73 magazine
for radio amateurs

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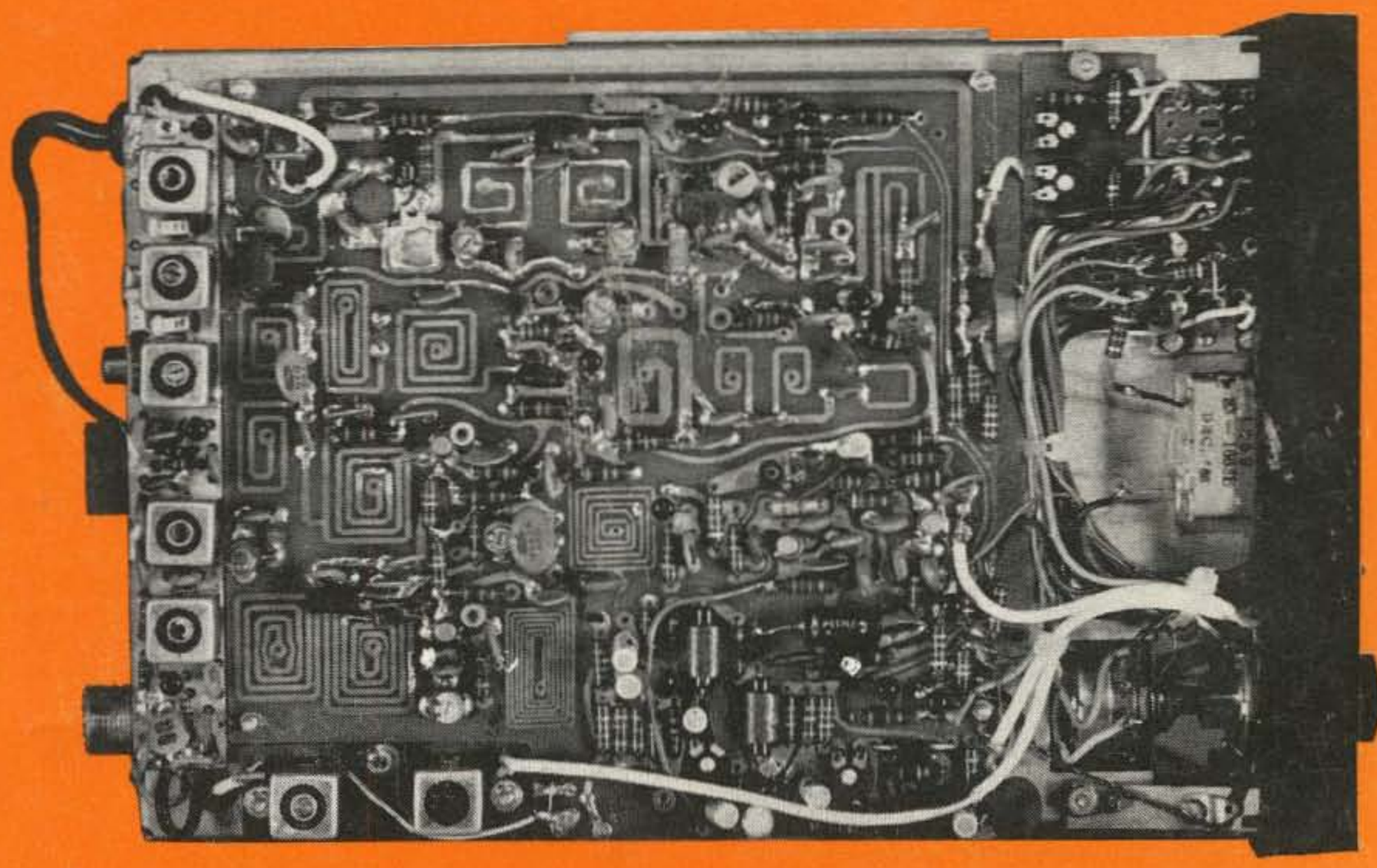
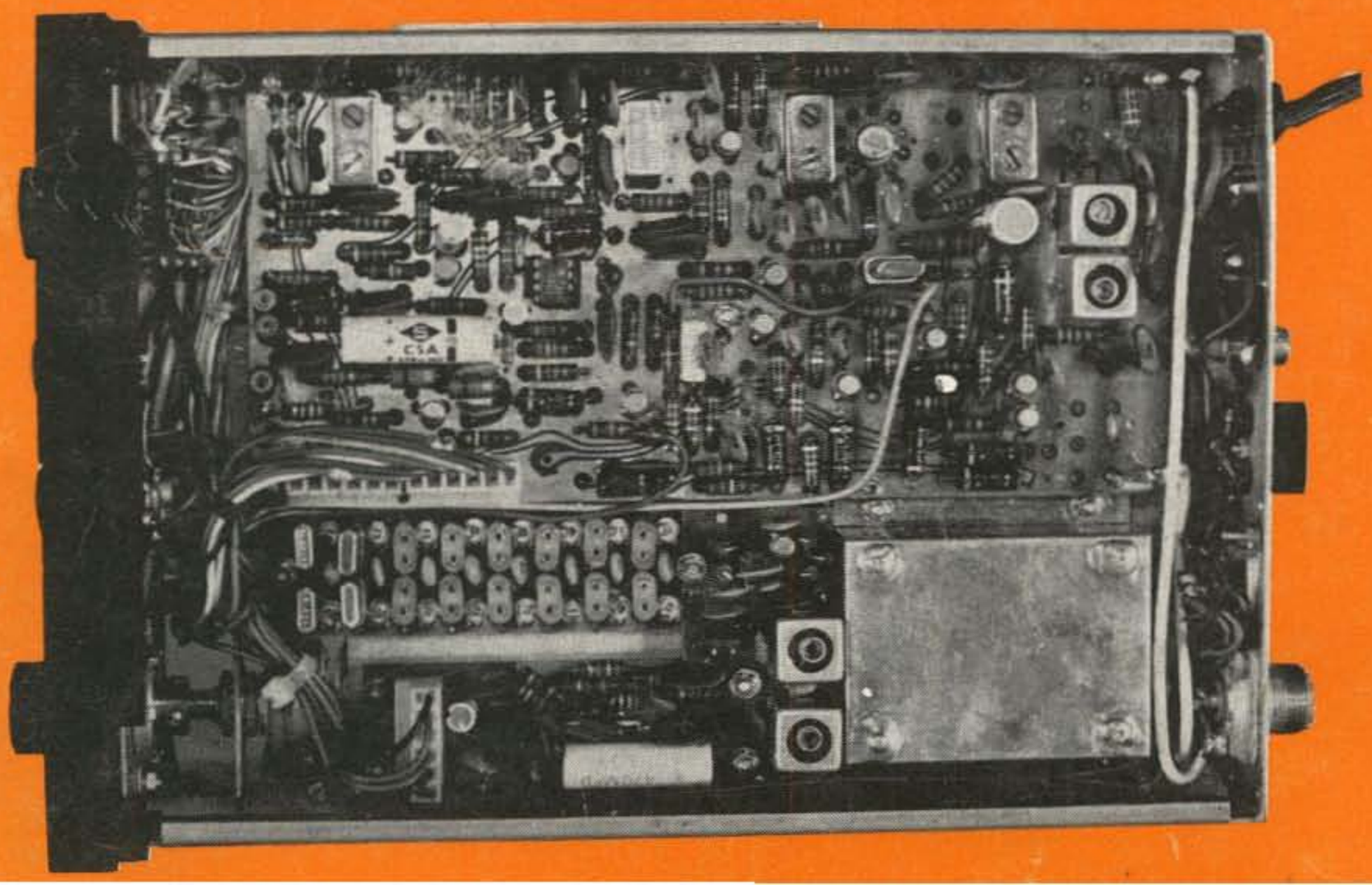
JUNE 1974





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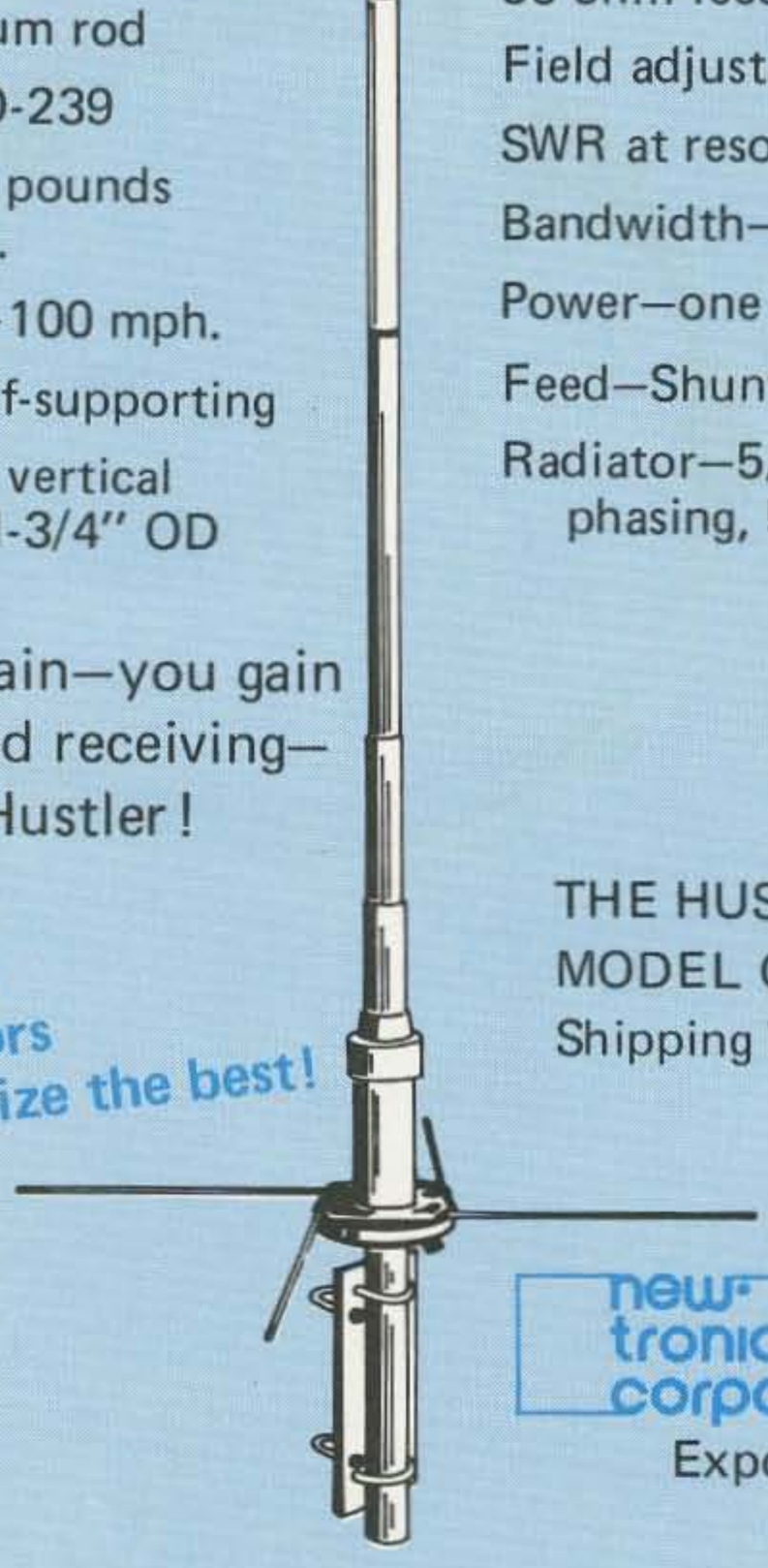

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73 magazine
for radio amateurs

165 JUNE 1974

FEATURES

2 Never Say Die W2NSD/1
4 SSTV Scene
6 Letters
8 Social Events
9 50 MHz
10 Repeater Update
12 Caveat Emptor
13 Looking West
14 New Products
74 Schematic of the Month
76 Amsat
76 Traveling Ham
77 Circuits — Circuits

CONTENTS

17 Poor Man's Quad W6SUN
The Adventures of George, The Antenna Maker.

27 Reconciling the Long Squared Quad W4KAE
Developing a new type antenna.

33 Antenna Load Indicator W5JJ
Whoops, there goes another swisher!

37 Matching WB2PAP
The poor little match girl and her coathanger.

45 Remotely Tunable Antenna Coupler W2EEY
Watch out, Johnson.

51 A Practical Ground System for 160 . . . . . .W6FPO
Makes a difference!

55 Wide-Range Antenna Tuner VE1TG
For wide range antennas.

59 Old Antennas and New Baluns W2EEY
Build a double zepp.

63 A Multiband Ground Plane WA8IYL
10-40 meters.

65 Mod Quad for Frustrated Cliff Dwellers WN3QBK
The old hidden antenna game.

COVER: *The new TPL-220 transceiver — shown at Dayton — has a tunable receiver in addition to crystal FM channels so you can tune the whole band. More and more 220 gear is being made available. Perhaps, with the 220 CB deal a dying, the manufacturers will help us get the band going for amateurs?*

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NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

GREEN VS IRS

While my complaints about the IRS in the past issues of 73 have been raised mostly on the basis of what they have done to a lot of other people and what powers they have, as well as how this can affect you and what you might do about it, the fact is that the IRS has been working diligently on me — and with some success.

Samuelson said in his interview in Playboy (whether you like the pictures or not, it is one of the few magazines powerful enough to be able to speak out against the IRS) that the IRS can, if it wants, convict anyone of criminal fraud on the basis of their tax returns. I can testify that he was not exaggerating.

Readers who dislike my carping, pushing and shoving the ARRL, the FCC and other such seemingly immovable objects, while taking delight in my problems, will ask why I should air my personal troubles in the magazine and thus offend them. The answer is simple — what happened to me was no more personal than polio or cancer — it can (and does) happen to anyone. It *is* something to be concerned about.

Readers who are able to look at the long run — the things that I have helped to get changed down through the years as a result of my needling and bitching — know that I am not without some effect, in spite of my irritating way of going about things. In my defense on this I would point out that no one in history who has tried to change things was very popular — not to draw a comparison, but look what they did to Christ. There have been a lot of martyrs in history, but this editorial happened to be written on Easter Sunday and the thought was fresh in mind.

ON TRIAL

The indictment which was handed down by a grand jury said that I was accused of knowingly having the tax returns for 73 Magazine and myself prepared falsely for the years of 1966-67-68. Since this was completely untrue, it seemed like a problem that would eventually get cleared up when light could be shed on it.

Three years of tax returns for 73, three for me, came to six counts on the indictment — plus six more counts for my signing the returns — that little line on the bottom which says under penalty of perjury — a total of twelve counts.

Those of you who have watched the Perry Mason series are familiar with the thinking of the prosecution — they want a conviction, whether the accused is guilty or not and they get furious when Perry is able to show that the accused is innocent. The actual innocence of their victim is of no consequence, only their need for a conviction is paramount.

What you don't see in Perry Mason is the back stage maneuvering of the government to win the case. They try to hide as much of their case as they can so the defendant will have a minimum of opportunity to prepare to argue or counter the evidence or testimony. In our case they had a list of over 200 witnesses which they withheld as long as they could to make sure that there was no possible way to do much about it. Their use of out of date addresses for many of the witnesses was an added obstacle.

Since they only used about a dozen of these 200 plus witnesses, it is rather obvious that this was an attempt to hide the real witnesses among a crowd of psuedo-witnesses to prevent any defense being worked up.

Even with all this I didn't worry exceedingly about the situation because I was sure that justice would be done, that the facts would have to come out in court. They did, but they were so obscured by trivia and massive amounts of irrelevant things, that they got lost in the shuffle.

Would you go into court as a defendant, knowing you are up against the very best lawyers the government can afford, brought in from Washington to do a job on you, and with you defended by a lawyer who has never tried a case before? You would if you were in my place and found that the mere indictment had cut off your credit so you had no money to pay an experienced trial lawyer — not even enough to have a second lawyer just sit and help with the paperwork during the trial.

Just as an added hurdle, let's make your lawyer an accountant with a small one-man office and a bunch of clients who need their tax returns prepared during the first three and a half months of the year — and let's put that trial at the worst possible time during that work period. Thus, he will not only have to work all day in court defending you, but will then have to work nights on his regular business instead of preparing for the next day's court action.

Would *you* expect a fair trial?

THE PROBLEMS

For the last twenty years I have had my tax returns prepared by accountants. I know only enough about taxes to know that there is no way for anyone but an expert to understand them, so I turn to professionals. My "professional" (General Business Services) for the years 1966-67 let me down and the IRS jumped in with glee to take advantage of the situation.

During those years I had little to do with the financial end of the magazine. We had a business manager and he took care of all that. I depended on the accountant to make sure that any personal expenses paid by the magazine would be charged to me and all checks spent were clearly marked as to their purpose to simplify this. Nothing was hidden or obscured. Starting with some of these expenses which the accountant did not properly allocate, and then adding an unbelievable number of "disallowed" expenses, the IRS built up a formidable figure for taxes. Each disallowed expense counted twice, of course, once as unreported income for me personally and once as unreported income for the magazine, so this doubled each disallowed expense.

What sort of items did the IRS disallow? In my office they disallowed my desk, a chest, the paintings on the walls, the chairs, tables, lamps. They disallowed the decorations in the reception room, the table and chairs in the lunchroom, and many other pieces of office furniture — lamps — tables — chairs. Then add to that the expenses on trips to hamfests and conventions where I have given talks and sold subscriptions — total disallowance of DXpedition expenses — cameras — books and magazines for research — all car repairs, licensing, purchase costs, even for cars used strictly by the magazine — ad sales trips — interview trips for new editors — entertainment of visiting hams, advertisers and dignitaries — and you end up with a formidable list — times two.

The trial lasted almost a month and during that time there was never one word of testimony that I falsified my records, that I hid anything, that I tried to deceive the accountants, that there was any double bookkeeping, or anything that I did was wrong. The accountants all testified that I did not try to influence them when it came to

business vs personal expenses and that I accepted their decision without complaint.

Some of the expenses involved were indeed personal — many were in what the accountants call the gray area — where accountants and the IRS get together and haggle — and many were very clearly and obviously business expenses. It should be mentioned that the IRS did not make any effort to even find out what most of the disallowed expenses were. They went by what was written on the check and asked few questions. And some of the disallowed expenses were things which had been allowed by an IRS audit in a previous year!

My lawyer pointed out that if he could get one businessman on the jury we would have no problem. No way. The jury was mostly retired people, housewives and a couple of blue collar workers. They were as lost as I was during all of the obscure accounting and tax talk and they ended up voting, I suspect, on the basis of the closing statement of the prosecutor, which was masterful. My lawyer took a few minutes to point out that there had not been a shred of evidence produced during the long trial that I was guilty of anything except hiring a lousy accountant. The prosecutor took well over an hour to dwell on the indictment and the massive amount of disallowed expenses.

It didn't help a lot that I managed to get the flu half way through the trial and had to sit there day after day, with a fever of 102 or so, shivering with chills, unable to really be aware of what was happening. In ten days I lost 15 pounds and was so weak I could just barely walk — this, of course, was when I was called upon to testify. I have little recollection of it.

In retrospect I understand how foolish I was to trust the IRS. I thought that if I was honest with them that we could solve the few problems we had with the taxes. I didn't realize that they are desperate for goats to parade at tax time to frighten taxpayers into compliance. My case was complex enough to be made to order for them. I should never have cooperated with them — shown them our records — for I'm now convinced that they were interested in a fraud conviction right from the first and pretended to be interested in a civil audit just to pick out items which might convince a jury.

WHAT NEXT?

The decision of the court is not yet known in the case, so it is still premature to say that I have been convicted of tax evasion. Whether I am convicted or not I will do everything I can to help keep other people from getting into the same position. I now know personally that it can indeed happen to anyone.

You are undoubtedly familiar with the frustration of being accused of something you didn't do. It is infuriating. You want to do something about it when someone lies or distorts things, yet under the trial system you have to sit there and grind your teeth. I'd love to publish the transcript of the trial, but that is over 3000 pages! No wonder the jury fell asleep. Unless the court stops me, I do want to cover the essential points of the trial — the story developed by the IRS — and the story they so successfully covered up. Knowing that most juries work on the "where there's smoke there must be fire" principle, the IRS generated an almost inpenetrable smoke screen.

If the court does convict me we will appeal and try to do better next time. In view of the total lack of evidence that I did anything wrong, it is possible that there will be no conviction.

DO YOU WRITE

If there is anyone out there who has been working with Novices a lot and has an understanding of what information they need — and who is able to write coherently — there is a possibility that a relatively short Novice column in 73 might be well received. Any takers?

There is also a rather continuing need for research articles for 73 — things that you might suppose would be done by the 73 staff — if there were that much of a 73 staff. About once a year or perhaps every other year the readers would like to have a survey of the equipment available for a particular band or a particular mode. For instance, an article on all of the 220 MHz gear available, including any specific accessories. Or one on 12vdc power supplies. Or one on 6m ham gear. 450 gear. Test equipment for the ham shack. Two meters would have to be split up a bit — hand units — mobile and fixed station units — power amplifiers — antennas. Low band sideband gear. 160m gear. You get the picture. It means getting the latest information from manufacturers, pictures, making up charts of comparison, and providing a brief review of each unit. . .etc. It pays.

TO CB OR NOT TO CB

A call from a friendly eastern FCC inspector explained some of the working of his organization. When calling on licensed CBers he has the authority to levy a fine on them for breaking the rules. When the CBer is unlicensed he can just warn them and then, if they continue, go to a U.S. magistrate, file a complaint of violation of the Communications Act and apply for a search, seizure and arrest warrant. He can then get a U.S. marshall to accompany him and to execute the warrant.

Amateurs who have CB neighbors who are operating illegally must wrestle with their conscience about calling the FCC. Is it better to turn in an illegal operator and perhaps get rid of a lot of local TVI and bad will towards amateurs, or just keep quiet and thus be a party to the lawbreaking? Silence is assent. If you don't do anything about it, you are guilty.

MORE NEWS REPORTS NEEDED

Radio amateurs have been performing emergency services in recent months as never before. While it is important to see that news of this service reaches your local papers, always remember that other amateurs will want to know what you've done too, so be sure to either send a copy of the news clipping to 73 or send in a brief writeup of the service to the magazine. Pictures of the people involved are also helpful, if they are available or can be taken, either in group or solo. The deadline for newspage material is the 15th of the month.

While some congressmen may get to see your newspaper articles, most of them won't. Only 73 sends copies of important amateur news from the newspages to congress. The FCC will get to see them this way too.

Long, detailed articles on emergency service normally should go to QST, while briefer reports should be aimed at 73.

HOTLINE COOKING

The HOTLINE, a ham newsletter sent out by first class mail every other Friday, is drawing bravos from all over. It covers all the late breaking news — the latest FCC reports — the hamfest news — contest news — jobs open in the industry — DX late news — new equipment announced — new books — propagation flash — repeater update — so why wait two months for these items to reach you through 73 Magazine. Get the inside scoop while it is still news. It'll make your contacts a lot more interesting. All this for only $8 per year sent first class — and that reaches most places as fast as airmail — and some places it reaches faster.

NEW FCC FORM

Repeater groups who have been asking about their license applications have been receiving a new FCC form from Walker. This form announces that they've lost the application, so please do it again.

W2NSD/1

SSTV SCENE

Dave Ingram K4TWJ
Rte. 11, Box 499, Eastwood Vil. 50N
Birmingham AL 35210

This year's Slow Scan contest appeared a fine success, and I'm sure all of you enjoyed it. As of this writing date, I have tallied U.S. results, (see Chart 1) and am standing by for world results from Franco I1LCF. I understand some of the U.S. stations sent their logs directly to Franco (rather than either sending me a copy, or having me forward them to Franco, as I mentioned in the January column) so the final tally was from received information.

Don Miller W9NTP, was the winner with a rather impressive score which included WAC on SSTV. Next was Bob WA7MOV, and Connie WA1NXR, both who are quite active on Slow Scan. Although everyone agreed conditions were anything but optimum, it's interesting to note East Coast stations reported fair openings into (primarily) Europe, while West Coast stations reported fair openings into (primarily) the South Pacific and Asia area. "Centrally located" stations appeared to have the advantage of catching both areas. Like most contests, this one also had its points of interest. WB4ECE reported "being tied up with business 'phone calls most of the time." K9BTU had his Ham-M Rotor give up, leaving the beam stuck on Europe, plus taking time out to attend a wedding. WA1NXR operated the contest without AGC action on her TR-4 (Boy, I bet that was good on the ears!) only to have the rig go out completely right after the contest. Quite a few of the gang reported falling asleep at their rig during the wee AM hours. AhAh. . .the pleasures of the chase. Our thanks to all for your comments and pictures. Naturally next year will be even better!

Slow Scan on 2m appears to be growing in popularity, probably because it is handy in checking ideas and circuits with others under "closed circuit" conditions. (Just watch deviation — present regs call for this to be low). In some circumstances this could prove advantageous. One could "show" a problem to another local SSTVer, even while driving to work. That's as simple as remembering to grab the cassette unit on your way out. Newcomers could check out and get familiar with Slow Scan gear by taping these QRM free pictures also. (Again, just a cassette recorder in the car is all that's necessary.) No "tuning for proper syncing" is required on FM. In fact, a simple PLL circuit could be built which would energize the recorder while Slow Scan was being received, thus a "no hands" operation could be accomplished. I have found a two cartridge system works best. . .one for recording and one for transmitting. The "Program" is recorded on both "sides" (directions) of one cartridge, so I needn't worry about rewinding. Then, when receiving SSTV, I just swap cartridges. I also often use my car's 8 track stereo tape deck for Slow Scan. One of my "home recorded tapes" has a SSTV ID on one track's left channel output and a SSTV program on the right channel output. Simple switching circuits are used to also feed this (through a small attenuator) to the 2m rig. Incidentally, I might mention here although good results can be obtained by just holding a mike near a speaker, (watch the volume) a better way would be to connect the audio through a .005 μF capacitor to the deviation pot. This bypasses the first audio stages that usually incorporate limiters that could clip the signal. This also is a much better way to connect a touchtone pad into a 2m rig, as it's more stable and reliable (and more convenient). I accomplished this on my TR-22 (yes, R.L. Drake agrees it's the better way) by disconnecting the speaker positive leads from the earphone jack, taping them and sticking them back beside the jack. Then "quick soldering" a small lead to the actual wiper on the deviation pot, running this lead to the earphone jack completes the modification. Plugging either a touchtone pad, cassette or 8 track player into this jack (watch that level) gives double capability. I can even talk low into the mike during SSTV transmission for mixed audio and video. Slow Scan transmissions on 2m can be kept very short since there is no QRM. A single frame can be spliced into a tape loop and replayed indefinitely. And if you would like a good antenna for SSTV especially try the New-Tronics CGT-144 — 5.2dB gain job. It really helps me from the car. I feel SSTV on 2m is good for experimenting (watch that deviation!) but would defeat its basic purpose (that of long distance TV communication) if used for 20m style QSOs. 440 MHz Fast Scan would be better suited for that purpose. However, pulse modulation SSTV for moonbounce might be a worthwhile consideration. (Let's see you beat that 262dB path loss!)

UNITED STATES RESULTS
4TH SSTV CONTEST

CALL	QSOs	CONTINENTS	BAND/ COUNTRIES	TOTAL POINTS
W9NTP	82	6	42	9348
WA7QBV	43	3	56	5334
WA1NXR	44	4	31	3608
WB4ECE	43	4	33	2279
WA1KYW	33	4	21	2046
K9BTU	16	3	10	560

K9BTU Transmission

Ralph ZL2AAV, should have received his Robot monitor by now, so watch for him around 14.230 kHz. He has some interesting taped programs that show active volcanoes, crater lakes and ski slopes in his area. In fact, Ralph has been quite busy on a sampling camera that might be working by now. Bill XW8DO, reports being back on 2m and looking for SSTV QSOs mainly on Tuesday and Wednesdays (approx. 1400 GMT) and Saturdays (around 0100 GMT). Joseph WA2ZDF/CP1, is busy finishing his new 'MXV monitor and should be on 20m soon, at least with some taped programs while he builds a plumbicon camera.

