292	W7JYX	281
W4EEE	314	K6WR	309	DK2BL	302	K9RF	291	K8LJG	280
I8KDB	313	WA2EOQ	309	W0SFU	302	VE7CE	290	WB2RLK	280
VE3MJ	313	F2MO	308	EA4LH	301	W6FET	290	VE7HP	280
XE1AE	313	I8YRK	308	VE3GMT	301	DJ7CX	288	9H4G	279
F9RM	312	K9MM	308	I5WT	300	OE3WWB	288	DJ2AA	276
K4MQG	312	W4DPS	308	HP1JC	299	YS1O	286	K9PPY	276
VE3MR	312	ZL3NS	308	K6XP	299	W4MWT	285	VE3FJE	276
W3AZD	312	OZ3SK	307						

S.S.T.V.

W8YEK	108	G3IAD	110

*ST0 - Southern Sudan and 4U1 - United Nations added this list.

The WPX Program

Mixed

676	N5FG	678	DL7JK
677	N5RR	679	K0VSX

S.S.B.

1082	IS0NZA	1084	PP8DD
1083	KL7AF		

C.W.

1724	EA7AAW	1729	9H1ED
1725	OK1JMW	1730	I5IRM
1726	JA2TK	1731	W7XN
1727	DM4FZM	1732	JE1JKL
1728	KL7AF		

WPNX

123	WN4KKN	124	KP4EQF

Endorsements

Mixed....400 DL7JK. 450 PA0ASD, K0ZFL. 500 N5FG, OE1JKW. 600 W6LC, N5RR. 650 W2HAZ, K4ZYU. 700 VE7IG, W1CNU, CX9CO. 1050 W8CNL. 1500 VE3GCO. 1600 YU2DX.

SSB.....300 IS0NZA, KL7AF, PP8DD. 400 I1RYS. 600 VK3SM, K8LJG. 650 CX9CO. 1100 K2VV. 1300 I8KDB.

CW.....300 EA7AAW, OK1JMW, JA2TK, KL7AF, 9H1ED, W7XN. 350 OK1DVK, DM2BYJ, I5IRM. 400 K6ARE, DK8NM. 450 OE1KJW, VE7CNE. 500 OK1DKW. 550 K4CK. 600 JE1JKL, N6UH. 650 LZ1XL. 800 VE1MF. 950 K2VV. 1300 DL1QT. 1400 W8KPL.

15 meters...HI8MOG
20 meters...KL7AF
Africa: K8LGJ, W8CNL.
Asia: K8LJG, CX9CO, N5RR, KL7AF, EP2TY, W8CNL.
Europe: N5RR, DL7JK, PA0ASD, KL7AF, W8CNL.
No. America: KL7AF, GM4DKO, W8CNL.
Oceania: N5RR, N5FG, W8CNL.
So. America: K8LJG, W8CNL.

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

2. Log data, (when to forward)
3. QSL printing and who will pay for the cards
4. Extra cash for postage needs
5. Where should QSL cards be sent
6. Who will notify organizations of the new QSL Manager relationship.

Let us discuss each of these 6 items in more detail.

"In the matter of getting acquainted I find it desirable to give the D.X. Station a thumb nail history of myself, my D.X. accomplishments and a sentence on the family and the station facilities. As an added gesture I generally supplement the letter with a picture of myself at the rig.

"After we are aquainted I make the following suggestions on how we should coordinate our activities. If he is an active amateur, I suggest that logs be forwarded to me every 2 weeks, and I feel it is imperative that the log sheets be numbered. If he is only moderately active I recommend that the logs be forwarded every month, and that all logs go via air mail. The next most important item of course will be his QSL cards. I usually send a sample copy of a QSL card that I am now using and ask him approve it or make what changes he may wish to make. At that time I also suggest that the QSL cards be printed here in the States as the price will generally be lower than across the pond. For an active D.X.'er it is recommended that 2,000 cards be printed, whereas for an average D.X. Station 1,000 cards should last a long time. When replying, advise the station the approximate cost of the QSL cards and suggest that an extra $5.00 or $10.00 be included to pay for postage to those non-deserving amateurs who do not include an SASE with their QSL cards.

"As for the QSL card itself, the cardinal rule is *Keep Them Simple*. This I can not stress enough." One side is a must, however, if you insist on a card printed on two sides, be sure the call letters are on both sides of the card. Most awards, including WAZ, WPX, and DXCC are only concerned with the log data. Preferably the data should be arranged across the card by: Station, date, GMT (time), band RST and mode. When a QSL Manager has a number of cards to process, it is imperative that the cards be simple. An example of a card which is easy to process is the one I now use for Station 9K2FX, reproduced here for your information. With more and more stations applying for the worked all zones award, it is recommended that the zone be shown on the card.

"It should be suggested to the D.X. Station that he have all U.S. and foreign QSL's come direct to you, his QSL Manager. This will relieve the D.X. Station of the burden of mailing the cards to you. However, as an emergency measure I generally send about 100 cards to the D.X. Station for him to use in replying to cards which come to him direct.

"In your first letter also state that you will notify amateur publications and the D.X. Associations that you are his QSL Manager. The organizations you should notify are the same as those you contacted, when you offered your service as a QSL Manager: For example: *CQ* Magazine, *QST* Magazine, etc. I find it very desirable to send the D.X. Station a supply of address labels, not the small variety, but your complete address on a 1 x 3 adhesive label, and be sure to type on each the words United States.

"Last but not least, in your letter make it very plain that you as his QSL Manager will not send out QSL cards unless the calls appear in his log sheets. It is surprising to note in this connection that of the hundreds of QSL cards I have processed, seldom do I find one that is not in the log.

Some Dont's of a QSL Manager

1. Never send out a QSL unless the call letters are in the log.
2. Never send out a QSL unless one is first received.
3. Never guess at the data in the log (return log for confirmation)
4. Never send out a blank QSL card to anyone.

It is the prime responsibility of the QSL Manager to make out an ac-

The WAZ Program
Single Band WAZ
15 Meter Phone

7...K6YRA (First U.S. Station to get this award)
8...N4YD

20 Meter Phone

168...VE7DEN
169...VE3AKK
170...AA4VK
171...WA6WZO
172...G4CHP

20 Meter C.W.

57...W2LZX

40 Meter C.W.

8...JA8EAT

ALL BAND WAZ
S.S.B.

1521...WA7SLC
1522...WA4ZLP
1523...EA3OJ
1524...WB0RTZ
1525...DL3UH
1526...DK9KD
1527...F6BDS

C.W.-Phone

4347...W6TC
4348...N2UN
4349...VE3CXL
4350...WB6NJW
4351...ZP5RS
4352...JA4VAD
4353...K8NW
4354...AB0X
4355...YU4VKR
4356...K4SXD
4357...SM7FWZ
4358...W9NO
4359...JR1FYS
4360...DK2SZ
4361...DK8KS
4362...LZ2JF
4363...DK7BJ
4364...YU3AE
4365...K2IGW
4366...JA1PIG/PZ
4367...K9UTS

All Phone

546...DL1EY

The complete rules for WAZ are found in the May, 1976 issue of CQ application blanks and reprints of the rules may be obtained by sending a self-addressed stamped envelope to the WAZ Manager, Leo Haijsman, W4KA 1044 Southeast 43 Street Cape Coral, Florida 33904. Applicants forwarding QSL cards direct to the WAZ Manager, should include sufficient postage for the return of the QSL cards.

Dr. Harry Cincura, OK3RA, is a pediatrician and DXer in Samorin, Czechoslovakia. Harry's favorite leisure activity is DX and Contests and the CQ Worldwide DX Contest is his favorite. He was the first OK to earn the USA—CA award. Harry uses an FTDX-505 exciter to a homebrew linear and a 2-element cubical quad at 12 meters. He is 46 years young. (Photo courtesy K6XP)

The CQ DX Committeeman in the maritime provinces of eastern Canada is Stan parsons, VE1RY/of above Riverview, New Brunswick. OM Stan can check QSLs for Canadians applying for WAZ, Single Band WAZ or the CQ C.W. and S.S.B. DX Awards. Jack Reed, VE3GMT, continues to be on the Committee and is the most convenient checkpoint for central Canada, while Howard Martin, VE7AFY, is now handling the western reaches of VE-land.

curate card. It is my policy to check the log the second time before placing the card in the envelope. An additional responsibility of a QSL Manager is to process the cards in a reasonable length of time after the logs are received. I feel that two weeks is a reasonable length of time to process the cards after receipt of the logs.

"Many QSL Managers sign the QSL cards as Bill, Joe, or Leo. I see nothing wrong in this procedure and I am sure the cards are just as valid as a full signature. However, at my Station I generally prefer to sign my full name.

"If you have an active DX Station you may receive many QSL cards prior to the receipt of the log sheets. I find that if I arrange the incoming QSL cards in accordance with the date of the cards, then when the log sheets are received they are much easier to process. This system saves a lot of time.

"It is not normally recommended that a QSL Manager monitor his DX Station and then issue the QSL card from the date he secures off the air. It is preferred to use log sheets for all QSL'ing. This method prevents most errors.

"QSL Managers who receive a copious reply from amateurs who do not include an SASE may consider the distribution of these cards by one of several methods.

1. Private QSL Bureaus
2. ARRL Outgoing QSL Bureau

Several excellent private QSL Bureaus are, W3KT Malvern, Penna: W1EP Raynham, Mass. and W7IZH of Tuscon Arizona. The charge is generally about 5 or 7 cents per card and considering the high rate of current postage, this is an economical way of card distribution. However, during the past year ARRL Headquarters established an outgoing QSL service. This service has been outlined in past issues of QST Magazine. Bob White, W1CW, administers the program and you can send your QSL cards to him with $1.00 and a wrapper from your QST Magazine. This service is available 12 times per year, and there is no limit to the number of cards sent during any one month. The only request is that all cards should be sorted in accordance with country prefix. An additional service this route provides is that all W and VE cards will also be accepted for distribution, since you represent a foreign DX Station. When using this service don't forget your SASE to Bob White. He will acknowledge your cards and indicate when distribution is expected.

"When IRC's (International Reply Coupons) are received by a QSL Manager it has a tendency to slow down your processing. My experience is that amateurs in Japan and most European countries have access to the U.S. 31 cent air mail stamps which really speeds up the processing of cards. For the information of those who are not to familiar with IRC's, these coupons about 3 x 4 inches in size are available at local post offices at a price of 42 cents in the states. Any IRC, United States or foreign, can be redeemed at your local post office for one stamp for the surface mail, which now means a 20 cent stamp. As most DX amateurs know, IRC's are good only in those countries who are signatories to the universal postal union. An IRC purchased several years ago for 15 cents can now be redeemed for a 20 cent stamp. IRC's United States or foreign carry no expiration date. Many of the small countries of the world, including many of the Pacific Islands do not recognize IRC's for postage, as stated above, because they are not signatories to the universal postal union.

"After you are an established QSL Manager it is also suggested that you notify several publications which print QSL Manager lists.

1. WB0MSZ publishes an IBM list.
2. DJ9ZB publishes a 38 page QSL Managers book.
3. The "*CALL BOOK*," Lake Bluff, Illinois, also has a listing of U.S. and foreign QSL Managers.

"Probably one of the best known QSL Managers of recent years is W3HNK, Joe Arcure, who has felt the sense of duty to the DX Fraternity and has given freely of his time and efforts. Joe is currently Manager for more than 100 DX Stations, and needless to say is doing a 100% job in every respect. However, the QSL Managers duties are by no means limited to the OM's as we must acknowledge the fine job being done by Mary Ann Crider, WA3HUP. Mary is an ardent member of the International Single Side Banders Group and acts as QSL Manager for some 30 DX Stations, this is all in addition to keeping a household and family.

The CQ DX Awards Program

S.S.B.

599...WD8AHS
600...W4MWT
601...VK3AKK
602...G4CJQ
602...TG8NE
604...TD76GI
605...WB8ZRL
606...K0HSC
607...VE3FJE
608...W2RS
609...W9JT
610...WB6NJW
611...K0GT

C.W.

324...WB4RUA

S.S.B. Endorsements

310...K2FL/317
310...K6YRA/316
310...W9JT/315
310...I8KDB/313
310...W9QLD/311
310...K6EC/310
300...K9MM/308
300...VE2WY/306
300...W0SD/303
275...VE7CE/290
275...W4MWT/285
275...VE3FJE/276
200...VK3AKK/220
200...WB0RTZ/200
150...K0HSC/151
150...K0GT/150
150...WB6NJW/150
3.5/7MHz...W2RS

C.W. Endorsements

310...K6EC/315
310...W6ID/314
300...K6JG/306
275...K9MM/296
275...K4CEB/287
3.5/7MHz...W2RS

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

QSL Information

CE9AT - Via CE2BIO, Antarctic Dept., Naval Postoffice, Valparaiso, Chile
C31NM - To PA0GIN
C31QR - c/o PE0MOT
CM2HB - Via ON5YL
CN8AK - To WA3HUP
CO2HZ - c/c P.O. Box 1, Havana, Cuba
DF1CF/OH0 - Via Box 395, APO, New York, N.Y. 09611
EI43BUN/OD5 - To U.N. Peace Keeping Forces, Beirut, Lebanon
EL2EU - c/o W3HNK
EP2MS - Via W8CXS
EP2SL - c/o G3XCS
F0DUL/FC - To DK6AS
FB8XS - c/o F5VU
FM7WU - Via R.E.F., 2 Square Trudaine, 75009 Paris, France
FP8DX, FP8ML and FP8HL - c/o R.E.F.
FP8DH and FP8YY - Via K9OTB
FR7BU/P - To F6EQN
FY0EOL - c/o R.E.F., 2 Square Trudaine, 75009 Paris, France
H44CD - Via W4BAA
HB0AIC, HB0BNP & HB0NL - To HB9AIC, HB9BNP & HB9NL, respectively.
HC2TI - c/o P.O. Box 6627 Guayaquil, Ecuador
HG8RTT - Via HA8UD
HH5DX & HH5HR - To P.O. Box 524071, Miami, FL 33152
HK0BBF - c/o Box 133, San Andres Island, Columbia
HZ1BS/8Z4 - Via DJ9ZB
IA5DMK - To I2DMK
J3AJ - c/o W3VW
J28AY - Via F6ETO
JG1DUN/JD1 - To JH1FSF
K4IIF/TF3 - c/o W4KA, 1044, Southeast 43rd. St., Cape Coral, FL 33904
KC6MK - Via Box B, Ponape, Eastern Caroline Islands, 96941
KM6FC and KM6FD To Box 100, FPO, San Francisco, CA 96614
KP4ERI - c/o W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904
KV4KC - Via W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904
LU1NR - To P.O. Box 207 Santiago, Argentina
LU1OB - c/o P.O. Box 449 Salto, Argentina
N0TG/KP1 - Via Randy Rowe, **N0TG, 3237 Connecticut Ave., St. Charles, MO 63301**
OH0AL - To Toiva Sorvali OH2AL, Siimakuja 3, SF-00720 ¢Helsinki, Finland
OJ0MA - c/o OH0NA
PJ2PE - Via Box 363, Curacao, Netherlands Antilles
SU1AL - To Loufty Morsy el Mahdy, 13 Giza Street, -72 Giza, Egypt
ST2SA - For operation by K5YY, QSL to K5YY. For regular ST2SA contacts QSL to DJ9ZB
ST0RK - c/o DL7FT
ST0YY - K5YY
SV1JH - To DJ9ZB
TA1ZB - c/o I8YCP
TF3US - Via P.O. Box 1058, Reykjavik, Iceland
TR8RG - To DA1CZ, A. Bell, Zugspitzerstrasse 42, D-8013 Gronsdorf, West Germany
VE1MTA - c/o Upper Air Station, Sable Island, P.O. Box 40, Elmsdale, Nova Scotia BON 1MO, Canada
VK0AS - Via VK3ZAT, 340 Gillies St., Thornbury, Victoria, 3071, Australia
VO1LX/SU - To VE3IWI
VP2ECW - c/o WB4BQZ
VP2EKK - Via WA3HUP
VP2ER - To WD4BRE
VP8MX - c/o GM3ITN
VR3AK - Via KH6AHZ, Box 30323, Honolulu, HI 96820
VS5XU - To DL1LD
WB6BRW/OZ - c/o Box 395, APO, New York, NY 09611
W0ZH/KP1 - Via Randy Rowe, N0TG, 3237 Connecticut Ave., St., Charles, MO 63301
XE1CCK - To Box 717, Puebla, Mexico
YB3KA - c/o J. Sotyakantjana, P.O. Box 27, Surabaya, Indonesia
YS1GMV - Via W3HNK
YS1RVE - To WA0JYJ
ZB2BU - c/o Box 292, Gibralter
ZB2EE - Via WA6RT
ZD8RG - To K8VIO
4D88UT - c/o JA1UT
4S7DA - Via W3HNK
4S7EA - To WB9OQU
5H3FW - c/o DF4TA
5Z4OL - Via N4PF/WB4UAN
5Z4PW - To Box 14445, Nairobi, Kenya
5Z4RT - c/o I8JN
6Y5KG - Via VE3KGK
8R1R - To P.O. Box 25, Georgetown, Guyana
9G1JI - c/o Box 1835, Kumasi, Ghana
9H1ED - To WA1YYX
9M2FK - Via YU4HA
9V1TK - To JA6RIL

73, John, K4IIF

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The January, "Story of The Month" courtesy of Bill, W7GHT is:

Charles "Bud" Heap, W7WVD All Counties #139, 11-14-75

"Charles (Bud) Heap, W7WVD was born March 13, 1932 in Emmett, Gem County, Idaho. His father was a logger, so the family lived near the work-namely in the "boonies" of Idaho. Bud's schooling was in small communities. Unfortunately while a high school senior in Garden Valley, Idaho, he contracted polio. Nevertheless he completed his high school education, but only while he was in the hospital and in an iron lung.

Special Honor Roll

All Counties

#194 James J. Freeman, WB2NHP 9-19-78
#195 Eric S. Johnson, WA9ZRP 9-29-78

Among other things, Bud lost the use of his legs and his ability to breathe properly, due to the polio disease. He must rely on iron lungs, portable or fixed, or pumping devices, without these, any respiration is by "gulping" air.

Bud's illness prompted his father to purchase a bulk oil distributorship in Emmett and to move the family there. In 1955 the three amateurs that lived in Gem County demonstrated amateur radio to Bud. They loaned him books to study and equipment to play with, while someone else bought Bud a little pistol-light with the code printed on the side. Bud learned the code by pulling the trigger and pointing the pistol-light at the ceiling, after his parents were in bed! Bud was licensed WN7WVD in 1955, he dropped the "N" the same year.

In 1959, Bud's father was killed in a traffic accident. That same year, doctors told Bud he should move from Emmett (½ mile high) to sea level where breathing is easier. Since Bud had relatives in Costa Mesa, California, he made arrangements to move there and to enter San Diego College. About that time a local gal was hospitalized, the victim of an automobile accident. That accident resulted in the lose of the use of her lower extremities. Bud and Delores saw a lot of each other, and they promised they would marry as soon as Bud graduated from college.

Instead of entering college, Bud went to work for his cousin in Costa Mesa as an office manager and bookkeeper, he did his hamming as WA6HLR. Things went well so he sent for Delores.

Twelve years later, the doctors advised Bud to quit work or die. One day, Bud casually suggested to Delores that he might follow this advice and return to Idaho. Delores started packing immediately!

In July 1972, Bud happened to hear two County Hunters on the 75 meter band. They were W7SUY (All Counties #134, now N7SU) and W7VSE. They seemed real friendly and invited him to join the CH group, and that started it all for Bud.

His last County came at a time he had been in bed with flu. Frank, WA4UPW called long distance and arranged to give him Hyde, North Carolina on October 23, 1975 - Frank traveled in excess of 100 miles one-way to accomplish this. Bud says the signals were fine until immediately after the QSO and then Frank dropped right out of the picture.

Those who attended the Northwestern Mini in August 1976 remember Bud and Delores as perhaps the most friendly, cordial and congenial couple associated with County Hunting, the Mini was held at their home.

Bud, W7WVD showing his portable lung, and another breathing device. The big lung is in the background,, also his hoisting paraphernalia.

Awards Issued

Jimmie Freeman, WB2NHP received USA-CA-500 #929 in 1973 and he finally got around to finish them *all*, endorsed all SSB.

Eric Johnson, WA9ZRP was issued USA-CA-500 endorsed all SSB, all 20, all 75, all Mobiles. USA-CA-1000 and 1500 endorsed all SSB, all 20, all mobiles. Also USA-CA-2000 through all, endorsed Mixed.

Bea Dietz, WA2GPT raised her endorsement for her All counties #137 to all SSB, all 20, all mobiles.

Fred Kamp, W5UMD did well and won USA-CA-500 through USA-CA-2500 endorsed all SSB.

Ron Toller, W4MNZ claimed USA-CA-2500 endorsed all 2XSSB.

Bob Robertson, N5QQ (ex WA5TPO) obtained USA-CA-1500 and 2000.

Larry Taylor, AC2J (ex WB2PMO) was issued USA-CA-1500 endorsed all SSB.

Nathan Rosen, W2-6893 qualified for USA-CA-1500.

Bill Grim, W0MHK made USA-CA-1500.

Jim Clary, WB9IHH sent for USA-CA-500 endorsed all CW.

Patrick McNamara, EI9CB had me send him USA-CA-500 endorsed all 2XSSB, #1 Award to EI.

Paul Clement, K1TOL who was sent USA-CA-500-#1149 endorsed all 50 MHz., #14 Award all 50 MHz., then received all Phone and now received #1 endorsed all SSB.

USA-CA Honor Roll

3000		2000		1000	
WB2NHP	214	N5QQ	321	WB2NHP	495
WA9ZRP	215	WB2NHP	322	W5UMD	496
2500		W5UMD	323	WA9ZRP	497
WB2NHP	271	WA9ZRP	324	500	
W5UMD	272	1500		W5UMD	1274
W4MNZ	273	N5QQ	375	WB9IHH	1275
WA9ZRP	274	AC2J	376	WA9ZRP	1276
		WB2NHP	377	EI9CB	1277
		W2-6893	378		
		W5UMD	379		
		WA9ZRP	380		
		W0MHK	381		

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

Awards

May I repeat: CQ Awards & Custodians are:

Worked All Zones (WAZ): Leo Haijsman, W4KA, 1044 Southwest 43 Street, Cape Coral, Florida 339904.

Prefix Awards: WPX, VPX, WPNX: Robert Huntington, K6XP, 5014 Mindora Drive, Torrance, California 90505.

CQ DX AWARD: Rod Linkous, W7OM, 5632 47th Avenue S.W., Seattle, Washington 98136.

United States of America Counties Award (USA-CA) Ed. Hopper, W2GT. P.O. Box 73, Rochelle Park, N.J. 07662.

Note: For full data on these *CQ Awards,* send s.a.s.e. to CUSTODIAN.

HAROAA Awards and Certificates:

General rules are:

1. The Awards are of high quality and will make a very nice addition to any radio room.
2. The Awards are available to all licensed amateurs and amateur stations.
3. Each application should be accompanied by two (U.S.) dollars ($2.00) to cover postage, handling, and award costs. Payment may be made by cash, check, IRS, or USA stamps. DX applications please use IRCs.
4. Please do not send QSL cards. A list showing full details of the contacts (log information) should be certified by one other amateur or radio club officer. Photocopies of your QSL cards or original log will also be permitted.
5. At your request, special endorsements will be added, such as: CW, SSB, All YL, QRP, RTTY, SSTV., One band, etc. If you so desire, you may request separate awards for each special endorsement.
6. Contacts may be made over any period of years. Contacts made through repeaters cannot be used. Satellites permitted.
7. Please pass this award information along to another amateur or post at your local club meeting.
8. All correspondence or applications should be sent to: HAROAA, P.O. Box 341, Hinckley, Ohio USA 44233.

HAROAA DX Award.

HAROAA Great Lakes Award

HAROAA DX Award: This is obtained by working DX stations. It is the number of stations worked that is important. Each DX station counts as one, even if several are from the same country or area. Special endorsements for this award are: 10/25/50/75/100/20 and 500 DX contacts.

Great Lakes Award: This requires one contact with each state bordering the Great Lakes: New York, Pennsylvania, Ohio, Michigan, Indiana, Il-

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No antenna tuner needed–Full legal power limit–Fully assembled and ready for operation–No radials required–1:1 VSWR to 50 OHM coax.

MODEL	Band	Ht	Price
TV-215	20 15	13'	$34.95
TV-4215	40 20 15	22'	$44.95
TV-84215	80 40 20 15	30'	$69.95

HIGH PERFORMANCE COMPACT VERTICAL ANTENNAS
Uses "top loading for reduced size and maximum efficiency–No antenna tuner needed–Folds to 5' package.

Model	Bands	Ht	Price
CV-160	160	23'	$44.95
CV-80	80	20'	$39.95
CV-40	40 15	15'	$34.95
CTV-8040	80/40/15	20'	$59.95

FULL SIZE VERTICAL ANTENNA
Full quarter wave which can be configured for 20, 15, or 10 – No coils or traps No tuner needed–VSWR less than 1.2:1 over each entire band–Folds to 5' package

Model	Bands	Ht	Price
FV-201510	20 15 10	16'	$29.95

APARTMENT-PORTABLE-TRAILER AV-1 ALLTENNA
Use portable antenna anywhere– Mounts on window sill or patio railing–Solves landlord problems – 80-10 meters – Change bands by switching preset inductance–Adjustable to 1:1 VSWR at any frequency–13' manimum extended height–light weightunder 10 lbs. Use on travel campers and vans–Mounts easily on ground post(included) or on side of camper or van–No antenna tuner needed–Full legal power limit–Fully assembled & ready for operation–No radials required–Folds to 5' package for easy storage.

Model	Bands	Ht	Price
AV-1	80-10	13'	$49.95

Z-1 BALUN $9.95
1:1 ratio, takes place of center insulator helps eliminate TVI, coax fitting, full legal power.
A-1 Center Insulator $4.95
with antenna orders:

RG58AU & connector	50'	$5.95
	100'	$9.95
X8 Aluminum Radial Wire	100'	$3.99
Nylon Guy Rope-450# test	100'	$3.49

FULL SIZE DIPOLES

Model	Bands	Lgth.	Price
D-80	80/75	130'	$31.95
D-40	40 15	66'	$28.95
D-20	20	33'	$26.95
D-15	15	22'	$25.95
D-10	10	16'	$24.95

FULL SIZE PARALLEL DIPOLES–ONE FEED LINE

PD8010	80/75 40 20 15 10	130'	$41.95
PD4010	40 20 15 10	66'	$35.95
PD8040	80/75 40 15	130'	$36.95
PD4020	40 20 15	66'	$30.95

LIMITED SPACE DIPOLES

SP-160	160	130'	$41.95
SP-80	80/75	63'	$33.95
SP-40	40 15	33'	$30.95

NEW MSP8010 ALL BAND DIPOLE SYSTEM

MSP-8010	80-10	69'	$49.95
MSP-1	80/75 40 15	70'	$41.95

TRAP DIPOLES–Rated legal limit

TD-160	160 80/75 40	104'	$45.95
TD-8040	80/75 40	78'	$43.95
TD-4020	40 20	40'	$38.95

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Same coils as the SP & MSP series– use with your own antenna–complete instructions.

S-160	160	130'	$14.95
S-80	80/75	63'	$13.95
S-40	40 15	33'	$12.95

TRAPS ALONG–Complete instructions

T-160	160 80	104'	$17.95
T-8040	80/75 40	78'	$15.95
T-4020	40 20	40'	$12.95

(Dipoles are complete with balun, No. 14 antenna wire, insulators, 100' nylon support rope, rated for full legal limit. Can be used as inverted V, MARS, SWL).

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Balun or Connector	1.00
Traps and Shorteners	1.50
Parcel Post add	2.00
APO add	3.00
Mexico and Canada add	4.00

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Please send all reader inquiries directly

linois, Wisconsin, and Minnesota.

Insomnia Award: This award is earned by communicating with one other amateur radio station for a minimum of one hour between the hours of 1:00 and 5:00 AM. A super conversation piece for your shack. More HAROAA Awards next month.

The Fraser Valley DX Club Award: Canadian and U.S. stations must work 15 members of the FVDXC. Rest of the world must work 5 members of FVDXC. Canadian and U.S. send one dollar ($1.00), rest of the world send one dollar ($1.00) or 5 IRCs. Send log information only, show date, time, call sign, name, frequency, and mode to: FCDXC P.O. Box 3112, Langley, B.C. Canada V3A 4R3. Membership of FVDXC includes-VE7s ADC, AFY, AIO, AKH, AQC, AUF, AUZ, AVA, AVM, AVW, AZA, AZC, AZG, BBQ, BCP, BJM, BSM, BVF, CBM, CC, CEK, CGR, CGY, CIO, CJG, CMC, CMD, CMN, CML, CMZ, CNY, CXE, SZ, TB, TT, WJ, XQ, HV, CMK, CKW, FY, BUS, AAR, KE YD, YQ, CMF, MP, BTV, CMO, FY, CID, AVC. N7RO, WA7ZWG, W7EKM, W7ISX, and WB7CLU.

Notes

I would like to repeat the strange story about Bill Shannon, who apparently fooled many of us, even the FCC, for awhile. At one time he apparently had the call as a Novice, of

HAROAA Insomnia Award.

WA6GFH. Since then he has *used* the calls of W6VK, W6NV - these are genuine calls but *not* assigned to him, and the holders of these calls are not County Hunters. He also used KL7NV. In 1975 he applied for and received USA-CA-500, 1000 and 1500 under the call W6VK. He also had 10-X-#3157, YLSSB #8956 and MARAC #660. He also did some mobile work and DX-pedition work under those calls - so *do not* use W6VK, W6NV nor KL7NV QSOs for your USA-CA applications. Those calls to be added to WB6CKU, not to be used for USA-CA.

Regarding the fine efforts by Fred, W6TKV (ex K2AMN) for a special-plaque for Keith, WA7RKN (silent key). There is a big misunderstanding, I do not issue any Cliff Corne Awards nor numbers, they are issued by MARAC. I issue USA-CA Certificates and Plaques and only for those who have accomplished the feat. I would not like to set any precedent on issuing Awards for those who did not qualify, that would tend to cheapen the award. We do have many handicapped County Hunters - for the, amateur radio is a God sent hobby, and unfortunately we have many County Hunters who are now silent keys. I think a better idea would be that Keith's friends send me some data (the more the better) and a photograph or two, so that I could honor him worldwide with a "Story" in a future issue on *CQ*.

Regarding MARAC, Tom, WA0YJL is now Awards Custodian and Bob, K0AYO is Editor of the Newsletter.

A couple of obvious errors appeared in my October column. In the *Special Honor Roll,* All Counties #190 went to VE1RQ, *not* WE1RQ. The photograph of the K9ATQ family got turned around and should have read - left to right: Wife, Kristi, Tom, K9GTQ, Jolene and Ruth in front.

One suggestion that if you send any QSLs for an Award, be sure to send them via certified mail or registered mail and add a few cents to the cost and get a return receipt.

Hope we *all* have a wonderful 1979. Remember to write and tell me, How was your month? 73,Ed., W2GT.

160-10 Automatically!

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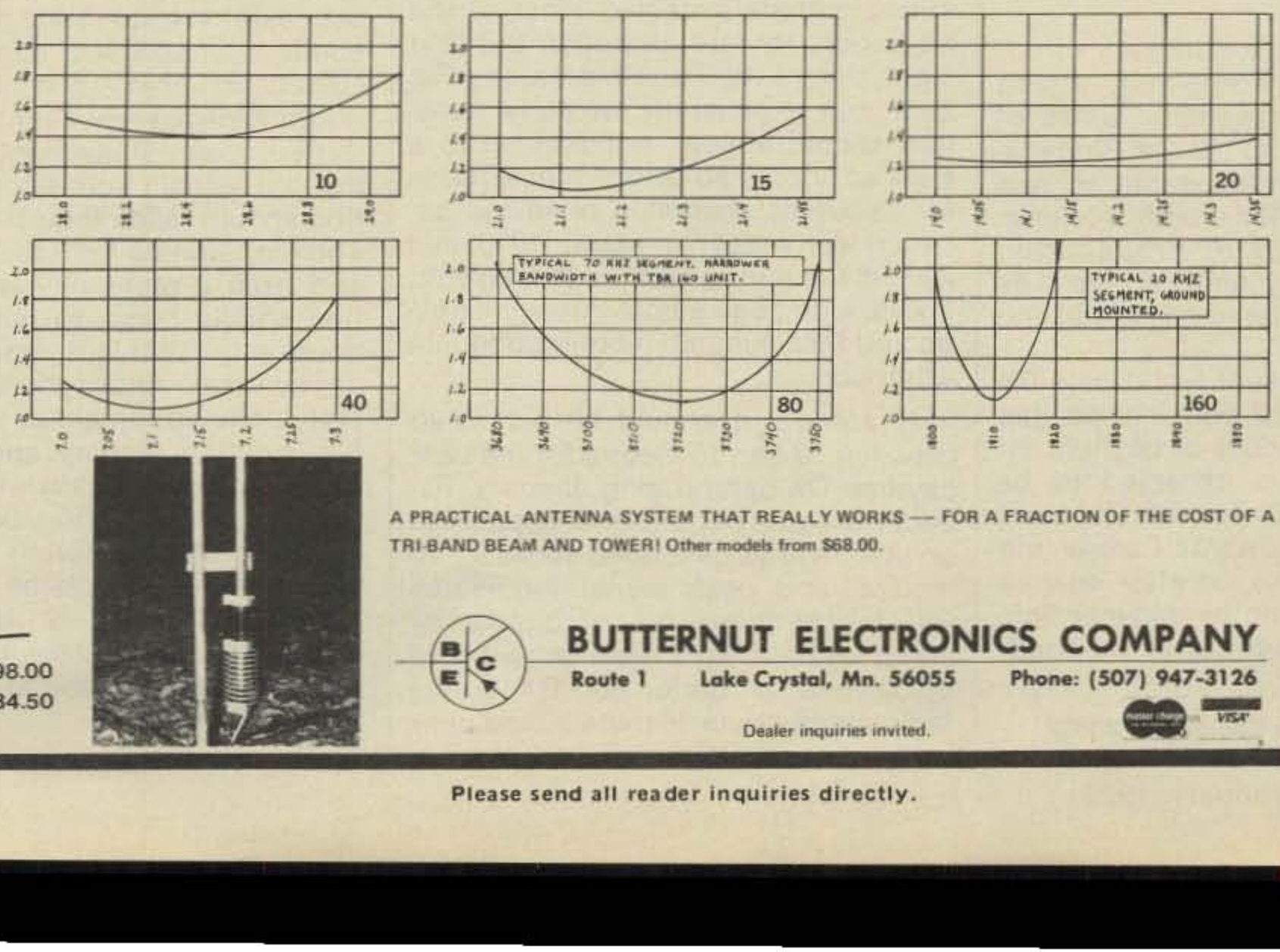
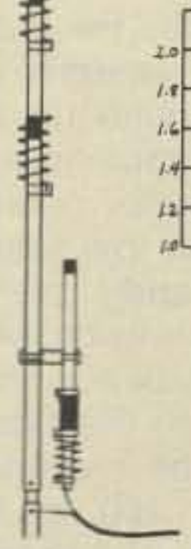
ONLY THE HF5V-II VERTICAL GIVES YOU THE CHOICE: 80-10 meter operation with the antenna alone, or 160-10 meter operation with the antenna and optional TBR-160 unit. COMPARE: Easy to install and adjust . . . 26 ft. tall . . . 80+ mph wind survival . . . no guys needed . . . stainless steel compression clamps . . . aircraft alloy tubing . . . low angle of radiation for superior DX performance . . . only one feedline required . . . mounting post included . . . 90 day factory warranty (Write for details) . . . At your dealer or factory direct . . . post card for catalog. PATENT PENDING.





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Please send all reader inquiries directly.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

1979 should be a *great* year for propagation conditions on the high frequency amateur bands. As good as conditions seemed to be during 1978, they are going to be even better during the new year!

This is due, of course, to the rapid increase in the activity of sunspot cycle 21. For example, the monthly mean sunspot count of 137 reported by the Swiss Federal Observatory at Zurich for September, 1978 was the highest level observed since January, 1960. At no time during the entire twelve year period of Cycle 20 did monthly solar activity rise this high. September's level results in a 12-month running smoothed sunspot number of 68, centered on March, 1978. Progress of a sunspot cycle is measured by the level of smoothed sunspot activity. A smoothed sunspot number in the low 100 range is forecast for this month, as Cycle 21 continues to climb.

The present sunspot cycle, the 21st recorded since telescopic observations on a daily basis were first made during the 18th century, began in March, 1976.

The cycle is expected to increase steadily during 1979. It is almost certain to exceed Cycle 20's peak of 111., and there is a fairly good chance that it may climb to beyond 150 by the end of this year.

The following is a summary of h.f. band conditions expected during January, 1979. For specific times of DX openings refer to the *DX Propagation Charts* which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* for January and February, as well as Charts centered on Hawaii and Alaska.

10 Meters: Excellent world-wide DX openings should be possible on this band during the hours of daylight on all but those days expected to be *Below Normal* or *Disturbed*. The band should first open towards Europe and the east an hour or so after sunrise with signals peaking by mid-morning. Skip should swing towards the south by noontime, with exceptionally strong signals expected most of the afternoon. By late afternoon the first signals from the Pacific area, the Far East and a generally westerly direction should appear, building up to a peak an hour or so before sunset. Look for excellent short-skip openings between distances of about 1000 and 2300 miles during most of the daylight hours, with peak signal intensities expected between mid-morning and late afternoon.

15 Meters: It should be a toss-up between *10* and *15* meters for the best daytime DX band during January. Expect the same pattern of DX openings on this band as described above for *10* meters, and peak signal intensities will follow those on *10* meters by about an hour. This band should hold up somewhat better for DX during radio storms than *10* meters, and peak signal intensities will follow those on *10* meters by about an hour. This band should hold up somewhat better for DX during radio storms than *15* meters. Expect to hear signals from every nook and corner of the world on *15* meters during January, often with exceptionally strong signals. Expect excellent short-skip openings, ranging between 800 and 2300 miles, during most of the daylight hours.

20 Meters: Excellent conditions to most areas of the world are expected to continue on this band from shortly after sunrise to an hour or more after sunset. For a window of about two-to-three hours after sunrise and again during the late afternoon this should be the optimum band for DX, with exceptionally strong signals possible from all directions. Twenty meters should often remain open towards South America and the Pacific area through the early evening hours, and to as late as Midnight. Excellent short-skip openings, over distances ranging between 300 and 2300 miles, should be possible during much of the daylight hours.

40 Meters: The first DX signals should arrive from Euorpe and an easterly direction during the late afternoon, with signal levels increasing steadily as night falls. After sundown the skip should shift towards the south, with excellent openings to the Caribbean area, and Central and South America. By Midnight, most of the European signals will have faded out, but signals from a southerly direction should reach their peak intensity. The first signals from the Pacific area and from a generally westerly direction should begin to build up a few hours after Midnight, reaching a peak at sunrise. Atmospheric noise, or static, should remain at low seasonal levels during January, and signals will often be exceptionally strong on this band. Excellent short-skip openings are also forecast during the hours of daylight over distances ranging between approximately 100 and 750 miles. As darkness falls, the short-skip range should increase to between 750 and 2300 miles.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for Jan. 1979

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 5-6, 23, 31	A	A	B	C
High Normal: 1, 4, 24, 27, 30	A	B	C	C-D
Low Normal: 2-3, 8-9, 16-19, 21-22, 25-26, 28-29	B	C	D	D-E
Below Normal: 7, 10, 13, 15, 20	C	D	D-E	E
Disturbed: 11-12, 14	C-E	D-E	E	E

Where expected signal quality is:

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

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for and day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on Jan. 1, fair (C) on the 2nd & 3rd, good (B) on the 4th, excellent (A) on the 5th & 6th etc.

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

11307 Clara St., Silver Spring, MD 20902

80 Meters: Between sundown and sunrise DX propagation on *80* meters should be quite similar to that on *40* meters, with the exception that signals may not be as strong, and openings somewhat less often. During the daylight hours, short-skip openings should be possible up to about 300 miles. During the hours of darkness, skip should increase to distances between approximately 250 and 2300 miles.

160 Meters: DX conditions between stations in the Northern Hemisphere often peak during January. Look for some DX openings on this band from a few hours after sunset to shortly before sunrise. Remember that DX conditions tend to peak when it is *sunrise* on the easternmost terminal of a path. Short-skip openings up to the one-hop geometric limit of 2300 miles should be possible during the hours of darkness. Because of extremely high solar absorption, skywave propagation generally is not possible during the daylight hours, although it may sometimes occur over distances of a few hundred miles or so.

V.h.f. Ionospheric Openings

With rapidly increasing solar activity, expect a considerable amount of DX openings on the *6* meter band. Signals in the segment from northeast to southeast should peak by midmorning. Best reception from the Caribbean area and from Central and South America should be about Noontime. Skip should swing towards the segment between southwest and north-west during the early afternoon. The best days for the band to open are those forecast to be *High Normal* or *Above Normal.* Exceptionally strong signal levels may be posible at times. F-layer short-skip openings should be possible from mid-morning to mid-afternoon over distances as short as 1500 miles. During periods of radio storminess, E-layer short-skip openings may also be possible over distances between approximately 1000-1300 miles.

There should be a noticeable seasonal decrease in the number of trans-equatorial (TE) openings on *6* meters during January, but some may be possible between 7 and 10 p.m., local time.

There is a good chance for some meteor-scatter openings on both *6* and *2* meters during the Quadrantids meteor shower which should take place between January 2 and 4. Look for peak of about 40 meteors an hour on January 3.

Best time to check for auroral-scatter openings and other forms of sporadic-E propagation on both *6* and *2* meters is during periods of radio storminess. Check the "Last Minute Forecast" at the beginning of this column for those days during January that are expected to be *Below Normal* or *Disturbed.*

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

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

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

3. Times show 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. On the Short-Skip Chart appropriate *standard time* is used at the *path midpoint.* For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone, 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave length above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

5. 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.