Next month I plan to have world results of the Slow Scan contest, a recap of the Dayton bash, and much more. 'Till then,

K4TWJ

The K9BTU SSTV Setup

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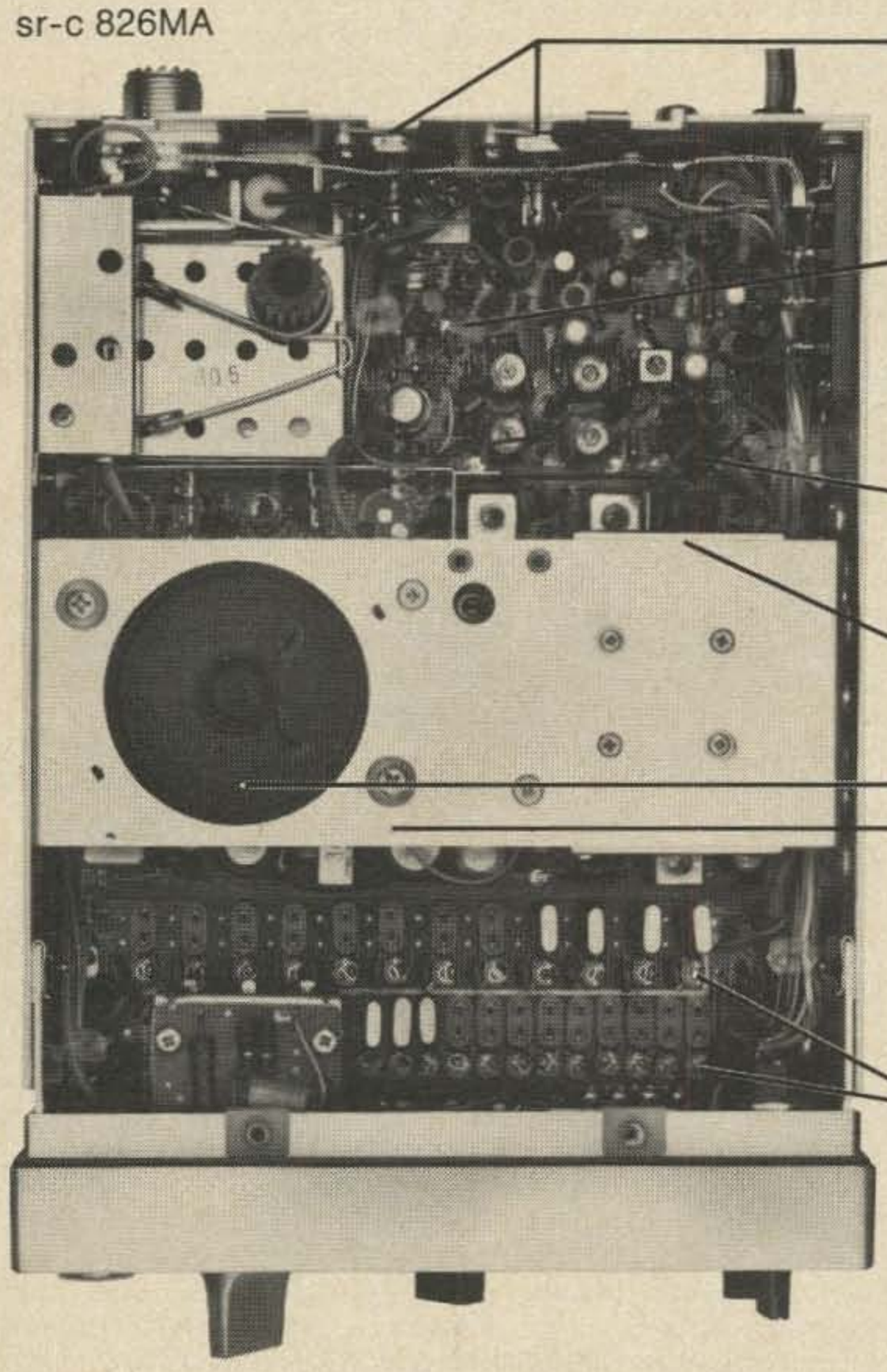

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LETTERS

COUNSEL FOR THE TAXPAYER

Internal Revenue Service officials have assured congress that IRS employees do their best to comply with the letter and spirit of the Freedom of Information Act, now in its eighth year of operation. Do they?

No. I'm sorry to report that they're still flaunting the law despite repeated warnings from Capitol Hill. Eloquent proof is found in the results of a recent survey of nine IRS district offices. The inquiry was made by representatives of Freedom, a journal of national circulation published by the Church of Scientology.

Reverend Kenneth J. Whitman, Freedom's editor, authorized the survey after examining instructions that all IRS employees are supposed to be following. They're contained in an IRS manual supplement entitled "Release of IRS and Other Telephone Directories to the Public."

This manual was distributed by the IRS national office to all IRS district offices. In accordance with the Fol Act, it clearly states that IRS district telephone directories are to be made available to the public on request.

Certainly there's nothing hush-hush about a mere list of employees, with their office telephone numbers. I keep one in my desk that covers the entire IRS national office, as well as other listings. This directory can be obtained at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Yet Freedom representatives were allowed a look-see at district office directories in only three out of nine cities: St. Paul, Detroit and Portland OR. They were summarily turned down in Los Angeles, Honolulu, San Francisco, St. Louis, Boston and Austin TX, after receiving the third degree in each office.

Whitman said the results lend great weight to the charge, frequently heard, that IRS operates like a secret police organization.

Portland was the most cooperative office. But even there, the inquirer was interrogated before being allowed a peek at the directory.

Apparently it was only by luck that the Freedom requester was successful in St. Paul. The IRS employee who handed over the directory said, "Here you go. Monday is my last day anyway."

Freedom got a chilly reception in San Francisco. An IRS public servant said, "I wouldn't know why you would want a directory except to spread propaganda." IRS spends millions of tax dollars every year to spread its own propaganda from the Atlantic to the Pacific.

When turned down in Austin, the Freedom representative asked if there was any way to get a directory. Answer: "No."

Freedom pollsters really got the run-around in Los Angeles and Honolulu. The inquirer in L.A. was told that he'd have to write to the district director and state exactly why he wanted to see a directory!

In Honolulu, an IRS official said the directory wasn't available to the general public. It was only for inter-office use, he said. The Freedom man was asked what company he was with, who he represented, what he wanted to use the directory for and how he came to know there was such a telephone book.

Reverent Whitman's conclusion: If you want to know how IRS really operates, watch what it does, not what it says it does.

E. Edward Stephens
Third Floor
815 King St.
Alexandria VA 22314

IRS – BAH!

I am in complete agreement with you on your stance on the blood-sucking Infernal Revenue Service.

You want to do away with the income tax? It is a very simple matter, according to the Constitution of the United States, which has been used as toilet paper up till now by the Nixon administration. The First Amendment to the Constitution says: "Congress shall make no law respecting an establishment of religion. . ." Yet, the church in this country is free from the burden of paying its fair share of taxes. It does business in this country via owning railroads, buildings, houses and bingo halls. It makes hundreds of millions of dollars per year. It has billions of dollars in real estate and priceless jewelry and gems. All untaxed! If this is constitutional then I am the Statue of Liberty.

In Mr. Green's editorial, in the April issue, he states, "The IRS has no right to see your records, cancelled checks, etc. without a court order. . ." I am very sorry to say, Mr. Green, that the Nixon court (formerly the Supreme Court), has just this week, declared constitutional, the 'right' of the government to examine any and all financial transactions, checks written, etc. without a court order. All banks must now keep a micro-filmed record of all activity in your bank accounts, and make them available at the government's request. Of course, the stooges appointed to the high bench by Nixon, voted for this.

Name Withheld
Flushing NY 11352

HOW TO MAKE $100

Received the April copy of 73 this evening. Could hardly wait for dinner to be over so I could get started reading. Imagine my surprise when I read the article entitled "The New Breed On 2 Meter FM."

No foolin Wayne, the same thing happened to me about 2 weeks ago. I drove into a service station to have my car serviced. Naturally the attendant noticed my call sign in the back window and the bumper mounted antenna. Some one had told him there was a 2m repeater hookup nationwide, and he has a licensed brother in Oregon. The attendant knows the code but not the theory. If he had a license he figured he could talk to his brother.

When I told him I got an advanced license about three years ago he says, you ought to be pretty good, and if I would take the exam for him, he would give me $100.

Boy oh boy!

George A. Lewis W7SBZ
Mesa AZ 85202

RECTANGULAR PEG IN A ROUND HOLE

Do you sometimes want to chassis mount an IC in a round can? Here's my solution: Use the bottom side of a tube socket as a round terminal strip on which to mount the IC. No large hole is made in the chassis; only those for the mounting screws. Flat wafer type sockets work best. For example, suppose you want to mount an 8-pin, TO-5 IC. I suggest a 7-pin, miniature socket. Obviously you will have one pin left over on the IC. Look at the IC diagram – almost always at least one pin is a "no connection." Make that the "extra" pin. Cut the lead short or at least make sure it doesn't touch anything.

There is one fly in this ointment. Some ICs are unstable with leads this long. However, the popular self-compensated operational amplifiers (such as a 741C) are completely stable. Try to keep all output wires from getting close to the + or non-invert input.

The IC can be soldered in either right side up or upside down (looking at the bottom of the tube socket), but make damned sure you know which pin is which. If an octal socket is used, the upside down way will mean that the IC will fit neatly into the hole in the middle of the socket! However, be careful here as some ICs have power supply connections to the can – the IC might touch the chassis through the hole and short out.

Clyde E. Wade, Jr.
Little Rock AK 72205

MORE RECEIVER INFORMATION RECEIVED

Thank you for publishing "How The Communications Receiver Began," March 1974. Truly a refreshing look at the great beginnings of radio communications, with most of the contributions by active "hams."

Concerning National Company and the justly famous HRO. Two names deserve special mention: James Millen W1HRX and Dana Bacon W1BZR. The precise division of labor at National is a bit unclear, but I know that Millen was by training a mechanical engineer and was responsible for the National line of "Velvet Vernier" dials and also the entire PW series used on HRO and other receivers.

Rumor once had it that Millen vacated National to form a company in his own name because someone insisted that the HRO be redesigned into a prettier radio, with band-switching and a direct-reading dial. The HRO continued unchanged!

The correct name is McMurdo Silver – not McCurdo Silver! I believe that McMurdo Silver won international competitions with his receiver designs a number of times, and that his sets were chosen for use on Arctic expeditions as being the best available.

A final addendum: Hallicrafter DD-1, a real brute of a receiver! This was a dual-diversity receiver consisting essentially of two separate SX-28's connected to independent antennas with automatic sampling to choose the stronger signal and feed it to the common audio system.

B. van Sutphin
St. Petersburg FL 33701

TAPE GREAT STUDY GUIDE GREAT

Fantastic! Both the code tape and the Extra Class study guide!! The tape enabled us to bring our code speed to 22 WPM in short order, while the guide. . .well, it was just about the most lucid text I've ever read. It has been said that good writing is transparent; that is, with good writing, the reader never stops to think, "Now, isn't that a cute way of presenting this or that." But the guide *IS* well written and many times I found myself stopping to observe how well a particular point was made, or how something that I really never had a good feeling for was suddenly crystal clear! That I passed the Extra Class exam today on the first go around is due in no small way to the tape and guide you supplied!

Ted Cohen
Alexandria VA 22308

WRETCHED SUCCESS

A pleasant surprise to see wretched Coward writing again in 73. I had wondered where he was hiding out. Seriously, the warning about "license consultants" was well taken. All I can say is nix on that type of activity!

J. R. Johnson WA5RON
Austin TX 78751

$9 – OUTRAGEOUS

While Wayne Green is hassling with the FCC perhaps he could shame them into reducing the fee for re-application for the Ham license. I think nine bucks is outrageous, when I was a lad in the early teens (years on the calendar that is) it cost nothing for a ticket and Uncle Sam issued the ham and commercial call books for a very nominal sum, a buck I recollect. Now we are supporting a bureaucracy which is not doing the job.

Christopher Noble Ex/W6HEC
Comdr. USN Ret.
Durham NC 27707

CIRCUIT CORRECTION

Your feature column on Circuits is great – provides the experimenter with many useful ideas. But the one circuit shown on page 34 of the April 1974 issue scares the H--- out of me and it is no April fools joke either. Of course I am referring to the line operated audio power amplifier.

As it is shown, the common side of the input can be riding directly connected to the hot side of the AC power line. And this condition is true as long as the unit is plugged in, whether or not the power switch is on or off. The only way to use this with safety would be through an isolation transformer. It could be used with a three terminal plug and making sure that the grounded side of the AC line is the one connected to the common return line of the circuit. But even this is risky unless the user checks the outlet he uses to make sure the electrician didn't make the wrong connection in the outlet box.

Harley Gabrielson K6DS
La Mesa CA 92041

DQ

Re: *Sexton's Laws* (March 1974). Mr. Sexton neglected to mention the means of estimating the complexity of any amateur project. This is the DQ, or "dammit quotient," and it indicates the number of dammits required to complete a project. The more complicated the project, the higher the DQ.

Full credit for discovering this handy measuring unit must go to my husband, Bill Hood W2FEZ, who employed it for years before becoming fully aware of its utilitarian potential.

Barbara Hood
Albion NY 14411

INFORMATION PLEASE?

I live in a small cottage in an industrial park. The back of my house is up against a large concrete-steel reinforced building. Lots of electrical QRN and high powerlines all over. I can't have an outside antenna, so I must use an indoor one. If anyone has any suggestions or designs I'd appreciate hearing about them.

P. Cook WA7CSK
Phone: 762-0358
218½ S. Findlay St.
Seattle WA 98108

TWA SERVES?

I haven't noticed any answer to the "TWA Serves" and "What am I Eating?" published a few issues ago. My wife says the "TWA Serves" is a type of Coffee Creamer and "What am I eating?" is another brand of the same thing. (Right. . .ed.)

This is just another example of today's advanced technology. If that makes you wonder what you are eating, look up what our convenient "processed" cheese is made of. A very good book which covers this field is "Consumer Beware" by Beatrice Trum Hunter. But if you read it, beware – you may want to stop eating things you accept as everyday food.

Happy reading and EATING.

Bob MacArthur
Penticton BC Canada

XU1AA WHERE OH WHERE!

I have received the following note from Bill Spencer KA6WS, relative to problems with the lost XU1AA logs. Bill offers the following aid:

"All USA and other stations working with XU1AA who was MC on prearranged skeds with XU1AA, be advised that the logs of XU1AA for June through September 1973, have been lost. When, and only when, KA6WS acted as MC he maintained a copy of the logs. To obtain a QSL, send complete QSO information and SASE to: Bill Spencer KA6WS, P.O. Box 128 MCAS (H), F.P.O., Seattle WA 98772.

Bill is not acting as the general QSL manager for XU1AA, he is only offering to confirm those QSO's for people who checked in through him for an XU1AA QSO.

Ed Moody W3GID
Furlong PA

AUTHOR HINTS

Many times your construction articles appear to be "just what the doctor ordered." Regretfully, some projects meet an untimely end. Why? Because:

(1) The author has access to a line of experimental or limited run devices from a "friend" employed by the manufacturer.

(2) The particular project involves a key device with a $40 price tag and said project needs six of them.

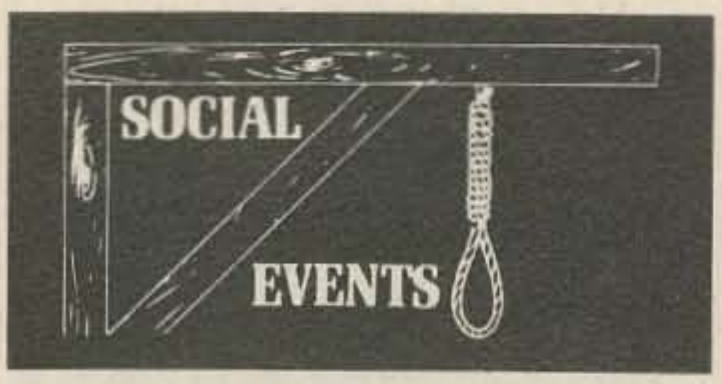
I would like to see all authors make note of limited availability devices and include a cost estimate based on major components (Tubes, ICs, diodes, transistors, etc.,).

Tom Valosin WB2KLD
Middleburgh NY 12122

NOVICE NET

Is there anyone that could tell me if there is a net in any of the novice bands? Thank you!

Joel Craig WN6WKQ
308 Shamrock Dr.
Ventura CA 93003



PENN-CENTRAL HAMFEST

The Williamsport and Milton Club's 11th Annual Penn-Central Hamfest will be held Sunday, June 2, at the Union Township Volunteer Firegrounds on Route 15 in Winfield PA. Indoor and outdoor facilities for contests, auction, and fleamarket. Starting at noon, gate registration $3, free parking. Talk-in on 3940, 146.52, and 146.94. More information available from Clair Yeagle WA3QXI, 714 N. Main, Watsontown PA or call (717) 538-9292.

MISSOURI SINGLES

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

POMONA FEST

The Tri-County Amateur Radio Association will hold a field day celebration on June 23 and 24, at the Water Department Filtration Plant in Claremont CA. General Dynamics ARC and our club will join forces.

On August 4th, we will have our hamfest picnic at Westmont Park in Pomona CA. Drawings for prizes and gifts. For more information contact: John Goodreau, P.O. Box 142, Pomona CA 91769.

SEE YOU IN DES MOINES

2nd Annual Des Moines Hawkeye Hamfest will be held on Sunday, June 16, 1974, at the Iowa State Fairgrounds. Plenty of free parking. Fleamarket, covered display booths available, small charge; open arena, no charge. Dealer displays, prizes, and expanded XYL activities. Saturday night auto races and camping-extra. Registration $1.50 advance/$2.00 at gate. Write Des Moines Radio Amateur Association, Box 88, Des Moines IA 50301.

EGYPTIAN BASH

The Egyptian Radio Club Inc., will hold its annual HAMFEST on Sunday, June 9, 1974 at the picnic grounds, 700 Chouteau Slough Road, Granite City IL. Something for everyone – prizes – games for the children – food at the club house – parking for swaps, etc.

ROCKY ARRL FEST

The 1974 ARRL Rocky Mountain Regional Convention will be held June 7, 8, and and 9, at the Ramada Inn in Pueblo CO. Pre-registration fee is $6, at the door $7. Meals, accomodations and camper/trailer hook-ups will be available for the three days of the convention at special reduced rates. Sunday afternoon banquet with speakers from Industry and the Amateur Radio Field. For additional information write: Convention Committee, P. O. Box 92, Pueblo CO 81002.

SSB IN MISSOURI

The Missouri Single Side Band Net will have their annual picnic at Memorial Park in Jefferson City MO, Sunday June 9, 1974. A covered dish dinner will be served at 12:30. Coffee, ice tea and soft drinks will be provided by the net. Door prizes given. All amateurs, their families and friends are invited.

6M – WOW!

The 6m club of Chicago, Inc., will hold its 17th Annual Hamfest Sunday, June 9, 1974, Southwest of Chicago at Santa Fe Park, 91st and Wolf Road, Willow Springs IL, swap row – picnic grounds – plenty of parking space – refreshments. Advance registration $1.50 – at the gate $2.00. For more information or advance tickets contact: Val Hellwig K9ZWU, 3420 South 60th Court, Cicero IL 60650.

FLUSHING FESTIVITIES

The Hall of Science Radio Club will hold its annual Fleamarket/Auction/Picnic at the Hall of Science, 111th St. and 48th Ave., Flushing Meadow Park, Queenes, on Saturday, June 8, from 10:00AM to 4:00PM. Fleamarket setup 9:00-10:00AM. Admission $1. Sellers $2. No commission. Free parking. An auction service available with 10% fee. Rain date is Saturday, June 15. Zoo, Childrens' Farm, Golf, Boating, Art Museum, Science Museum, etc., adjacent. For more information call/write: 212-699-9400 or Box 1032, Flushing NY 11352.

MONTREAL '74

The 1974 Montreal Hamfest will be held August 4, at the MacDonald College Farm, Ste Anne de Bellevue. Prizes, giant fleamarket, technical sessions, family fun – $2.50/Adult. For more information contact: VE2RM, Box 201, Pointe Claire-Dorval, Quebec H9R 4N9.

FUN IN KANSAS

The Central Kansas ARC sponsored Hamfest will be held June 2. For more information contact: Charles R. Svoboda WØLQK, 225 West 9th, Chapman KS 67431.

MILWAUKEE FEST
(Bastille Day Celebration)

South Milwaukee Amateur Radio Club 4th annual Southeastern Wisconsin Swapfest will be held Saturday, July 13, 1974 at Shepard Park (American Legion Post 434), 9327 South Shepard Avenue, Oak Creek WI. Activities begin at 7:00AM and will run to 5:00PM or later. Parking, picnic area, hot and cold sandwiches and liquid refreshments will be available on the grounds. Admission is $1.00 and includes a "Happy Hour" with free beverages. Prizes will be awarded. Talk-in on 146.94MHz. More details available from: So. Wilwaukee Amateur Radio Club, S.F. Schreiter W9AKF, Secretary, 104 Brookdale Drive, South Milwaukee WI 53172.

INTERNATIONAL HAMFEST

The 11th Annual International Hamfest will be held July 13 and 14, at the Canadian Pavilion in the International Peace Garden between Dunseith ND, and Boissevain, Manitoba. Camping excellent. Party – Contest – Prizes – Meetings. For information contact: Ken Larson

"INDY" 14
(Another Bastille Day Bash)

The Greater Indianapolis Hamfest will be held on Sunday July 14, 1974 at the Marion County Fair grounds on the South East side of Indianapolis at the junction of Interstates 465 and 74. All events including the giant flea market will be under roof. Thirteen area amateur radio clubs combine to bring central Indiana an outstanding convention of technical forums, commercial displays and fellowship. Complete food facilities. Free coffee and donuts in the morning. Gates open at 6:00AM. $2.00 at the gate entitles the bearer to hourly and main prize drawings. There will be a presale ticket drawing for a Genave transceiver. The main prizes consist of an impressive array of low band and 2m Drake gear. There is a good restaurant on the grounds. Free prizes for the kiddies and a full schedule of women's activities.

GRAND EVENT

The Grand Rapids Swap and Shop will be held Saturday, September 21, 1974 at the Hudsonville Fairgrounds, M-21 at 40th Street, three blocks west of the Hudsonville traffic light. Admission is $1.75 at the gate, no charge for tables or trunk sales. Talk-in on .16/.76 and 146.94. For more information contact: Grand Rapids Amateur Radio Association, Inc., P.O. Box 1333, Grand Rapids MI 49501.

TURKEY RUN

The 27th Annual Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

GLACIER FEST

On the weekend of July 20 and 21, 1974 the WATERTON GLACIER INTERNATIONAL HAMFEST will be held in the beautiful Waterton Lakes National Park. For more information contact: John A. Fyke VE6AIV.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold its annual hamfest on Sunday June 2, 1974, 1-6 PM, at the Irvington PAL Building, 285 Union Ave., Irvington NJ. Admission – 50¢ in advance, $1 at the door. Table rental – $2.50. Refreshments will be available. Door prize!! For more information and advance tickets contact WA2PWZ, 9 Barbara St., Newark NJ 07105.

SRRC HMFST

The SRRC Hamfest will take place June 2, at a new sight – the Bureau County Fairgrounds, Princeton IL (It has formerly been held in Ottawa IL). Easy access Rtes. 80 – 6 – 29 – 34. Advance registration $1.50 before May 20, $2 at the gate. For more information write: G. E. Keith W9QLZ/W9MKS, RFD #1, Box 171, Oglesby IL 61348.

MELBOURNE HERE I COME

The 9th annual Melbourne Hamfest is September 7-8. All air conditioned, $1.50 at door. Tables $2/day. PCARS, P.O. Box 1004, Melbourne FL 32901.

NINTH SWAPFEST

The ninth annual Northwest Texas Emergency Net Picnic & Swapfest will be held at the City Park in Levelland, Texas on Sunday, August 11, 1974. Bring your own picnic basket. Free registration begins at 0900. Lunch at 1300. Swapping all day. This event is for the entire family. Mobile talk in frequency is the net frequency 3950kHz and 28/88, 34/94 on 2m.

MOBILEERS BASH

The Maryland Mobileers ARC Hamfest is June 16, Father's Day, at Anne-Arundel Community College, Arnold MD, at 10:00AM – rain or shine. Talk-in on 10/70 and 146.94. Games, refreshments, contests and an auction are planned. Top awards: 2m transceiver and an electronic calculator. Registration $2, tailgating $2. Free parking, but plan car pools to save precious petrol. For futher information contact: Ted Redick K3UPU, 2 Acton Place, Annapolis MD 21401. Telephone: 301-269-5577.

ZERO-BEATERS A.R.C. HAMFEST

August 4, 1974, Washington MO City Park. It starts at 10AM CDST, Auction at 11AM. Attendance prizes and other goodies. Auction, free bingo for XYL, cake walk, candy scramble – gigantic traders row. For Hamfest information and tickets write or contact Zero-Beaters ARC, Box 24, Dutzow MO 63342.

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

From Maine WA1EXN reports a March 21st Aurora during which 2s and 4s were worked. Art comments that not many stations were active. April 4th brought a repeat with better signals and 2-3-4-8 and 9 land represented. The high point of the month was working WA2OAF and giving ham state number 50. Ed had been looking for Maine for 14 years from his New Jersey QTH. Art says he spent the winter building test equipment, reworking the rig and "slumming" on 40m.

From the far Northeast to the far Northwest and WA7ECY, Oregon, who reports a dead February except for a short opening to Phoenix on the 28th during which K7PXI, K7VYL and WA7VIS were worked with Q5 signals peaking S7 to 8. March was a similar situation with an opening the 29th to WA7FPO Phoenix and WB6RAM, Barstow. Scott says he and K7ZCB are tentatively planning a DXpedition to Idaho over a weekend sometime this summer to operate 6 and 2m SSB. More details are promised as they develop.

From Texas, Ray K5ZMS/5, says, "16 March...Today it gets interesting. At 2055CUT I started hearing strong FM signals and carriers at a number of frequencies below 50.1 from the Southeast – Spanish speaking types. Evidently the MUF shot up this high very quickly from the high 40s for a short period of time. This lasted about a half hour. After a number of calls I heard nothing and it subsided. March 17th worked W4LZW, SC, for QSO #5000 on 6m then worked Alabama, Mississippi and several in Tennessee. March 22nd weak opening to Georgia, Kentucky and North Carolina, conditions unstable, few on. March 27th open to Florida." Ray also says SMIRK now has 89 members in 16 states and 5 countries and is still growing daily.

The New Jersey chapter of the National Awards Hunters Club is sponsoring a "1st Annual 6m QSO Party" from 0000CUT June 1st to 2359CUT June 8th. The exchange is to be RST, ARRL Section and if you are a NAHC member. Scoring is one point for stations in your section, two for stations outside your section and three points for stations outside the continental 48. Multiply your total score by the number of sections plus add one point for each NAHC member worked. Any mode is acceptable with the exception of repeater contacts. Certificates will be awarded to the top scorer in each section. Mail logs to NAHC Contest, c/o Vince Del Giudice, P.O. Box 91, Franklin Lakes NJ 07417 by July 31st.

JM Communications, 101½ Washington St., Venice CA 90291, has announced a linear version of their Model 6100 6m amplifier. The 6100 previously advertised is intended for FM use and is capable of 100 to 145 Watts output with inputs of 15 to 25 Watts. The Model 6100L produces 120 Watts PEP output when used in conjunction in an exciter delivering 10 or so Watts. AM operation is also possible with 40 Watts of carrier being developed when driven by a typical (Communicator III) AM rig. Both amplifiers operate from a 12V supply, feature Silicon balanced emitter transistors, solid state automatic antenna switching, reverse polarity protection, broadband (no tuning) circuitry, plus provision for remote ON-OFF and relative output metering. Both are 10.48cm x 22.86cm x 8.89cm (4 1/8" x 9" x 3 1/2"), come complete with cables, manual, final test sheet and a one year warrantee. The 6100L is switchable from class C to linear operation. The 6100 is $199.95, the 6100L is $219.25 postpaid. A modification kit, the LAK-6100 at $19.95, is available for 6100 owners who would like to convert to linear operation. Solid state has finally fully arrived for the 6m operator. Owners of SBE SB-50s, Gonset Sidewinders or the new Regency and Genave FM rigs will have a ball running this kind of power.

WAØABI

73 REPEATER ATLAS REGISTRATION

REPEATER CALL (WR only)	FORMER CALL	LOCATION (City)	STATE

INPUTS	OUTPUTS	TT Wh TB PL	FM AM RTTY	AUTO PATCH	ERP
		Hz			
		Hz			
		Hz			
		Hz			
		Hz			

USEFUL RANGE (RADIUS)

EQUIPMENT

ANTENNAS & HEIGHT ☐ SPLIT SITE ☐ DIPLEXER

REPEATER GROUP/SPONSOR	TRUSTEE	ID–TYPE OR MFR.

☐ I certify that I have received no outside assistance while completing this form.

DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS

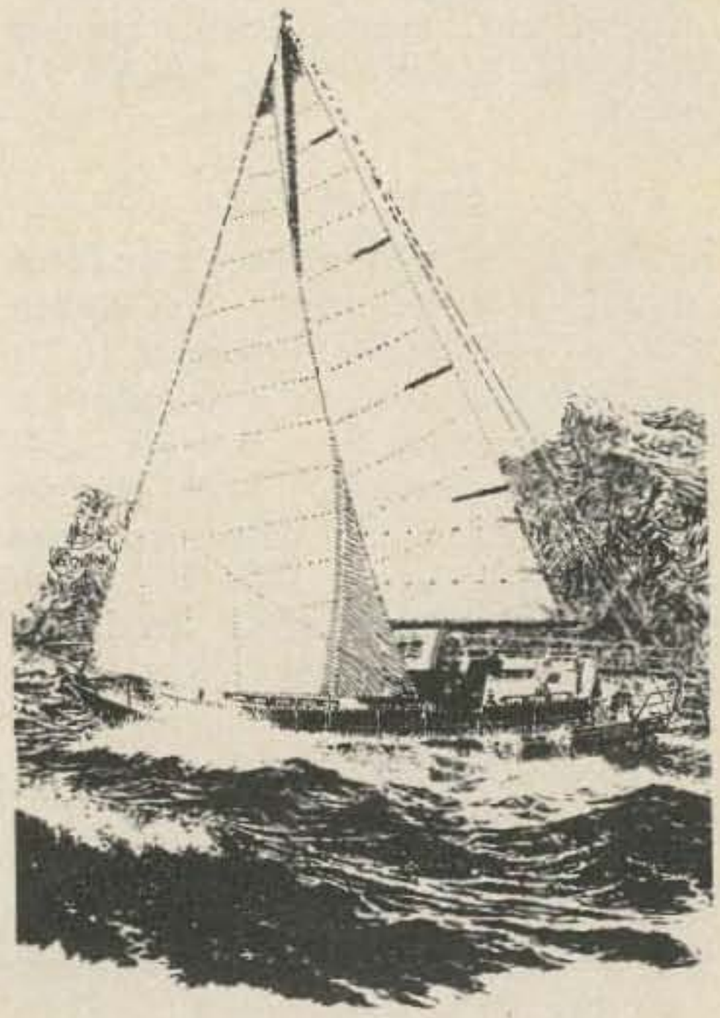
CA	WR6ADZ	Pacifica	T1.8	6.25-6.85
CA	WR6ADY	Pise Look		
CA	WR6ADY	Pise Lookout	T1.95	6.25-6.85
CA	WR6AEA	Woodside	T2.1	6.25-6.85
CA	WR6ADZ	Pacifica	T1.8	6.25-6.85
CO	WR0ADO	Castle Rock		6.07-6.67
FL	WB4QER	Panama City		6.10-6.70
GA	WR4AGD	Augusta		6.34-6.94
				7.90-7.30
GA	WR4AEW	Valdosta		6.16-6.76
IN	WR9ADA	La Porte		6.01-6.61
MD	WR3ACR	Baltimore		7.63-7.03
MI	WR8ADA	Flint		6.31-6.91
MS	WR5ADC	Gautier		6.28-6.88
NC	WR4AGC	Durham		6.22-6.82
NJ	WB2AHF	Vineland		6.055-6.655
NM	WR5ABV	Capitan Mountain		6.34-6.94
NM	WA5YTK	DELETE		
OH	WR8ABS	Middletown		6.01-6.61
OK	WR5ACB	Oklahoma City		6.22-6.82
				52.680-52.525
WA	WR7ACB	Chehalis	T1.95	7.66-7.06
WA	WR7ADB	Marysville		CLOSED
CANADA				
Manitoba				
	VE4BDN	Brandon		6.34-6.94

UPDATES NEEDED

QSL CONTEST

Sailing, sailing, over the. . . Your editor spent many wakeful nights this month trying to pick a QSL Contest Winner. There were so many excellent entries that reaching a decision was extremely difficult. However, this card sent in by Russell Butterworth WA6TJS/mm, had that special something that set it apart from all the others. Perhaps it's the lure of the sea that tugs in all of us. Nevertheless, congratulations Mr. Butterworth and your boat, the Spucomba.

Is your card something special. Does it arouse oohs and ahs from visiting hams. If so, you have a chance to win a one-year subscription to 73. Send your winning entry to 73 Magazine, Peterborough NH 03458.

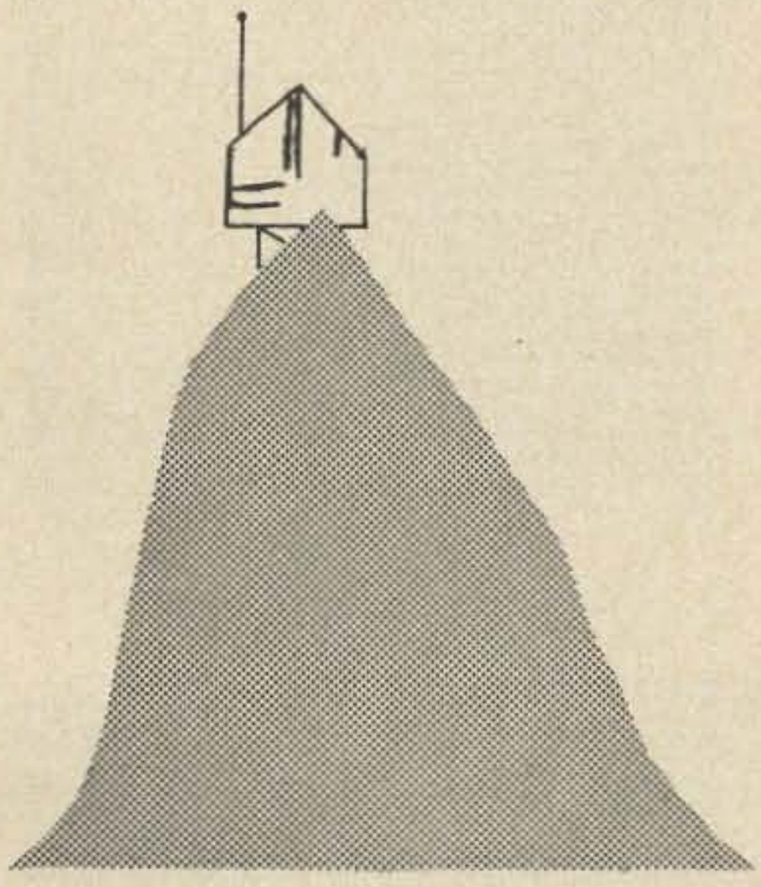


WA6TJS

MM

REPEATER OWNERS

Don't Take Chances. SENTRY offers custom made crystals made exactly to your specifications. When it comes to crystals for your repeater, BUY THE BEST – SENTRY.



REPEATER USERS

If you want reliable access to the repeaters in your area, you want and need SENTRY CRYSTALS. SENTRY CRYSTALS are custom made for your rig. We don't stock a large quantity of crystals for a certain frequency and hope you can tweak them to frequency in your rig. We do offer FAST service on crystals made especially for you and your rig. If you want reliable, on-frequency operation, INSIST ON SENTRY.

SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018

PHONE: (405) 224-6780

TWX-910-830-6425

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

THE 27th ANNUAL Turkey Run Hamfest and VHF Picnic, sponsored by the Wabash Valley ARA, Inc., will be held Sunday, July 28, at Turkey Run State Park near Rockville, Indiana. Don't miss the Midwest's finest fleamarket. Fun for the whole family: XYL Bingo and fleamarket; food and refreshments, camping facilities, and park recreation for the kids. First Prize: Genave GTX-10, Second Prize: Regency HRT-2, Third Prize: Drake WV-4 VHF Wattmeter; plus many more. Activities begin at 9:00 AM with free coffee and doughnuts. Talk-in 146.94 by W9UUU/9. For details, send SASE to WVARA Hamfest, Box 81, Terre Haute IN 47808.

AUTOMATIC TELEPHONE Answering Computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road, Conway MI 49722.

U.S. GOVERNMENT Topography Maps in six colors are available for most areas in U.S. Send $2.00 and latitude & longitude for each map. Write: Maps, 274 Mainzer, W. St. Paul MN 55118.

TELETYPE EQUIPMENT For Sale: Models 14, 15, 19, 28, 32, 33. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices. Larry Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners WI 53130.

SALE-TEST EQUIPMENT: Heath TV Alignment Sweep Generator IG-52 $35.00; Pyramid Capacitor/Resistance Meter, 10 pf-2000mf-25megohm $30.00; Dumont Electronic Switch/Square Wave Generator $15.00; Heath Color Bar/Dot Generator CD-1 $20.00; Heath VTVM V-7A $19.00. All good working condition. Add approx. postage. Michael Windolph, 3140 Meramec, St. Louis MO 63118.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis. Please send Money Orders or Certified Checks only to 73 Magazine, Peterborough NH 03458.

MITS 908M Calculator w/p.s./case ($143) new	$ 100
Logiclocks ($120 new) 3/4" numbers – 6 figs	$ 75
Heath IB-101 counter ($170) – 5 figs	$ 140
Vanguard Scaler – by 10 – to 200 MHz ($120)	$ 75
Clegg 21 220 MHz xcvr – new ($300)	$ 235
Regency 16ch scanner TME-H-LMU ($300) – new –	$ 245
SBE Scanvision, complete, like new ($900)	$ 500
Robot Monitor – new – ($296)	$ 240
Pickering CW keyboard KB-1 ($265) – tested	$ 175
Heath HW-202 – brand new – ($180)	$ 165
Heath HA-2022 amplifier – new ($70) – built	$ 65
Gladding 8ch scanner – Cheyenne – brand new – ($150)	$ 99
Gladding Hi-Scan – 8ch scanner – tested ($180)	$ 99
Genave GTX-2 – used – ($250)	$ 180
Motorola KW 2m amplifier – used	$ 350
Heath IC-2009 calculator – brand new ($92)	$ 88
SBE-450 xcvr – new – ($450)	$ 299
Standard 1400 2m 22ch xcvr 10w ($550) – used	$ 250
Heath HWA-202-1 power supply – new – built ($30)	$ 25
Signal One CX7-A – tested – perfect – like new – fantastic	$1990
Kenwood Twins – Tested – like new ($900)	$ 750
Standard 146 2m HT – used ($289)	$ 190
Fannon intercom – exec – 6 ch master – ($60) tested	$ 35
Icom IC-60 450 MHz xcvr – brand new ($375)	$ 275
Concord TV camera MTC-15 ch5-6 output – tested ($500)	$ 250
Concord video monitor VM-12 – tested ($400)	$ 250
Concord all channel TV tuner Dem-911 ($600)	$ 250
Concord VTR – like new – fantastic ($400)	$ 300
Bell & Howell 2966 VTR – like new – excellent ($995)	$ 350
Bell & Howell 2965 portable VTR – new ($1595)	$ 475
Batteries for B&H 2965 – like new ($36)	$ 25
Vanguard 2m preamplifier – used – ($25)	$ 15
Regency 450 MHz scanner – ($200) – like new	$ 140
Varitronics PA-50 2m amp ($110) – brand new – 10w in 50 vout	$ 75
RP tone burst gen – 5 freq – TB-5 – exc ($37.50)	$ 25
Electro-Voice 717 noise cancelling ceramic mike – new ($13)	$ 10
Hitachi stereo cassette recorder – exc – ($120)	$ 75
Hitachi AM-FM-cassette recorder – exc – ($90)	$ 50
Turner mike – noise can NC350DM – brand new	$ 30
Vanguard conv 144-146/14-15 MHz –407 – new – ($50)	$ 40
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
SWR meter – exc ($25) KW	$ 12
Test Labs – 10 in 1 – SE-400 ($25) as is	$ 10
Concord stereo recorder-changer – 12 cassettes ($240) brand new	$ 135
VTR Monitor – exc – Hitachi ($225)	$ 125
Radio Shack Code cassette – new ($6)	$ 4
Regency HR-6 ($240) six meter 10w xcvr 12ch	$ 199
Standard SR-C826M ($360) 2m 10w xcvr 12 ch	$ 299
Regency HR-220 ($239) 220 MHz 10w 12 ch	$ 199
Regency ACT-R8H/L Scr ($160) VHF/UHF 8ch scr receiver	$ 136
Standard SR-C826MA ($398) Latest model 10w 12ch 2m xcvr	$ 339
Regency HR-2MS ($319) 2m 15w xcvr with 8ch scanner	$ 269
Icom IC-22 ($289) 10w 22ch 2m xcvr	$ 245
SBE SB-450TRC ($180) 450 MHz transverter	$ 149
SBE SB-1PA ($190) 10w in 40w out power amplifier 2m	$ 159
Pace 164H ($90) Scanner VHF 4 channel	$ 69
Regency Pocket scanner 4 channel ACT-P4H ($120)	$ 99
Cobra 220 MHz Transceiver 10w 12ch ($300)	$ 255
Amphenol RG-8/U Polyfoam 100' with PL-259 connectors ($24)	$ 19
Icom IC-21 ($359) demo unit – perfect shape 10w 22ch ac/dc	$ 299
Standard 14U 2m 22ch superfantastic rig, VOX ($510) demo	$ 499

All Prices fob: UPS collect.
73 Magazine – Peterborough NH 03458

THE ORIGINAL FM Hamfest Sunday August 4, 1974, near Angola IN. Free flea market, entertainment for ladies and kids. Picnic grounds, campsites, boating, food, soft drinks, available rain or shine. For information contact: Fort Wayne Repeater Assoc. Box 6022, Fort Wayne IN 46806.

TECH MANUALS for govt. surplus gear – $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive WA DC 20021.

COLLECTORS ITEM, Nazi Kwea German Wehrmacht WW-II Receiver, magnesium alloy chassis, working condition, spare tubes. Freq range LW-BC-SW with crystal calibrator. Requires 2 volt filament, 90V plate. WT, 100 pounds FOB Dartmouth, N.S. Best offer over $400.00. Contact Jim Murphy VE1PV, 100 Joffre Street, Dartmouth, Nova Scotia.

FREE CRYSTALS with the purchase of any 2m FM radio. Write for our deal on the rig of your choice. Factory-authorized dealers for Regency, Drake, Icom, Kenwood, Tempo, Alpha, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, Telex, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. 812-894-2397.

FLEA MARKET/AUCTION/PICNIC! Hall of Science Radio Club annual event Saturday June 8 10am-4pm Flushing Meadow Park Queens, 111th St. 48th Ave. Rain date June 15. Admission $1.00 - sellers $2.00 no commissions. Auction service at 10% fee. Free parking. Zoo, Children's Farm, golf, boating museums adjacent. Info 212-699-9400 or write Box 1032, Flushing NY 11352.

DANVILLE HAMFEST at Douglas Park in Danville IL on September 1, 1974. Take Bowman Avenue Exit off I-74 and follow the signs. Prizes will include a low-band rig and VHF gear, antennas, electronic keyer, wattmeters, SWR bridges, and many others. Camping and motel accomodations nearby. Food and plenty of parking available. Huge flea market and commercial displays. Tickets are $2 or three for $5. Advance tickets available from Dave WA9PDS, Dolan Rd., Catlin IL 61817. Send check or M.O. and SASE. Talk-in on 22/82 and 94 simplex.

NE555V: $1.10, 8038 Waveform Generator: $6.95, 1103 (1024 Bit Ram): $4.50, DG200BA Analog Switch: $3.25, 2N6084 RF PWR: $10.50, 74181 Alu: $3.75, Catalog: 10¢. ELECTRONIC DISCOUNT SALES, 138 N. 81st St., Mesa AZ 85207.

G.E. MASTR 100W highband RPT or base station, RPT panel, perfect cond $400.00. G.E. Mastr 60W mobil high band U.H.S. RX 8 freq, 6 inc. $375.00. G.E. Port-a-mobil high band 10W 94 16-76 with charger $250.00. Jim Maloney, 2670 Tierra Cir., Winter Park FL 32789, Ph. 305-678-0244 after 8PM.

KLM AND MADISON ELECTRONICS present the finest in VHF antennas. 144-148MHz, 7-element to 16-element; 9-element $31.95; 14-element $45.95; 16-element $49.95; 220MHz; 420-450MHz, 14-element $19.95; 27-element $41.95; write literature. All prices FOB Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on September 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075.

WANTED: HT200 2 meters, any condition. State price and condition. Ron Dierkens WA6QVE, 3367 Ellington Dr., Altadena CA 91001.

SB-102 FOR SALE. Excellent condition. Prefer Dallas-Fort Worth area buyer. Must deliver in person. Call or write 817-293-2128, 6920 Stonewall, Fort Worth TX 76119.

DRAKE 2B, all crystals, manual, calibrator, excellent $160 plus shipping. John Skubick, 1040 Meadowbrook, Warren OH 44484.

FOR SALE: NCX-5 MK11 Digital, 200W, 10-80 SSB, CW, AM transceiver with matching NCXA power supply-speaker and manual. $350.00 Jim W1VYB 617-922-3850.

GIVE your voltmeter a memory. Don't look the other way with meter probe in the works. Details free. Dan WN8RJZ Box 423A, Owosso MI 48867.

Looking West

Bill Pasternak WA2HVK/6
14725 Titus St. #4
Panorama City CA 91402

Guess by now you may have gotten the idea that Sharon and I are very happy and proud to be a part of the "Southland." I am also quite proud of an amateur organization out here that some two and a half years ago begot itself into existance and in short order straightened out the mess that was the Southern California FM scene. True, like any other part of the nation we too have our problems from time to time, but the Southern California Repeater Association has never run away from any of them. Quite the contrary, they have faced any and all situations with a willingness and objectivity that is unsurpassed. While not everyone is always happy with their decisions, the record is proof positive that the majority of the FM populous has benefitted from what they have done and will continue to do. On March 24, SCRA held a meeting and this time I was able to attend and see the SCRA in operation for myself.

Aside from the election of Dick Flanagan W6OLD, as their 1974 chairperson, the most important announcement made was that of the FCC granting the WR6ABB repeater "Special Temporary Authority" referred to as STA for development and implementation of a fully automatic remote control system for the machine. Thanks to the hard work of Dick McKay K6VGP, outgoing SCRA chairperson and Fred Deeg K6AEH, the trustee of WR6ABB, permission has been granted for the *Pallisades Amateur Radio Club* to utilize the repeater input channel as a secondary control frequency and designate certain individuals that the club selects to control WR6ABB via this system. The STA stipulated that the existing wireline control system was to remain as primary control system and that the secondary, on-channel system was only to be used when a designated control operator was within reach. Moreover, it was stipulated that all regular users of the machine would be considered to be "Official Repeater Observers" and put upon them the responsibility of immediately notifying either a primary or secondary control operator in the event of malfunction or misuse of the repeater. According to Fred, the system will be in operation in the near future. If this experiment runs well, and there is little reason to doubt it will, a petition for rule-making will be presented to the FCC by the SCRA when the STA expires in mid-September. However, both P.A.R.C. and SCRA are determined to go by the book in this matter, and knowing both groups as well as I do, I can assure the FCC that they will get an accurate report on the outcome of this authorized experiment, as they have requested in the STA. It is my sincere hope that we here in the Southland can lead the way in easing the control restrictions that all repeaters now must operate under.

One of the major problems that we face here is the overcrowded conditions that exist on 2m within the 146-148MHz spectrum. Even with all standard repeater allocations filled and one machine sharing a 1MHz plus special split with simplex there are not enough channel pairs to go around. Yet, the SCRA continually receives requests for channel allocations from new groups that want their own 2m machine. To that end, a resolution was adopted to study the feasibility of issuing split-split or tertiary channel allocations in this area. For those of you unfamiliar with the term split-split it means putting new repeaters halfway between already existing machines. As you may know from past writings, I was personally involved in such a project back in NY about three years ago and from personal experience I can attest to the fact that it can be done. In fact, the job should be much easier today owing to the many improvements in the receiver selectivity of today's newer transceivers. Add to this the type of terrain we have, i.e., mountain vs valley, and I can see successful doubling of the available number of available allocations. The SCRA Tech Committee was delegated to study the matter and make recommendations on the matter at the next meeting and LW will keep you informed of the outcome.

Finally, a new concept in amateur repeaters is being born in Phoenix AZ. The sponsors of WR7ABT call it a "Full Service" amateur repeater and the first of its kind anywhere in the U.S. By using a number of tape recorders and touchtone control, and being very careful in providing program material that will not violate the Commission rule prohibiting broadcasting, WR7ABT will soon provide its users with such diverse material as multi-speed code practice, assistance in correcting FM problems, location and time of radio club meetings and other information that will be of benefit to their amateur community. One innovation that they are incorporating I think is of top benefit. How many times have you been in QSO only to have another ham break for a signal or deviation report. One of WR7ABT's new services should eliminate this. An operator will be able to access a tape recorder via the repeater, make a 10 second test transmission and then play him or herself back for a first-hand look (or hear) of the way they sound. Now that one I really like and if I ever put up a machine again that's one idea I will be sure to incorporate. LW wishes Phoenix good luck with their "second generation" machine.

I usually close with a little aside or comment, but this time I will answer a question; an important one to me. Many times I have been asked why I write a monthly column. It's not for money or glory, but rather it's because I sincerely believe in the following, "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; *or abridging the freedom of speech or of the press;* or the right of the people to peaceably assemble, and to petition the government for a redress of grievances." If perchance you didn't recognize it, you have just read the First Amendment to the Constitution of the United States of America. To that ideal and to the betterment of amateur radio I devote this column.

WA2HVK/6

NEW PRODUCTS

73 TESTS THE IC-230

ICOM has come up with a two meter transceiver which has set many manufacturers to burning the midnight oil in their labs. It has 66 channels of synthesized operation, and that covers all of the standardized FM channels from 146.0 to 148.0 – the dial readout is for the receiver and the transmitter can be switched to send 600 kHz higher or lower, as well as on the same channel for direct (simplex) communications. It is exceptionally versatile.

The receiver, which is the most important aspect of any transceiver, is a beaut. Mr. Inoue and his engineers went for every dB they could with this one, always being careful not to forget the probales of intermod, overload, and other discouraging miseries we've had with more than one of the other rigs on the market.

The receiver is dual conversion. Single conversion is on the horizon, but we haven't tried a receiver using it that was quite as good as a well designed double conversion job. They'll be along, you may be sure, as the scientists cram more and more transistors into those IC chips. The 230 has an FET front end and high-Q helicalized cavity resonators to keep out the garbage. By keeping the gain in the i-f the Icom gang got rid of a lot of the overload problems. They made up for it with a six stage i-f amplifier. The two local oscillators are zener regulated for stability.

The transmitter puts out at least ten watts and is also zener regulated in the oscillator. It is load protected in case your antenna falls off or gets shorted, and the low pass filter in the output will be appreciated by television viewers you drive past.

Now, outside of all the technical data on the unit, how does it work? Is it easy to change channels while driving?

The rig, being very small, mounts just about anywhere in a car. We put it on the side of the transmission hump next to my knee, facing up. It didn't take a half hour to get into place, even for a mechanical klutz. This puts the controls in easy reach of the hand, including the upper-lower offset switch for the transmitter which is on the top of the unit instead of the front panel. You have to get at this one when you move to the 147 MHz channels unless you make a small modification to put that function on the 146-147 MHz segment switch – and this is a very simple mod.

There are two knobs for switching channels, one for the hundreds of kHz, and one for the 30-kHz jumps. With this simple system you can switch from one repeater to another without even looking at the rig – which is excellent for driving. You just count the switch positions as you turn the knob. This is particularly handy for someone like Wayne who has to put on his glasses for the simplest of reading. It's a bore having to put your glasses on in the car just to change a repeater channel.

The 66 channels makes it so you can use most of the repeaters on the air today. If you do much traveling you'll appreciate having every standard channel in the rig. How many crystals would that take? If you wanted them all it would take 132 crystals, and at $4 each that would come to $528. You could get by for half that because most of us don't need the reverse pair crystals, but that is still a bundle.

The ICOM will put you on the reverse pair, if you want. This is almost imperative these days when you are flying so you won't lift every repeater for three hundred miles around every time you talk. It's also useful when you are close by the other op and can get him better on the repeater input frequency than the output. It happens.

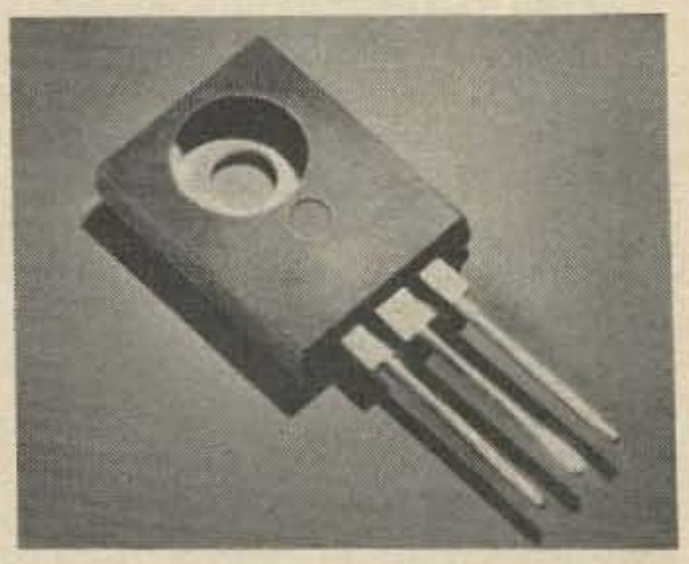
If you hook another 230 owner you can use any of the simplex channels for fairly private contacts. Or even a locally unused repeater input or output channel.

The ICOM 230 has worked without a flaw all through the New Hampshire winter, from about 20 below zero on up. It has always been right on channel on both transmit and receive, and it has always sounded superb. It is one of the few ham rigs that works well on top of the local mountain. Most of them have trouble with the several commercial repeaters up there, or even miseries from ham repeaters on adjacent channels. One well known rig loses sensitivity and cross modulates when the next channel lower is coming through strongly. Another very well known rig is totally useless on the mountain – everything comes through.

About the only drawback of the IC-230 is that it doesn't get the splinter repeaters, but even that can be corrected by changing a crystal, if you've got splinters in your area.

Bravo ICOM 230.

PUSH-PULL AMPLIFIER APPLICATION NOTE



The advantages and design of broadband push-pull amplifiers are described in an application note available from TRW Semiconductors. The 8-page application note discusses, in particular, 60 and 120W 225-400MHz push-pull amplifiers using TRW JØ2000, JØ2005 transistors.

The application note describes the basic concept of the push-pull approach and compares it with conventional designs.

Schematic drawings present the complete electrical circuit for 60 or 120W push-pull amplifiers, and layouts for components, heat sinks and circuit board. The electrical circuit for a push-pull driver amplifier providing up to 30 watts output is also presented.

The application note includes specification ratings, electrical characteristics and package dimensions for TRW JØ2000 and JØ2005 rf Power Transistors. The units incorporate internal integrated circuits to reduce the effects of the reactive part of the input impedance to nearly zero. JØ2000/JØ2005 units are rated for 30/20 watts and 200-400 MHz.

Further information and a copy of the application note are available from *Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale, CA 90260; phone (213) 679-4561.*

REALISTIC TIMEKUBE RADIO

Even if you don't have time on your hands, now you can have it at your fingertips with the new Realistic Timekube (TM) radio from Radio Shack.

A sliding scale on the front of the Timekube allows instant conversion of UTC to local time. Pushbutton selection of three different WWV frequencies (5, 10 and 15 MHz) is said to assure optimum reception in all parts of the country at any time of the day or night. National Bureau of Standards time signals are controlled by an atomic clock which is accurate to within 20 billionths of a second per day, or within one second in 31,709 years!

Some of the additional data broadcast by WWV includes: geophysical alerts and summaries of geophysical events during the previous 24-hour period. "At sea" weather information is broadcast in three 45-minute segments four times in each 24-hour period.

The Realistic Timekube desk radio, in simulated rosewood case, 8.26cm x 11.75cm x 8.89cm (3¼ x 4-5/8 x 3½"), is priced at $49.95. Operates on one 9V battery.

Realistic products are available from more than 2,500 Radio Shack stores.

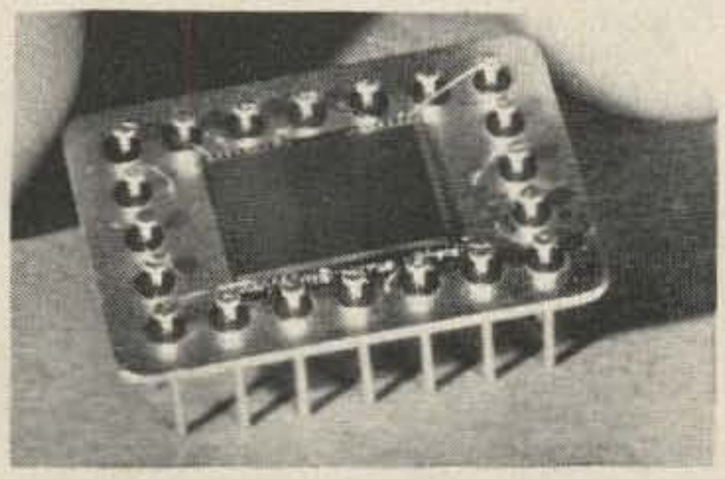
McMOS DATA BOOK

Over 300 pages of product data, basic technology information, applications information, and product selector guides are included in the new "McMOS Integrated Circuits Data Book," from Motorola. Just off the presses, it is probably the most comprehensive product directory of complementary MOS circuits ever produced.