CQ Short-Skip Propagation Chart
January & February, 1979
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	*Nil*	07-08 (0-1) 08-09 (0-2) 09-10 (0-3) 10-12 (0-4) 12-15 (0-3) 15-17 (0-2) 17-18 (0-1)	07-08 (1) 08-09 (2-3) 09-10 (3-4) 10-12 (4) 12-15 (3-4) 15-16 (2-4) 16-17 (2-3) 17-18 (1-2) 18-19 (0-2) 19-20 (0-1)
15	*Nil*	07-08 (0-1) 08-10 (0-2) 10-12 (0-3) 12-15 (0-2) 15-17 (0-1)	06-07 (0-1) 07-08 (1-3) 08-10 (2-4) 10-12 (3-4) 12-15 (2-4) 15-16 (1-4) 16-17 (1-3) 17-18 (0-3) 18-19 (0-2) 19-21 (0-1)	06-07 (1) 07-08 (3-2) 08-16 (4) 16-18 (3-4) 18-19 (2-3) 19-20 (1-2) 20-21 (1) 21-22 (0-1)
20	09-11 (1-2) 11-14 (1-3) 14-15 (1-2) 15-17 (0-1)	06-07 (0-2) 07-09 (0-3) 09-11 (2-4) 11-14 (3-4) 14-15 (2-4) 15-17 (1-4) 17-19 (0-3) 19-20 (0-2) 20-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-4) 09-17 (4) 17-19 (3-4) 19-20 (2-3) 20-22 (1-3) 22-00 (1-2) 00-06 (1)	06-07 (3-2) 07-08 (3) 08-10 (4) 10-14 (4-3) 14-19 (4) 19-21 (3-4) 21-22 (3) 22-00 (2) 00-03 (1-2) 03-06 (1)
40	07-08 (0-2) 08-09 (1-3) 09-10 (2-4) 10-17 (4) 17-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-07 (0-1)	07-08 (2) 08-09 (3) 09-11 (4-3) 11-15 (4-2) 15-18 (4) 18-20 (3-4) 20-22 (2-4) 22-02 (1-3) 02-07 (1-2)	07-08 (2) 08-11 (3-1) 11-15 (2-1) 15-17 (4-2) 17-18 (4-3) 18-22 (4) 22-02 (3-4) 02-05 (2-4) 05-07 (2-3)	07-08 (2-1) 08-15 (1-0) 15-17 (2-1) 17-18 (3) 18-04 (4) 04-05 (4-3) 05-07 (3-2)
80	07-08 (2-3) 08-10 (3-4) 10-15 (4-3) 15-21 (4) 21-00 (3-4) 00-04 (2-3) 04-07 (1-2)	07-08 (3) 08-09 (4-2) 09-10 (4-1) 10-15 (3-1) 15-16 (4-1) 16-18 (4-2) 18-00 (4) 00-04 (3-4) 04-07 (2-3)	07-08 (3-1) 08-09 (2-0) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-04 (4) 04-06 (3) 06-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-03 (4) 03-04 (4-3) 04-05 (3) 05-06 (3-2) 06-07 (2-1)
160	09-17 (1-0) 17-19 (3-2) 19-05 (4) 05-07 (3) 07-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-1) 07-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-1) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (1)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2-1) 06-07 (1-0)

ALASKA
January & February, 1979
Openings Given In GMT

To:	10 *Meters*	15 *Meters*	20 *Meters*	40/80 *Meters*
Eastern USA	18-20 (1) 20-21 (2) 21-23 (3) 23-00 (1)	16-17 (1) 17-20 (2) 20-23 (3) 23-01 (2) 01-02 (1)	11-15 (1) 15-17 (2) 17-22 (1) 22-23 (2) 23-03 (3) 03-04 (2) 04-05 (1)	04-13 (1) 07-12 (1)*
Central USA	18-20 (1) 20-21 (2) 21-00 (3) 00-01 (1)	16-18 (1) 18-20 (2) 20-23 (3) 23-01 (4) 01-02 (2) 02-04 (1)	11-16 (1) 16-18 (2) 18-23 (1) 23-01 (2) 01-04 (3) 04-05 (2) 05-06 (1)	05-14 (1) 08-13 (1)*
Western USA	18-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-02 (3) 02-03 (2) 03-04 (1)	16-17 (1) 17-19 (2) 19-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1)	11-17 (1) 17-18 (2) 18-20 (4) 20-01 (3) 01-04 (4) 04-05 (3) 05-06 (2) 06-07 (1)	04-05 (1) 05-12 (2) 12-15 (1) 15-16 (2) 16-17 (1) 05-12 (1)* 12-15 (2)* 15-17 (1)*

HAWAII
January & February, 1979
Openings Given in Hawaiian Standard Time

To:	10 *Meters*	15 *Meters*	20 *Meters*	40/80 *Meters*
Eastern USA	07-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-12 (2) 12-14 (3) 14-16 (4) 16-18 (2) 18-19 (1)	12-15 (2) 15-17 (3) 17-19 (4) 19-22 (3) 22-01 (2) 01-06 (1) 06-08 (2) 08-12 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Central USA	07-08 (1) 08-10 (2) 10-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	13-14 (3) 14-19 (4) 19-21 (3) 21-23 (2) 23-04 (1) 04-06 (2) 06-08 (3) 08-13 (2)	18-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Western USA	06-08 (1) 08-09 (2) 09-11 (3) 11-13 (4) 13-15 (3) 15-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-16 (4) 16-18 (3) 18-20 (2) 20-22 (1)	06-07 (2) 07-10 (4) 10-14 (3) 14-18 (4) 18-20 (3) 20-22 (2) 22-06 (1)	17-18 (1) 18-19 (2) 19-02 (4) 02-04 (3) 04-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-07 (1)*

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

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

The recent CQ World Wide DX contest has been dedicated to the late Larry LeKashman, W2AB/W9IOP/-W2IOP one of the founders of the contest.

The World, Single Operator, All Band C.W. Trophy that Larry has been donating for the past 20 years will be awarded in his memory by W1WY for the 1978 contest.

Larry and Herb Becker, W6QD were the founders of our World Wide DX Contest 30 years ago, and it was through Larry's dedicated efforts that the contest was kept alive in the early 1950's when *CQ* gave up the sponsorship.

Wayne Greene, W2NSD then editor of *CQ* had a change of heart and the magazine again picked up the contest in 1955. That's when I came into the picture.

The '55 contest generated 1,005 entries. Last year we went over the 4,000 mark. With the exception of a few minor changes we have followed the orginal format set-up by Larry and Herb. Their original idea of a world wide type contest has now developed into the World Championship of all DX competition.

W2AB may be a "silent key" but come the last week-end in November each year his spirit will still be alive.

73 for now, Frank, W1WY

CQ WW 160 C.W. Contest
Starts: 2200 GMT Fri. January 26
Ends: 1600 GMT Sun. January 28

Rules are the same as previous years. Like last year all logs will be checked more closely, penalties and disqualification criteria will be closely observed,

This is a c.w. only contest, c.w. to phone contacts are not permitted.

Exchange: RST plus a three figure QSO number starting with 001, and your state or province for Canadian stations. It is not necessary for DX stations to send their QTH, their call will identify them.

Scoring: For W/VE/VO stations. Two points per QSO with other W/VE/VO stations. All DX contacts are worth 10 points. (DXCC country list)

For DX countries: Two per QSO with stations in other countries. Except for QSOs with W/VE/VO which count 10 points.

Multiplier: For all stations. One point for each U.S. state, VE province and DX country worked. (KH6 and KL7 considered DX, and the District of Columbia same as Maryland. Also remember that VE1 is divided into 3 provinces, New Brunswick, Nova Scotia and Prince Edward Island).

Final Score: Total QSO points times the sum of the multiplier.

Penalties: Three additional contacts will be deleted from the score for each duplicate, false or unverifiable contact removed from the log.

Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of the contest, or unsportmanship conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification.

A second multiplier will be deleted for each one lost by the above action.

Disqualification can result if in the opinion of the Committee the penalty total is considered excesive. Disqualified stations and operators may also be barred from competition in all *CQ* contests for a period of up to three years.

Awards: Certificates to the top scorers in each state, VE province and DX country. Additional awards if the score or participation warrants.

Two Plaques are being awarded by the West Gulf A.R.C., both for single operators. One to the highest score in the U.S., and the other to the highest scoring European.

There is no Trophy for the overall World Champion this year, since the originally announced donor for the past two years has bowed out.

The same plaque may be won once only by the same station within a three year period.

Log and summary sheets may be obtained from *CQ* by sending a large s.a.s.e. with sufficient postage to cover your request. (A 15¢ stamp will get you 5 sheets, 40 contacts to the sheet.)

Mailing deadline for contest entries is February 28th to: CQ 160 Contest, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050

Gugliemo Marconi DX Contest
C.W.: Jan. 13 - 14 Phone: Jan. 27 - 28
0000 GMT Sat. to 2400 GMT Sun.

Organized by the Associatione Radiotecnica Italiana to commemorate Marconi and the special occasion of WARC 1979, and the international amateur friendship and solidarity under the leadership if IARU.

The objective being to contact as many ITU Zones and "special locations" on all bands 3.5 thru 28 MHz.

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

Exchange: RS(T) plus ITU zone number. Stations operating from "special locations" will include their

Calendar of Events

Jan.	13-14	ARRL VHF Sweepstakes
Jan.	13-14	Marconi C.W. DX Contest
†Jan.	13-14	YU 80 Meter C.W. Contest
†Jan.	13-14	DL QRP C.W. Contest
Jan.	13-14	Hunting Lions Contest
†Jan.	13&21	Giant RTTY Flash Contest
Jan.	**26-28**	**CQ WW 160 DX Contest**
Jan.	27-28	Airline Hams QSO Party
Jan.	27-28	Marconi Phone DX Contest
Jan.	27-28	French C.W. DX Contest
Jan.	28-29	Clasic Radio Exchange
Feb.	10-11	QCWA C.W. QSO Party
Feb.	17-18	YL-OM Phone Contest
Feb.	24-25	French Phone DX Contest
Mar.	3-4	YL-OM C.W. Contest
Mar.	3-4	ARRL Phone DX Contest
Mar.	10-11	QCWA Phone QSO Party
Mar.	10-11	Virginia QSO Party
Mar.	17-18	ARRL C.W. DX Contest
Mar.	**24-25**	**CQ WW WPX SSB Contest**
Apr.	28-29	Dutch "PACC" DX Contest
May	**26-27**	**CQWW WPX C.W. Contest**

† Not officially announced.

14 Sherwood Ln., Stanford, CT 06905

QTH. (Special locations are areas where Marconi conducted his experiments. A s.a.s.e. to W1WY will get you a list.)

Points: (a) Contacts between stations on the same continent but different countries count 1 point on 7, 14 & 21 MHz., and 2 points on 3.5 and 28 MHz.

(b) Contacts between stations on different continents count 2 points on 7, 14 & 21 MHz., and 5 points on 3.5 and 28 MHz.

(c) Contacts between stations in the same country are permitted for ITU zone and "special location" multipliers but have zero point value.

Multiplier: (A) Multiplier of 1 for each different ITU zone worked on each band.

(B) Multiplier of 10 for each "special location" worked on each band.

Note: Own country may be worked for both A and B credit, however zone locations which are included in multiplier B can be counted once only per band.

Final Score: Total QSO points multiplied by the sum of A and B multipliers from each band.

Awards: Certificates to winners in each class, in each country and each call areas of W/K, VE, VK, JA and ZL. Single operator entries must show a minimum of 16 hours of operating time and 36 hours for multi-operator stations.

Use a separate log sheet for each band, include a column for QSO points and one for multipliers. Indicate the multiplier only the first time it is worked on each band. A summary sheet showhing the scoring and other pertinent information and the usual signed declaration is also requested.

All entries must be received no later than May 15th for the C.W. section and May 30th for the Phone. Indicate C.W. or Phone on your envelope.

Logs go to: G. Marconi Contest Committee, Att: G. Nucciotti, I8KDB, Via Fracanzano 31, 80127 Napoli, Italy.

YU 80 Meter CW Contest

Starts: 2100 GMT Sat. January 13
Ends: 2100 GMT Sun. January 14

The YU DX Club is again sponsoring this contest to stimulate more activity on 80 meter c.w. Both single and multi-operator operation is permitted.

Exchange: RST plus QSO no. (001 and etc.)

Scoring: Contacts between stations in the same country 1 point. With other countries on the same continent 2 points. With countries on other continents 5 points. With YU stations 10 points. (Only one QSO with the same station.)

Multiplier: Each DXCC country including your own, and each YU prefix worked.

Final Score: Multiply total QSO points by sum of DX countries and YU prefixes worked.

Awards: Certificates to the top scorers in each country, 2nd and 3rd place awards where justified. Call areas in W/K, VE, PY, VK, ZL, JA, and UA9 & UA0 will be considered separate areas for awards. There are also Trophies for continental leaders.

Results of 1978 French Contest U.S.A. and Canada

C.W.

W1BWS	13,108
W1OPJ	10,980
W2FAS	100,036
W2GKZ	62,243
K2PF	12,870
N2CM	11,284
W3ARK	154,700
W3HDH	51,968
N3RL	6,720
WB3DBI	360
N4NX	138,240
WB4ENI	10,528
W4YN	9,360
AA4RR	22,854
WB4WHE	120
K5UR	20,898
N8BB	82,871
W8DSO	11,780
W8VSK	5,940
WB8WVW	40
W90A	56,154
K9WA	14,490
VE3KZ	361,030
VE2EHF	72,896
VE2WA	66,430
VE3BR	21,200
VO1AW	105,480

Phone

F2YS/W2	183,084
K2PF	360
N3RL	5,500
W3MR	9,212
WB3DBI	40
N4NX	5,000
WA4LOF	2,381
K5RF	1,000
K8MN	15,640
WB8TGS	490
WA9FZQ	34,833
W9LKI	26,789
W9TLU	6,120
W9SS	6,090
W0CDC	7,364
VE3KZ	516,420
VE2OG	201,880
VE2AFC	124,976
VO1AW	5,267

Include a summary sheet and the usual signed declaration with your entry. Check log for duplicate contacts. Taking credit for duplicate contacts in excess of 3% of the total made may mean disqualification.

Mailing deadline is March 1st to: YU DX Club of SRJ, P.O. Box 48, 11001, Belgrade, Yugoslavia.

DL QRP Activity C.W. Contest

Starts: 1500 GMT Sat., January 13
Ends: 1500 GMT Sun., January 14

Power input for this contest is limited to 10 watts or less, single operator and on c.w. only. QRO stations may participate but only contacts with QRP stations are valid.

Limit your operation to 15 hours. The 9 hours off may be taken in two parts. Contacts may be made on any five bands in the 1.8 to 28 MHz. spectrum.

Exchange: RST plus QSO no. and power imput. Add "X" if crystal controlled. (579001/8X) Stations using more than 10 watts indicate QRO instead of power figure.

Scoring: Contacts with stations in same country 1 point. Other countries but same continent 2 points. DX on other continents 3 points. If QSO is with another QRP station add 3 points.

Stations using less than 3.5 watts get credit for 1 handicapp point, and another handicapp point if rig is crystal controlled. Double the above points if both stations meet above handicapp requirements. (8 to 12 final points possible)

Reducing input power of a commercial rig does not qualify it for handicap bonus.

Multiplier: Each DXCC country worked, one if on own continent, two if on another continent. Plus call areas of JA, PY, VE, VK, W/K, ZS.

Final Score: Total QSO points from all bands times the multiplier points from each band. (Scoring for QRO stations same.)

Include a summary sheet showing the scoring, equipment description and the usual signed declaration.

Mailing deadline Feb. 15th to: Hartmut Weber, DJ7ST, D—3201 Holle, Kleine Ohe 5, West Germany.

"Hunting Lions" QSO Party

Starts: 1200 GMT Sat. January 13
Ends: 1200 GMT Sun. January 14

Sponsored by Lions International and coordinated by the Lion Club of Rio de Janeiro, Brazil, this activity is between Lions and also non-members. The objective, "to create and foster a spirit of international understanding and cooperation," among Lions and amateur radio operators.

Exchange: Call, QSO no. and the time. Lions or Leos will add their club name.

The same station may be contacted once on each band, 10 thru 80, both phone and c.w., but each mode is scored separately.

Scoring: One point for contacts between stations within the same continent, 3 points if between different continents. There is a bonus of 1 additional point if QSO is with a member of a Lion or Leo club, and 5 extra points if you contact a member of the Rio de Janeiro Arpoador Club.

Total QSO points is your score.

Awards: Will be made for both phone and c.w. A Trophy for 1st place. A Trophy Medallion for 2nd place. And a Plaque for 3rd place. There are also medallions for the 4th thru 10th place. Each participant making more than 20 points will receive a special QSL from

the Arpoador Club.

It is suggested that you write to the Arpoador Club for additional information.

Logs must be submitted no later than 30 days after the end of the contest to: Lions Club of Rio de Janeiro Arpoador, Rua Souza Lima No. 310-Apt. 802, Rio de Janeiro 22.081 ZC-37, Brazil.

Giant RTTY Flash Contest

Two Periods
1500—2300 GMT Sat., January 13
0700—1500 GMT Sun., January 21

This is the 11th RTTY contest sponsored by the IATG of Italy, called Flash because of the short periods of operation.

All bans may be used, 3.5 thru 28 MHz. and also via Oscar, in that portion of the bands used by RTTY stations. The same station may be worked on each band for exchange and multiplier points.

Exchange: Call, RST and CQ Zone.

Scoring: Contacts with stations in own Zones 2 points. With stations outside own Zone, according to the value in the "exchange point table." Oscar contacts double in point value.

Multiplier: Each DXCC country and W/K, VE and VK call area worked on each band.

Final Score: QSO contacts X exchange points X total multiplier. There is also a handicap of 2% to 12% deducted from the final score based on the position of winners in previous contests.

Awards: Gold, Silver and Bronze medals for first three places. The 4th to 7th place winners, a year's subscription to *CQ Electronic* magazine, 8th to 10th place a 6 month's subscription.

Points and position achieved in this contest will be included for the World RTTY Championship for 1977. (This is last for 1977)

The contest is also open to SWL RTTYers with the same scoring system.

It is suggested you write to Prof. Fanti for a more detailed rules sheet with an "exchange point table," handicap table and sample forms.

Logs must be received no later than Feb. 28th and go to: Prof. Franco Fanti, via Dallolio 19, 40139 Bologna, Italy.

Airline Hams QSO Party

Starts: 1500 GMT Sat. January 27
Ends: 1500 GMT Sun. January 28

This is the first party organized by the International Association of Airline Hams.

It's open to all "Airline Hams" and non-members. Members of the IAAH may work both members and non-members, and visa-versa.

Exchange: Non-members—Indicate "non-member", QSO no., RS (T) and state, province or country.

Members—Indicate "member", rest same as above. Plus IAAH roster number, 3 letter airport identifier, (if applicable) and flight number or aircraft number if station is Aeronautical Mobile.

Note: Specific laws apply to amateurs operating their equipment from on board an aircraft. Contact the IAAH for rules before doing this. (P.O. Box 82412, Hapeville, Georgia 30354)

Bonuses: Score 4 points for airport operation, 5 points for contcts with an Aeronautical Mobile

Scoring: (1) Add total number of points (including bonus points) (2) Add states, provinces and countries worked. (3) Multiply # and #2 together for total score. (No mention was made of value of contacts not in bonus locations.)

Frequencies: CW - 3550, 7050, 14050, 21050, 28050, 50.095. SSB -3975, 7275, 14280, 21375, 25550, 50.105. Novice/Tech - 3725, 7125, 21125, 28125. FM - 146.52 and 146.55 simplex. Repeater contacts are permissable.

Awards: Certificates to the top 3 scoring members and non-members.

Use a separate log for each band and submit before March 1st to: Frank Sadilek, WB9OUE, 3818 N. Newcastle Ave., Chicago, IL 60634

Classic Radio Exchange

Starts: 2000 GMT Sun. January 28
Ends: 0300 GMT Mon. January 29

This is the winter edition of this unusual Activity sponsored by the Southeast A.R.C. of Cleveland, Ohio.

Object is to restore, operate and enjoy older equipment with like minded amateurs.

A classic radio is defined as any gear built since 1945 but a least 10 years old. An advantage in the contest but not required in the exchange.

The same station may be worked on each band and mode and with different equipment combinations. Non-contestants may be worked for credit.

Exchange: Name, RS(T), state, province or DX country, and receiver and transmitter type. (i.e. home brew, 807 final and etc.) Also any other interesting information.

Scoring: Multiply total QSOs by number of different receivers, transmitters, states, provinces and DX countries worked on each band. Multiply that total by your Classic multiplier. Total years old of all receivers and transmitters used. (Three QSOs minimum per unit.) If equipment is a transceiver multiply age by two.

Frequencies: C.W. - 60 kHz. from low edge of each band. Phone - 3910, 7280, 14280, 21380, 28580. Novice/tech -3720, 7120, 21120, 28120. Listen to 10 on the quarter hour, 20 on the half hour, and 15 on the three quarter hour.

Awards: Certificates will be awarded for the highest scores, longest DX and "unusual achievments."

Send logs with comments, pictures, anecdotes and etc. to: Stu Stephens, K8SJ, 2386 Queenston Rd., Cleveland Heights, OH 44188. A s.a.s.e. will get you a copy of the Newsletter with the results.

French DX Contest

C.W.: Jan. 27 - 28 Phone: Feb. 24 - 25
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

You may work any of the following list of French and associated stations. (Francophone countries)

1. French Europeans. (95 departments)
2. Belgians. (9 provinces)
3. Switzerland. (22 cantons)
4. All DUF countries. (FB8, FG and etc.)
5. LX, 4U, OD, 3B, 9Q, 9U, 9X, HH, VE2)
6. French and Belgium armed forces in DL.

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

Single operator stations are limited to 36 hours out of the 48 hour contest period.

Exchange: RS(T) plus QSO no. (579001) The "Francophones" will include two figures or letters to identify their QTH. (/67, /LU, /VD and etc.)

Points: Three points for contacts between stations in the same continent, 10 points if with another continent.

Multiplier: Each F department, ON province, HB canton, DUF country and etc. as indicated in above list. (Worked on each band.)

Final Score: Sum of all QSO points multiplied by the sum of the multiplier from each band.

Awards: Certificates to the top scorers in each country and each USA call area. In the past contest contacts have been accepted for the many French award. DUF, DPF, DDFM, DTA, DNF.

Include a summary sheet showing the scoring, multiplier list for each band and etc. with your entry.

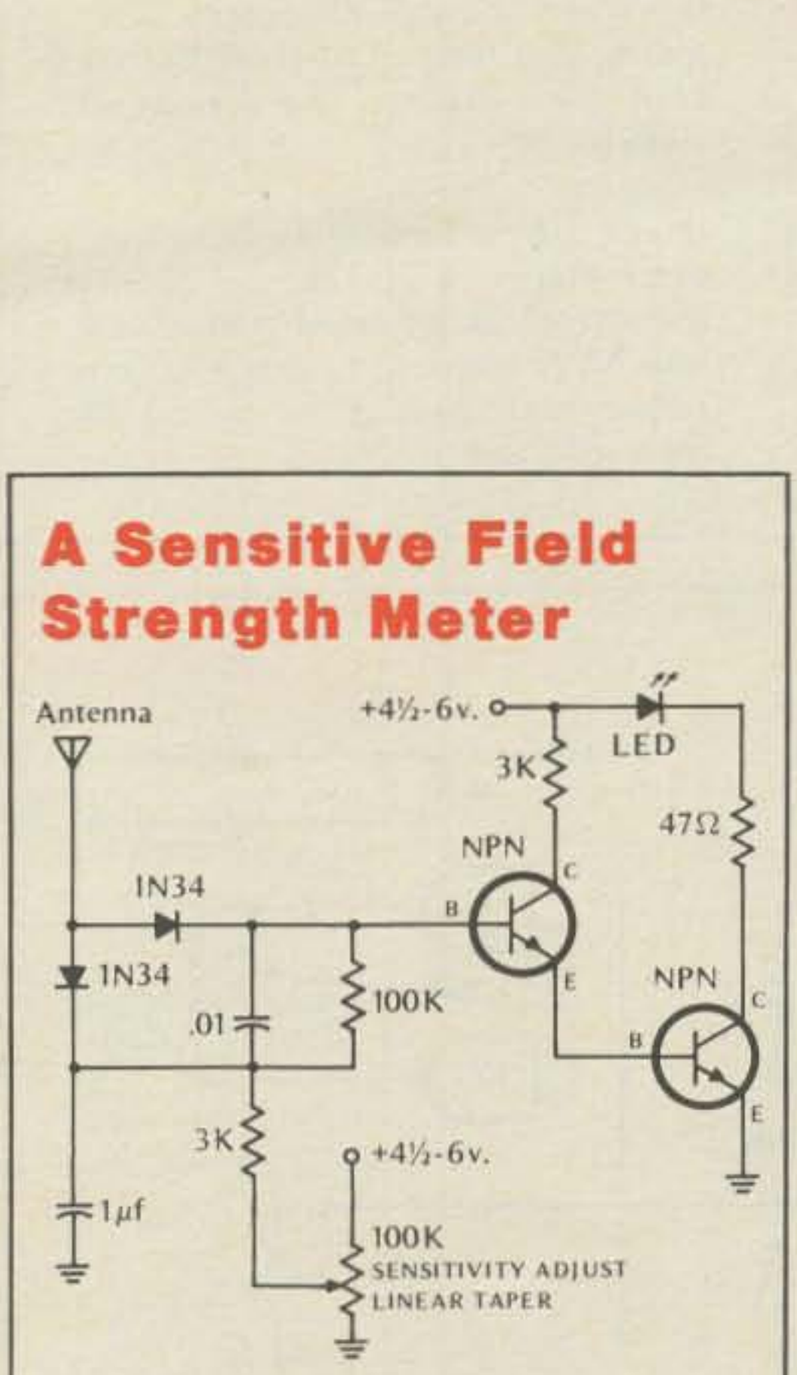
Logs go to: REF French Contest, Att; Lucien Aubry, F8TM, sq. Trudaine 2, Paris 75009, France.

modern electronics

Build These 13 Electronic Projects

For Under $10 Each!

A Sensitive Field Strength Meter

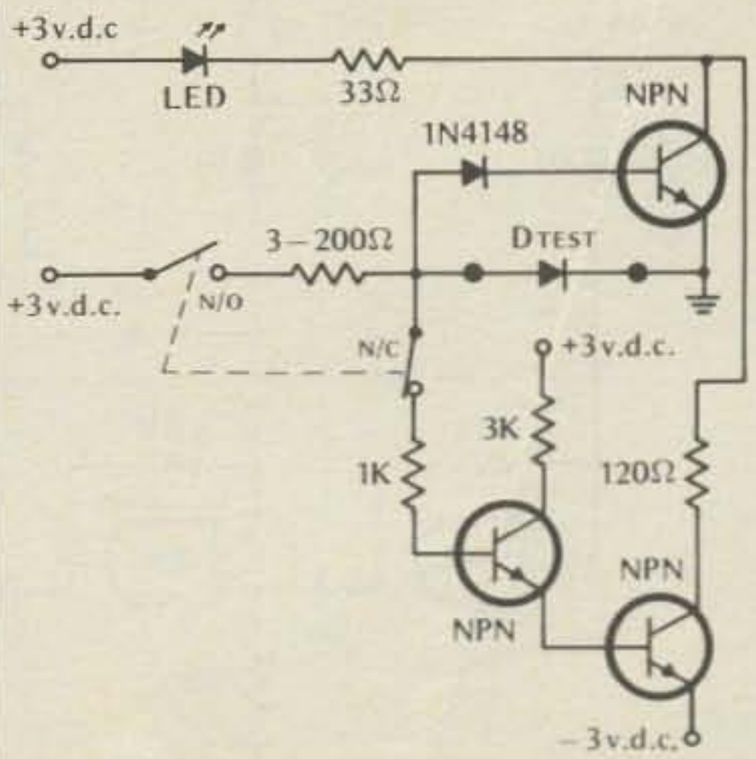


This transmission indicator is 100 times more sensitive than field strength meters at one-fifth the price. An LED lights only if the RF field is higher than you preset as the field strength level. Watch out of the corner of your eye to see if the LED is glowing as you transmit. Any small signal NPN transistors can be used. Two penlight cells provide power and will last about a year.

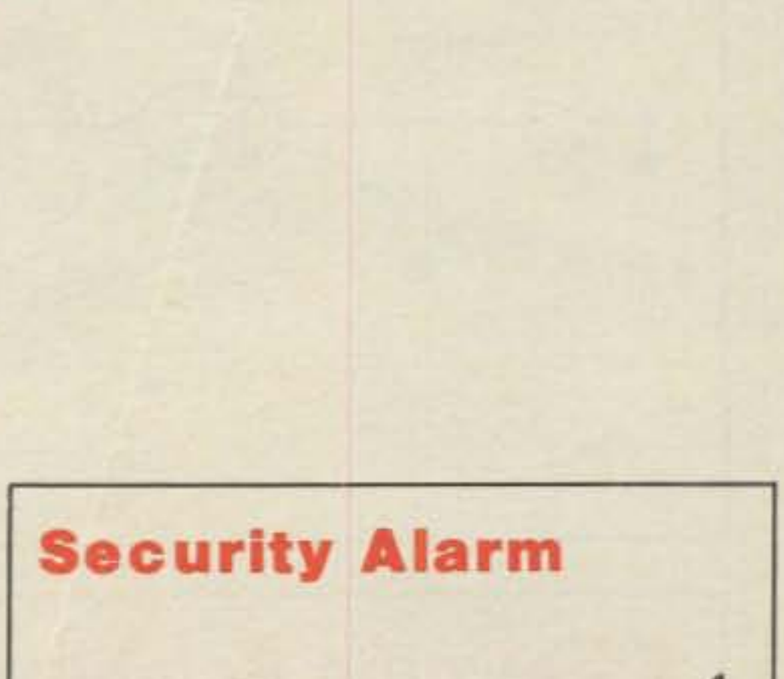
*10 Idell Rd., Valley Stream NY 11580

Diode Checker

Check diodes under load with ME's diode tester. Avoid mistakes, caused by using a VOM, with this foolproof method. First, place the diode across terminals so LED is *off*. If this can't be done, the diode is bad. Second, press switch. If LED stays off, the diode is good. The cathode of the diode being tested is the end connected to ground. Note that sometimes "leaky" germanium diodes cause the LED to light dimly.



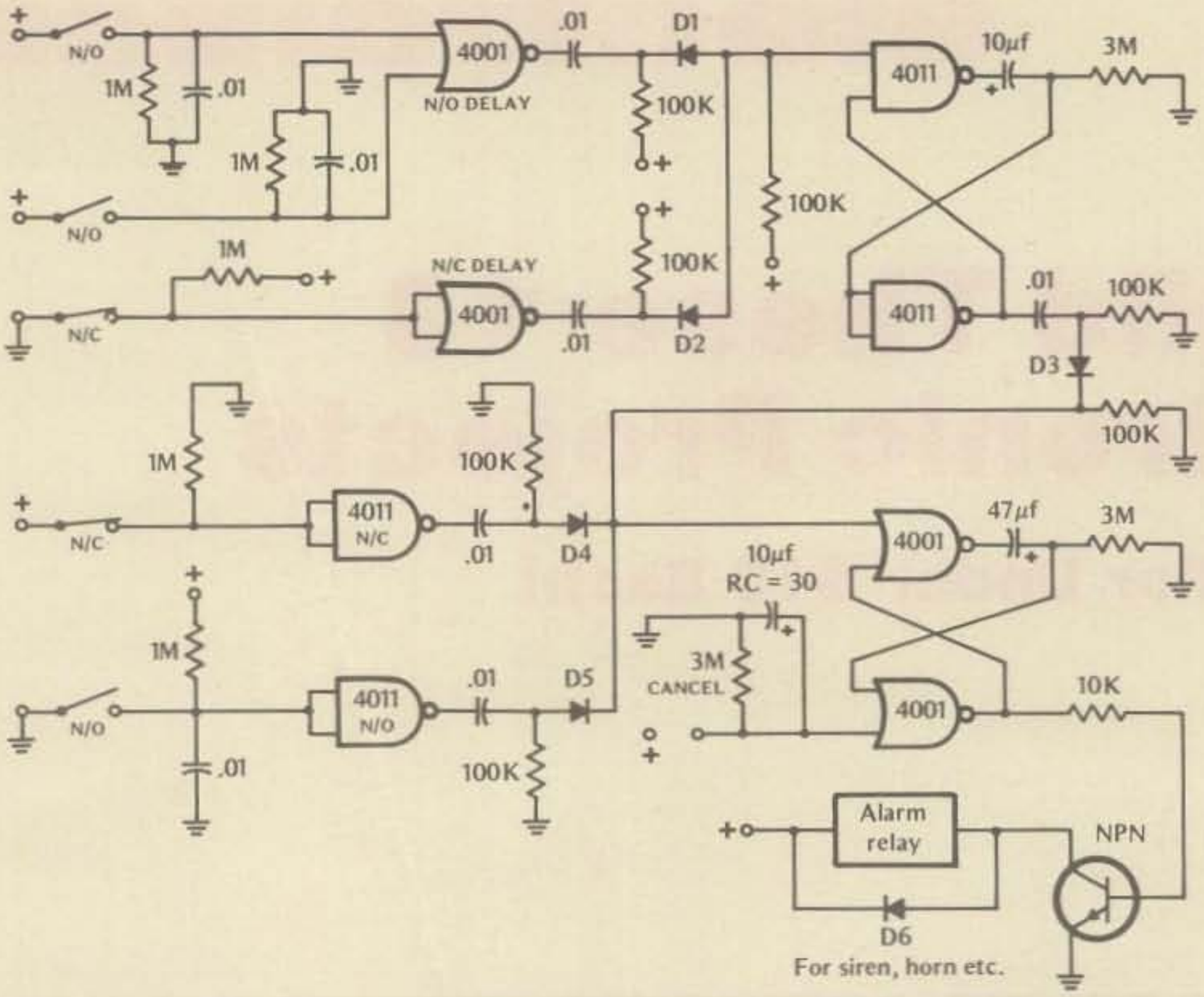
Security Alarm



Sound off with the wail and shriek of a fire engine. The blast of sound can be varied depending on transistor and speaker selection. By varying component value, you can change the sound to suit your tastes. The rise and fall of the wail's pitch plus the percentage of change in pitch also can be adjusted.

110-97-98

Home Security Brain



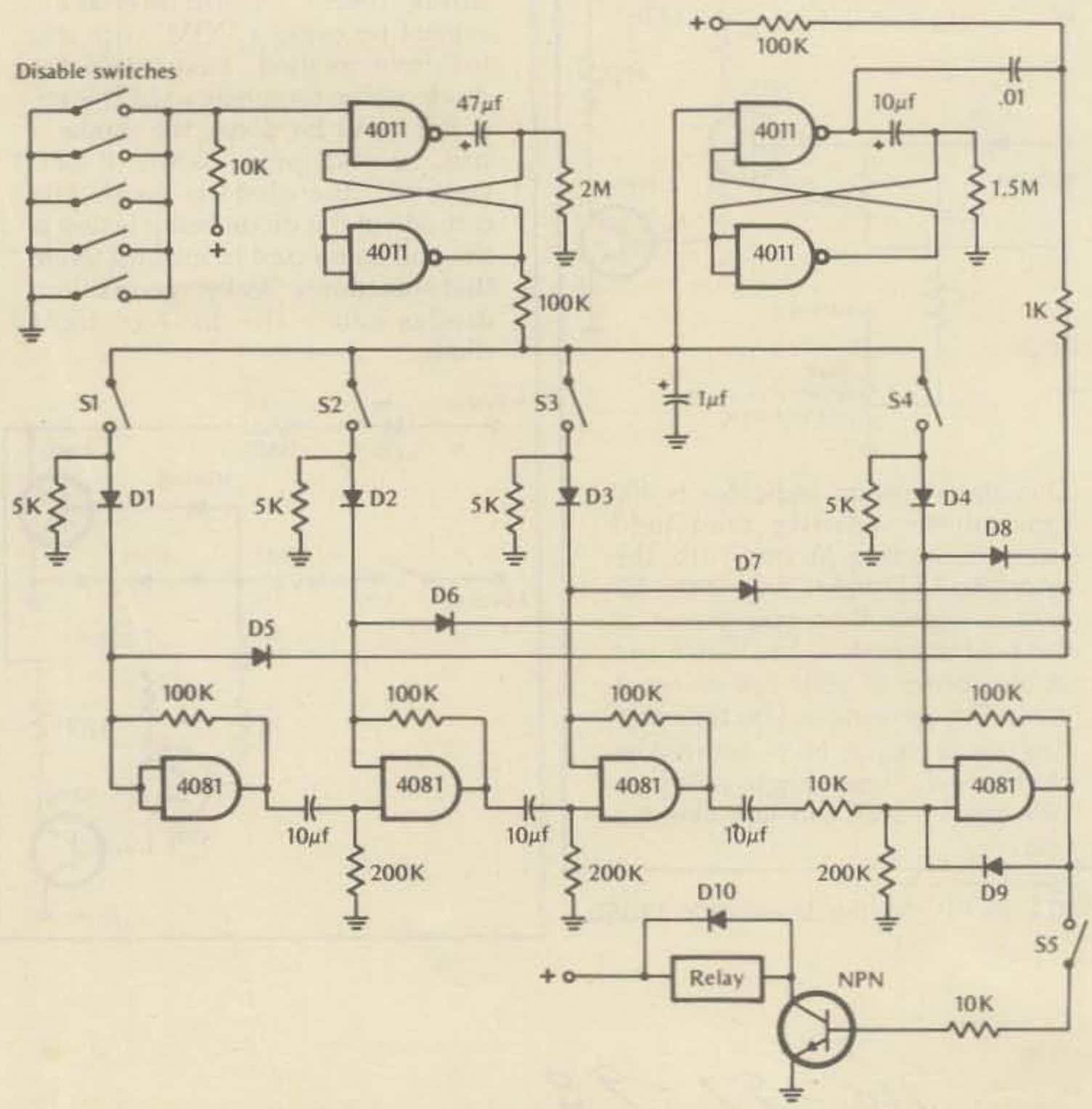
Get a loud blast of sound for your home security monitoring system for protection against forced entry by burglars. Battery powered, the unit is on duty even during power failures. Standby current drain is so low the batteries will perform for their shelf life. The circuit shown provides both normally open contacts (NO), such as fail-safe magnetic door switches, and normally closed contacts (NC), such as window tape. The two lower switches provide instantaneous operation. The three upper switches turn on the alarm after a 30-second delay, giving you time to turn off the system by closing the "cancel" switch.

If you use a reed relay to activate your alarm, a 2N2222 or 2N3904 transistor can be used. Otherwise, any NPN transistor with a current rating high enough to power the relay you use will work.

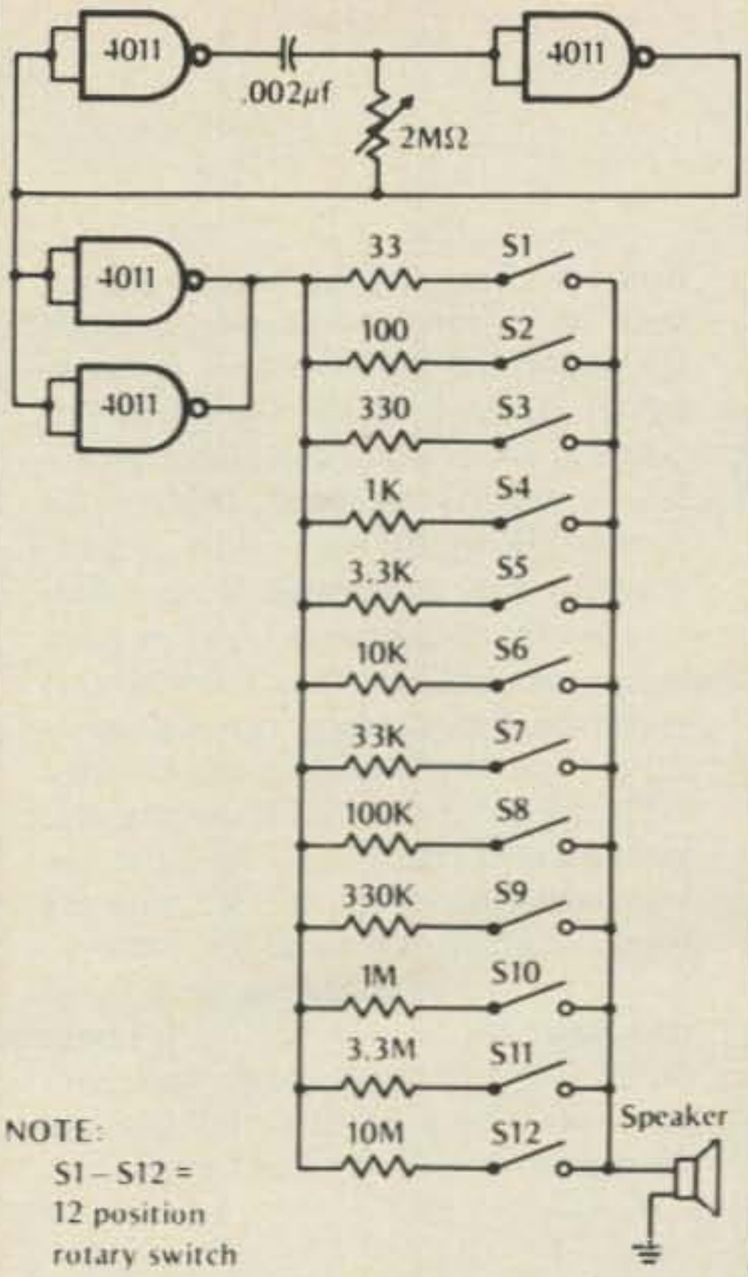
Electronic Combination Lock

A thief has only seven seconds to crack this 10,000 combination pushbutton lock. If an incorrect button is pushed, an alarm sounds and all pushbuttons stop working for two minutes. The relay built into our circuit lets you control anything from your front door lock to car ignition. A nine-volt transistor radio battery runs the circuit one year.

To operate the lock, you must close S1, S2, S3, S4, and S5 in rapid sequence. By connecting these five switch leads in a random fashion to a 10 button switch pad, you can make any sequence you want—9, 2, 5, 4, 10 for example. To further complicate things, you connect the "disable" switch leads to the remaining switches on the pad. So, if the intruder pushes 9, 2, 5, 4, 8, the lock disables so that even if he then pushes 10, it still won't open. You can use any NPN transistor with ratings high enough to power the relay you use to activate a circuit or electrically operated lock.



Test Your Hearing!

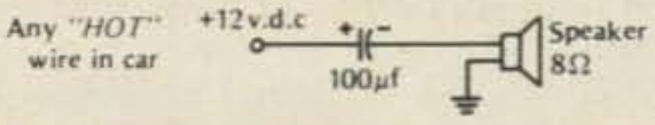


NOTE:
S1 – S12 =
12 position
rotary switch

Is your tv set turned up louder than anyone else's? Do others hear sounds you can't? You can test your hearing with this handy hearing tester. A built-in variable tone generator lets you set the frequency from about 400 Hz to 20 kHz. Then just turn the selector switch through each of 12 positions. Each switch advance reduces the sound by 10 dB. By comparing the switch position at which the sound becomes inaudible to you with the positions for others, you can get a good idea of how your hearing stacks up.

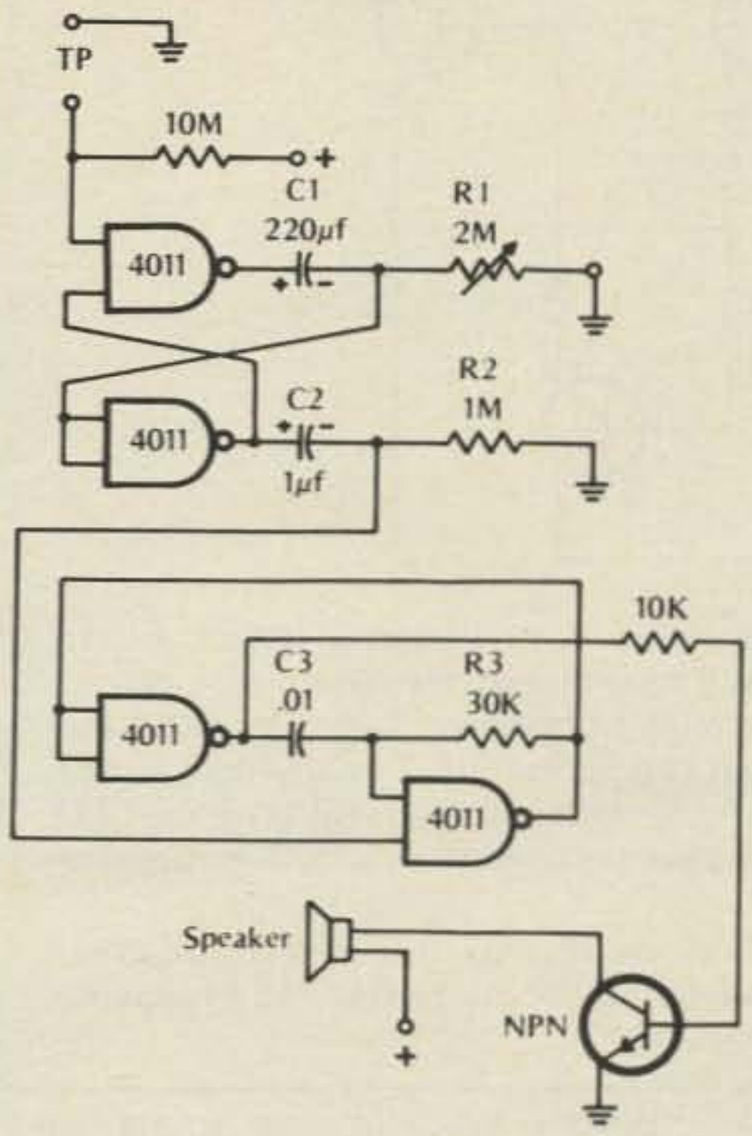
For best results, use a 100-ohm speaker. If you can't obtain a 12-position rotary switch, use 12 SPST switches. A nine-volt battery will power the tester adequately.