The McMOS product line cataloged in this new book includes complete data on 68 separate functions. These devices plus 12 new devices introduced in late 1973, (not included in the book) offer the system designer a choice of 80 logic functions. It is now possible to implement any type of digital system using McMOS circuits; therefore, presenting the design engineer with the same type of design flexibility in CMOS that before was possible only with bipolar logics such as MECL 10,000 and DTL/TTL from a logic design point of view.

Order your copy of the, "McMOS Integrated Circuits Data Book," by sending $2.50 to: Technical Information Center, Motorola Semiconductor Products, Inc., P.O. Box 20924, Phoenix AZ 85036.

SUB-MINIATURE SENSOR



A miniature optical sensor no bigger than an adult's thumbnail has been developed by General Electric Company for use in hand-held or vest-pocket TV camera systems for a host of uses in business, industry, government and the home.

Making possible a tubeless TV camera no larger than a pack of cigarettes, the tiny solid-state sensor and essential circuitry is called a "CID Module" (Charge Injection Device) and converts optical images to electrical video signals.

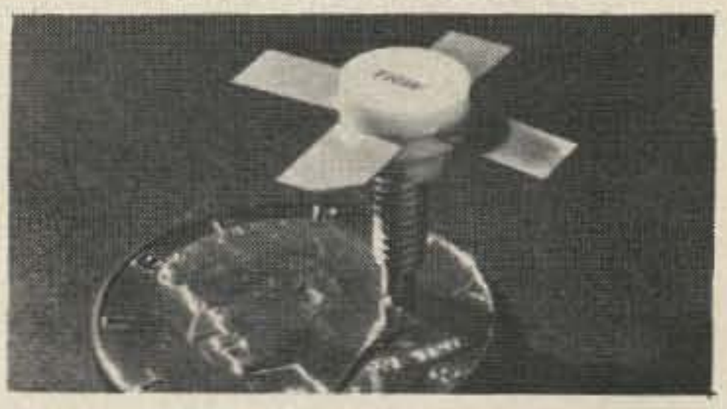
With decided advantages over tube and other solid-state imagers, GE's CID Module brings into sharp focus the possibility of completely new imaging and sensing systems in the foreseeable future. Such systems include home video, industrial control, TV cameras, security systems, auto safety, supermarket checkout and numerous other applications for systems' manufacturers and users.

The dynamic range of the CID module — approximately 500:1 — provides broad gray shade or tonal rendition exceeding the performance of conventional image tube cameras.

Matrix readout of the CID sensor provides several inherent advantages over existing solid-state technologies. Total area of the CID device is used for sensing, thereby providing higher sensitivity than devices requiring transfer and storage in their readout technique. "Rand m access capability," also provides a valuable characteristic for applications such as low bandwidth communications and guidance systems.

The tiny 100 x 100 image sensor by GE's Optoelectronic Systems Operation, here, is only 1/4-inches long X 3/8-inches wide and consists of a two-dimensional array of 10,000 charged storage image sites. For more information write: *General Electric, 2100 Gardiner Lane, Louisville KY 440205.*

HIGH POWER PLASTIC TRANSISTOR SERIES



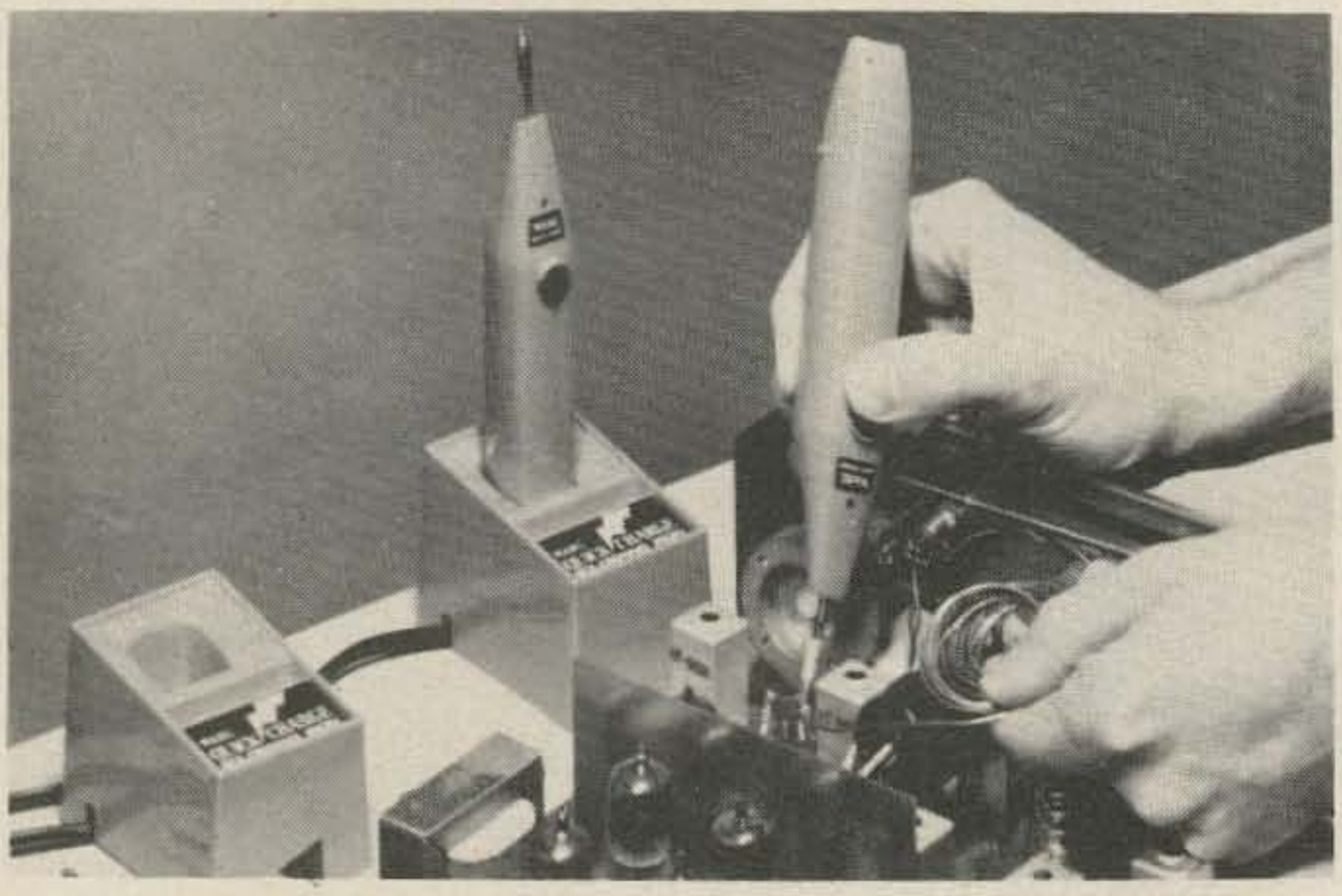
Motorola's new 2N6497, 2N6498 and 2N6499 silicon NPN power transistors have dissipation ratings of 80W P_D' made possible by a significantly better plastic package. Motorola's type 199 plastic package design eliminates mechanical mounting stress while providing improved heat transfer characteristics, and convenience and cost savings in mounting.

These devices are rated at 5Adc continuous collector current 10 Amperes peak, and have a Gain-Bandwidth product of 5 MHz. Well suited for inverter and ignition system applications as well as general purpose use, this series is priced 15 to 25% below comparable metal parts.

The 2N6497, 2N6498, 2N6499 are rated at 250, 300 and 350 Vdc V_{CEO} respectively, and priced at $1.55, $1.85 and $2.75 in 100-999 lots. Convenient mounting hardware for this series is also available from Motorola.

For further information please contact the *Technical Information Center, Motorola Semiconductor Products, Inc., Box 20924, Phoenix AZ 85036.*

QUICK CHARGE CORDLESS ISO-TIP SOLDERING IRON



Wahl eliminated the cord from the soldering iron quite some time ago with its 'Iso-Tip' Cordless Soldering Iron. But now it's cordless for even a greater percentage of the time with the new, orange, "Quick Charge" Iso-Tip.

This decrease in recharging time is due to the "Quick Charge" iron's special premium quality long-life nickel cadmium batteries. These batteries are designed for charging at high rates for longer periods of time without deterioration and will outlast standard batteries.

The new lower base stand (with slot for spare tip) will return a partially discharged battery to full capacity in an hour or two. And a completely discharged battery can be fully recharged and used again in about 4 hours, giving tip performance equivalent to up to 50W and over 700° temperature.

The "Quick Charge" has the same low voltage and special isolated-tip construction as the original 'Iso-Tip' which eliminates electrical leakage and the need for grounding, reducing and the risk of heat damage to sensitive components. The tip is easily replaceable with any of the 4 completely different tip sizes from heavy duty to fine. The manufacturer *does* caution against interchanging a 'standard' Iso-Tip and a "Quick Charge" stand, however, as the units are not interchangeable.

Pressing the button gives you soldering heat in 5 seconds plus a built-in work light on the working area. Pilot light, too. And an exclusive "lock off" switch to prevent accidental heating of the tip.

The unit is designed for good "feel" and balance – only 8 inches long with tip and weighs just 6 ounces. The "Quick Charge" carries enough power to make up to 125 electronic joints (or more) per charge. And it automatically begins recharging when replaced in its stand. No wires to connect; no "positioning" of the iron in its stand. And it can't overcharge itself.

Model 7700 "Quick Charge" kit consists of Cordless "Quick Charge" Soldering Iron; Separate Recharging Stand; One #7545 Fine Tip; One #7546 Heavy Duty Tip; and an instruction booklet.

For further information contact your local electronic dealer or *Noel Wallen at the Wahl Clipper Corporation, 2902 Locust Street, Sterling, Illinois 61081. Phone: 815-625-6525.*

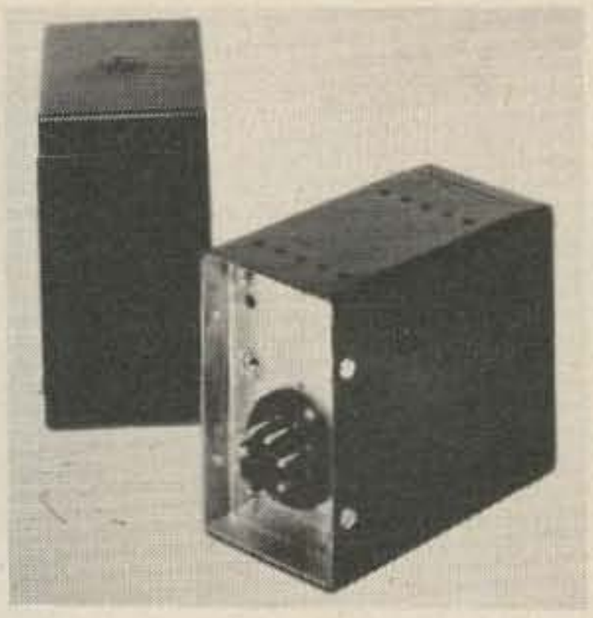
SIMULTANEOUS READ/WRITE MEMORY

A high performance 16-bit Multiport Register File capable of reading 4-bits and/or writing 2-bits at the same time has been introduced by Motorola. Designated the MC10143L, this MECL random access memory is an excellent example of a large scale integrated (LSI) device produced in the very fast MECL 10,000 series logic family. This versatile memory unit has a complexity equivalent to 110 gates. Access time to any four bits is 10 nanoseconds while simultaneously writing in new data.

The ECL outputs of the MC10143 are capable of driving transmission lines directly eliminating translator delay times. Outputs of the MC10143 can be wire ORed together or several registor files can be combined on a bus line. On chip decoders and write amplifiers reduced the number of external components required to use the MC10143.

For further information contact: *Technical Information Center, Motorola Inc., Semiconductor Products Division, P.O. Box 20924, Phoenix AZ 85036.*

HV POWER SUPPLY



The James Millen Manufacturing Co., Inc. is pleased to announce the addition of the new #90202-D Plug-in Module High Voltage Power Supply for use with small Cathode Ray Display Systems. The #90202-D supplements the other Millen plug-in modules.

The Millen #90202-D High Voltage Power Supply is designed to provide up to 1400V high-voltage dc accelerating potential and filament-heating power for small and medium size cathode ray tube indicators. The high voltage is rectified by a semiconductor bridge, producing a 120Hz ripple frequency which is filtered by a 2-stage RC filter. With a 1.1mA external dc load, the ripple voltage is less than 1.5V rms and increasing the dc output current to 3.0mA increases the ripple-voltage to less than 3V rms. With the 1.1mA dc output current, the voltage provided is 1350V ac input. Since this power supply unit is not regulated or stabilized, the output voltage is proportional to the input voltage. It is possible to adjust the output voltage within reasonable limits, by varying the load current, such as by choosing high, or low, values of voltage divider resistors for the focusing and brightness control network.

The #90202-D High-Voltage Power Supply is designed for continuous service under suitable conditions where adequate ventilation is provided. Momentary short-circuits will not destroy the circuit elements internally mounted, but continued short circuits may burn out some of the over-loaded components. Hence, it is desirable to use a fuse which will prevent burn-out conditions from becoming established.

A feature of the circuit allows grounding of either the (+) or (-) terminal of the dc high voltage. The 6.3V, 0.6A filament winding is insulated to stand the full dc output voltage, with the filament connected to either the positive or negative high voltage terminal. For more information contact *James Millen Manufacturing Company, Inc., 150 Exchange Street, Malden MA 02148.*

George McCarthy W6SUN
1191 Calle Arroyo
Thousand Oaks CA 91360

POOR MAN'S QUAD

(If you aren't poor when you start, you will be.)

Thanks very much for the QSO, Fred. I'd like to talk with you more, but I must QRT now. I've been on for over an hour and I do have some things to do, so 73's and hope to meet you again. This is FG7XL signing off and clear and leaving the air."

The soft French accent of Monique's voice slipped permanently away, leaving only background static, punctuated by a few calls from the diehards who never can bring themselves to believe that anyone could have the temerity to turn a receiver off, just because they had politely and firmly announced that this was their intention.

Soon only the static filled the speaker of my Drake 2-B. I sat slumped in the chair, conjugating obscenities in every tense I could think of. Oh, how I wanted that first contact with Guadalupe Island! Monique had been on ten meters for over an hour. Her signal had gradually slipped as band conditions changed. As the signal faded, I had grown more and more desperate, employing every technique my slim resources could muster. My left hand vibrated with anticipation as I waited for the crucial sign-overs. Only nanoseconds could have elapsed before I had turned the transmit switch on the HT-37 and blurted out my call sign. Somehow there was always some jerk in the middle of *his* call letters when I started mine. I tried tail-ending. The cacaphony of calls stopped momentarily and I jumped in like sly old Rennie the Fox. Back on receive. Another station is calling her with a 20 over 9 signal and capping it off by having the gall (or is it de Gaulle) to call in *French*. Naturally, she was delighted to talk to *him*.

I sat there for fifteen minutes, gradually slipping into a state of torpor, which is my equivalent for deep thought. It had been less than three months since I had been back on the air after an absence of fifteen years. I had been a ham for over twenty-five years, and there were Novices who had logged more operating time than I.

My return had been a joy after all the years of intending to get back on the air and not quite making it. I operated 75 phone to start. Having three quarters of an acre of land eliminated any antenna space problems. The 75 meter dipole was up fifty feet and gave good east-west transmission. A friend had given me a Mosley trap vertical for the other bands. He was the comptroller where I had worked and he had temporarily become interested in becoming a ham. He had purchased a brand new Drake 2-B and the Mosley vertical. He installed the vertical on his roof without any radials, and then compounded that oversight by shorting out the RG-58U at the base of the vertical. He

was disappointed with the performance of his receiver for some reason and quickly lost interest. Subsequently I bought the Drake for two shares of stock in a glamorous defense conglomerate and $25 cash. Some time later I accepted employment with said conglomerate and their stock promptly dropped to one-third of its former price. I maintained this was the sheerest coincidence, but my friend never lets our occasional lunch pass without a hurt reference to the stock deal. My rejoinder is that I sold him the stock, I didn't tell him to *keep* it.

Shortly after I had returned to the air I worked XE1CCW in Mexico City. Gus was putting in a tremendous signal. He said he was using a vertical on top of a flat-roofed home. The vertical was mounted on a 4 ft cement pillar and had 64 radials! He had put 16 radials for each of the four bands and they sloped down to the roof, making about a 110 degree angle to the mast. Gus reported very low SWR and high signal-to-noise ratio on all bands.

My home is one of those long, low, California ranch types with a cedar shake roof of moderate pitch. It was totally unsuited for a duplication of XE1CWW's installation. Naturally, I attempted to duplicate his antenna.

Unfortunately I didn't have the right kind of wire. A quick calculation of the length required indicated that I would need to refinance the home to pay for No. 12 copper. Refusing to give up on that basis I found a large roll of No. 32 PE wire I had surplus from some warehouse.

Gus had said the more radials the better, so I cut twenty for each of the four bands. I made an eight inch circle of No. 12 copper and began to solder one end of the eighty wires to the circle. It takes a while to solder eighty wires. I had conceived the result to look like the spokes of a wheel. I dragged the entire mess up to the roof where I was confronted with a simple problem. The house is 107 ft long, but only 30 ft wide. The ten and fifteen meter radials wouldn't have posed any problem, *if* I could have unsnarled them from what had somehow become an extended Gordian knot. I stood on the roof grasping one end of this unplanned cable, looking as though I were

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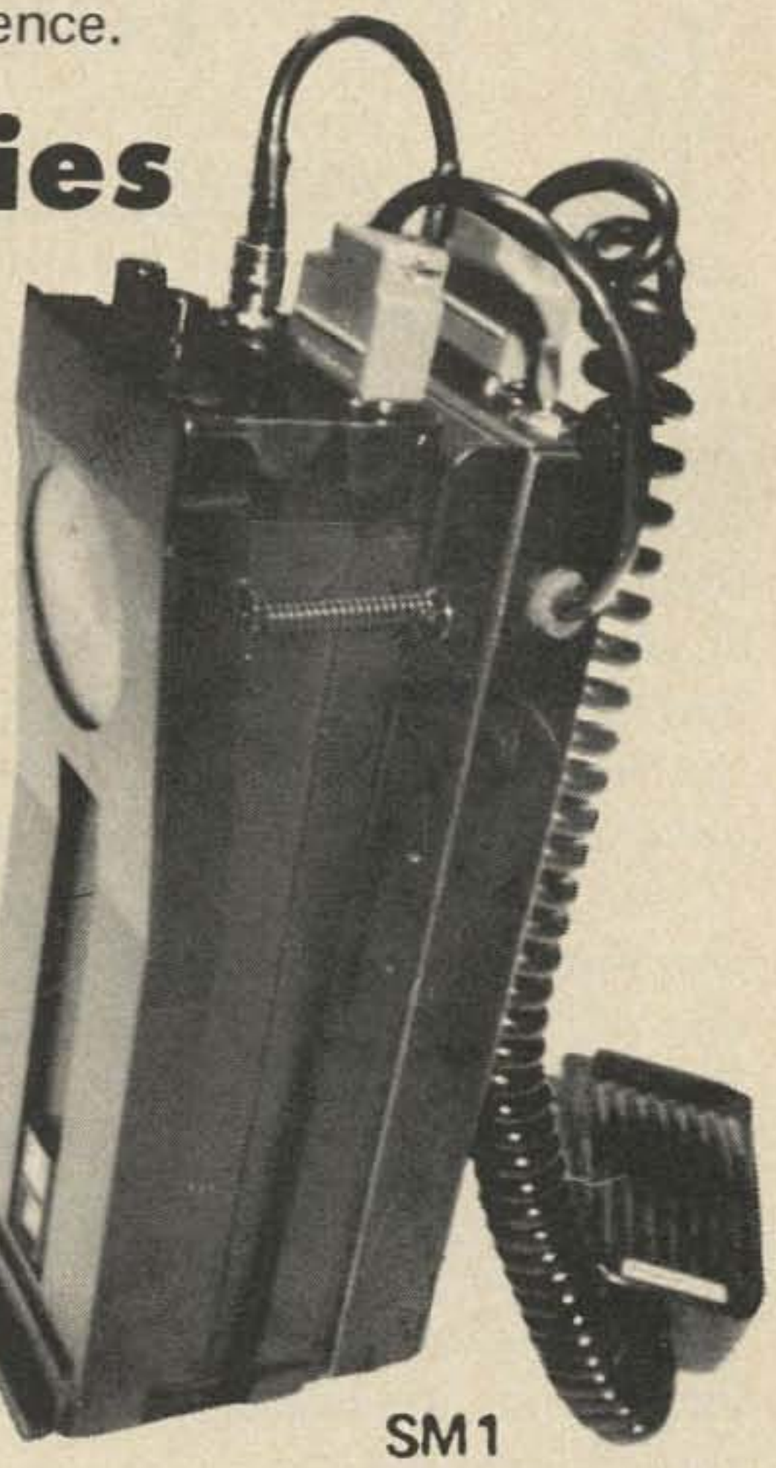

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posing for the cover of one of the old Bell Telephone books.

Several hours later and only minutes away from a total nervous collapse, I gave up trying to sort out the radials and just laid them on the roof and tried to spread them around in some semblance of a circular pattern. The forty meter radials dangled over the front and rear of the house. I climbed down and went inside for a drink or two.

When I emerged an hour later the sun was just dipping into the west. We were having one of those gorgeous California sunsets. The sky glowed red. It was beautiful. I turned and looked at my house. Every little curled and twisted piece of No. 32 wire had captured a glint of sunset. It looked as though a giant spider had squatted over the place and disgorged a year's supply of metallic spider web.

"Oh, what the hell," I thought, "it didn't cost anything, and I only blew one weekend." Eventually most of the forty meter radials got pruned off with hedge shears. It was this peerless contribution to the art of communications that had unsuccessfully transmitted my pleas for recognition to Monique.

I got up from the chair and walked outside. I glared at the Mosley. There must be a better way. I quickly brushed aside the obvious, a cram course at the Berlitz School of Languages so I could call anyone in *their* native tongue.

How about those guys who always seemed to get through in spite of the pileup? They said they were using QUAD antennas. That's it. I will build a QUAD antenna and then I also will get through any pileup with my barefoot HT-37.

I got Bill Orr's book, *All About Quads*, and poured over it until the pages were dog-eared. It was the only definitive information available. I began to dream of the DX I would work with my quad. At that time I was working for a major space firm fifty miles from the QTH, so I had at least two and a half hours of driving time each day to devote to thinking about quads. I spent ten hours a day thinking about quads.

After stopping at several rug emporiums I found that rugs no longer came rolled on bamboo poles but on cardboard tubes. I called an outfit that made rattan furniture. I got a quick answer. "We don't have no bamboo for no goddammed antennas!" I surmised I had just joined a large group of Los Angeles hams looking for bamboo.

Thwarted? Not on your life! Why not just buy a ready-made quad kit from one of the several outfits on the market? *Buy?* I shrank back from that notion like Dracula from a crucifix. There must be a way.

One day at work, while I was supposed to be concerned with some business proposal, it came to me. A sudden inspiration. All great ideas are inspirations, born of that magic amalgam of insight and sheer genius. I could hardly wait for the coming weekend. My idea? Simplicity itself! Just make the spreaders out of plastic pipe easily and cheaply obtainable at the local building supply house.

I began to expand on the concept during the next two days and nights. (When I'm in a creative mood time becomes meaningless.) I would use 3/4 in. pipe for the first ten feet and a reducing coupler down to 1/2 in. pipe for the remaining three feet. I had laid a lot

of plastic pipe in the lawns and had no trouble gluing it together with solvent. I plunged on. Cross couplers would be used to insure a perfect X. For a simple two element quad I would only need 80 ft of 3/4 in. pipe and 24 ft of 1/2 in. pipe, 8 couplers, 2 cross couplers and a can of solvent.

You must realize that with us creative types the thought is father to the deed, and I was waiting outside Builders' Emporium for opening hour Saturday morning. Naturally the clod who runs the hardware section leaped to the conclusion that I was embarked on a sprinkler job and offered to show me the new pop-up heads. I favored him with a patronizing smile and allowed as how my purchases were destined for a use far above such mundane matters as lawn watering.

I struggled through the cash register line clutching my lengths of plastic pipe with all of the protective zeal of a missionary carrying the native Chief's first born son toward the baptismal waters. The bill was just under $15. What a wonderful thing the human brain is! To think I had conceived this idea and was about to witness its birth. I rushed home and laid the pipe out in the back yard. With glue can and hacksaw I quickly assembled the eight spreaders. The next step was childishly simple. I inserted the ends of the 3/4 in. pipe into the cross fittings and cemented them in place. My two quad sections were finished! Less than an hour had elapsed!

I decided to transport the sections over to the driveway where I would attach them to the 30 in. squares of plywood with C clamps. I stooped down and raised the center section waist high. The four ends remained imperturbably on the ground. A hint of disaster began to penetrate. I raised the center to the top of my head. Oh, no! I raised it as high as I could reach. The ends just cleared the ground. I stood there looking like I was holding the framework of a giant parasol. As soon as I began to walk my creation began an undulating motion. I tried to damp its oscillation by changing the cadence of my step. This required a rapid change of rhythm since the damn thing was really responsive. I was in the midst of this inadvertent boo-ga-loo when I noticed my neighbors staring thoughtfully in my direc-

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tion. They have tended to view my behavior as a little strange for some time, and this latest exhibition did nothing to shake their confidence in the opinion that I was a prime candidate for the local laughing academy just north of here.

I'll admit it. I was undone. I laid the whole thing down on the driveway and sat in the sun, gently flexing my fingers along the back of my neck. Sometimes I get these damn headaches . . .

At times like these, ham radio can be such a help. I went inside and fired up the rig on fifteen. A WØ in Milwaukee came back to my CQ. After the amenities, I described my plight in lucid terms. He immediately had the perfect solution! "Yes, sir," he said, "just cap the ends, fill it up with water and freeze the whole thing. It'll be just as rigid as you want. Ha, ha, ha," he cackled insanely, vastly amused at his cleverness. I complained of sudden QSB and signed off.

After a few days I went out and disassembled the whole thing. The plastic pipe is lying on the ground in the far end of the back yard. It can be had for a very reasonable price. It has been there for three years.

Subscribing to some idiotic ethic that postulates that adversity is meant to strengthen character, I resumed brooding about how to put up an inexpensive quad.

In no time at all it became evident to me that I should have chosen material with more strength, say like one-inch wooden doweling. In order to insure success I decided to fiberglass the doweling. Better to spend a little extra and be sure. I asked some of the boating types at work about fiberglassing and was assured it was a relatively simple operation.

Naturally, I was crouched by the door of Builders' Emporium on Saturday morning, money in hand, awaiting opening hour.

The only problem with the doweling was length. The longest pieces they had were eleven feet, two feet too short. This was only a temporary setback. My fevered brain devised an on-the-spot fix. I picked out eight pieces of 3/4 in. doweling. I would simply drill out the ends of the 1 in. doweling about eight inches and insert the 3/4 in. dowel and glue them together.

Congratulating myself on my obvious problem-solving ability, I proceeded to the section containing materials for fiberglassing. Horror! The prices! The boating types had forgotten to tell me I could have gold plated the poles for less money. A further complication – Builders' didn't have the glass cloth in rolls. I wanted the materials right then, not later. I bought two large squares of glass cloth and the cans of resin and setting agent. I forgot to buy solvent for cleaning up the resin. This time the bill was more imposing – $15.40 for the lumber and $18.85 for the fiberglass junk. Heck, with tax, it was only a little over $35, and that's still a long way from the $59.95 most quad kits are advertised for.

I rushed home with my newest purchases, imbued with new enthusiasm, a blend of overconfidence and plain ignorance.

I glanced at the directions for fiberglassing. Admittedly, it was raining out and the temperature was in the low 60's, but who wants to split hairs over little things like that?

I laid out the big squares of glass cloth and began cutting strips for rolling onto the doweling. No one had told me that glass cloth has such a tendency to unravel. In short order the family room looked as if Florence Nightingale had held a bandage-wrapping rally for the Crimean War. I decided it would be better if I conducted the actual wrapping operation out on the porch even though the weather was miserable.

I had less trouble drilling the ends of the 1 in. doweling to accept the 3/4 in. doweling than I had expected. (I was beginning to develop a paranoidal expectation of trouble at every step.) Realizing that I had weakened the walls of the doweling with the drilling, I wrapped the outside with copper wire (No. 32 PE of course) and wrapped electrical tape over the wire. The result would have pleased a Watusi tribesman. It looked like a thirteen and a half foot spear.