Be An Expert Whine Tester



This simple under-$1 circuit tells you if there's anything wrong with your car alternator by analyzing the whine. A clean-sounding whine means the alternator's OK. Whine with a buzz means one or more diodes burnt out. If whine frequency doesn't keep pace with engine speed, the fan belt is loose.

A Handy Timer



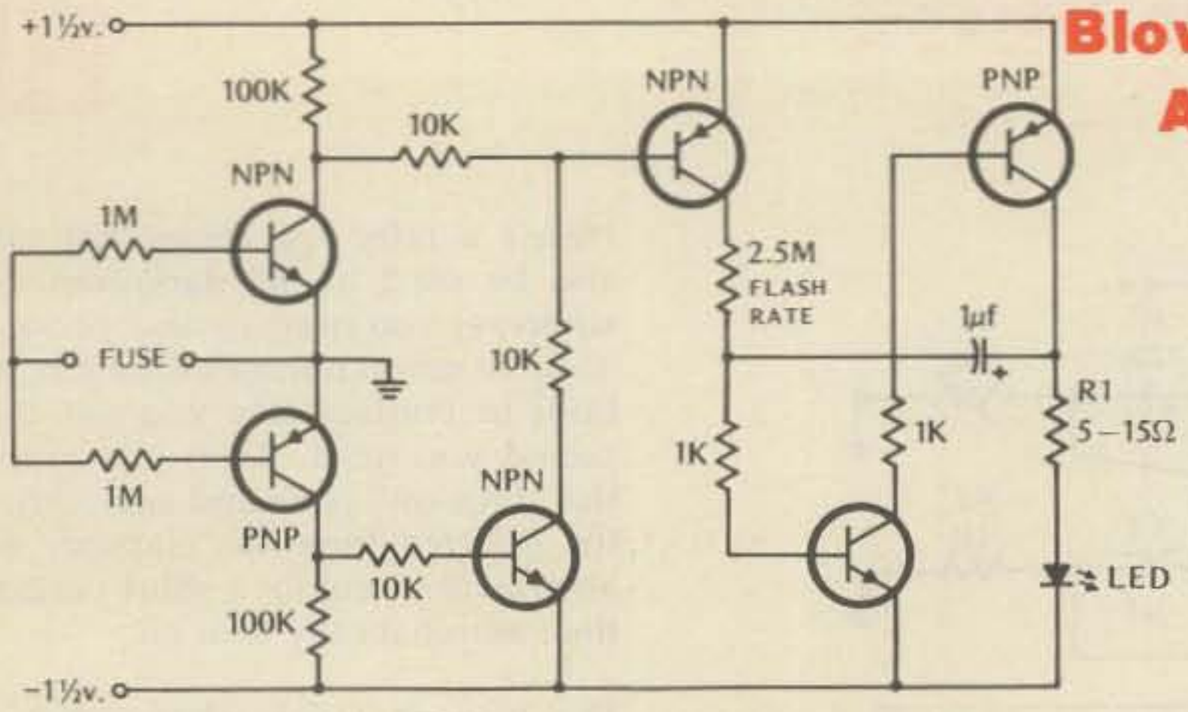
Here's a nifty egg timer that can also be used in the darkroom, or wherever you need to time periods of up to seven minutes duration. A built-in control lets you set the period you need. Then just touch the "turn-on" plate and wait. After the selected time has elapsed, an alarm will sound for a short period, then automatically turn off.

The turn-on touch plate, labeled "TP" in the diagram, is two metal strips about 1/16th-inch apart. Bridging the gap with your finger activates the timer. If you need more time range, increase R1 and/or C1. R2 and C2 determine the period of time that the alarm will sound. Increasing either will extend the time. The tone of the alarm is determined by R3 and C3. Increasing either *lowers* the tone, decreasing them *raises* the tone.

Fast, Faster, Fastest

This great party and coffee table game tests players' reaction times. The fun game is activated by closing switch S1, which starts the tone generator and "arms" the circuit. The touchplate, labeled "PLAY" in the diagram, consists of two metal strips about 1/16th-inch apart. The first player to bridge the gap with his or her finger turns off the tone and lights the associated LED indicator. A second touchplate, labeled "CLR" in the diagram, clears the circuit, extinguishing the LED, when its gap is bridged by a fingertip.

Blown-Fuse Alarm

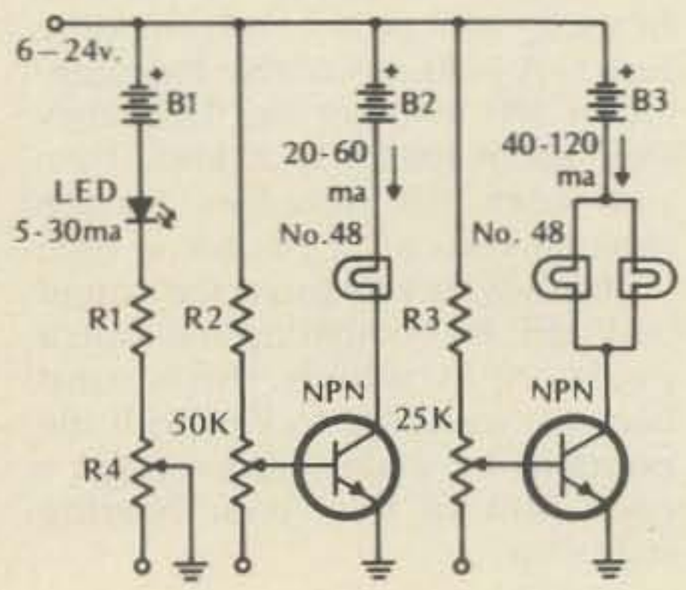


If you've ever spent an hour looking for a fault in an electronic circuit only to find the problem was a blown fuse, you'll love this handy blown-fuse alarm. Just connect it across the fuse in your circuit—the alarm does the rest. If the fuse does blow, an LED indicator, which can be mounted in any convenient location, will begin to blink. A pair of AA penlight batteries will keep the LED blinking for up to three months if you don't use the protected equipment regularly.

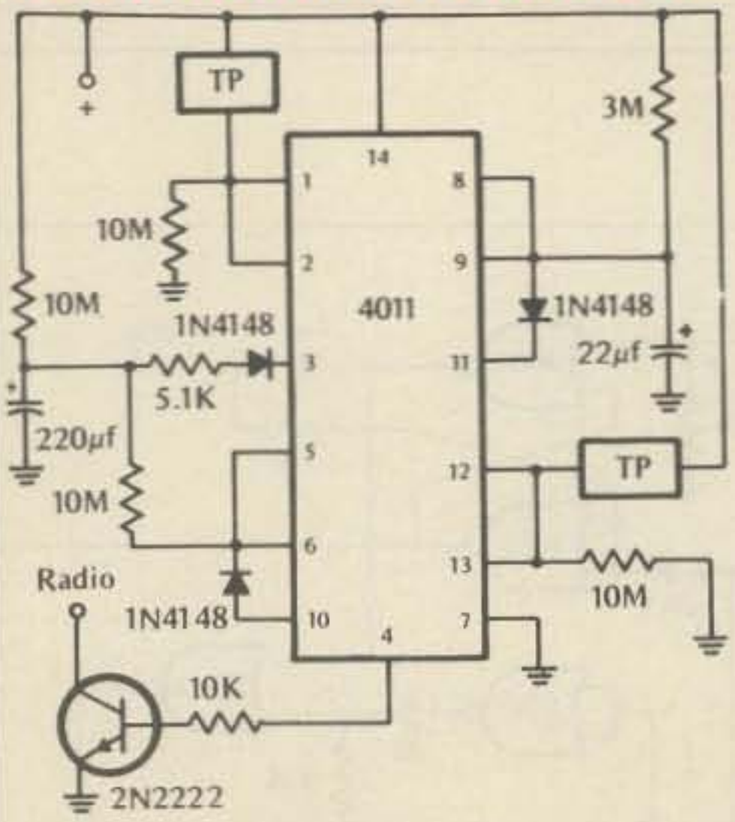
Any small signal NPN transistors, such as the 2N3904, and PNP transistors, such as the 2N3906, can be used. The value of R1 should be selected to provide average light intensity from the LED you use.

A Versatile Battery Charger

Build a charger that handles three sets of different-voltage batteries for one-third the cost of a conventional charger. With a plug-in AC adapter from your calculator and a few inexpensive parts, this circuit accurately monitors within 20 percent the rate of charge of each battery by the brightness level of pilot lamps or an LED. Any 6 to 24 volt rechargeable battery can be handled. The transistors can be any NPN types capable of handling the voltage and current of the batteries you want to charge. R1, R2, and R3 limit the current flow to the battery. Refer to our Handbook section in this issue for how to calculate resistance for a given voltage and current. R4 must be selected for the current range of the LED used.

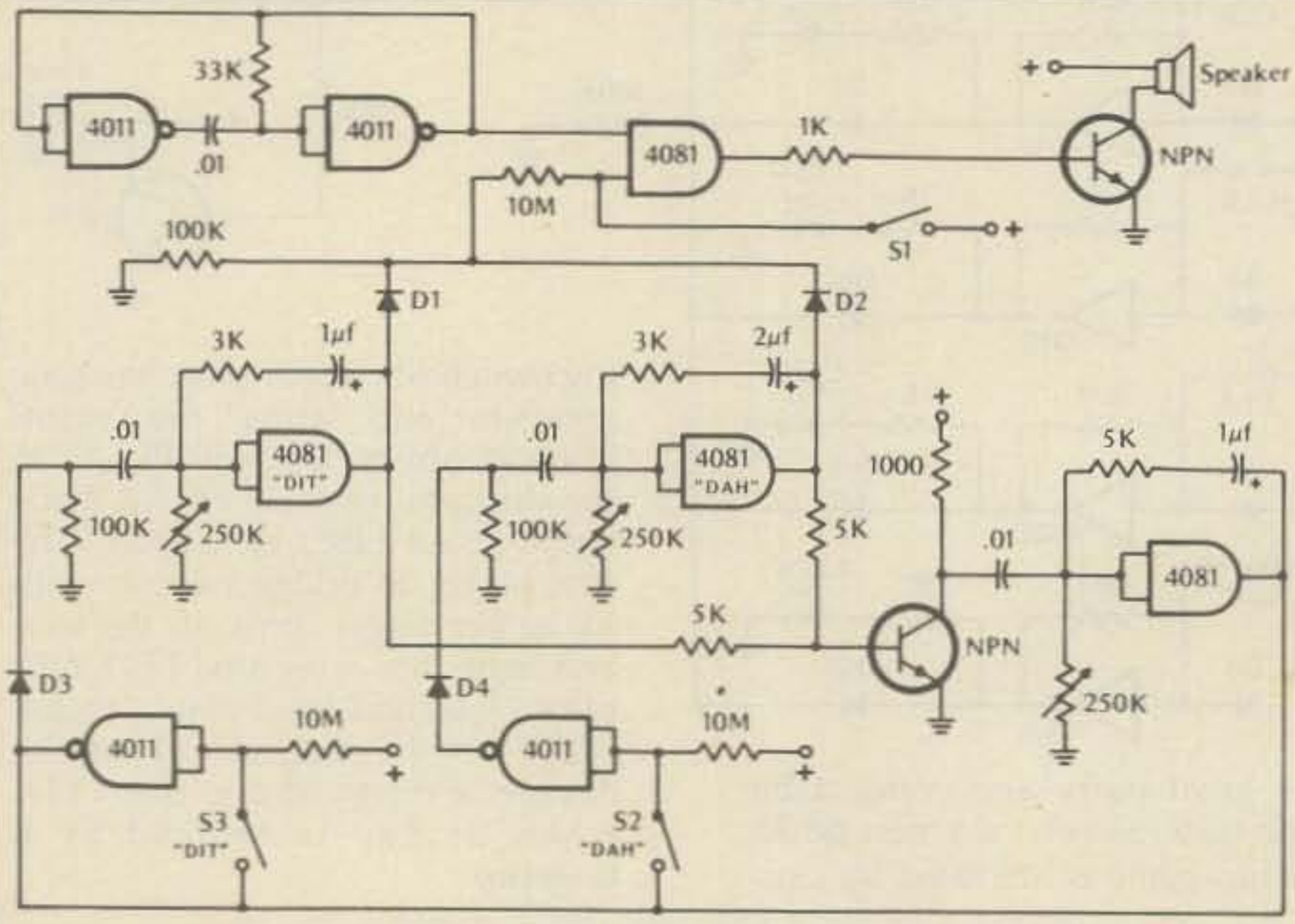


A Commercial Killer



With a touch of your finger, you can turn on your radio for up to a half-hour, after which it turns itself off automatically. With a second touch, you can kill the sound for one minute—long enough to silence annoying commercials. Each touch plate, labeled "TP" in the diagram, consists of two strips of metal about 1/16th inch apart. Bridging the gap with your finger activates the circuit. When you've built the circuit, you can mount it right inside the radio case. Power it from the 9-volt radio battery. To connect it to the circuit, remove the wire presently going to the minus (-) terminal of the battery and reconnect it to the collector, marked "radio" in the diagram, of the 2N2222 transistor.

A Code Practice Oscillator For Use With A Paddle Key



This sophisticated code practice oscillator costs pennies to build, yet has individually adjustable *dit*, *dah*, and *space* duration controls. You can use separate SPST switches for S1 and S2, but for the feel of ham radio, use a sideways-moving "paddle" key. Just connect the paddle to the 4011/4081 output line, one of the contacts to the *dit* 4011 input, and the other contact to the *dah* 4011 input. You can use any small signal NPN transistors—2N2222 and 2N3904 work well. The oscillator runs on a standard 9-volt battery, but will work on 6 volts as well.

Here's a BASIC programming package that will help you calculate voltages, currents, input resistances and the gain of transistor circuits.

A BASIC Program For Transistor Amplifier Calculations

BY THOMAS ROHR*

The transistor amplifier circuit of figure 1 is perhaps the most common circuit configuration. It is an NPN transistor used in the common-emitter circuit to provide gain in audio and other low-frequency applications. Depending on the values of the resistors and capacitors used, it can provide gain in the range of five or less up to a hundred or more. It can operate at supply voltages from a few volts up to a hundred volts (with suitable transistors), at currents ranging from a fraction of a milliampere up to several tens of ma.

Our computer program, written in the Basic programming language used in home as well as professional computers, calculates the voltages and currents in the circuit, as well as the input resistance and the gain of the circuit. The voltages and currents are useful in troubleshooting, since they are easily measured with almost any inexpensive multimeter.

If you have a circuit to check, you can use this program to calculate the voltages and currents that it should have, and then compare these with the values actually measured. The gain, which describes how much larger the ac output voltage is than the input, can also be measured with fairly inexpensive equipment. The input resistance, while not especially useful for troubleshooting, is useful in deciding what can be connected to the amplifier's input.

Even if you do not have access to a computer, the program can still be interesting. By studying it, you can see that the Basic programming language is

*123-19 95th Ave., Richmond Hill NY 11419

BASIC PROGRAM FOR TRANSISTOR AMPLIFIER CALCULATIONS

```
1 PRINT "ENTER VALUES OF VCC, R1, R2, R3, R4, R5 (IN OHMS)"
2 INPUT S, R1, R2, R3, R4, R5
3 PRINT "ENTER YOUR VALUE OF BETA"
4 INPUT B
5 V = S * R2 / (R1+R2)
6 R = (R1*R2) / (R1+R2)
7 I1 = (V-Ø.7) / (R + B*(R4+R5))
8 V1 = V - I1*R
9 I2 = I1*B
10 V2 = S - I2*R3
11 V3 = I2 * (R4+R5)
12 D = Ø.Ø25/I2 + 2
13 G = R3 / (R4+D)
14 T = B * (R4+D)
15 N = (R*T) / (R+T)
16 PRINT "BASE CURRENT IS "; I1*1ØØØ; " MILLIAMPERES"
17 PRINT "COLLECTOR CURRENT IS "; I2*1ØØØ; " MILLIAMPERES"
18 PRINT "EMITTER CURRENT IS "; I2*1ØØØ; " MILLIAMPERES"
19 PRINT "BASE VOLTAGE IS "; V1; " VOLTS"
20 PRINT "COLLECTOR VOLTAGE IS "; V2; " VOLTS"
21 PRINT "EMITTER VOLTAGE IS "; V3; " VOLTS"
22 PRINT "INPUT RESISTANCE IS "; N; "OHMS"
23 PRINT "THE GAIN OF THE AMPLIFIER IS "; G
24 PRINT
25 GO TO 3
26 END
```

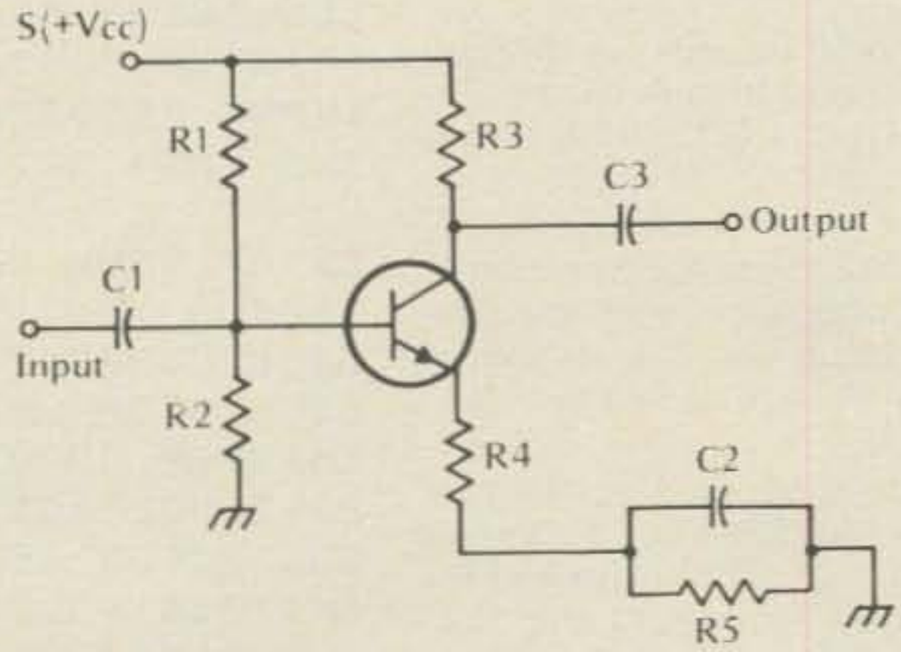


Figure 1: schematic diagram of amplifier

quite easy and straightforward to use and understand.

As most programs, this one has a short section at the beginning which asks for the user to enter the values of the supply voltage, the five resistors, and the beta of the transistor (also called h_{fe} in the transistor spec sheets.) The center section of the program calculates the results, while the last section of the program prints them out in an orderly format.

As it turns out, the circuit's operation does not depend very much on the beta of the transistor at all. This is one of the reasons why it is so popular. To illustrate this point, the program has an instruction at the end which says *GO TO 3*. This returns the computer back to line 3, and allows the same set of calculations to be repeated, but with a different value of beta. A sample set of calculations is shown beneath the program listing.

If you want to use the formulas without having a computer, the following calculations are done. Start with these given values:

S = value of dc supply voltage (also called V_{cc})
R_1 = top base bias resistor (see figure 1)
R_2 = bottom base bias resistor
R_3 = collector resistor
R_4 = emitter resistor which is unbypassed by capacitor
R_5 = emitter resistor which is bypassed
B = transistor beta.

If the Beta is not known, a good trial value is 100 for small transistors. If no emitter resistor is present at all, use 0 ohms for R_4 and R_5. If the entire emitter resistance is bypassed by a capacitor use 0 ohms for R_4. If no emitter bypass capacitor is used, then use 0 ohms for R_5.

Each line of the Basic program has a line number, which identifies the line to the computer. Lines 5, 6, and 7 are performed, in that order, to find I_1, the base current. Arithmetic formulas in Basic are written in the same way as they might be written in algebra, except that they must be written all on one line. Thus line 5 could also be written as

$$V = \frac{S\,R_2}{R_1 + R_2},$$

but the one-line form used in the program is equally easy to understand. The only strange symbol is *, which means 'times'.

To solve the problem without a computer, the equations are done in order as listed in the program. After the base current is found in line 7, base voltage V_1 is found in line 8, followed by collector current in line 9.

The collector and emitter voltages are found next in lines 10 and 11. Following this, lines 12 and 13 are done to find the gain G, followed by lines 14 and 15 to find the input resistance N.

The calculated values then are printed by the computer using lines 16 through 23. In each case, a *PRINT* instruction tells the computer to start a new line, print the words enclosed in parentheses exactly as shown, followed by the value of the calculated result. Since the currents were found in amperes, each current value is multiplied by 1000 in the *PRINT* instruction to convert it to milliamperes.

After the last printout in line 23, line 24 says *PRINT* one more time, but without specifying anything to be printed. This is used to skip a line in the printout. Then the program says *GO TO 3*, which instructs the computer to return to line 3 and start again from there. This allows you to keep the same resistor and voltage values specified at the beginning, but enter a different value of beta. The computer will repeat the program as long as you wish, allowing you to try different values of beta each time.

The printout of the results shows the values calculated by the program for the typical circuit of Figure 2. As you can see, doubling the value of beta, from 50 to 100, has very little effect on the results. Only the input resistance changes markedly.

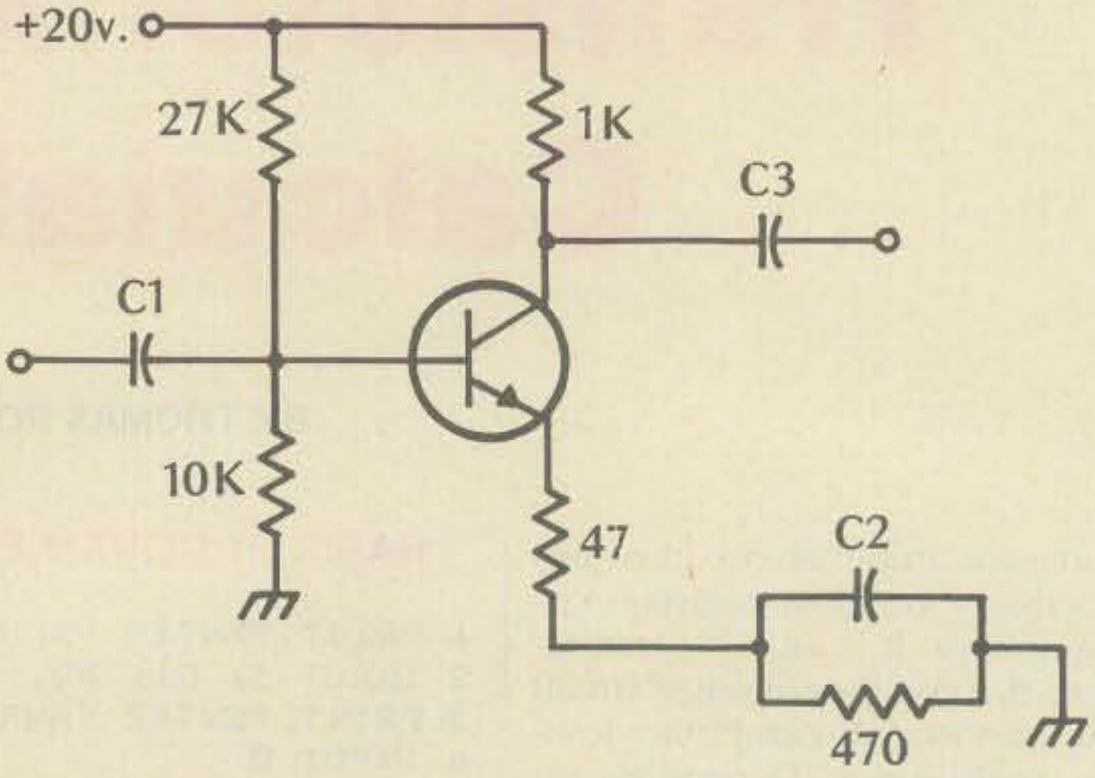


Figure 2: sample circuit

SAMPLE RESULTS FOR CIRCUIT OF FIGURE 2

```
ENTER VALUES OF VCC, R1, R2, R3, R4, R5 (IN OHMS)
?20, 27000, 10000, 1000, 47, 470
ENTER YOUR VALUE OF BETA
?50
BASE CURRENT IS  .141954     MILLIAMPERES
COLLECTOR CURRENT IS  7.09772     MILLIAMPERES
EMITTER CURRENT IS  7.09772     MILLIAMPERES
BASE VOLTAGE IS  4.36952     VOLTS
COLLECTOR VOLTAGE IS  12.9023     VOLTS
EMITTER VOLTAGE IS  3.66952     VOLTS
INPUT RESISTANCE IS  1931.14     OHMS
THE GAIN OF THE AMPLIFIER IS  19.0396

ENTER YOUR VALUE OF BETA
?100
BASE CURRENT IS  7.97563E-02     MILLIAMPERES
COLLECTOR CURRENT IS  7.97563     MILLIAMPERES
EMITTER CURRENT IS  7.97563     MILLIAMPERES
BASE VOLTAGE IS  4.8234   VOLTS
COLLECTOR VOLTAGE IS  12.0244     VOLTS
EMITTER VOLTAGE IS  4.1234   VOLTS
INPUT RESISTANCE IS  3040.91     OHMS
THE GAIN OF THE AMPLIFIER IS  19.1811
```

Although the least expensive component of your stereo system, the cartridge can make the difference between fair to poor sound and true high fidelity. Here are some tips on choosing the right cartridge for your system.

Phono Cartridges

BY MITCH RAVITZ*

Ask the person who has invested a small fortune in his phonograph audio system what type of cartridge he is using and the chances are he will give you a blank stare. Yet, all of the components that make up his system, the cartridge, without question, is number one for critical reproduction. You could invest a year's salary in the speakers and other components, but you're not going to get top quality sound if the cartridge is not up to its task of getting out of the record what the sound engineers and performers put into it.

Looking at an expanded view of a cartridge will dispel any notion you may have had that it is as simple as it appears in its streamlined casing. We reproduce here such a view of an Empire cartridge. In most particulars, the view shown here is representative of any good magnetic cartridge. There are three basic types of magnetic cartridges:

- *Moving Magnet*—In this type, a magnet, moving in relation to an assembly of stationery coils, induces voltage in the coils.
- *Moving Coil*—This is the reverse of method #1: the coils move and magnets remain stationery.
- *Moving Iron*—There are two types here. Induced Magnet and Variable Reluctance. In both, the magnets and the coils are fixed. The Induced Magnet type uses the iron to carry the magnetic flux into the coils.
  In a Variable Reluctance type of cartridge, the moving iron acts like a valve to control the magnetic flux flow within the cartridge.

Crystal and ceramic cartridges also are used, but they are not recommended for good hi-fi equipment. Crystal tapes reproduce a very narrow range of frequencies; ceramic pick-ups are better but require heavy tracking force to stay in the record grooves.

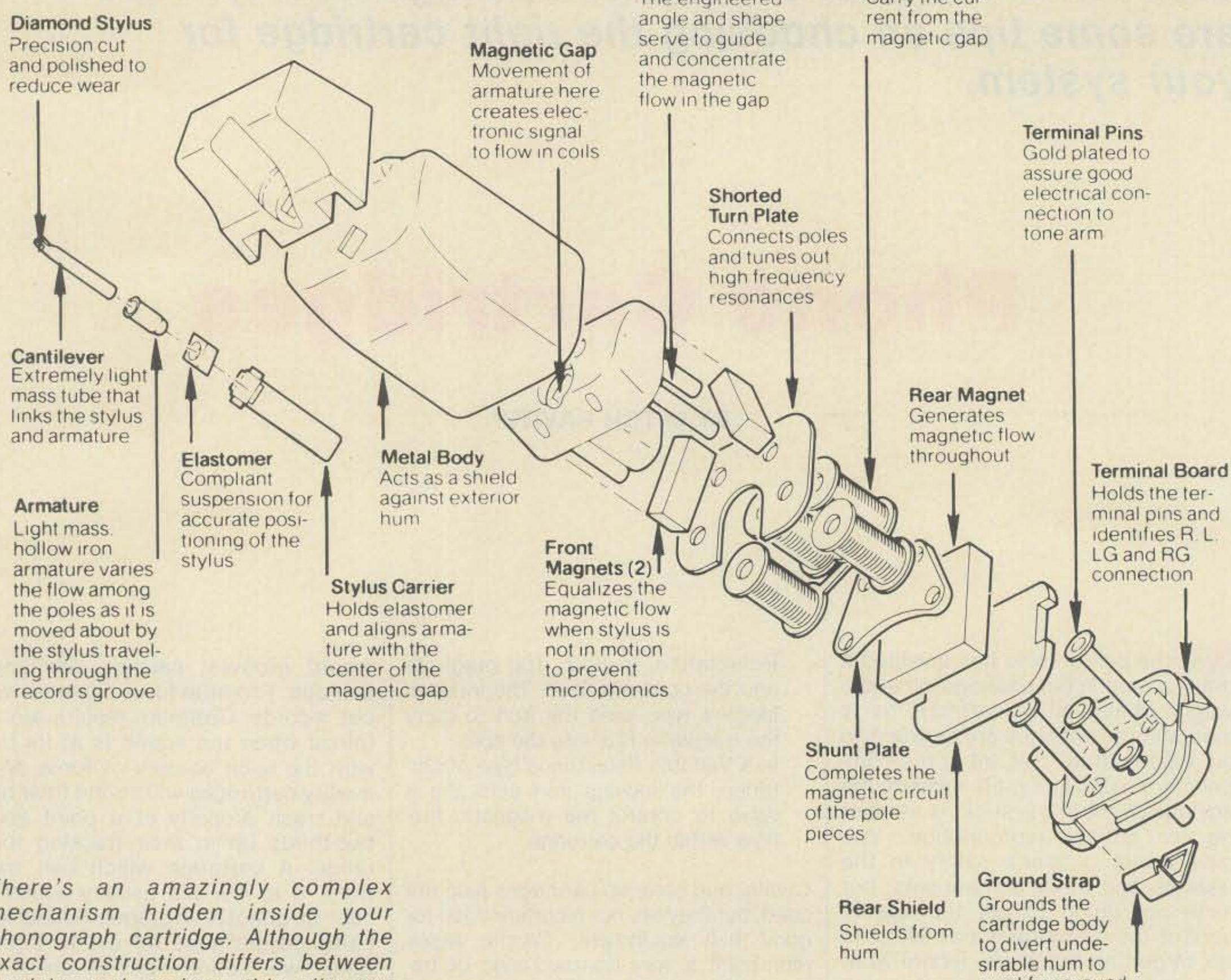
A magnetic cartridge is the obvious choice for superior reproduction and minimum record wear. But, which one should you choose? Your ear usually judges one sound that is somewhat louder than another being "better", but that can be misleading because the best cartridges have the lowest output. Here are some things to consider in testing different cartridges:

- Be sure all other components are the same throughout the test.

Listen to different kinds of music. A cartridge that reproduces the bass may not do as well on the highs.

- Before actually auditioning different cartridges, be certain that the total sound level is the same. Adjust the volume control to compensate for the difference in loudness.
- Look for the manufacturer's tracking force range, which is stated in grams. Too much force will cause the diamond stylus to plow through the record grooves, causing permanent damage. Too little force can also wear out records. Optimum results are obtained when the sound is at its best with the least amount of force. Most quality cartridges will sound their best and track properly at a point about two-thirds up in their tracking force range. A cartridge which can track from ¾ to 1½ will usually sound its best at about 1¼ grams. Similarly, a cartridge designed for a 1 to 2 gram range will sound right at about 1.7 grams.
- A cartridge's tracking ability is a measure of its capacity to faithfully follow the meanderings of a record groove. If it's able to hug the curves, you'll get everything out of the record that was put into it. Tracking is usually expressed in terms of the highest velocity, such as 20 centimeters per second (20cm/sec), at which the stylus can move to a particular frequency while maintaining accurate reproduction under a specific amount of tracking force.
- Frequency Response refers to the range of frequencies that a cartridge can reproduce. 20 Hz to 20,000 Hz covers the full range of hearing of the human ear. Your own hearing range will depend on many factors including age and working conditions. Almost every cartridge will cover this range, but this is not the only thing to consider. How accurately does it reproduce sound at various frequencies? This is usually stated in decibels (dB) with a plus or minus tolerance. As

*Technical Director, Empire Scientific Corp.



There's an amazingly complex mechanism hidden inside your phonograph cartridge. Although the exact construction differs between models and makes, this diagram shows what you will find inside a typical stereo pickup.

an example—Frequency Response: 20 Hz - 20,000 Hz ± 3 dB. The smaller the deviation, of course, the better. Although 20,000 Hz, or 20 kHz, might be good enough for stereo record production, it won't be for discrete 4-channel records with frequencies beyond 45,000 Hz. So, to get the most out of 4-channel records, you'll need a 4-channel cartridge, which can also play regular stereo records perfectly.

Last, and by no means least, there is the stylus. Styli have three common shapes: Spherical, elliptical, and Large Area of Contact (LAC). The LAC stylus configuration encompasses all those styli called "Bi-Radial", "Shibata", "Aliptic", "Stereohedron", "Fine-Line", and "Hyper-elliptical". These were originally engineered to provide the necessary performance to reproduce 4-channel (CD-4 type) records without destroying the very high frequency information moulded into the grooves.

The advantages of this shape are substantial. The stylus shape has a larger contact area to spread the tracking pressure. This gives a reduction in record wear. Yet, the width of the stylus (where it contacts the grooves) is small enough to trace frequencies up to 50,000 Hz accurately. Remember, 1 Hz is 1 cycle per second, and a cycle requires two movements of the stylus. By simple arithmetic, you can see this is equal to a rather astounding 100,000 changes of direction per second.

You are going to pay more for the LAC stylus because shaping it to the very critical specifications required is a high-precision, time-consuming task. But if you're looking for absolutely top-flight reproduction of your precious records, the difference in cost will be a minor consideration.

The spherical stylus has a large contact area between it and the record groove. However, because it is so large, it loses some of the detail and quality of the music, especially at higher frequencies where the tighter groove indulations will force it to lose contact.

The elliptical shape has a much smaller footprint. The advantage here is much better resolution of detail, and an overall increase in clarity. These usually operate at a lighter tracking force than spherical styli.

There is one more vital factor to consider before making your choice of a cartridge: be sure it is compatible with your turntable. If you don't know how, consult your dealer before you buy.

Showcase

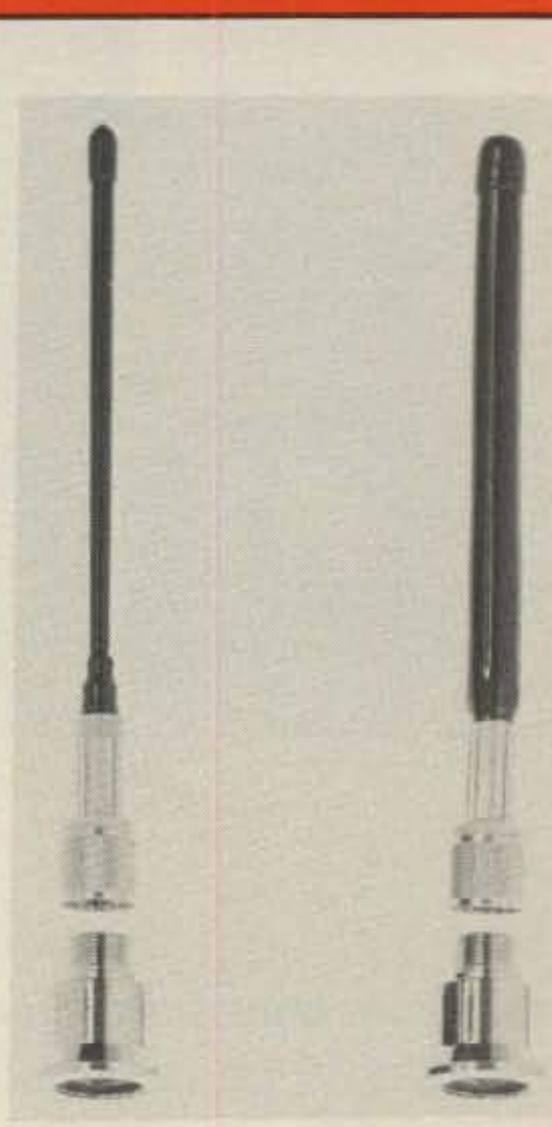
Amperex Electronic Corp. Two-Meter 100 Watt Amplifier

Amperex announces a new line of v.h.f. amplifiers. The amplifiers will deliver a minimum of 100 watts of solid-state power across the frequency band of 140 MHz to 150 MHz. Two models are available.

The Model 110 sells for $189.90 and the 130 sells for $179.90.

CIRCLE 61 ON READER SERVICE CARD

More!



Russell Industries, Inc. "Rubber Duckie" Mobile and Portable Antennas

Russell Industries, Inc. announces a new line of flexible "rubber duckie" mobile antennas. These antennas mount vertically on any auto trunk, roof, mirror mount or any other base assembly which has a 7/16" screw-on base.

Literature is available on request from Russell Industries, Inc., 3069 Lawson Blvd., Oceanside NY 11572.

CIRCLE 63 ON READER SERVICE CARD

OPCOA's LED's With Current Limiting Resistors

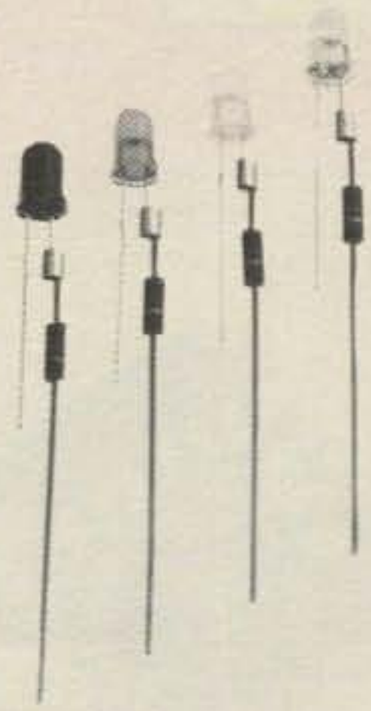
OPCOA has introduced a gallium phosphide LED with an externally attached current limiting resistor. The lamp is available for operation at 5, 6, 12, 15, 24, and 48 volts and can be purchased in red, green, yellow and orange.

All models feature long life, fast switching and require low current drive. They are encapsulated in rugged epoxy lenses.

The lamps cost 59¢ each in quantities of 100.

For further information contact OPCOA at 330 Talmadge Rd., Edison NJ 08817.

CIRCLE 62 ON READER SERVICE CARD



Gemini Instruments, Inc. "Dial Spotter" Universal Received Frequency Indicator

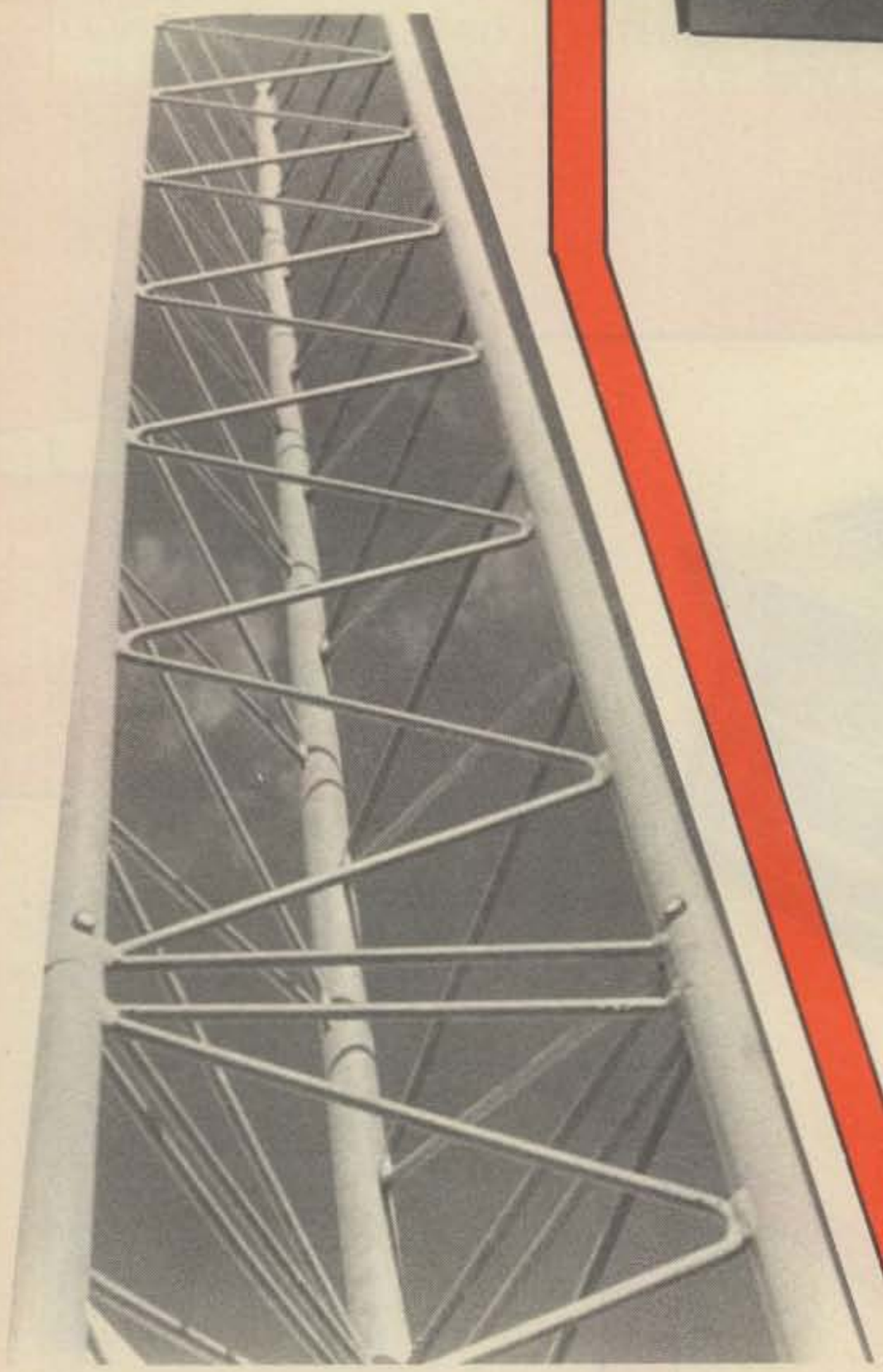
The series 35000 "Dial Spotter" is designed as an add-on for single conversion superheterodyne receivers. It can also provide kHz tuning indication for receivers with multiple i.f.'s if connected to the low frequency v.f.o. circuit of this type of receiver.

It has a 5-digit ½ inch LED indicator display which reads out the counter's frequency, from 1 kHz to 35 MHz, with 1 kHz resolution and accuracy.

Installation simply involves connecting the r.f. input cable to the output of the receivers v.f.o. circuit.

The unit measures 10.5" x 10.5" x 2.5" and costs $169.95. It is available from Gemini Electronic Sales, Box 205, Larchmont NY 10538.

CIRCLE 65 ON READER SERVICE CARD



Vega Model 188 Sub-Miniature Sub-Audible Tone Encoder

Vega introduces its new sub-miniature, sub-audible tone encoder for portable and mobile use.

The tone frequency is continuously field tunable and does not require any modifications or additons to the unit. The Model 188 maintains frequency and level accuracy over the temperature and voltage variations encountered in mobile applications.

The encoder measures 0.8" × 0.85" × 0.52", is backed by a three-year warranty and is available from Vega, 9900 Baldwin Place, El Monte CA 91731.