I laid one of the spears between two chairs and began the fiberglassing operation. The trouble was that the three foot strips of glass cloth tended to come loose before I could overlay the next strip and get it started. I had liberally doused the spear with

resin before starting. The whole operation wasn't going well. The resin got all over my hands and arms. Bits of the glass cloth started to adhere to the resin. I began to panic. More cloth. More resin. The spear was beginning to look lumpy in places. I abandoned all pretence at competence. Resin was puddling on the concrete floor beneath the spear. The resin on my hands, arms and clothing was beginning to congeal. More cloth came off on me. I felt like an old W. C. Fields movie, trying to peel cloth off of one hand only to have it stick on the other hand. I also felt like an ass.

My teenagers chose this moment to arrive home with some friends. "Hey you guys, look, it's the MUMMY." They all peered at me. "I think it's FRANKENSTEIN," said the youngest. "You're both wrong," the eldest said flatly, "can't you see the neighbors have tarred and feathered the Old Man while we were gone? I told you they would get him sooner or later." They beat a hasty retreat. There's a certain look I get at these times.

I made one right decision. The other seven poles would remain unfiberglassed. It was raining anyway, so I couldn't go much further. Back down to Builders' Emporium and the purchase of some epoxy paint. Expensive as hell, but the paint man said it would withstand anything. Only another $5.15 which beats trying to fiberglass the poles anyway.

While the epoxy paint was drying, I zipped back down to Builders' Emporium (I'm well known there) and picked up two three inch end bells, a three inch threaded T, and a twelve inch threaded pipe. Then over to the lumber section where I got more doweling to fit into the pipe sections. I forced a five foot section of doweling through the T joint and jammed an end bell on either end. Another section of doweling was stuck into the bottom of the T joint to make a mast. The end bells would be bolted to some aluminum plates and the spreaders attached to the plates with C clamps.

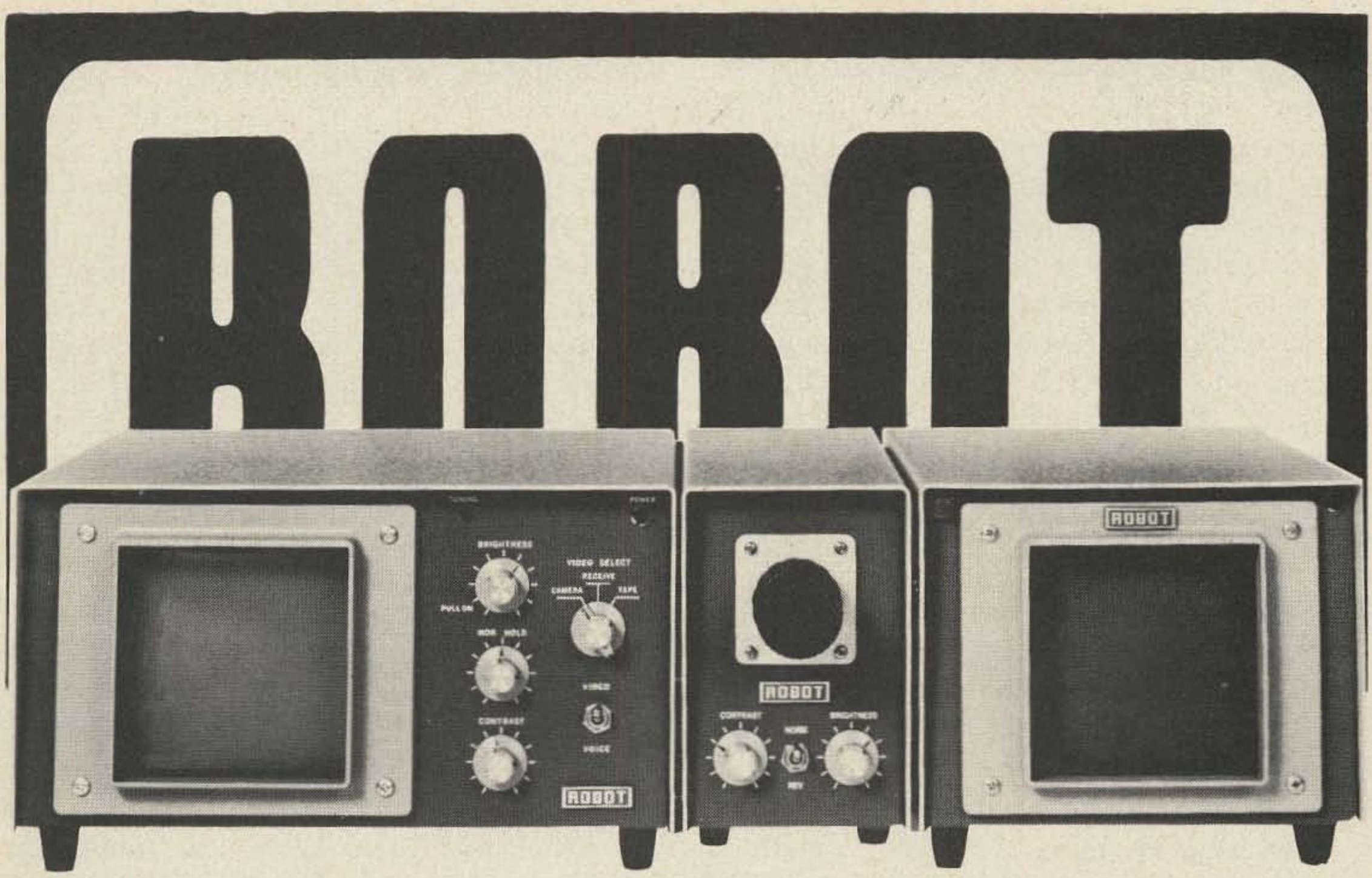
The pipe fittings were expensive and the doweling wasn't cheap either. The bill came to $13.71, but the end was in sight.

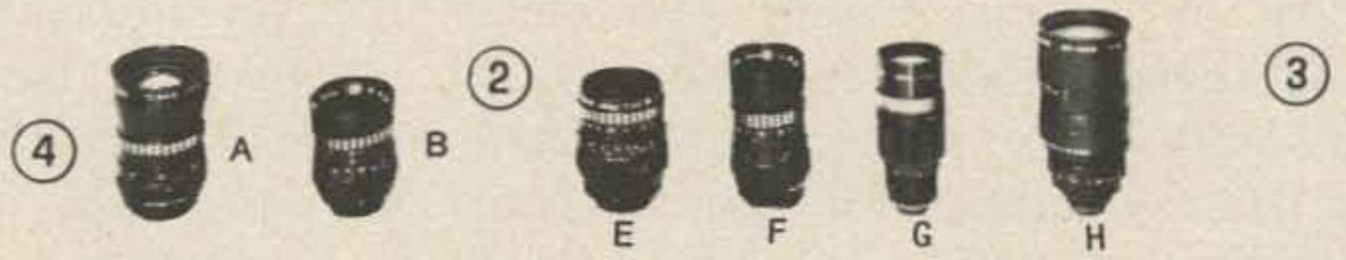
I was forced to wait for the next weekend to assemble my masterpiece, since it was January and too dark to work by the time I got home.

Saturday I strung the wires for the three bands on each of the sections. I had been advised by competent engineering talent at the space factory where I labored that some of the hams had successfully fed all three elements with a single 52Ω coax by bringing the three driven elements together at a single feedpoint. This seemed so simple I wondered how it could work. It was simple. It didn't work. I tried resonating with my grid dipper, but I kept getting sharp dips all over the place and finally abandoned this brief attempt at the scientific approach. I copped out and used three different coax cables, one for each band.

I had started another project, an "inexpensive" home-built tower (more about *that* some other time) and decided I would use the first twenty foot section to test my quad.

I rounded up my teenagers, all four, and we hoisted the assembled quad up on the tower. I stood back to admire my handi-





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work. Alas! The weight of the No. 12 wire was too much for the 3/4 in. doweling. The whole quad appeared to suffer from advanced arthritis. Although the ten and fifteen meter sections attached to the 1 in. doweling were reasonably taut, the twenty meter section caused the 3/4 in. doweling to bend over at an awkward angle. The twenty meter section just wasn't going to hack it. I got up on a ladder with a saw and methodically cut the spreaders just above the fifteen meter attachment. The boom wasn't too tight in the end bells and so I was able to spin the spreaders around until all eight were cut down.

Standing amid the wreckage of tangled wire and stumps of wood, I could feel that funny headache in the back of my neck coming on. There was nothing more I could do that evening. I went inside and fixed some drinks. I drank all of the drinks.

The next morning I decided I might as well try out the remaining two bands. I hooked them up and turned on the rig. I could hardly believe my ears. I switched over to the Mosley vertical. The signal was S-5. I switched back to the quad. The meter read S-9 plus 10 dB. Fantastic! I swung the quad around. The signal started dropping. It was down to 40 dB off the side. Out of sight! I was so excited I forgot about breakfast and lunch. I was working one station after another, first on ten and then on fifteen. By early evening I was gracefully acknowledging S-9 reports from Japan. One JA gave me an S-8, and I immediately decided he must have inferior receiving equipment.

This was only the beginning of a long line of quad antennas in the three years that have passed since that lovely Sunday morning in January.

I found that the big end plates had a windmill effect, and I had steel straps welded to the end bells, which proved strong enough to support the spreaders with much less wind resistance. Also I found that I really needed some matching device between the coax and the driven element. A gamma match worked out quite well.

I began a long series of experiments with element spacing for the individual bands. My peerless engineering had limited me to ten and fifteen, but I was able to satisfy myself that the quad is one hell of an antenna when it is tuned up properly. Generally speaking, if you have a low SWR and are getting at least 20 dB front-to-back, you are in good shape. It is possible to get a higher front-to-back at some sacrifice in bandwidth. My present quad is a three-element job with no tuning stubs. I cut the reflector 5% longer and the director 5% shorter than the driven element and strung them up as closed loops without any tuning stubs. So far, after a week's testing, it seems to be working out pretty well, 25 dB over S-9 in Tokyo and 40 over in Guayaquil, Ecuador.

I suffered through a few further reverses. The wind blew the tower town and broke one spreader, which I quickly replaced. One day at work I got a phone call from the youngest harmonic who plaintively relayed the information that my daughter's horse had got loose, tripped over the guy wires and the tower was down again, this time with two broken spreaders. Small matter! Now I knew I had a working antenna, and I accepted these trivial happenings with equanimity, not even the hint of those headaches.

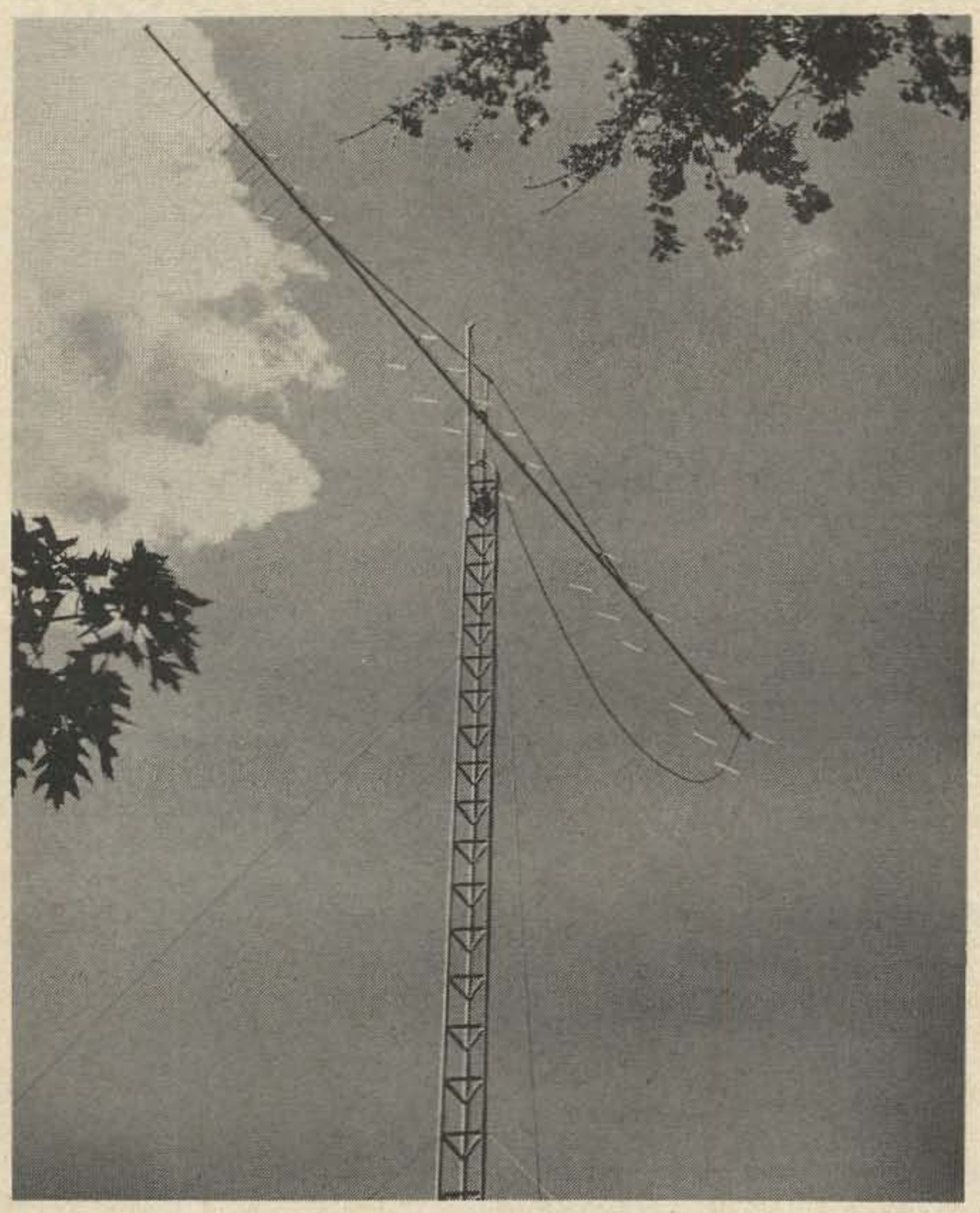
Honesty requires me to admit that by the end of the year I purchsed the $59.95 kit from Polyquad. This finally got me on twenty. Incidentally, I ran a series of tests while the quad was mounted on a twelve foot four-by-four. The twenty meter section barely cleared the ground. In both Europe and Africa I was only 5 dB under K6SHA who is about two miles away. Since Casey was running 2 KW PEP to a four-element Yagi 60 feet up and I was barefoot with the HT-37, he should have been at least 10 dB louder on power factor alone. Remember, my quad is barely off the ground.

I gave the original quad antenna to W6UOD and his son, Steve WB6UHE. It was really a minor investment anyway. Only cost me $68 or so, which any way you figure it is only a few dollars more than those store-bought kits. I don't care to discuss those headaches or the liquor bill. As the new generation would say, "It isn't relevant."

That 54 ft all-wood white tower though . . . but, as I said earlier, that's another story.

. . .W6SUN

Ralph W. Campbell W4KAE
405 Granite Circle
Lexington KY 40503

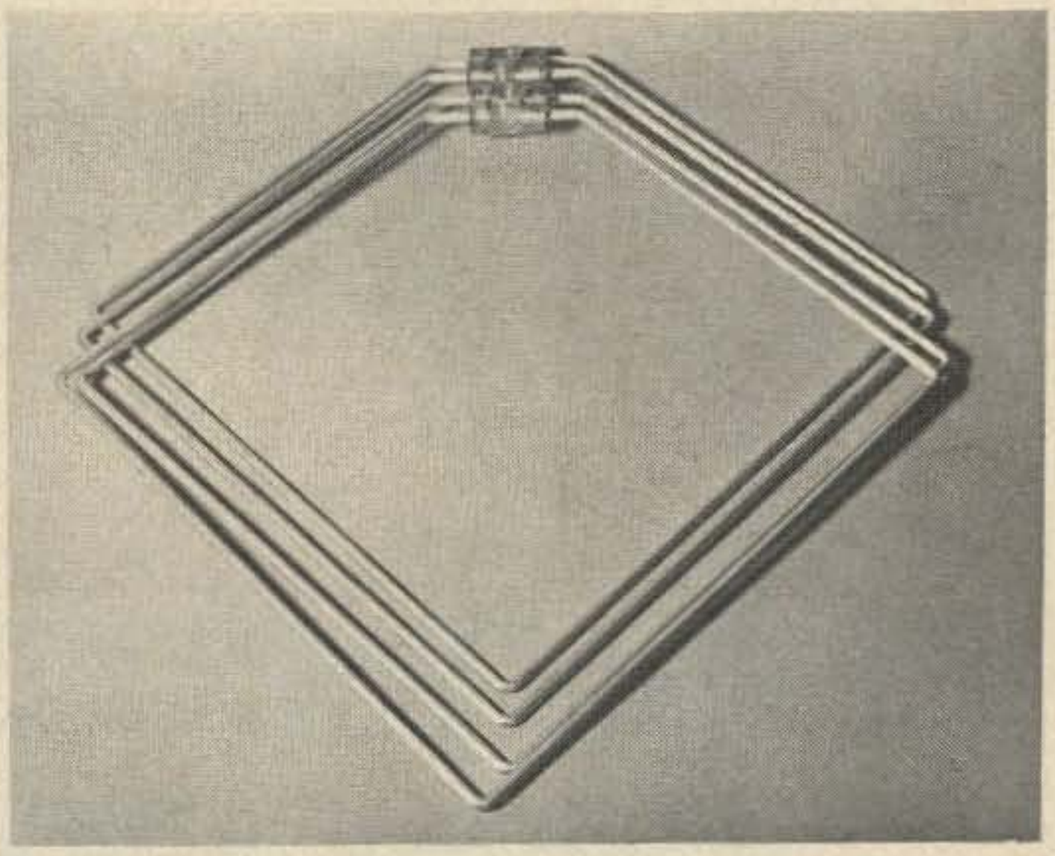


RECONCILING THE LONG SQUARED QUAD

Referring to the August 1969 issue of *73* Magazine: The article beginning on page-101 was the first full length composition I ever had printed. Although another paper was carefully rewritten for a non-paying journal, a nice check from the Editor spurred my research and experimentation which resulted in the final issuance of Patent No. 3,491,361. This was the birth of the Long Circular Quad, as we know it today.

Original work was performed with the diagonal-square or "diamond shape" parasitic-element quad; however, this approach was abandoned for the circular loops. The round model was tested free and the gain and performance properties were just about as expected, except for normalized frequency being somewhat lower than the array was cut for.

This article tells about *new* research on the older – diamond – model; and if it doesn't herald a new breakthrough in antenna design, at least it spells out the danger zones to be avoided. The L.C.Q. theory has therefore been more firmly established, using *circular* elements. From our experiment comes two new ideas: 1. The function



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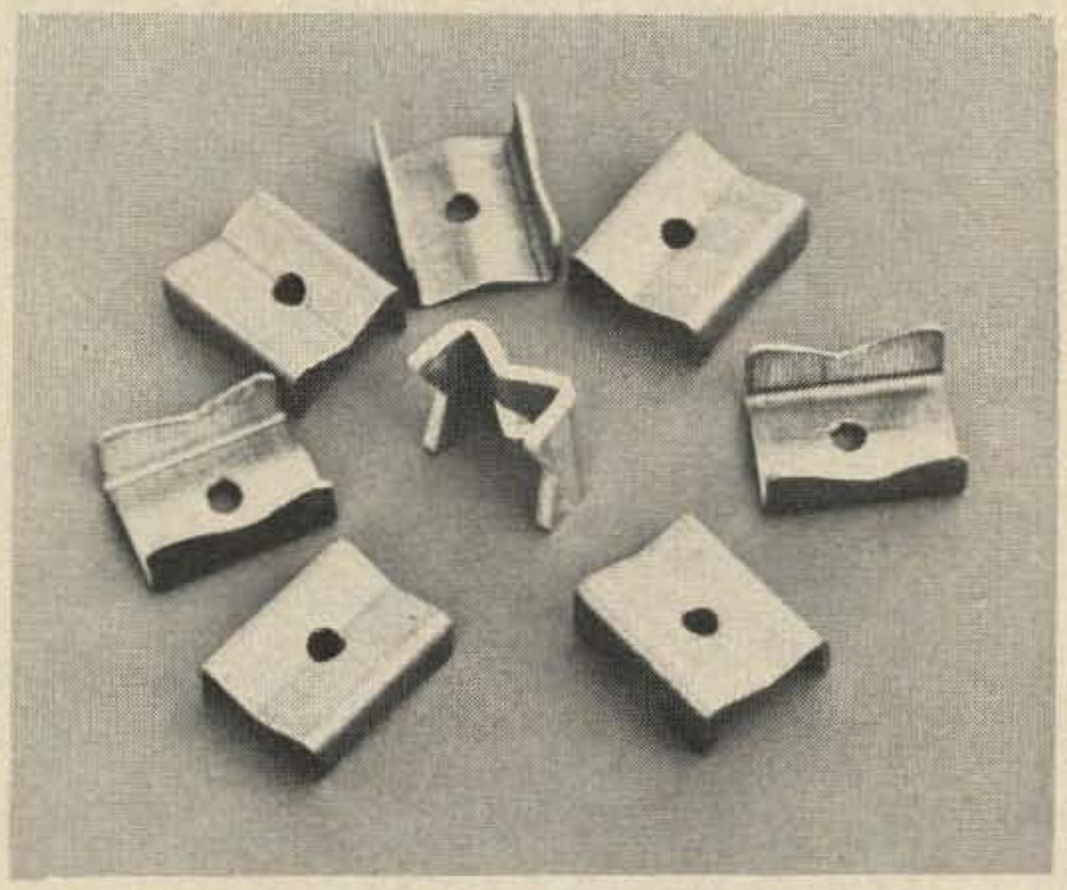


Parent-part of mounting hardware is shown in center of this photo. Note I had the seven additional parts manufactured by a local sheet metal shop; after being flatly refused help from a well-known antenna manufacturer! Parts are plastic insulator-to-boom clamps.

of the parasitic groups is compared to standard waveguide/mode concepts; 2. Constant-phase boom length, with regard to the number of discrete directors in any given group, is explained.

Curiously, the 18 dBi we were claiming for the original array resulted in 13 dBr, for an over-the-dipole comparison, when improvements were made. A separate article on the 11 Element L.C.Q. is in the files of 73 Magazine; and this is the antenna depicted on the August cover. The 11 Element L.C.Q. exceeds performance for a 215B long john (15 element) Yagi by a full 3 dBr. All models of the L.C.Q. in print can be scaled for higher UHF frequencies, but it is of prime importance to maintain proper circumference to wire-diameter ratios. On 432 MHz, my conclusion is that a 4 ft. reflecting screen may be needed to offset increased stray radiation behind the driven reflector, for the same gain figures as on VHF.

Theory

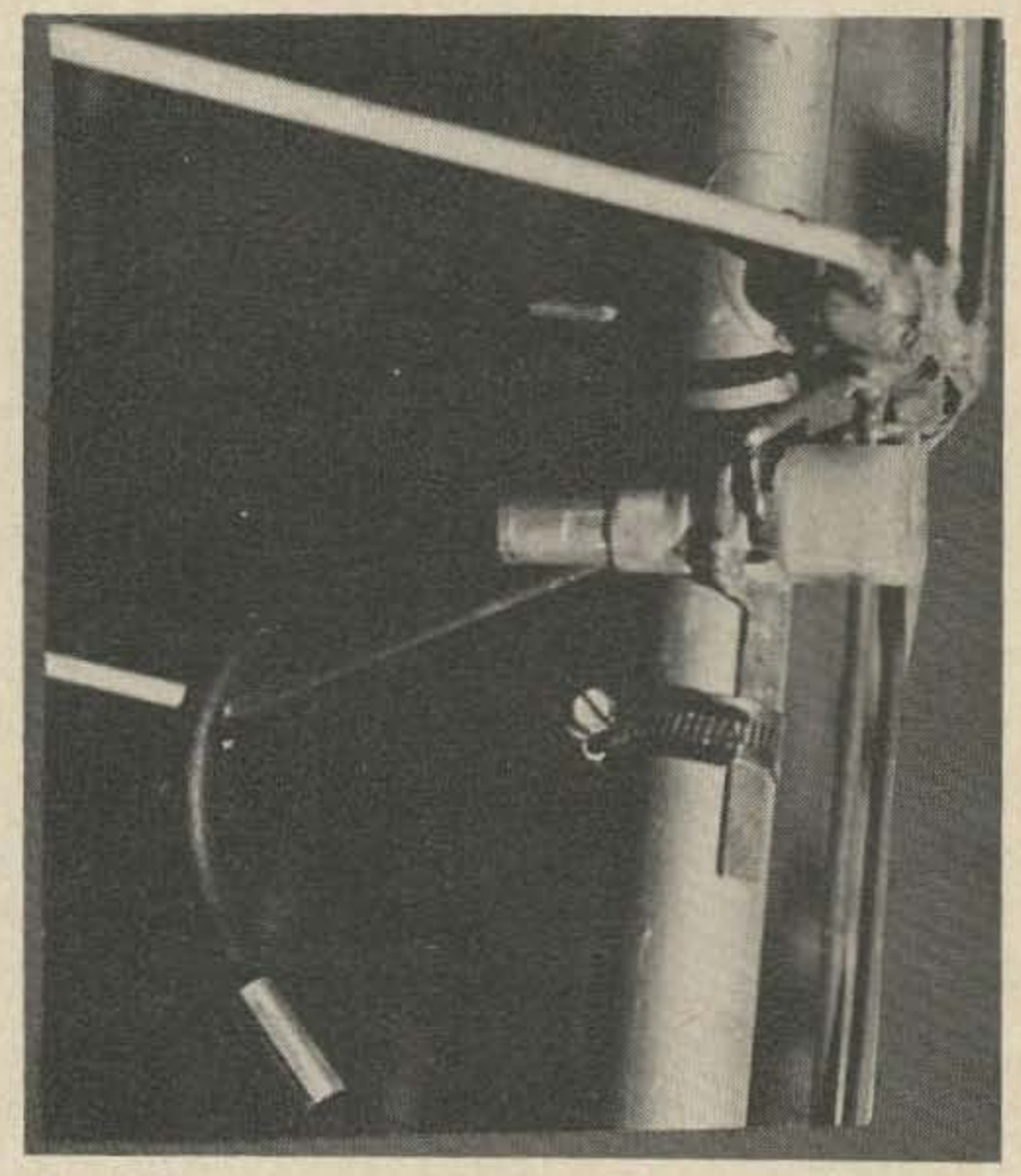
For a long time vertex-fed diamond-shaped elements have been used on the HF bands. There was apparently no difference between this type mount for quads, or for the kind with a square-side parallel to earth. This is for truly parasitic discrete elements, and not for driven parasitic groups. However, from my experiments on VHF, it is clear in my mind that an E-vector to H-vector cancellation can occur as noticed here, which must reconcile, especially in light of the fact that for both parallel and diamond configurations, the feed point is classically correct (i.e., feed connections made to the middle of a lower parallel member, or at the six o'clock vertex of the diamond-shape, for desired E-vector polarization to be horizontal).

For the VHF experiment, it seems that we've got a waveguide-type mode propagation similar to the TM (transverse megnetic) field pattern for Long Squared Quad versus the TE (transverse electric) for the L.C.Q. Subscripts are normally used below the TM or TE letters; however, since I cannot accurately define which mode is which, I am content to mention only that the TE field appears replaced by the TM field. If you consult MIT's Principals of Radar, or NAVSHIPS No.900,018, a simple breakdown is illustrated. With this apparent mode-shift, keeping the feedpoint the same obviously results in cancellation – which was noticed!

Mode considerations for discrete element parasitic quads (not groups) is not treated because there is no common-driven energy to be propagated. For the LCQ it is proper to think of this array as having properties of an irradiated slot-structure, or like several mag-

netic dipoles stacked end-to-end on a single boom. It is worth remembering that a vertical magnetic-slot antenna radiates a horizontally polarized E-vector.

Constant-phase boom theory is another concept derived from our work. Basically, this theory says that an increasing number of parasitic, strapped circular elements may be added (up to about 7 per group) as long as there's the same spacing (boom length) as there are quarter-wavelengths between the discrete elements in the next group ahead. Seven discrete elements have 6 ninety-degree intervals, so the previous group boom



Close-up view of the rugged ferrite balun, constructed for the square quad. Although complete balance of the driven diamond-shaped squares was obtained, as well as energy propagated along the structure, cancellation or cross polarization occurred.

spacing must be 540 electrical degrees, etc. To initiate another group on-the-boom requires an increase, on a per-group basis, of 90 electrical degrees so that array will become proportionately longer as more elements are added. Thus, the next group out from the 7 element one will contain 8 elements at 630 electrical degrees from the last element mounted. Since more than 7 elements could theoretically result in unwanted side-lobes, you can content yourself with a total of 24 elements VHF or 25

elements UHF, with use of a passive reflector. This concept is more fully explained in Patent No. 3,491,361. I will make patent copies available for $1.00 each, should anyone desire a copy of this document.

Construction

A great deal of time was spent in constructing the array shown in photograph No. 1. Other photos show how I handmade my own insulators from glass 9 dram pill bottles, with a finished closeup of this work. The 5/16 in. aluminum elements were fluxlessly welded, because of inferior quality of the material supplied.

Conclusion

Sometimes the best results in independent research come from failure. The array under discussion was just that, by amateur standards. Out of two months construction time (to get "weird" parts by mail) plus four months more in evaluation, new theories were developed which are protected in my patent; however, we don't mind if hams use these arrays for non-commercial purposes.

In retrospect it is impossible to get much more gain from the diamond-shaped quad with discrete parasitic elements, for anything you might build with more than 8 elements (see Fig. 1, page 101 of August 1969 *73* Magazine) unless you use circular loops and strapping. Horizontally square, strapped elements will work fair – I think – but the mode may be wrong. Our patent was allowed over the Wells' case, where interference was encountered, so we know our way works best!

Although not mentioned earlier, I recommend HF users of cubical-quad antennas to try the diagonal-square type of array in preference to the horizontally-square. I think Kirk Electronics, and Particularly Hy-Gain's new "Hy-Quad" array are top-of-the-line. Always check the match with the antenna mounted no closer than 1/8 wavelength above ground, on the lowest frequency (usually 20 meters) for unity SWR – AT THE ANTENNA TERMINALS. The advantage of the diamond shape on HF is probably a lowered angle of radiation. Don't strap those elements!

. . .W4KAE

Carl C. Drumeller W5JJ
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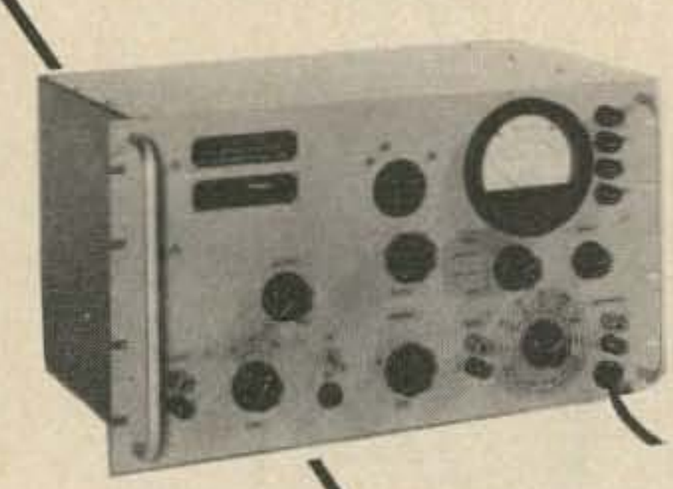
If one rocks back on one's haunches and considers the situation, what you're really concerned with is the antenna's ability to accept *power*. Once it accepts that power, it'll radiate it, less that very small portion that'll go out in the form of heat waves because of ohmic losses. Now, it's axiomatic that a reactive termination will not accept a load. So the point at which the antenna accepts maximum power is the point where its resistance (resistance, not impedance, not reactance) most nearly matches the feedline's impedance. you hope that its resistance is almost all radiation resistance, with a very minimum of ohmic resistance, but that's neither here nor there; you built that ratio into your antenna initially, and this is no time to be worrying about it.

Now that you've bought the acceptance-of-power concept, you next consider how you're going to judge it. Here's where you want to keep it simple, keep it basic. What, you ask yourself, is the most simple form of rf power generator for the frequency I want to use? You can't get any more simple than a Hartley! So build one. Use a tube big enough to put out a couple of watts so you'll not have to squint too much to detect that rf power. Of course, if you're dead set on going modern, there's nothing wrong with using a big and husky transistor.

How to detect that rf power? Still keeping it simple, you take a dial light bulb or a flashlight bulb and a single turn of insulated wire. Put them in a series circuit. Loosely couple it to the coil of the Hartley oscillator. Couple it closely enough to get a fair degree of light, keeping in mind that you can determine changes in that amount of light better when it's not at full brilliancy.

Now couple the antenna feedline loosely to the Hartley's coil, using another single turn of insulated wire. Tune the oscillator slowly. When it hits the frequency at which the antenna accepts a load (takes power out of the oscillator), the light will dim. Read the oscillator's frequency with your receiver. That's all. You've finished the job.

. . . *W5JJ*



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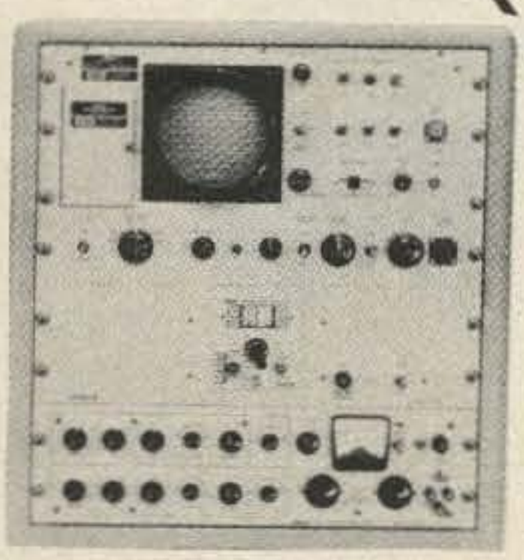

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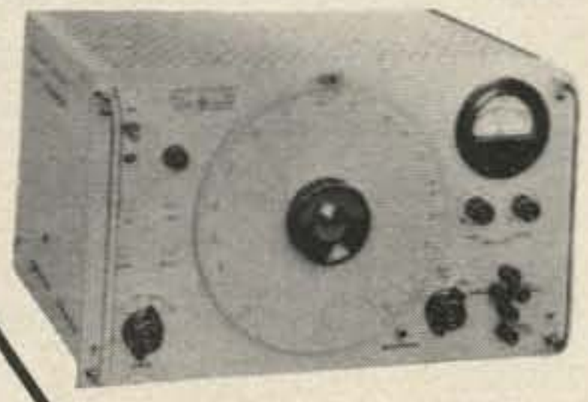

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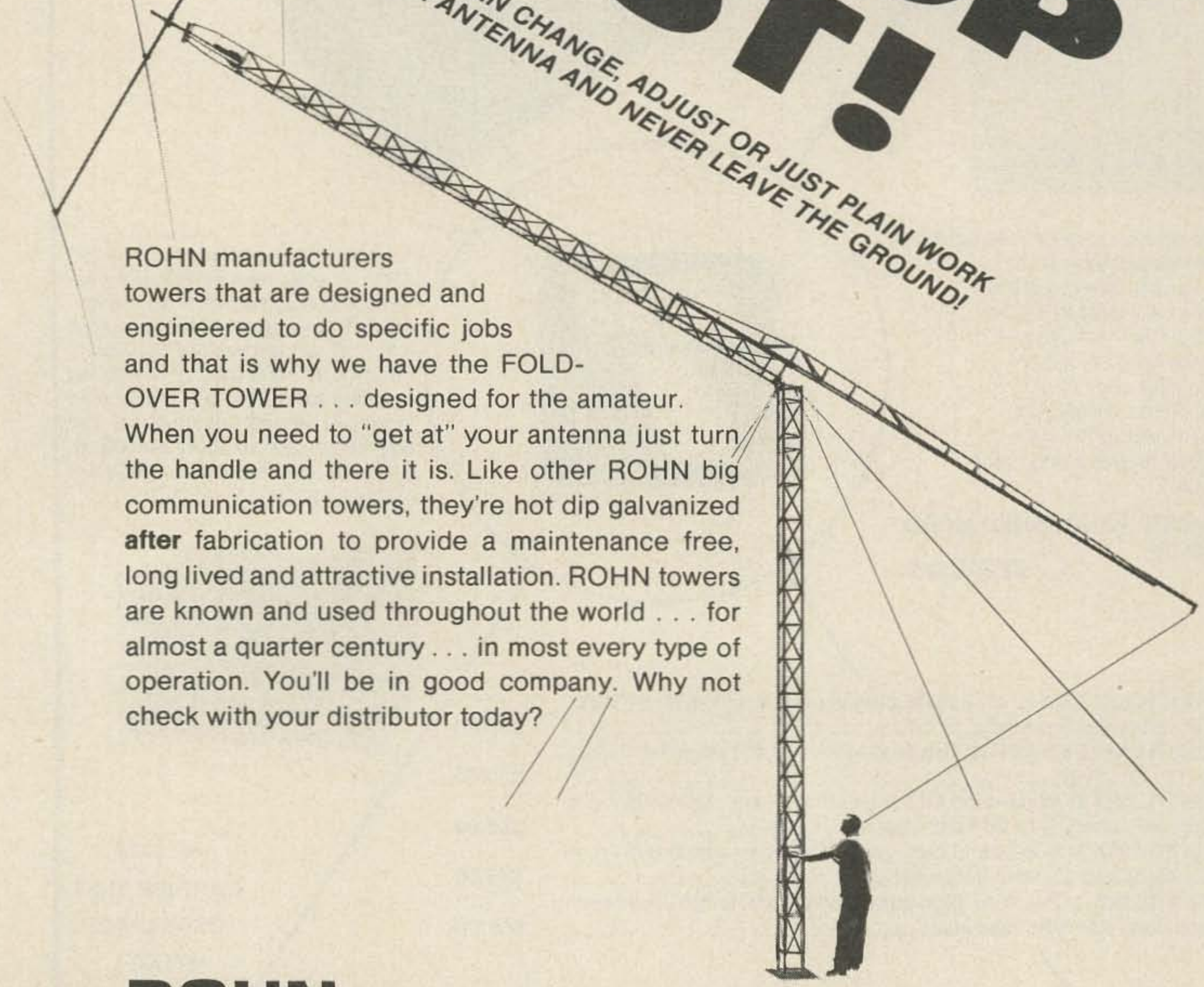

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MATCHING

Here are several methods for making everything match everything else.

Impedance-Matching" is a phrase that haunts the electronics student. He may ask half a dozen people before he gets any kind of explanation of what it means, let alone what it implies. And the explanation may be simply that "all impedances have to be matched to each other," which is occasionally correct, but more often wrong. He may even be told that it takes higher mathematics to explain, which is completely in error. Lower mathematics will do nicely.

This concept is not taught to beginners at all, though I think it should be, since it is an important part of how things work. I myself taught it to my Novice classes, to the amused surprise of my sponsors.

Let me point out at once that the effects of mismatch in impedances can be seen by man, woman and child in the family television receiver. The antenna has a 300Ω impedance, and it is connected to a flat ribbon line of 300Ω impedance, and the other end of this line is connected to the TV set which also has a 300Ω input impedance. All matched; that is the way it is supposed to be. But let us assume that the TV set input impedance is actually 600Ω instead of 300 for some reason – mistuning, trouble or whatever. Now the signal from the antenna enters the line, goes all the way to the TV set, and *most* of it enters and makes a picture. But the mismatch reflects a small part of the signal back up the line all the way to the antenna. Now the antenna is not a perfect match either; it should be, but in practice it can't be. Most of the reflected signal goes into the antenna and is radiated back to the transmitter and good riddance, I don't know a better place for it. But a small fraction is reflected from the antenna mismatch down the transmission line again to the receiver, where most of it goes in.

But the reflected signal, or echo, is late. Meanwhile, the scan on the face of the tube has moved a little, as it should, to pick up the next part of the picture. And here comes a late reflection of something already printed, which prints on top of the signal that should be received at this time to form a "ghost." This image is faint, but annoying, especially if it happens to be an extra face. Everyone has seen this. You have too – remember?

There is a very simple trick that often – not invariably – remedies this trouble. Take a palm-sized piece of aluminum foil from the kitchen and wrap it around the ribbon lead near the set, like a flat napkin ring. Watch the picture while you slide this gadget slowly

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0	10	1.000	1.000	10.00	0	10.00	0	0
∞	∞	0	0	0	0	0	10.00	0
990	1.000	.01	.0001	.001	.0990	.100	9.900	99%
11	21	.476	.227	2.27	2.497	5.767	5.236	43.28%
9	19	.526	.277	2.77	2.493	5.263	4.734	47.61%

up and down the line, an inch or so at a time, until the "ghost" is exorcised.

A friend of mine who is a pretty good TV repairman, had a very odd case of trouble. He checked the antenna and transmission line, which he followed through the house wall and across a clothes closet and thence downstairs to the TV receiver. He couldn't figure out why the line had been strung across the empty closet, but an even greater mystery was that someone had hung an ordinary wire coat hanger on the ribbon line. He took it off as a matter of course, and went down to the receiver (see Fig. 1).

Here he soon found the trouble, which he fixed. Confidently, he turned the receiver on again, fully expecting it to work perfectly. He got a hazy picture of poor quality. He was trying to clear this up with just about every adjustment the set had, when the lady of the house came in to check on his progress.

She took one look at the picture and exclaimed, "Oh, somebody must've taken the coat hanger off!" and dashed upstairs. This was ridiculous, of course – there wasn't so much as a kink or crease in the line, and the connections were good. The line was all in one piece.

Suddenly the picture cleared up and the woman came back downstairs. He got his money and left. When I heard this story, I asked him: "And was that *all* she did? Put the coat hanger back on?"

"I was afraid to ask her. Who knows about things like that?"

Auto drivers see the effects also, especially in the winter when they start their cars. When they engage the starter switch, the battery is connected straight across the starter-motor. This is wound with copper bars instead of wire, and is as near to being a short circuit in an iron casing as you could ask. It develops over a horsepower to spin a big engine.

In cold weather, it doesn't exactly spin it – it groans and shudders and grinds, but it does turn over, slowly. The ignition doesn't work very well, since the voltage is too low.

And why is it low? Because roughly half the voltage is being dropped in the battery itself. This also means that *half the power* is being lost in the battery! Under these conditions, the transfer efficiency is only 50%. This is why a battery is rated, say, 100 amp-

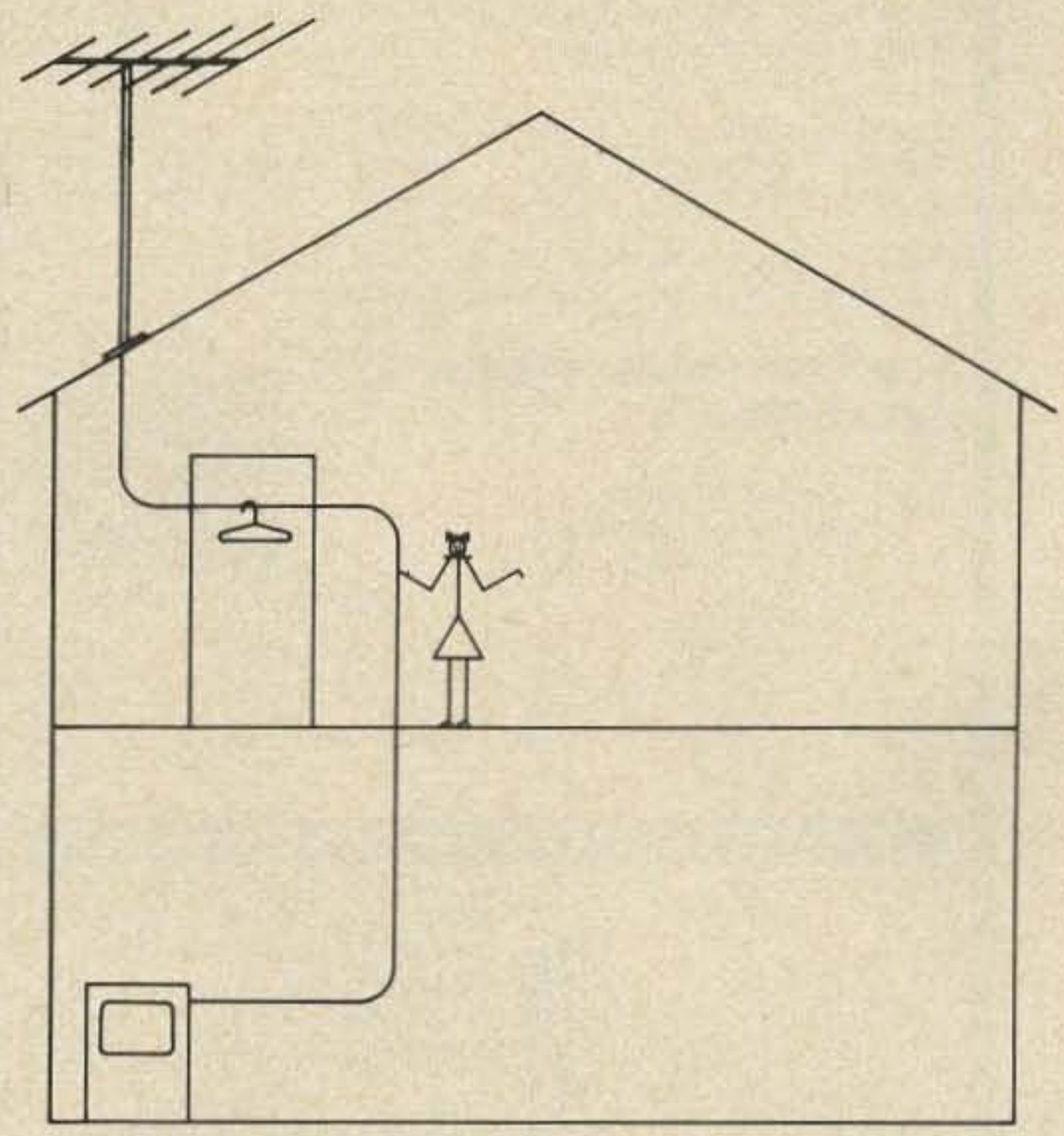


Fig. 1.

ere hours for a one ampere rate, and a great deal less for higher rates. The heat that is lost in the battery does do some good – in warming up the battery it speeds up the chemical reaction that produces the current and so gives a power boost when it is badly needed.

By this time, the heavy oil in the bearings and on cylinder walls has loosened a bit, and the engine turns easier. As the mechanical load lightens, the starter-motor turns faster. It generates more back-voltage to oppose the battery voltage, so that the current from the battery is less. Now the battery voltage goes

up in consequence, and the ignition has enough for a nice hot spark and VAROOOM! – the engine starts.

The only thing that could be done about that 50% business would be to increase the size of the battery. If you made it ten times bigger, then the voltage would drop only a little. But think of hauling all that big battery around, and of the room it would take, and what it would cost. Obviously, the solution is too costly.

Some drivers trickle-charge their batteries each winter night. (I do.) This puts a few ampere hours into their batteries, but more important, it warms them a little, making more current available for morning starts.

An example of the opposite case is your local power company. What is the output impedance of those big generators, do you suppose? One thing is sure – the entire load impedance of a big city won't match it, because the impedance of the generator would be much, *much* lower. If the impedances were equal (matched) the big, expensive generating machines would burn up literally in seconds – they run warm as it is, but they don't dissipate more than a couple of percent of the power they produce.

When it comes to impedance matching, the local telephone company is the champion. They match anything and everything to cut reflections to an absolute minimum. This means lines, coils, repeaters, test instruments, subscribers' telephones, the whole works. Even here there are exceptions: the volume indicator meters which are used to check transmission levels in broadcast stations, recording studios and telephone offices. They are deliberately made high impedance so they won't load down the line under test and drain the signal, at the same time giving a false indication. And that is exactly the same reason your VOM is 20,000Ω per volt instead of a much cheaper 1,000Ω per volt resistance – accuracy and minimum drain.

From this point on, generalities won't do; let's try some of the "lower mathematics" I mentioned. Figure 2 shows a simple generator which may be a battery-charging generator, vacuum-tube oscillator, or almost anything that puts out current and has an

internal resistance of 10Ω. You can't get in behind this resistance in any fashion; this is what you get at the generator terminals. The voltage is a constant 10V *inside the generator* but the voltage you get outside depends on the load.

Suppose the load resistance matches the generator resistance (impedances are the same). Refer to the table: the top line shows this condition, and reads as follows:

RI, the load resistance, is 10Ω. Rt is the total resistance in the circuit, 20Ω. I is the current in the circuit, .500A. I x I is this quantity squared, .250A. Pg is the power lost in the generator as heat, 2.5W. Pl is the useful power, the power in the load, also 2.5W. Pt is the sum of these two, the total power generated. E is the voltage across the line (generator terminals and the load, all the same point). K is the transfer efficiency, which you already know is 50%. This looks very low, and usually we want to do a lot better than this. Sometimes we can't, or other things are much more important, as in signal transmission.

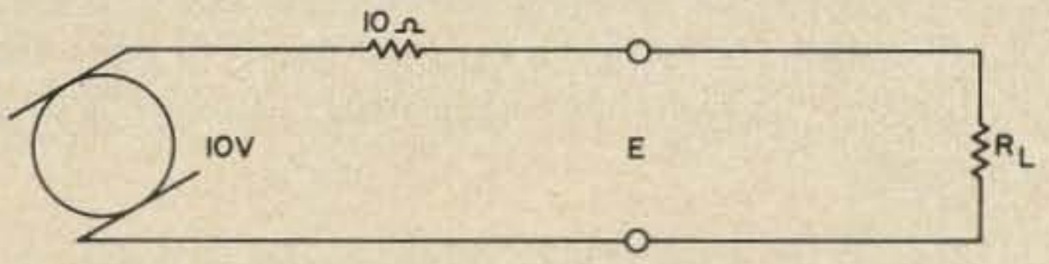


Fig. 2.

Look at line two. Here, the load is zero, a short circuit. The total resistance is only 10Ω the current 1A, the current-squared 1A, and all the power is lost as heat in the generator itself, 10W. The power transferred to the short circuit is zero because there is no resistance in it. The total power is, of course, that in the generator, 10W. The voltage across the short circuit is zero, and the transfer efficiency is also zero. Not hard, so far, just simple Ohm's law.

Now in line three we take the opposite extreme, or an open circuit. Load resistance, infinite. Total resistance, infinite. Current zero, current-squared zero, power lost in generator zero, power delivered to the load zero, total generated power zero, voltage equals the full 10V – no I x R drop. Transfer efficiency is zero too.

Here comes the lower mathematics – to make it easier, we'll use a load of 990Ω

which will simplify currents and such. Load 990Ω total resistance 1,000Ω, 10 mils (.01A), current squared 100 μA or .0001A, power lost in the generator is only a milliwatt (whee!), power delivered to load nearly 1/10W, total power is exactly 1/10W, the voltage is up to 9.900V (only 0.1V lost in the generator) and the transfer efficiency, K, is a great big 99%. This is the kind of setup the power company has. They are not interested in maximum power transfer, but maximum transfer efficiency. For this reason they use big generators and run them conservatively. Line 1 is the telephone company case. They *must* have minimum reflections and the power transferred is important. The actual power involved is tiny, so they are happy with 50% transfer efficiency – it's a cheap price for what they accomplish.

Here comes the sticky part in line five. Here we use 11Ω load. Theory tells us we should transfer just a little less power from the generator to the load, and that the efficiency should be a little less. And so it proves; the current I is a little less, but the voltage E is a little more – how *about* that? – won't they average out? – no, the delivered power is 2.497W for a K of 43.28%.

The last line tells the same story in different words; with a load of 9Ω, the current is higher and the voltage is lower, and the delivered power is 2.493W, with a K of 47.61%.

Mathematicians would sniff at proof like this – it really does take higher math to rigorously prove the proposition. But we all know instinctively that the power actually *does* peak at 10Ω, and that if you mismatch the load even the smallest amount, the delivered power drops off correspondingly, which is plenty good enough for our present purposes.

How good is your Ohm's law? Could you make up a table like this one to explain a different but similar case to someone else? Reading the values and agreeing with them is not quite the same as working them out. To thoroughly understand this impedance-matching (resistance-matching in this case, same thing) theorem you should be able to do all the pencil work too.

I is easy – it is equal to Rt divided into 10, the generator voltage. Don't let this confuse you – the generator 10Ω and 10V are equal by coincidence. Pl is I x I times the load resistance. How do you get E? Ohm's law again; I times Rl will do it in one step. If K puzzles you, it is simply Pl divided by Pt and can be expressed as a decimal, or more impressively, as a percentage. Unfortunately, the only way to do arithmetic is to *do* it. Shortcuts are mostly longer, unless you are wholesaling, such as when you make up a table.

Another case of deliberate mismatching is employed in some filters. You don't know how much the filter is actually mismatched, of course. But the designers have discovered that if the mismatch is exactly the right amount, the cutoff points are much sharper, and it works better all around. So they specify the in and out impedances they want you to use, and you use them. It is not wise to deviate here if you expect results.

One last case: Sometimes an audio amplifier must work into a specified load for lowest distortion. Look up any big output triode in your tube manual – you will find, under Class A conditions, that all output triodes work into a load impedance of twice their own plate impedance.

The reason is that as the load impedance is raised from equal to, to twice the plate impedance, the output delivered to the load goes down slowly, while the distortion goes down pretty rapidly. The two-to-one mismatch represents about the best compromise. At this value, the distortion is only about 5%. However, this is mostly even order stuff, which means that you can get rid of most of that by going to push-pull. But even single-ended amplifiers sounded pretty good, without reverse feedback or filtering or fooling around.

The pentodes had a lot more gain, which eliminated a stage and made the amplifiers simpler. Besides, they were the latest thing!

So this is the story of impedance matching and mismatching. If someone insists that impedances must always be matched evermore by Divine Law, be gentle with him. Why destroy his illusions? He won't believe you anyhow, unless he really wants to know.

. . .WB2PAP

REMOTELY TUNABLE DUAL-BAND ANTENNA COUPLER

John J. Schultz W2EEY/1
c/o RLC Inc.,
30 East 42nd St.
New York, New York 1004

Simplified and inexpensive motor-operated remote control of tuning and provision for remote reflected power monitoring are features of this coupler. The ideas presented can be applied to a variety of situations where remote control and band-switching of an antenna coupler unit is desired while utilizing only a single pair control cable for all remote control functions.

Instead of running resonant feedlines or the end of a voltage-feed antenna into the shack, it would generally be better to have the coupler used remotely located and controlled. In many instances, this would avoid most of the problems of rf in the shack and possibly permit a more optimum placement of the radiating portion of the antenna system. In apartment situations, it may also prevent TVI/BCI difficulties due to being able to use a coaxial transmission line to the remotely located coupler.

Many schemes have been developed for the remote control of antenna couplers. One can get involved with expensive motors, special relays, elaborate control circuits and the need for multi-conductor control cables. The coupler described, however, uses inexpensive components that really make it only slightly more expensive than a regular antenna coupler. The coupler is shown built for dual band operation, but the ideas used can be incorporated into more elaborate designs as required to fit a specific need.

Basic Scheme

The functional units comprising the coupler are shown in Fig. 1. The coupler itself contains a matching network with motor controlled tuning. The motor tuning is also arranged to provide a switching function. The reflected power sensor is simply half an in-line SWR meter. One could use an SWR meter located at the transmitter to indicate the effect of tuning the coupler but a reflected power indication directly between the coupler and transmission line is much more accurate. It is also generally easier to use than a field-strength type indicator when tuning. The indicator voltage from the reflected power sensing unit and the dc control voltage for the motor are both transferred over a shielded 2 conductor cable which is completely independent of the transmission line. The motor itself is a dc type and the direction of rotation is controlled simply by changing the polarity of the motor voltage supply.

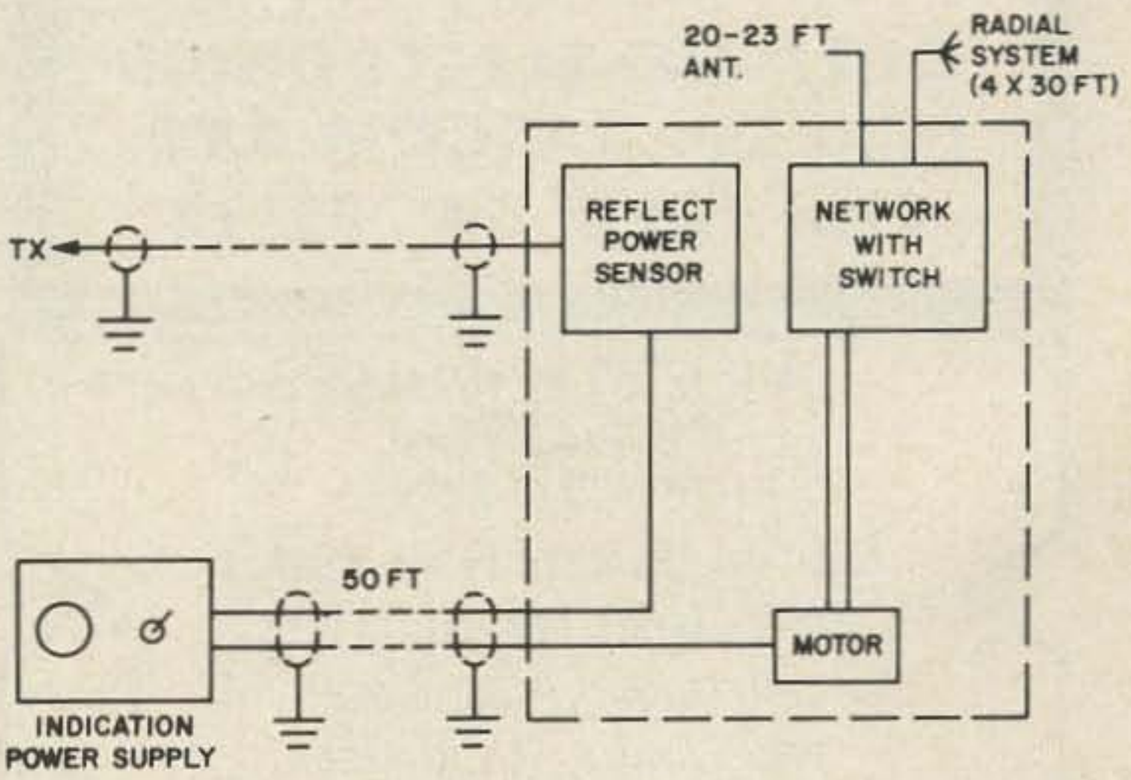


Fig. 1. Basic components of the dual-band remote antenna coupler system.