CIRCLE 66 ON READER SERVICE CARD

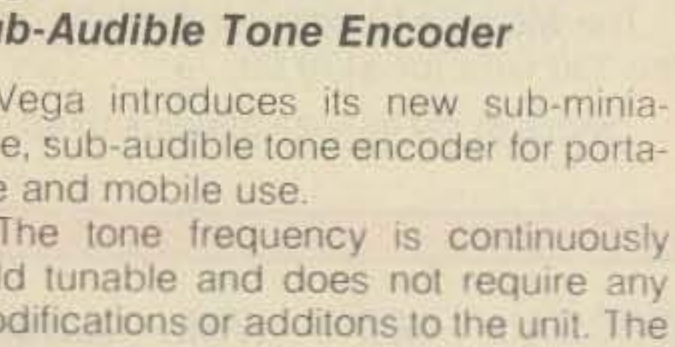
Advance Industries Lightweight Antenna Tower

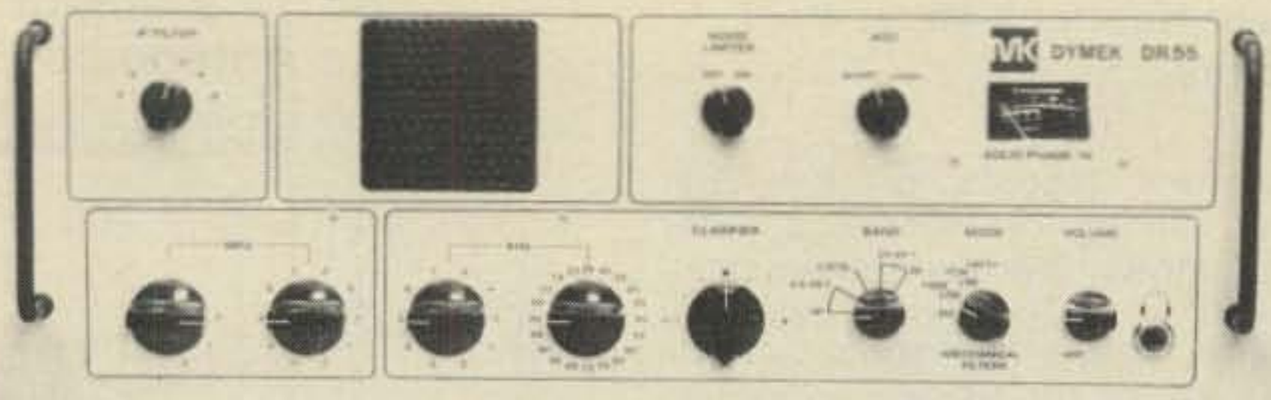
Advance Industries' new Model 115 is an all steel tower which has continuous diagonal face bracing and legs rated at 50,000 pound yield strengths. It is hot-dip galvanized after fabrication to prevent corrosion. Its face width is 12".

Kits include the number of 10' sections needed to reach the desired height (up to 60' for a self-supporting tower and 200' for a guyed tower).

To find out more about Advance's new tower kit, contact them at 2301 Bridgeport Drive., Sioux City IA 51102.

CIRCLE 64 ON READER SERVICE CARD





Dymek's DR55 General Coverage Communications Receiver

McKay Dymek Co. introduced its new DR55 general coverage receiver recently.

The DR55 features high level front end design and digital phase-locked loop tuning. Ceramic filters are supplied as the standard final selectivity element with optional Collins mechanical filters available for l.s.b., u.s.b., c.w. and RTTY.

The unit costs $800.

For further information contact McKay Dymek at 675 N. Park Ave., P.O. Box 2100, Pomona CA 91766.

CIRCLE 67 ON READER SERVICE CARD

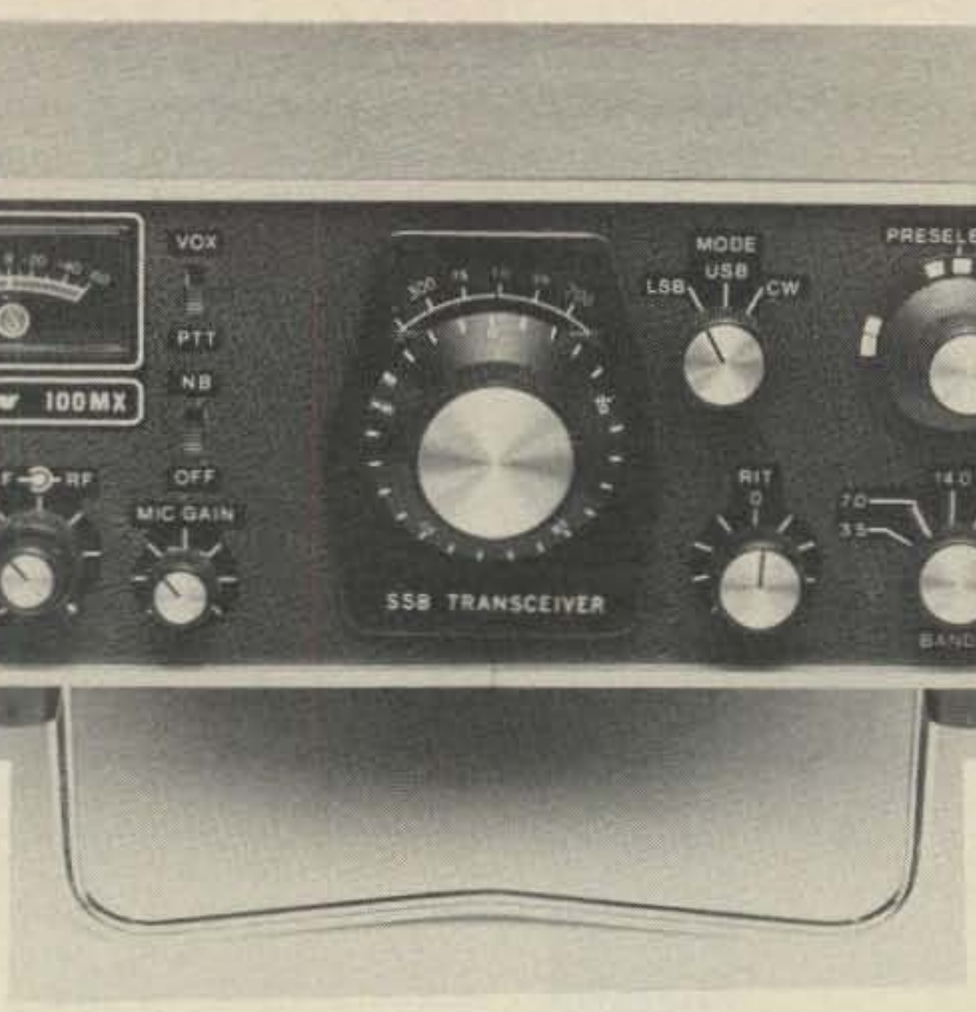
Henry Radio's Tempo S1 Synthesized Two Meter Hand-Held Transceiver

Henry Radio announces the introduction of its Tempo S1 fully synthesized miniature hand-held transceiver for two meter amateur use. The S1 is available with an optional Touchtone™ pad. Included with the basic unit are a telescoping whip antenna, a nicad battery pack and a charger.

The suggested list prices are $349 without the Touchtone™ pad and $399 with the pad.

Contact Henry Radio, Inc., 11240 W. Olympic Blvd., Los Angeles CA 90064.

CIRCLE 69 ON READER SERVICE CARD



Swan Electronics 100 MX Mobile Transceiver

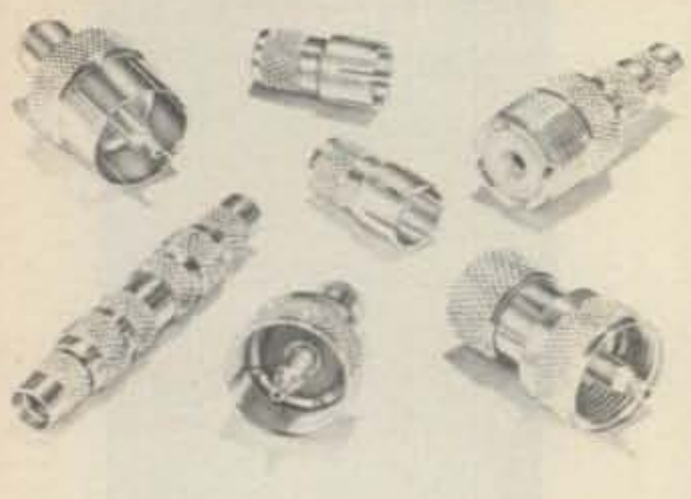
Swan has just introduced a new 100 watt p.e.p. single sideband mobile transceiver. It is completely solid-state and state-of-the-art.

The 100 MX features a stable permeability tuned oscillator with 1 kHz readout resolution, built-in noise blanker and VOX, semi-break-in on c.w., RIT, a 25 kHz calibrator and a preselector for transmit and receive.

The modes of operation include u.s.b., l.s.b., and c.w. on 80 through 10 meters. Extended frequency coverage is achieved by replacing the standard crystal with an optional crystal.

For additional information contact Swan Electronics, 305 Airport Rd., Oceanside CA 92054.

CIRCLE 68 ON READER SERVICE CARD



Sprague's Kwikette™ Coaxial Cable Connectors

Sprague Products Co. has introduced a new line of male and female connectors, quick-disconnect connectors and cable splice components. All are U.S.A.-made of brass with a nickel-plate finish.

Kwikette™ connectors feature "twist-on" installation with no special tools or soldering iron.

For further information contact Sprague in North Adams MA 01247.

CIRCLE 70 ON READER SERVICE CARD

New-Tronics Corp. 5 and 11 Element Hustler 2-Meter Yagi Antennas

Two new models of the Star Tracker™series of Hustler 2-meter yagi antennas have been announced by New-Tronics. The 5 and 11 element rotatable beams are tunable from 144-148 MHz with adjustable matching systems for 1.5:1 or better s.w.r.

The 3 dB beamwidths are exceptionally narrow. Forward gain for the model ST-5 (5 element beam) is greater than 10 dB and the front-to-back ratio is greater than 22 dB over the 4 MHz bandwidth.

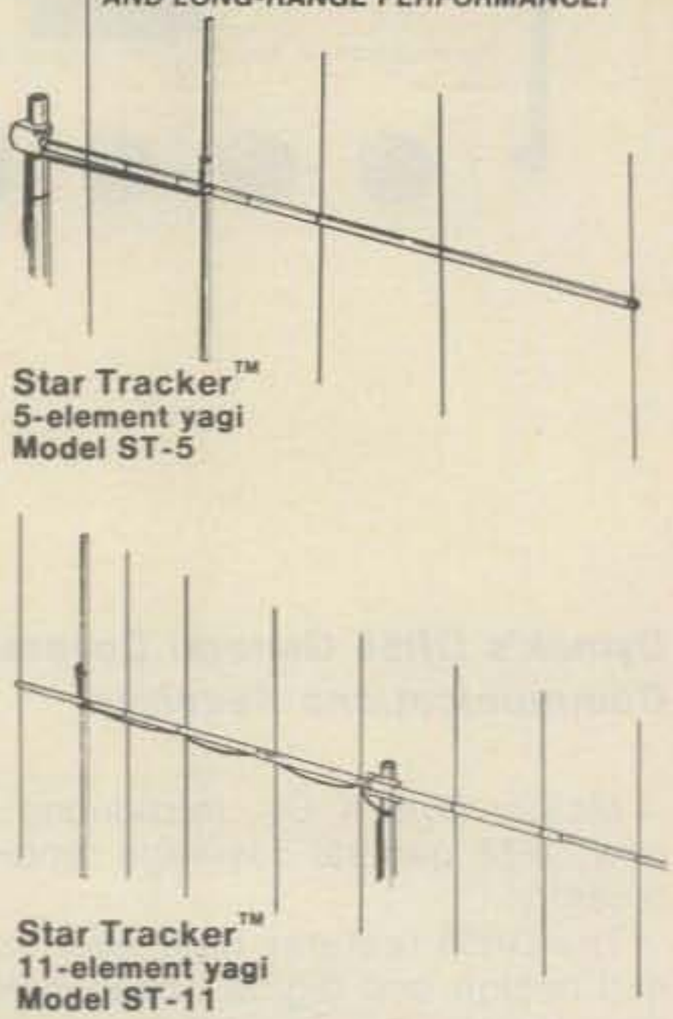
The antennas come with stainless steel hardware.

The suggested list price for the ST-5 is $39.95 and for the ST-11 is $59.95. For further information contact New-Tronics Corp., 15800 Commerce Park Dr., Brookpark OH 44142.

CIRCLE 71 ON READER SERVICE CARD

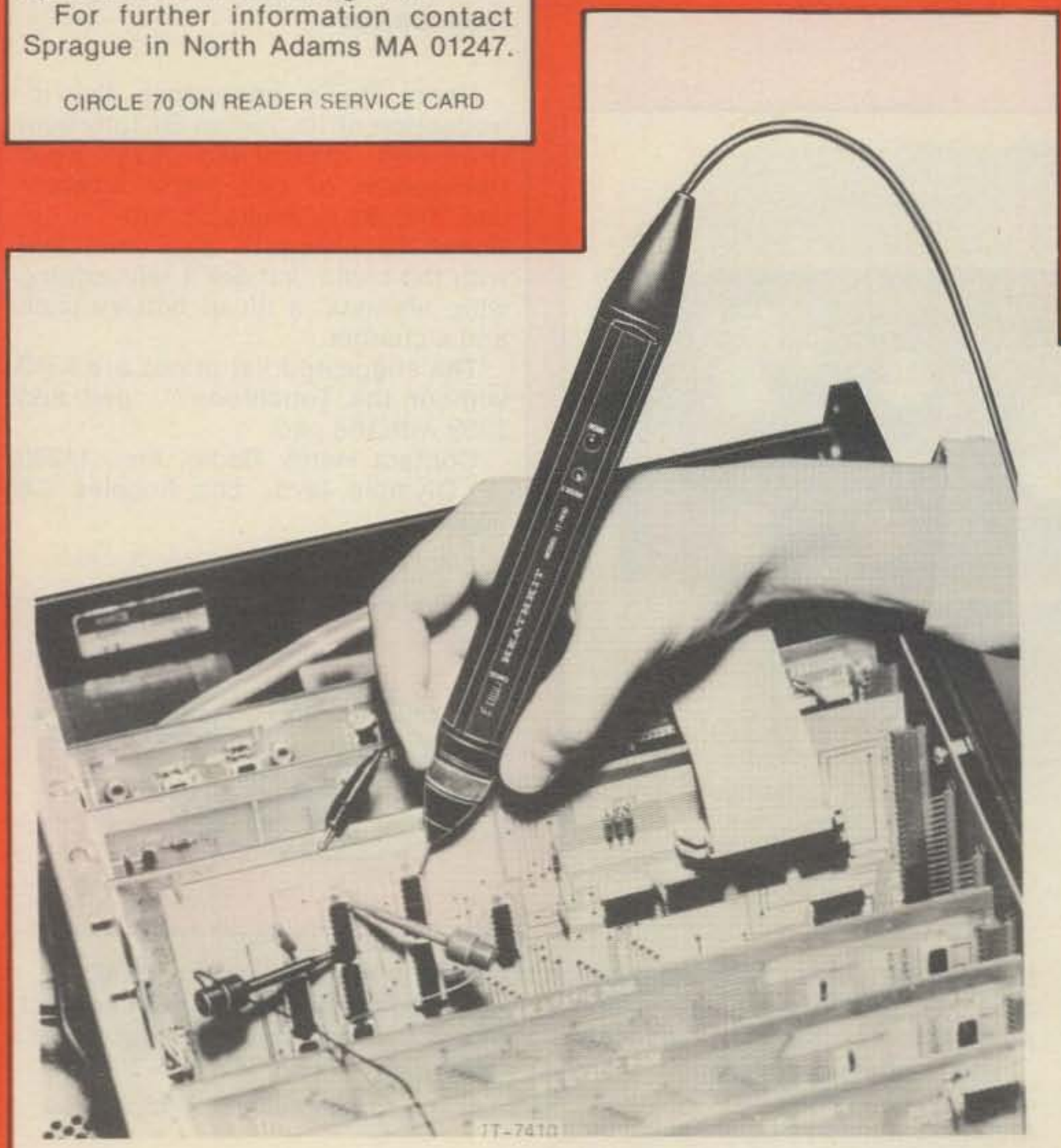
TWO METER 5 and 11 Element Beam Antennas

DESIGNED FOR MAXIMUM GAIN AND LONG-RANGE PERFORMANCE!



Star Tracker™
5-element yagi
Model ST-5

Star Tracker™
11-element yagi
Model ST-11



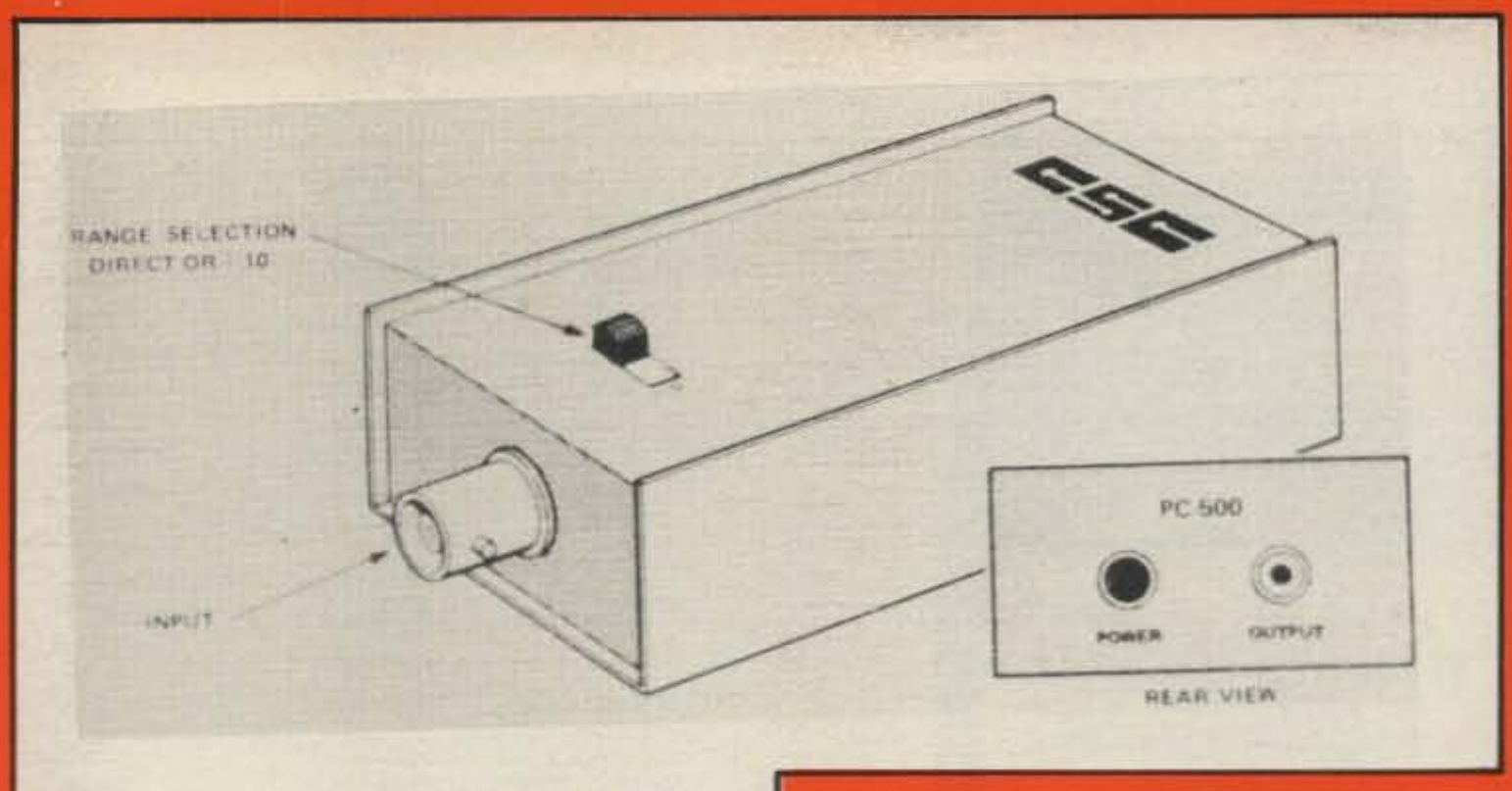
Heath Co.'s IT-7410 TTL/CMOS Logic Probe

Heath has released the IT-7410 logic probe which is designed for in-circuit testing on TTL and CMOS integrated circuits. Lamps on the probe turn on when the input voltage crosses the appropriate level. A memory circuit is incorporated in the design to turn on an LED when either threshold level is crossed.

The probe will detect pulses as short as 10ns. In addition, the upper frequency limits are 100 MHz for TTL or CMOS @ v.d.c. and 80 MHz for CMOS @ 15 v.d.c.

The IT-7410 kit is available for $39.95 and the ST-7410 (assembled unit) is available for $64.95. Contact Heath Co., Dept. 350-690, Benton Harbor MI 49022.