Coupler Unit

The coupler unit circuit is shown in Fig. 2. The unit was designed for use with about a 20 foot rod antenna on 80 and 40 meters. As was mentioned before, the basic scheme shown can be used with many coupler arrangements. However, one should be sure first that the coupler will properly tune manually with a given antenna before any attempt is made to control it remotely.

As shown in Fig. 2, the transmission line is link coupled to the loading coil. On 80 meters the variable capacitor is used to

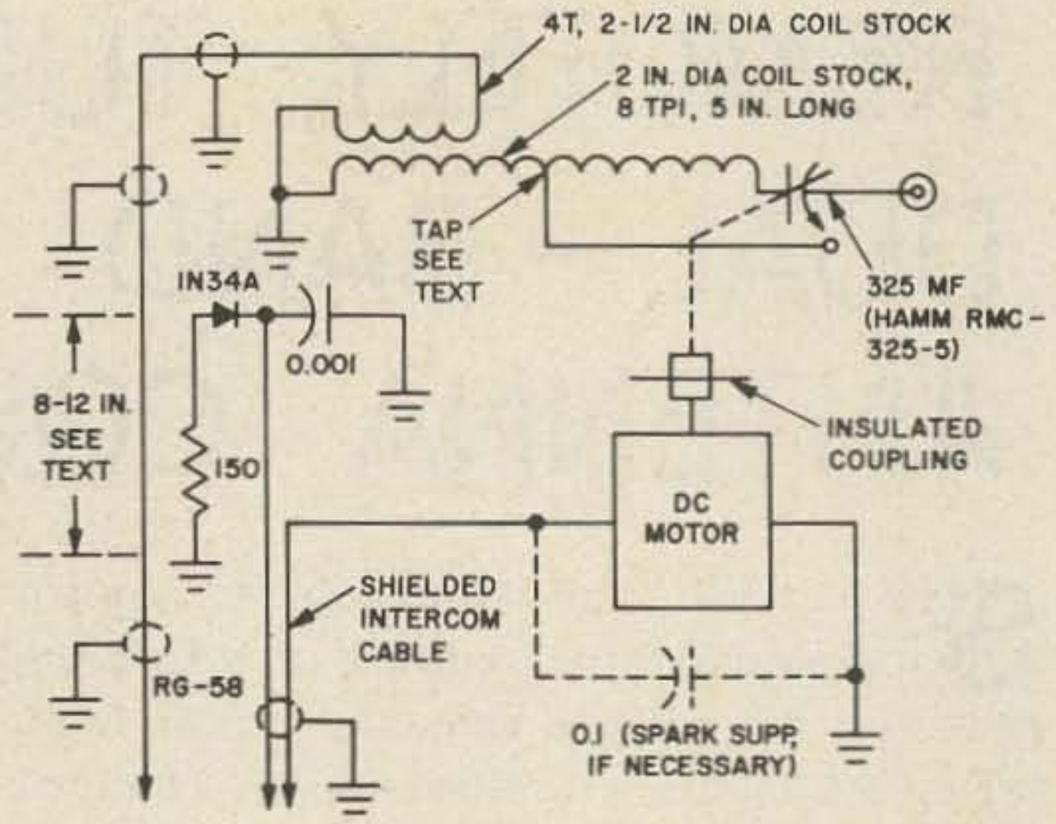


Fig. 2. Diagram of the remote antenna coupler.

allow tuning of the series resonant antenna/loading coil circuit across the band. For operation on 40 meters, the variable capacitor is placed on minimum capacitance. In this position, the rotor plate mates with a contact placed on the capacitor frame, and part of the loading coil is shorted out. The slower change in reactance across the 40 meter band allows operation over most of the band without the need for additional tuning. The dc motor is coupled to the capacitor by means of an insulated coupling.

The reflected power sensor is formed as part of the transmission line. The pickup

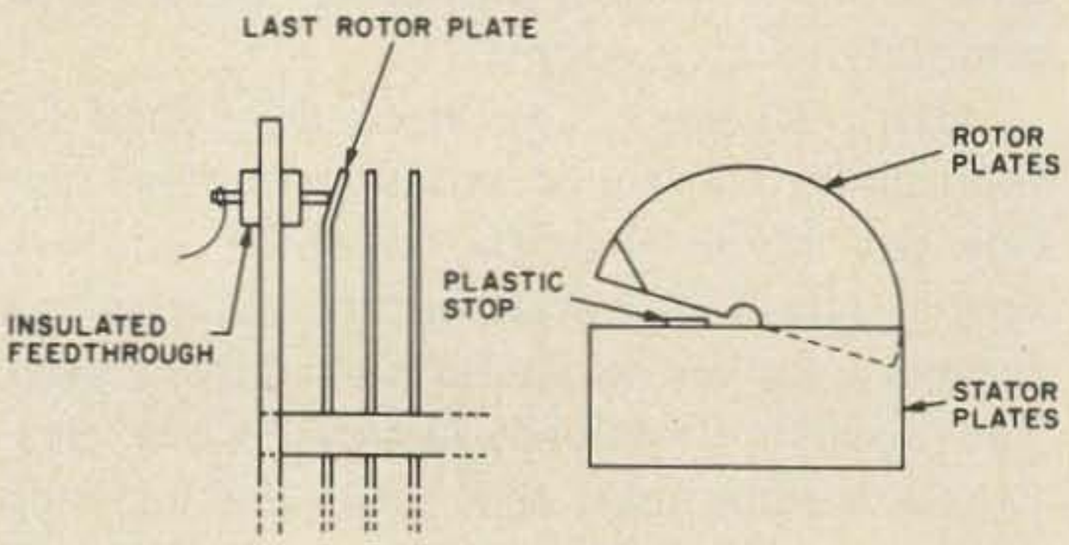
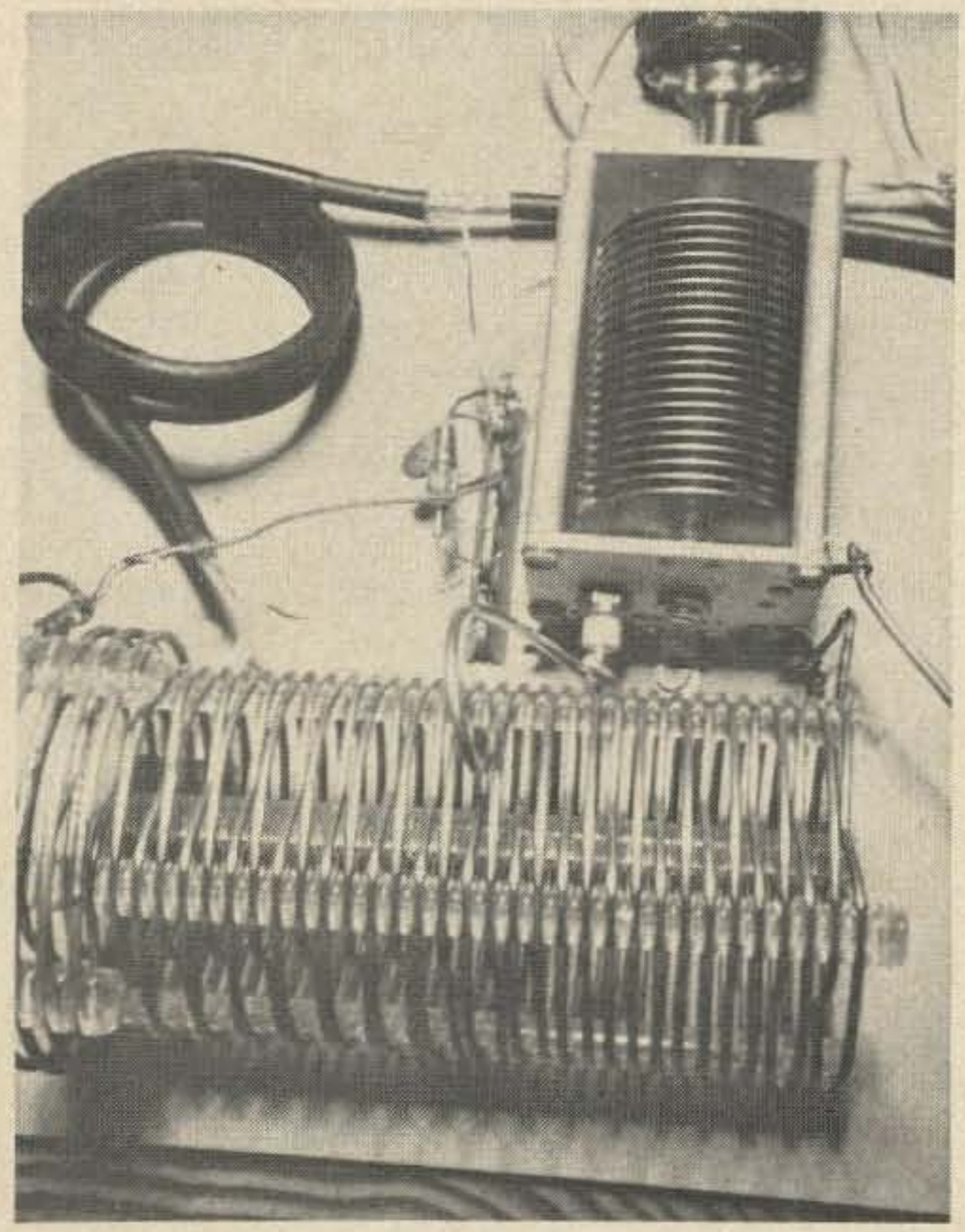


Fig. 3. Details of capacitor switch top view (A) and back view (B). Feedthrough is placed in capacitor back frame such that rotor plate makes contact with plates almost fully disengaged from stator plates.

link is made somewhat longer than usual in order to develop a reasonable current over the control cable back to the indicator unit in the shack. The unit is not designed to read the actual SWR, although this can be done if one calibrates the system initially with dummy load resistor simulating different SWRs. Assuming that the SWR was checked initially using a calibrated SWR meter, the

reflected power indicator is only used to set the motor driven variable capacitor for minimum reflected power at any given operating frequency. If one does, however, also use an SWR in the transmission line by the transmitter, there is a possibility of having a means available to continuously monitor the condition of the entire transmission line/antenna system. For any reference setting of the forward power indicator on the SWR meter by the transmitter, the same reference reading from the reflected power sensor in the coupler unit should be obtained as long as all components remain in good condition.



Remote Coupler Construction

The main coil is shown in the foreground with the link on the left. The feedthrough used for COR switching can partially be seen on the backframe of the variable capacitor. The coiled coax on the left forms the reflected power sensing unit with the components mounted on the terminal strip.

Coupler Unit Constructor

The photograph shows the general layout used for placement of the components on an approximate 8" square of wood which was placed in a slightly larger wooden enclosure. There is nothing critical about the construction as long as one keeps the variable capacitor insulated. A small metal enclosure

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06	.50	50	.30	123	1.25	176	1.00
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08	.30	53	.30	126	.75	180	1.25
09	.30	54	.30	132	4.25	181	6.25
10	.30	60	.30	141	4.50	182	1.25
11	.30	70	.40	145	1.75	184	3.25
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could be used just as well by placing the capacitor or standoff insulators. The motor shaft is connected to the capacitor by an insulated coupling which fortunately mated the 1/4" capacitor shaft and the approximate 1/8" motor shaft. Actually, a small piece of dowel with appropriate size holes drilled in each end and the use of epoxy cement will work just as well. The motor used was a "junk box" item which works on 12V dc and with internal gearing, and the friction provided by the capacitor results in a very slow tuning rate. Surplus and hobbyist outlets are sources for suitable motors.

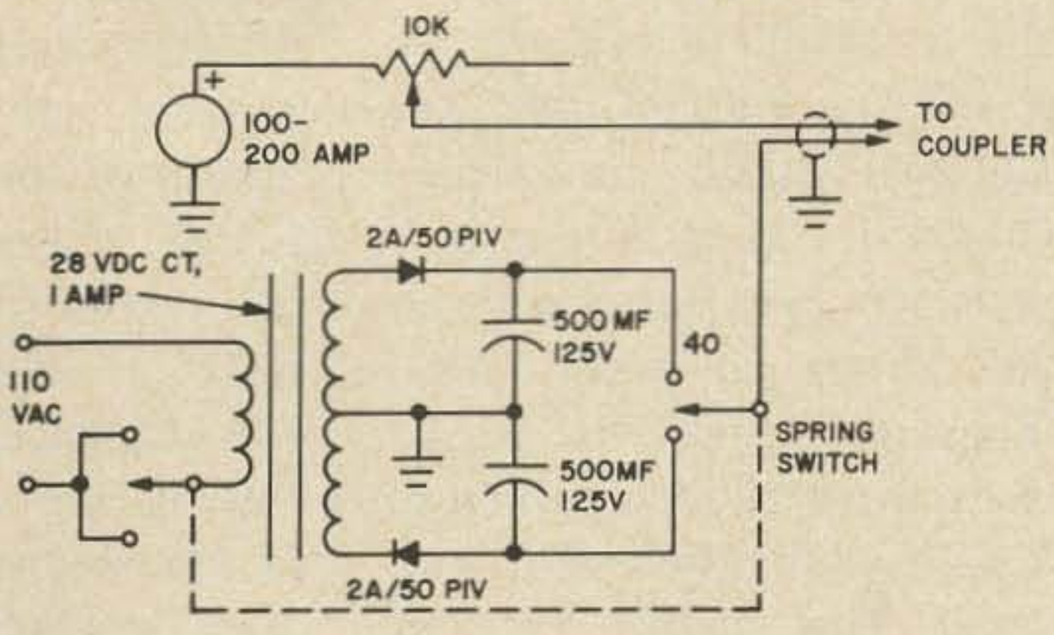

Fig. 4. Diagram of indicator/power supply unit. Batteries may also be used to power most small dc motors.

Almost any intermittent duty 12–24V dc type that has been geared down to 50 rpm or less will work.

The rotor plate on the capacitor nearest the back frame of the capacitor is bent slightly, as shown in Fig. 3, to form a sliding switch contact with one end of a chassis feed-through insulator mounted on the capacitor back-frame. A miniature chassis type feed-through such as USECO no. 1432 is used. Any small piece of plastic may be used as a stop to prevent further rotation of the rotor plates once the switch is engaged by placing it across the stator plates on the same side as the switch (see Fig. 3). Epoxy cement should be used to secure the top.

The reflected power sensor is constructed by carefully slitting the jacket away for about 8–12" at the end of the coaxial cable to be connected to the link. A length of #20 enamelled wire is then manipulated under the shield, the ends being connected as shown in Fig. 2. The jacket is then replaced

and the length of cable coiled together, if necessary, for compactness to fit the enclosure. The few components for the sensor are assembled on a terminal strip.

Indicator Unit

The indicator units contain only a microammeter and potentiometer as a reflected power indicator and a dual polarity source for the tuning motor. Batteries may be used for the latter function, although a small ac supply is shown in Fig. 4. Some overvoltage from the supply must be available in order to account for the drop in the control cable.

Adjustment and Operation

As was mentioned before, one should be sure first that a coupler operates properly manually before an attempt is made to remotely control the unit. In the case of the unit described, the numbers of turns in the

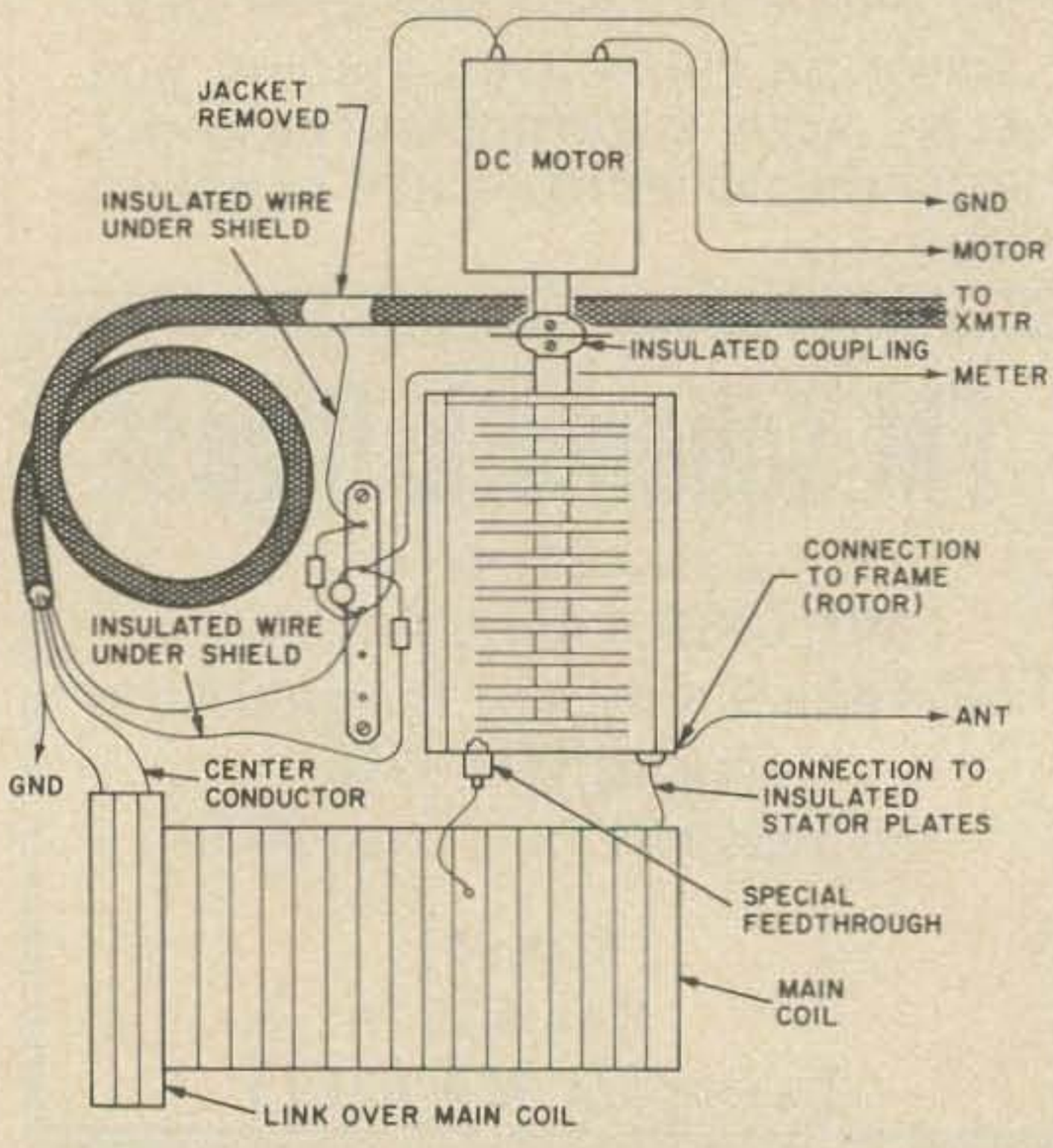

Fig. 5. Sketch of parts layout for dual band coupler.

main coil was established by trimming the coil on 80 meters and checking the frequency range of operation possible and the variable capacitor. On 40 meters, the capacitor switch was engaged and the coil top on the main coil established. These tests were done with a conventional SWR connected in the transmission line immediately before the coupler which was mounted in its operating position. Simultaneously, operation of the reflected power sensor was checked to see that minimum output from it corresponded to minimum reflected power indication on the conventional SWR meter. Operation of the motor should be checked with a length of cable equal to that actually used for the control cable. This is necessary to insure that the voltage drop in the cable is not enough to affect motor torque.

Operation of the unit is not complicated, but it does require a little practice since its simple design does not provide for automatic motor cutoff or signalling of motor position. By observing the speed of motor rotation, one can learn to anticipate when a complete revolution has been made. One position of the control switch on the indicator unit should be marked "40" (or something similar) to indicate one extreme position of the capacitor. Then if one loses an idea of the capacitor position, one can always return to this reference point. Alternatively, if one doesn't require the idea of the capacitor switch for bandswitching purposes, it can be used to activate a pilot lamp over the control line. This might in some cases prevent holding the motor against its stop for a prolonged period and drawing excessive current which could possibly damage the motor. A motor with an internal clutch arrangement can, of course, also be used to prevent this possibility.

In general, there is no great problem when tuning an antenna with a transmitter since the reflected power indication at resonance is clear. This is not the case if one uses an antenna only for receiving. Under fading conditions, it is often very difficult to determine proper resonance of a remote tuner by observing a received signal level.

Summary

The coupler shown was used with low power equipment – up to about 100/150 watts. For higher power levels, an increase in the coil wire size, the insulation path between the motor and capacitor shafts and the spacing of the capacitor plates will probably be necessary. The latter, meaning a larger capacitor, will probably also require a heavier motor. Nonetheless, the basic construction can be modified as necessary for any power level.

. . .W2EEY

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P.O. Box 1086
Felton CA 95018

A PRACTICAL GROUND SYSTEM FOR 160

Ground systems for 160 may be anything from a simple cold water pipe "connection" to an elaborate system of buried copper radials, second in performance only to a salt water marsh. For obvious reasons, such an ideal ground is impractical for most of us, so this poses the question of how good can a "make do" ground system really be? This problem came up while experimenting with a vertical antenna for 160, which is a quarter wave radiator normally working against ground.

First we needed something with which to compare our ground system. Since we had no "ideal" ground system available, it was decided to compare the antenna current when working against ground to the current obtained when working the antenna against a single wire counterpoise. The radiation pattern was of no concern – only the antenna current was measured at the same point in the antenna for both conditions.

First the antenna was grid dipped, using a cold water pipe ground. The resonant frequency was noted and a single horizontal wire was adjusted in length until the antenna resonated at the same frequency as with the ground connection; in the writer's case, 1990 kHz.

The transmitter was next loaded into the antenna first using the counterpoise and then using the cold water pipe with the following results:

	ANT. I
COUNTERPOISE	1.3A
WATER PIPE GROUND	0.5A

Care was taken to keep the final plate load the same for both conditions. From the above it is obvious that our ground is wasting a lot of rf.

A multiple ground system was tried next. This consisted of three 8 foot ground rods spaced approximately ten feet apart and two cold water pipe connections also spaced ten feet apart. The results were as follows:

GROUND SYSTEM	ANT. I
1 water pipe	0.5A
2 water pipes	0.7A
each ground rod	0.6A
2 ground rods	0.85A
3 ground rods	0.95A
combining grounds	1.15A

This compares very favorably with the antenna curent obtained with the counterpoise and it can be assumed that the ground system is just about as good as the counterpoise wire as far as losses are concerned.

The soil at this location is largely decomposed granite – not particularly low resistance without benefit of rock salt or copper sulphate treatment. After the above experiment, we decided against treating the soil and, much to our surprise, the antenna current varied only about 10% from wet to dry seasons. The two ground lead configurations used are shown in Fig. 1. As a matter of passing interest, configuration (a) resonated the antenna 75 kHz lower in frequency than configuration (b). Configuration (b) was finally decided upon at this station, since it was assumed that less "antenna effect" was present becuase of the higher resonant frequency.

. . .W6FPO

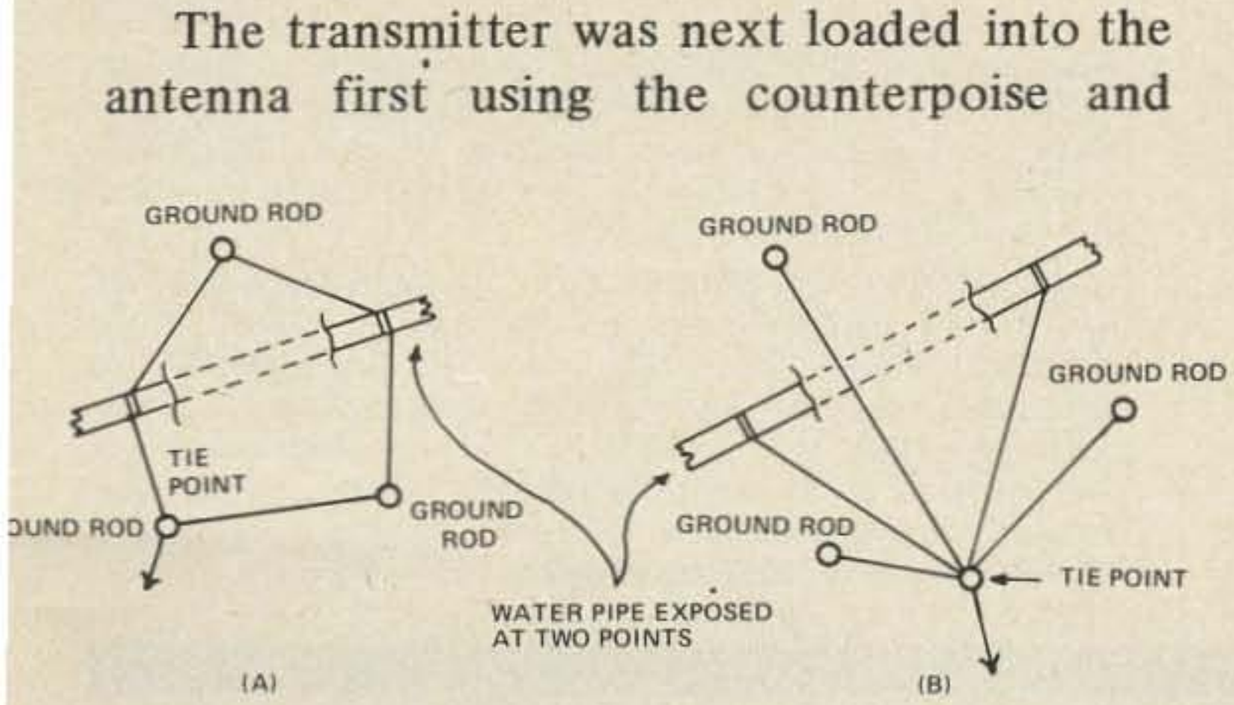

Fig. 1. Ground lead configurations. With a given antenna, (a) results in a lower frequency than (b).

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WIDE-RANGE ANTENNA TUNER

George Cousins VE1TG
R.R. 2 Box 18
Lower Sackville, N.S., Canada

Most modern ham rigs are designed with single-ended outputs for direct connection to coax-fed antennas, but there are still many cases where a good wide-range antenna tuner can be very valuable. The most obvious are:

1. To couple the transmitter to any one of the wide variety of antennas which require high impedance feedlines, such as V-beams, rhombics, Lazy H's, Zepps, folded dipoles, etc. This is especially important when the QTH will not allow the erection of several antennas, and the use of a wire antenna and tuner will permit multiband operation.

2. In moderate to severe cases of TVI, where the high harmonic attenuation of the tuner will be of considerable assistance.

3. To permit optimum coupling between the antenna feedline and the *receiver*, an advantage which seems to get little attention.

The tuner can be built in a variety of ways, using circuits which have proved to be reliable over the years. However, to be as useful as possible, the tuner should be capable of either series or parallel tuning, and should be continuously useful over the entire 3–30 MHz range. All controls should be operated from the front panel, and no bandswitching, coil changing, or coil tapping should be required. The tuner to be described satisfies these requirements, and is also a neat, good-looking addition to any station. This particular model was built by Bill Shearman, VE1AX, for use of both amateur and commercial marine frequencies.