CIRCLE 72 ON READER SERVICE CARD



Continental Specialties Corp.'s PS-500 500 MHz Prescaler

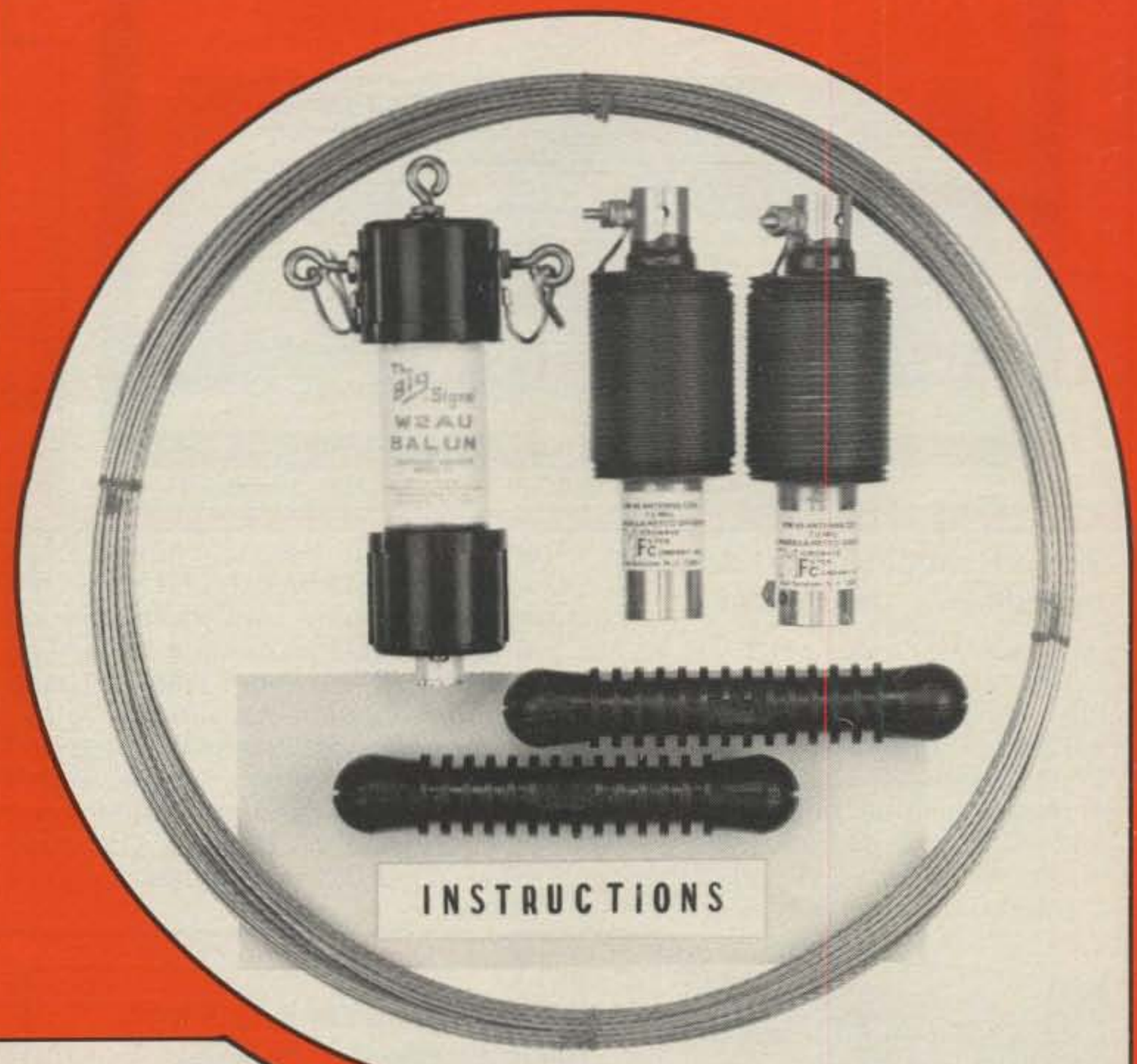
Continental Specialties Corp. has marketed a 500 MHz prescaler, called the Model PS-500.

It features a BNC input connector, diode protected 50-ohm input and 250 mV sensitivity from 50 to 500 MHz. Its output is a minimum of 400 mV (p.e.p.), capacitively coupled, available at a phone jack output. Direct or divide-by-ten prescale outputs are switch selectable.

Power requirements for the 1 x 2 x 3.5 inch unit are 7-12 v.d.c. at 100 mA. The unit retails for $59.95 and a line of accessories is available.

Contact CSC at 70 Fulton Terrace, New Haven CT 06509.

CIRCLE 73 ON READER SERVICE CARD



Radio Shack's 1979 Catalog

Radio Shack announces availability of their 1979 catalog. The 176-page book includes the latest in consumer electronics equipment and, of course, the potpourri of parts and components well-known to the amateur community.

The new catalog is available for the asking from any of the nearly 6000 Radio Shack stores throughout the country.

CIRCLE 74 ON READER SERVICE CARD

Microwave Filter Co., Inc.'s Five-Band Antenna Kit

This kit from Microwave Filter permits operation on all amateur bands, 80 through 10 meters. It includes the W2AU "Big Signal Balun," a pair of Reyco KW-40 traps, two shatter-proof end insulators and 125 feet of #14-7 stranded wire.

The kit can be purchased for $42.25 from Microwave Filter Co., Inc., 6743 Kinne St., E. Syracuse NY 13057.

CIRCLE 75 ON READER SERVICE CARD

CIRCLE 76 ON READER SERVICE CARD

Elemek, Inc. Standard Frequency Receiver

This new standard frequency receiver from Elemek, Inc. is accurate to better than one part in 100 billion and provides a time code source.

It is fixed tuned to receive WWVB at 60 kHz from Fort Collins CO.

Three BNC output connectors provide the user with the 60 kHz WWVB carrier signal, a 100 kHz signal phase-locked to the WWVB carrier and the demodulated WWVB time code. All output signal levels are at 9 volts p.e.p. square wave.

The unit will operate from 115 v.a.c. or 9/12 v.d.c. It is enclosed in a 4.5" × 5.5" × 6" steel cabinet.

The unit sells for $99.50. It is available from Elemek, Inc., 6500 Joy Rd., E. Syracuse NY 13057.

Saxton Products, Inc.'s Wire and Cable Catalog

This catalog from Saxton lists over 200 types of wire and cables. Included are hook-up wire, over 42 different types of coaxial cable and multiconductor cables.

For yours, send a note to Saxton Products, Inc., 215 N. Route 303, Congers NY 10920.

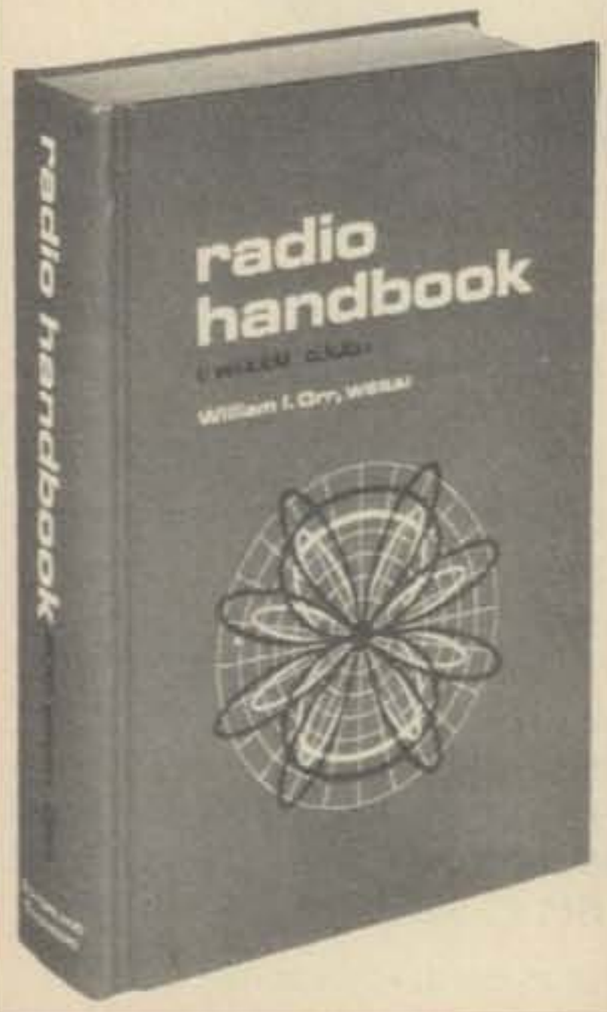
CIRCLE 78 ON READER SERVICE CARD

Radio Handbook *(21st Edition)* *by William I. Orr, W6SAI*

Howard W. Sams and Co., Inc. just introduced a completely updated 21st edition of the famous communications handbook. It contains a greatly enlarged section on semiconductor and IC circuit design. Included are s.s.b., RTTY circuits, an expanded section on linear amplifiers (both solid-state and tubes), v.h.f. and u.h.f. transmitters and converters, special-purpose and logic circuits, as well as information on new narrow band voice modulation (n.b.v.m.).

The book contains 1136 pages and is 6.5 by 9.5 inches, hardbound. It sells for $21.50 and can be obtained from Howard W. Sams & Co., 4300 West 62nd Street, Indianapolis IN 46206.

CIRCLE 77 ON READER SERVICE CARD



E & L Instruments BRS-5 NCR Basic Electronics Course

The BSR-5 is a 440-page, 6" × 9" paperback book that teaches basic electronic circuit principles. It was designed as a home study text for technicians and hobbyists. The volume was prepared by the technical department of the National Cash Register Co., Inc.

The book combines explanations, experiments and self-assessment tests.

The book assumes no previous experience with electronics and takes the student from fundamental theory of electron flow, through d.c. analysis to modern circut techniques.

The book is available for $9.50 from E & L Instruments, Inc., 61 First St., Derby CT 06418.

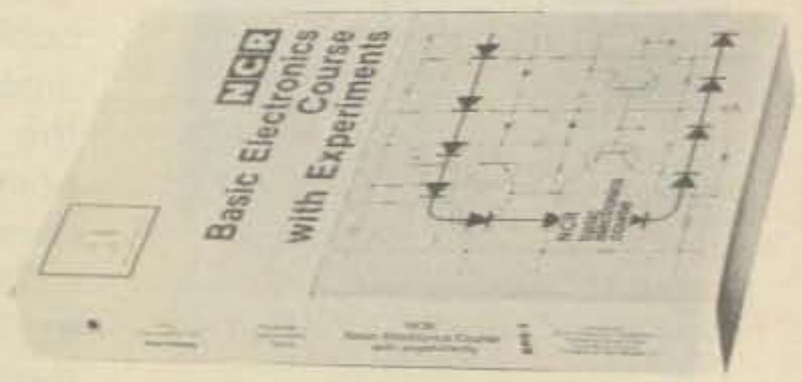
Advance Industries General Catalog

Advance Industries has announced the availability of its new catalog listing their entire line of towers, buildings and accessories.

Departments included in the catalog are Towers, Preassembled Buildings, Microwave Reflectors, Tower Lighting Kits, Replacement Components, Installation and Maintenance Services and Custom Design and Fabrication.

Write to Advanced Industries, 2301 Bridgeport Dr., Sioux City IO 51102.

CIRCLE 79 ON READER SERVICE CARD



CIRCLE 80 ON READER SERVICE CARD

Protect your car and its contents with this space-age security/alarm system!

Electronic Anti-Theft Protection

BY RON COGAN*

Every year, close to a *million* automobiles are stolen. Some disappear from sight permanently, a certain percentage reappear unscathed, and a great many are recovered in stripped condition or worse. Regardless of the ultimate outcome, however, a common denominator experienced by the ripped-off owners of these vehicles is aggravation, frustration, and the anger of being victimized. Add to this the fact that insurance companies seldom pay the full replacement or restoration cost, not to mention the delay in payment—and you have one monumental problem on your hands.

Security systems proliferate because of increasing auto thefts, and justifiably so. Adding any one of the available systems to your vehicle provides a decided edge in the war against auto thieves. Perhaps the last word in automobile protection, however, comes to us from the innovative people at Clifford Electronics, 7411 Laurel Canyon Blvd., No. Hollywood, California 91605. They have recently introduced a sophisticated electronics package that is a completely new concept in theft protection. Unlike many other devices that have a concealed switch or alarm to discourage the joy-rider, the totally integrated *Clifford Electronic Lock System* is supposed to prevent even the most skilled and experienced thief from stealing your car.

The heart of this package is a logic circuit with a combination that is programmed into its memory bank. Electronic and electrical functions in the car, such as the starter, ignition, or fuel pump in certain model automobiles, are controlled by the logic circuitry which, in turn, is controlled by a code that is punched into a dash-mounted keypad. This code consists of a five-digit number which is fed into the system by pushing the corresponding numbered buttons on the keypad, much like dialing on a pushbutton telephone. The thief cannot override the electronic system by cutting, crossing, or shorting out its wiring, as it will remain in the locked position.

Once you feed the correct combination into the computer, a red light comes on that indicates the car is operational and can be started at any time within the following 30 seconds. The system will automatically shut down if the engine has not been started within this period and the code will have to be fed into the computer again.

When you turn off the engine, the logic circuits disengage all subsystems and electronically lock your car's hood and engine. The car cannot be started even if you leave the key in your ignition. When you leave your car for service or with a parking attendant, you simply punch in the code and press the asterisk button on the keypad. An amber light will come on to serve as a reminder that you have bypassed the 30-second timer and the car can be started at any time with just the key.

Optional in the Clifford system is an air horn alarm and a motion sensor. The powerful air horns—250 decibels—are installed in your engine compartment and wired into the system. If a thief tampers with your car the air horns will blast for 45-seconds and then turn off automatically. The system then totally resets itself in the event of a second attempt is made to tamper with the keypad. The motion sensor, when used in conjunction with the air horns, will activate when an intruder attempts to jack up your car, tow it away, or force entry.

The slick system from Clifford Electronics is by no means inexpensive—but it does represent the most advanced kind of protection for your vehicle presently available. And for those of our readers who own exotic, expensive, or one-of-a-kind cars—or those who simply value their wheels and want 'em around awhile—this could well be the way to go. The Clifford Electronic Lock System is definitely the Rolls Royce of electronic security systems.

*7479 Arroyo Vista Ave., Cucamonga CA 91730

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The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., NW, Albuquerque, NM 97114. Please enclose $1 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

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SELL: 2 Meter FM Sonar transceiver, AC P/S, mobile bracket, $150. George Pataki, WB2 AQC, 34-24 76th St., Jackson Hgts., NY 11372.

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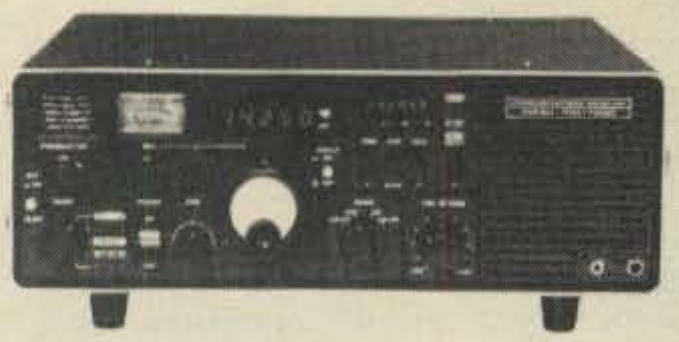

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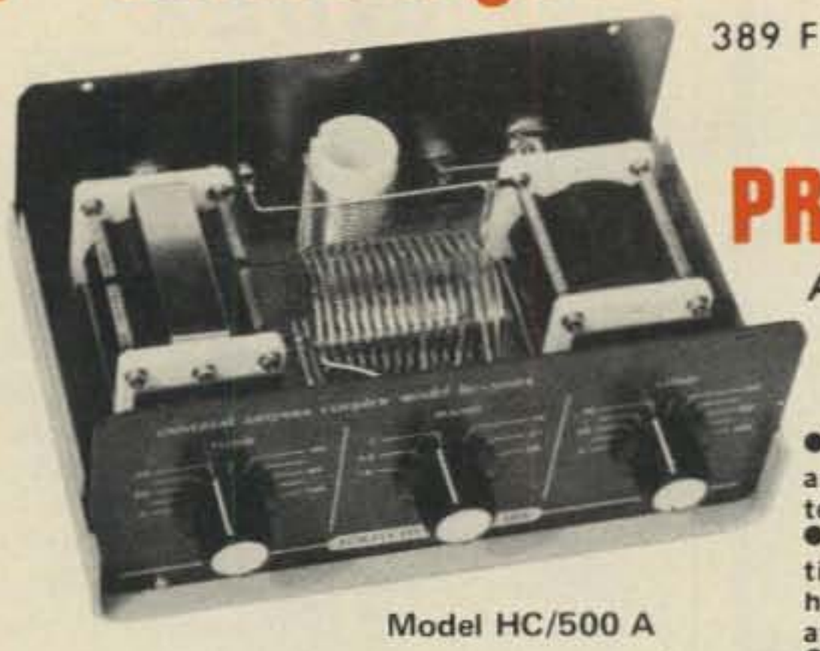

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WANTED: E.H. Scott radios, especially a Scott special communications receiver. Carl Elkins, AA4DE, 1701 Woodland St., Nashville, TN 37206.

WANTED: Any National receiver, Hallicrafters HA-10 preselector. T.N. Colbert, WA8MLV, 1800 Rhodes Rd., No. 612, Kent, OH 44240.

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FOR SALE: Old radio receivers. WA9IYF, Call (812) 273-5379.

SELL: HW101 with external VFO, power supply and spare tubes. $375. KL7IWE, SR 31071, Fairbanks, AR 99701.

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FOR SALE: Yaesu 221R 2m SSB/FM xcvr, mint $500. R. Hajdak, 1644 Morris St., SE, Mineral Ridge, OH 44440.

TV TEST EQUIPMENT: Precision E400 Gen., Sencore CA-122 analyzer, RCA WO-56A Scope, Triplet Tube Tester, $175. W. Davis, 2255 Alexander Ave., Los Osos, CA 93402.

WANTED: Tempo 8120 external speaker. For Sale: SB614 monitor (new), $140. Den-Tron Jr. Monitor $50. Bill Bechtold, N0WB, 7429 Frederick St., Omaha, NE 68124.

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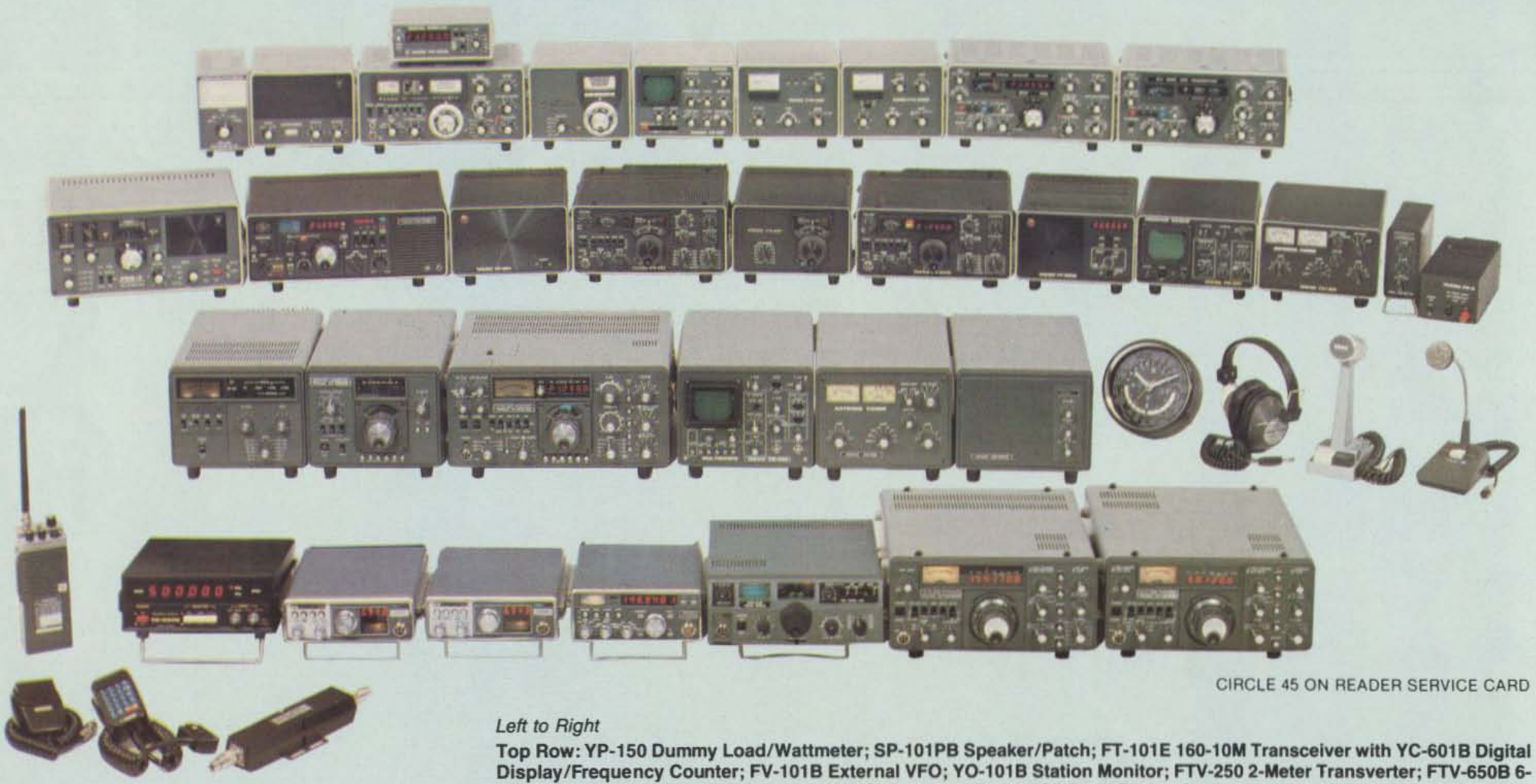

CIRCLE 45 ON READER SERVICE CARD

Left to Right

Top Row: YP-150 Dummy Load/Wattmeter; SP-101PB Speaker/Patch; FT-101E 160-10M Transceiver with YC-601B Digital Display/Frequency Counter; FV-101B External VFO; YO-101B Station Monitor; FTV-250 2-Meter Transverter; FTV-650B 6-Meter Transverter; FR-101 Digital 160M-10M Receiver; FL-101 All Band Transmitter.

Row 2: FRG-7 General Coverage Receiver; FRG-7000 General Coverage Digital Receiver; FP-301 13.8VDC Power Supply; FT-301 Solid State 160-10M Transceiver; FV-301 External VFO; FT-301D Solid State Digital 160-10M Transceiver; FP-301D 13.8VDC Power Supply with Clock & Identifier; YO-301 Station Monitor; FC-301 Antenna Coupler; LL-301 Landliner Phone Patch; FP-4 4A Power Supply.

Row 3: FTV-901 Three Band Transverter; FV-901DM Synthesized Scanning VFO; FT-901DM 160-10M "The Smart Radio" Transceiver; YO-901 Station Monitor/Analyzer; FC-901 Antenna Coupler; SP-901P Speaker/Patch; QTR-24 World Clock; YH-55 Super Soft Headset; YD-844A Hi/Lo Imp. Desk Microphone; YD-148 Hi/Lo Imp. Flexible Neck Desk Microphone.

Row 4: FT-202R Hand Held 2M Transceiver; YC-500E High Precision Frequency Counter; FT-227R 2M FM Mobile Transceiver "The Memorizer"; FT-227RA 2M FM Mobile Scanning Transceiver-4 Memory; CPU-2500R/K 2M FM Mobile Computerized Transceiver; FT-7 20W PEP Mobile Transceiver; FT-225RD 2M All-Mode Digital Transceiver; FT-625RD 6M All-mode Digital Transceiver.

Row 5: YM-24 Speaker/Microphone (FT-202 Accessory); YM-2500 Keyboard Microphone; FFDX-50 52 Ohm Low Pass Filter. 1278D

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