The general circuit arrangement is known as a "Z-match" and has been well

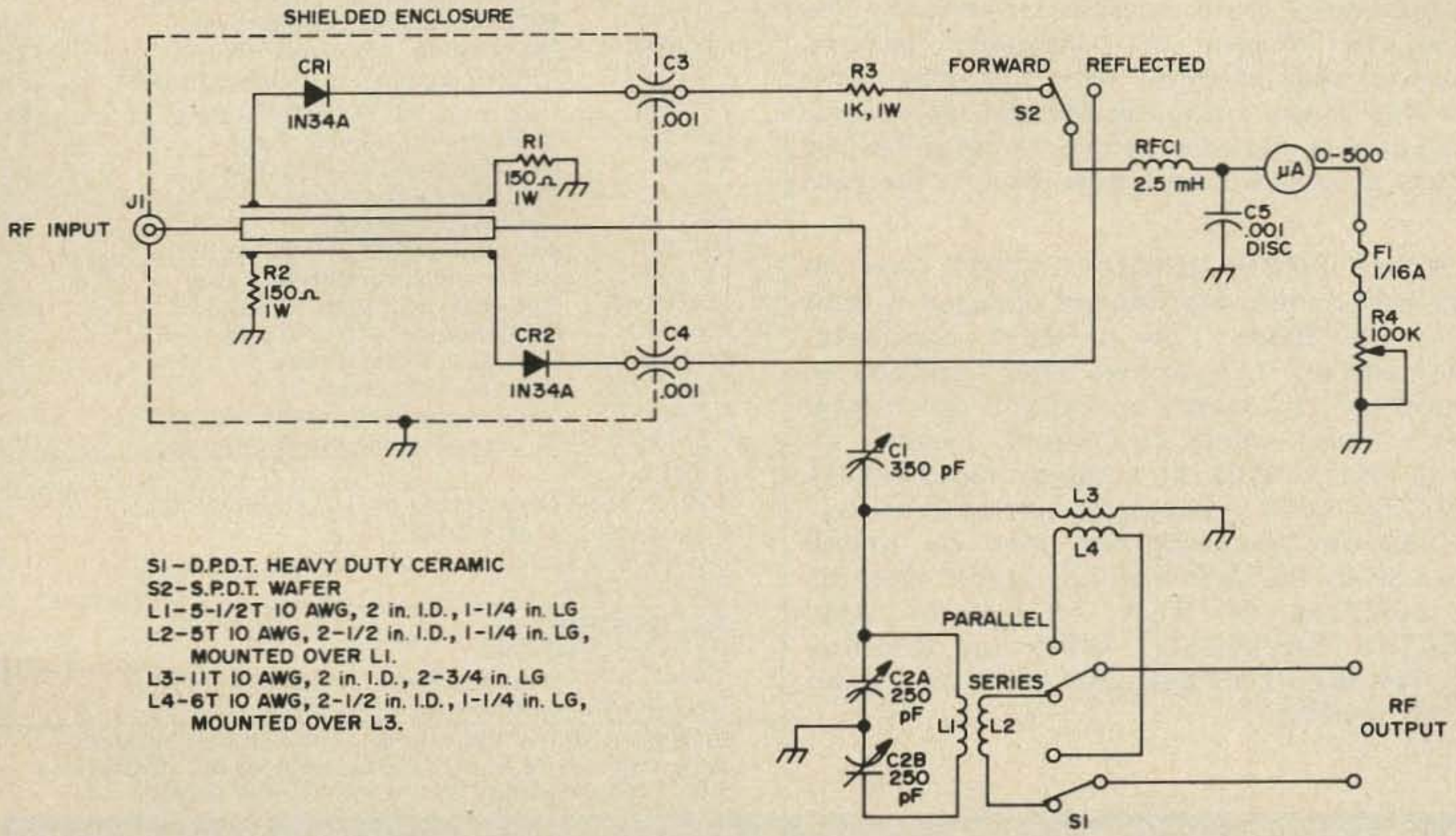

Fig. 1. Overall schematic of the tuner.

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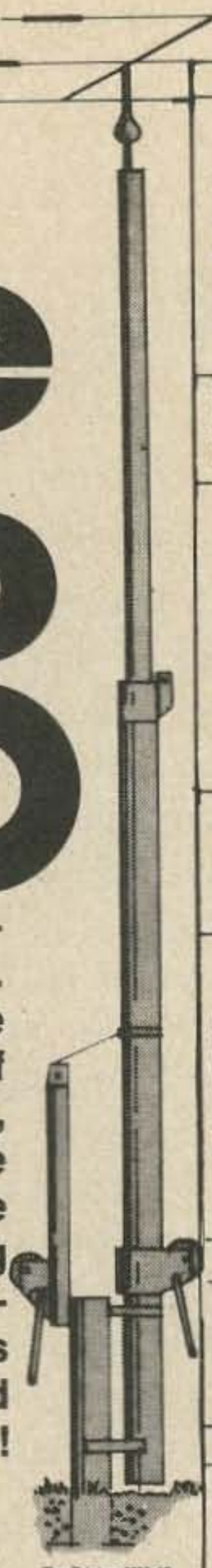

The Tristao MM-40 with accessories shown

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known for many years. Two coils are used in conjunction with a split-stator capacitor to cover two frequency ranges at the same time. This allows a smooth transition from series to parallel tuning and no bandswitch is required. An SWR bridge is incorporated, and is in the input line at all times, making tuneup a simple matter.

The tuner is built on a 10 x 17 x 3 in. chassis, with an 8½ x 19 in. front panel. Depending upon the power range of the station transmitter, smaller components could be used and thus reduce the size of the chassis. However, the unit shown will safely handle more than the legal limit on all bands and modes.

A close study of the photos and schematics will reveal most of the construction features. The input coaxial line is first routed through the small shielded enclosure used for the rf components of the SWR bridge. This will be described later. From this enclosure, the line is connected to the variable coupling capacitor C1, which must be insulated from the chassis and panel. A small vernier dial drives this capacitor through an insulated coupling and provides smooth control. (To aid in setting the tuner to the proper tuning point during rapid band changing, calibrated vernier dials are used on both capacitors along with a tuning chart on the front panel.)

The main tuning capacitor, C2A and C2B, is mounted parallel to C1, but *not* insulated from the chassis. A heavy-duty, two-pole, two-position ceramic switch (S1) is mounted on the front panel directly under the two large feedthrough insulators. The two coils are mounted at right angles to each other between C2 and S1 and are supported by their own leads. Commercial air-wound coil stock was used in this model, which made this method of mounting quite feasible. However, homebrew coils should be wound on ceramic forms and firmly mounted.

The SWR bridge is built in two sections, one containing the rf pickup, diodes, and matching resistors, and enclosed in the metal shell at the rear of the chassis, underneath. A small piece of terminal board holds the components associated with the meter, and the meter itself is mounted on the front panel, flanked by the sensitivity control R4 and the FORWARD-REFLECTED switch (S2).

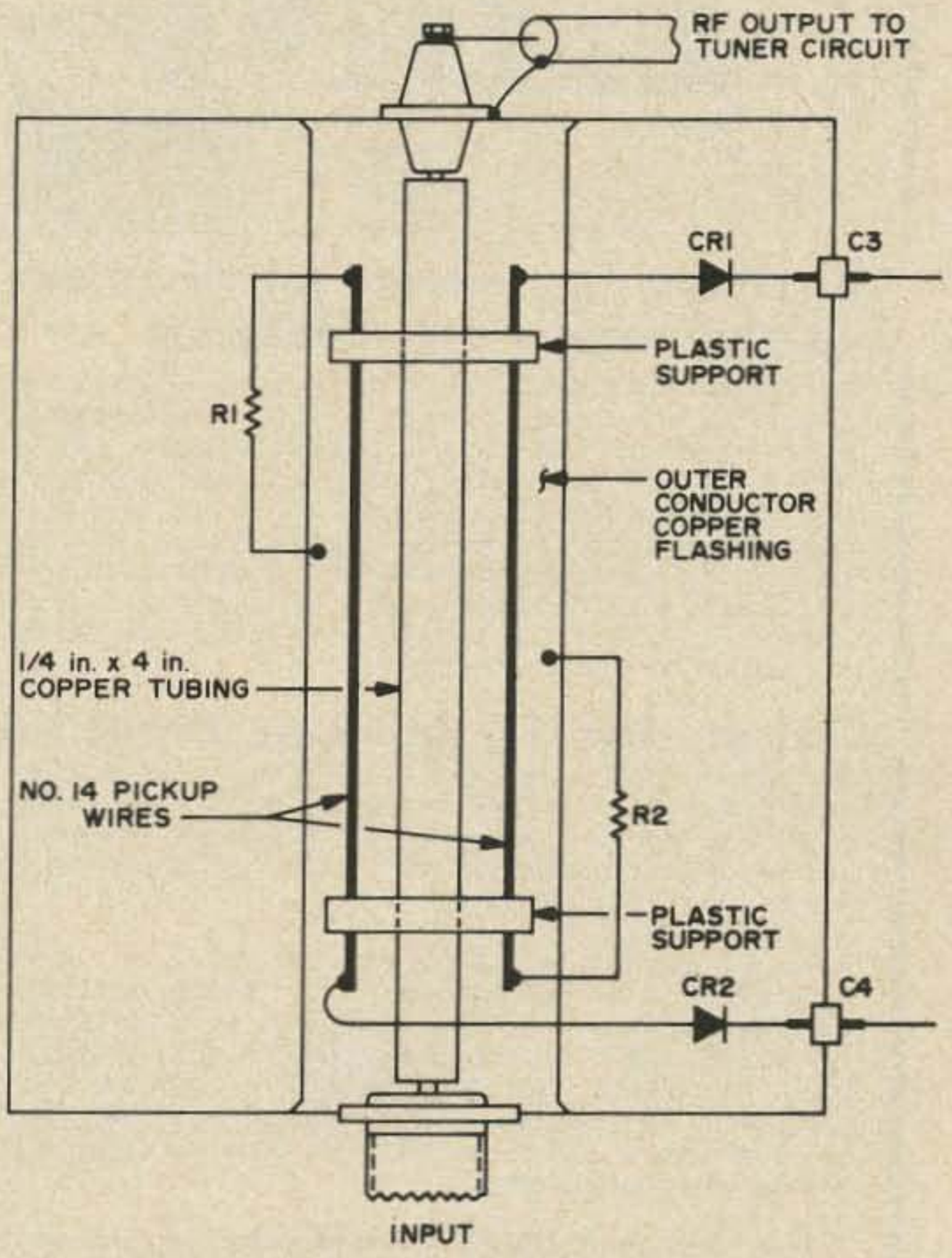

Fig. 2. Construction of the SWR bridge. See text for details.

The construction of the rf section of the bridge can be seen from Fig. 2. The inner line conductor is a 4 in. length of ¼ in. copper tubing. The outer line conductor is a flat piece of copper flashing mounted under the tubing and secured to small mounting bolts at each end of the enclosure. Small square pieces of Plexiglas are used to separate the two conductors, with the tubing being inserted in holes drilled in the center of the squares. Small holes are drilled in the outer edges of the squares to hold the two pieces of 14-gage copper wire used for coupling the rf to the diodes. A matching resistor is connected to one end of each pickup wire, and a diode is connected to the opposite end. The resistors are connected to the outer copper conductor, but the diodes are connected to the two small feedthrough capacitors mounted on the wall of the enclosure. Small shielded wires run from these capacitors to the terminal board, then via

S2 and the rf filter (RFC1 and C5) to the meter.

Operation of the unit is similar to most tuners: a matter of getting the unit set up

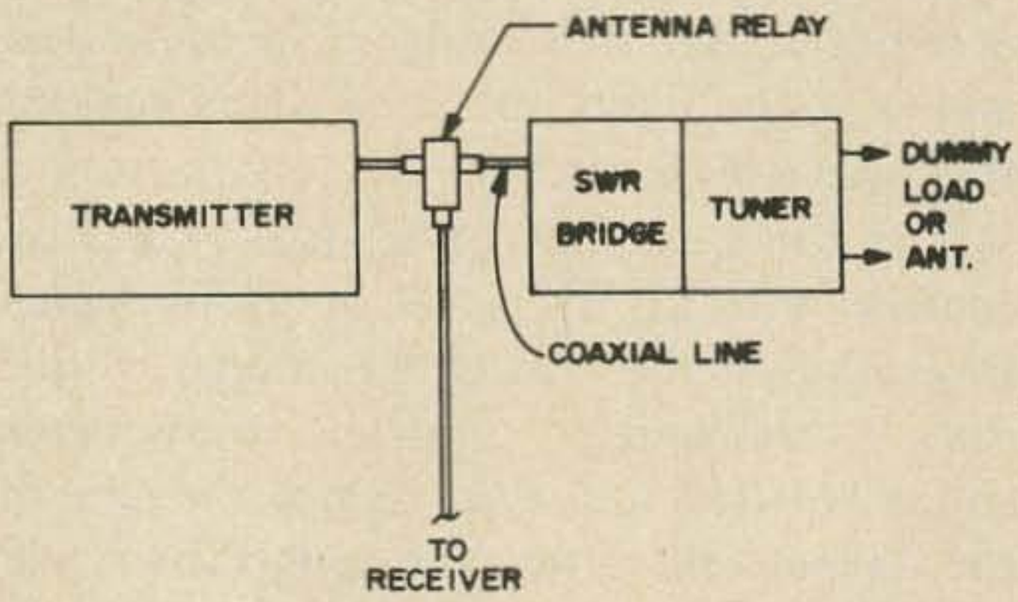

Fig. 3. Proper setup for using the tuner. The coax line to the transmitter may be any reasonable length, and a separate SWR bridge may be used if available.

on each band, and then marking the capacitor dial settings on the panel chart for easy reference. Fig. 3, shows the setup required. With low power fed into the tuner, adjust R4 for full-scale deflection on the meter with S2 in the FORWARD position. Switch S2 to REFLECTED and adjust C1 and C2 to obtain minimum reading on the meter. There is considerable interaction between the capacitors, so make sure they are both set properly and that the SWR is as low as possible. There is also a considerable reaction on the transmitter's plate tuning, so check this often and make sure it is in resonance at all times.

This can be a slow proceeding the first time, so only a small amount of power should be fed into the tuner, and a dummy load should be connected to the output until the settings have been determined. Then a short final adjustment with the antenna connected will suffice. Because there are no bandswitches or coil taps, the setup is very easy to follow and should result in an SWR of 1:1 or very close to it.

The unit was originally built to tune a V-beam feeder, but has also been used on several center-fed 80m dipoles to convert them into all-band antennas, using 300Ω TV ladder-line as the feeder. For the amateur with a space problem, this tuner could be the answer.

. . .VE1TG■

John J. Schultz W2EEY
c/o RLC INC.
30 East 42nd Street
New York NY 10017

OLD ANTENNAS AND NEW BALUNS

Antenna types rejuvenated by the use of toroid baluns.

Anyone who has been in amateur radio for ten to twenty years will remember the days of elaborate "wire" antennas. Newcomers can also glance in some of the old antenna manuals and find them replete with "wire" antenna designs. Wire antennas as the name indicates, are simply more elaborate antenna forms than a simple dipole which provide some gain and directivity and which were usually constructed from wire hung between the necessary supports. The advantages to such antennas was primarily cost, since relatively high gains could be achieved for the cost of additional antenna wire. All sorts of collinear arrays, broadside arrays, curtains, etc., were developed and used successfully. The problems associated with such antennas were many and one of the primary ones was the often awkward feed point impedances of the antenna and the requirement for a balanced feed. Open wire lines had to be used to feed the antennas at impedances ranging from 150–600Ω and then the balanced open wire line converted via an antenna tuner to an unbalanced coaxial feed. For these and other reasons, eleaborate wire antennas have fallen into disuse. Nonetheless, for the amateur who has the necessary space and is primarily interested in working single-band DX, these antennas can provide very good service at minimal cost. Fortunately, the advent of the toroid balun transformers with variable impedance ratios has also eliminated the feed problem once associated with these antennas. The purpose of this article is not to re-present every type of wire antenna array developed. A few examples are given and the use of a toroid balun illustrated. One can, however, glance back in some of the older antenna manuals and magazines and find any number of elaborate wire arrays to which the same feed techniques illustrated here can be applied.

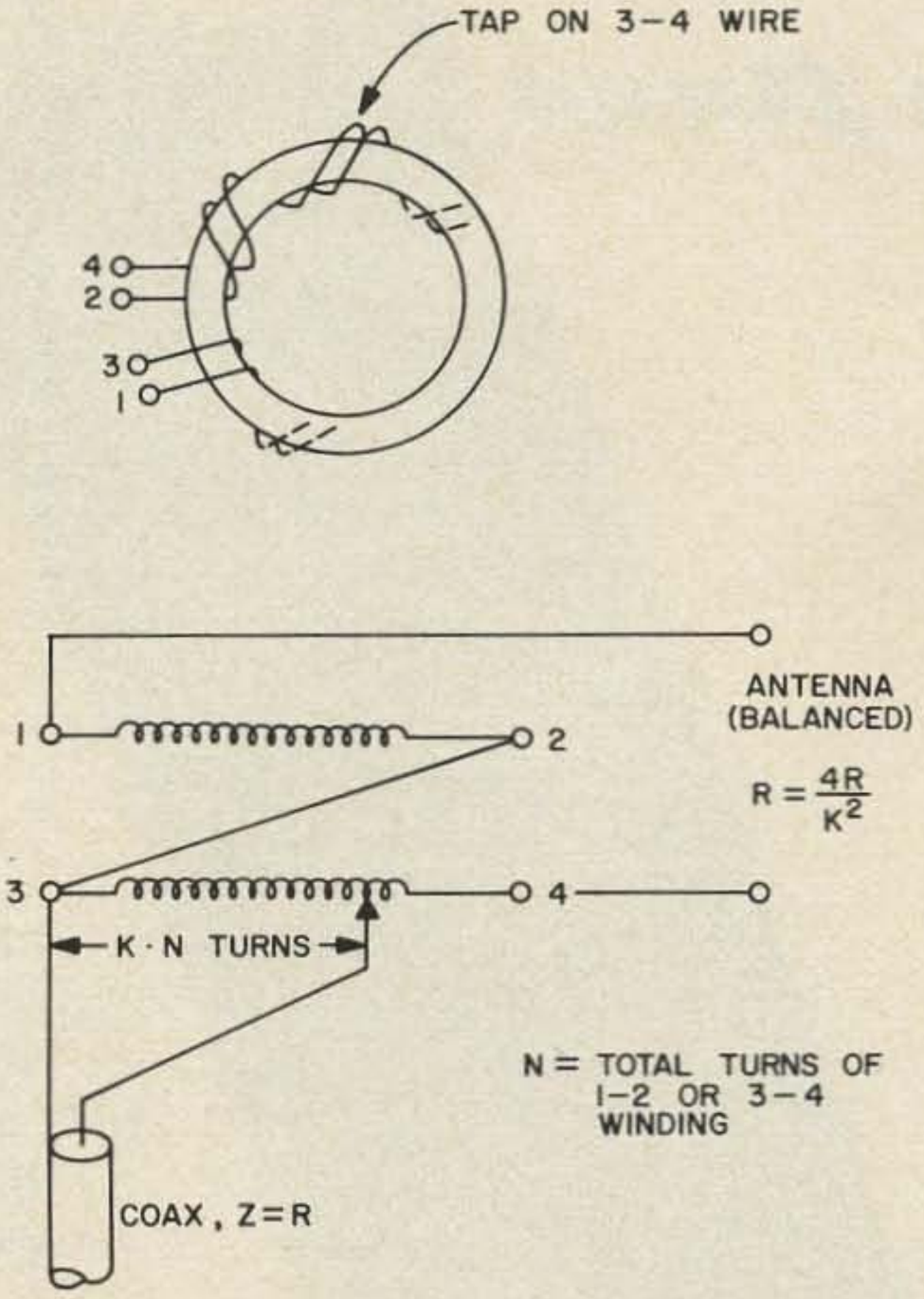

Fig. 1. Variable impedance transformation balun 1:4 to 1:10 or more.

Variable Impedance Toroid Balun

A toroid balun is usually thought of being a 1:1 or 1:4 ratio type unit. That is, going from 50Ω unbalanced to 50Ω balanced or from 75Ω unbalanced to 300Ω balanced. But any toroid balun kit can also be used as a variable impedance balun with transfor-

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mation ratios greater than 1:4 possible up to about 1:10. Fig. 1, shows a typical toroid balun winding. The instructions contained in any balun kit can be used to place the initial windings on the toroid core for a 1:4 balun. Note that if the coil tap on the 3–4 winding is placed at point 4, one has a normal 1:4 balun. If, however, this tap is moved closer to the 3 terminals, the transformation ratio of the balun increases according to the formula shown. For instance, if the tap were placed at the quarter way winding point between 3 and 4, that is one quarter of the turns from 3 to 4 away from 4, the transformation ratio would be approximately 1:10. A 50Ω unbalanced input would be transformed to a 500Ω balanced output. In a similar manner, the other tap points can be figured out for any impedance transformation ratio.

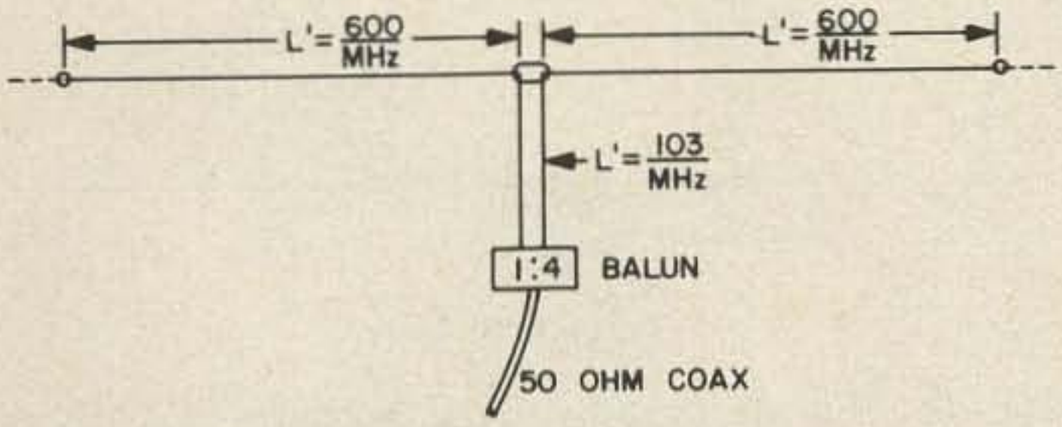


Fig. 2. Extended Double Zepp with balun feed.

Double-Zepp Antenna

The Double-Zepp antennas is a form of extended dipole as shown in Fig. 2, where the dipole elements are made as long as they can be while still having the radiation pattern of the antenna not split up and remain at right angles to the line of the antenna (in

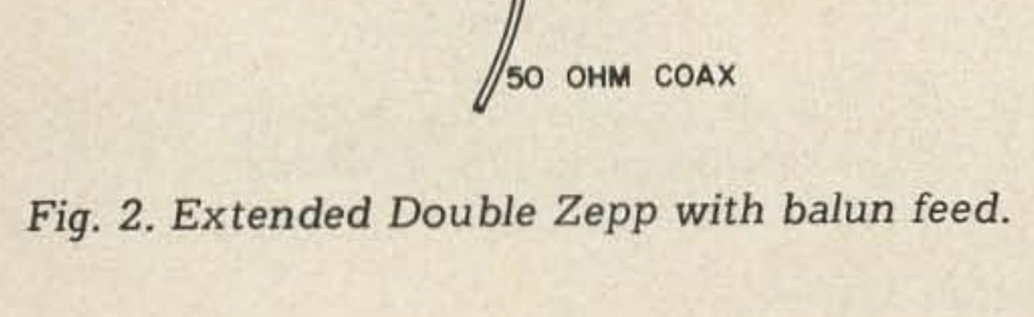


Fig. 3. Classic collinear array balun feed. See text for extending antenna to increase gain.

and out of the page). The gain achieved is an easy 3 dB. A small phasing section is still required at the center of the antenna, as shown, before the connection of a 1:4 balun.

3/4λ Dipole

The 3/4λ dipole of Fig. 3, also has its main radiation at right angles to the line of the wire and produces 3–4 dB gain. This form of antenna may be somewhat easier to construct than the Double-Zepp since the balun (a 1:6 unit in this case) may be connected directly at the center of the antenna. The phase reversal stubs between the ½λ elements can be made of simple 300Ω twinlead shorted at the far end. The antenna can be extended with another ½λ

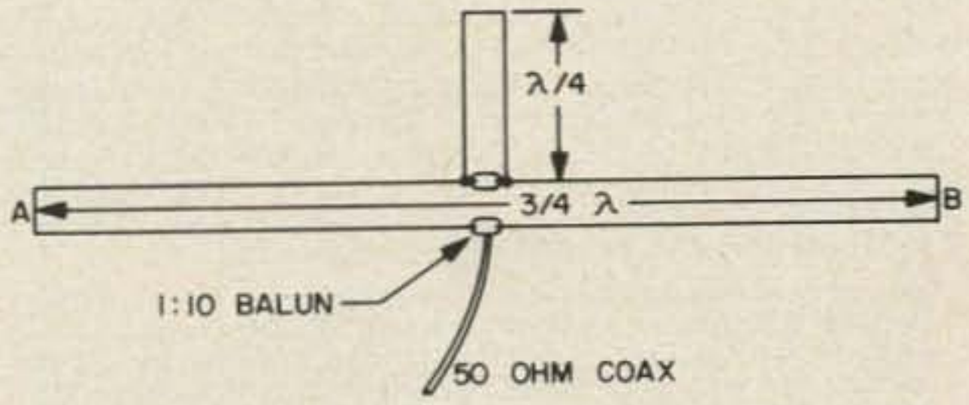


Fig. 4. 3/4λ folded dipole may be operated on two bands if desired by using stub switch.

element on each end (and a ¼λ stub to connect to the adjacent ½λ element) to raise the gain another dB or more. In this case, a 1:10 balun has to be used to feed the antenna.

Dual Band 3/4λ Dipole

The 3/4λ dipole shown in Fig. 4, can be used either as a single band or dual band antenna. Its total length is 3/4λ long at the lowest frequency band used. If used as a single band antenna, the shorted ¼λ stub shown is not required. If it is to be used as a dual band antenna, the stub is made ¼λ long

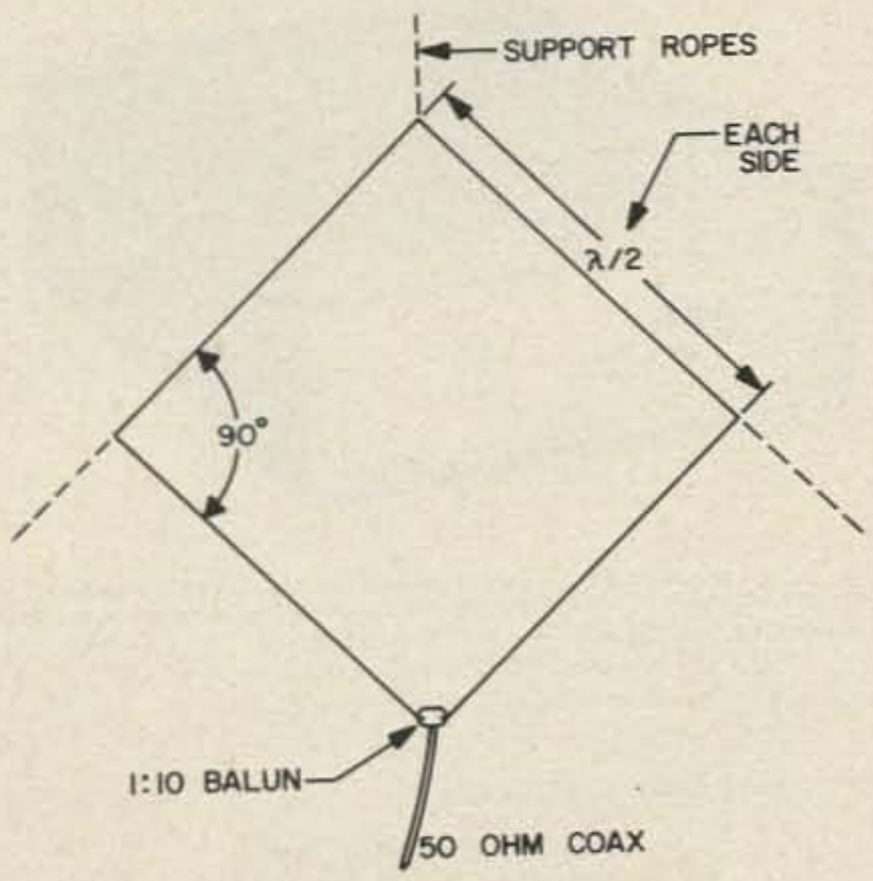


Fig. 5. Super loop or bi-square requires only single support and produces easy 4 dB gain.

at the lowest frequency band. On the next higher harmonically related band, the stub will act as a short circuit, since it becomes ½λ long, and allow the antenna flat-top to properly resonate. Whether used as a single band or dual band antenna, it can be fed via a 1:10 balun.

Super Loop

The large loop antenna shown in Fig. 5, can be mounted from a tower or other support. Its radiation is horizontally polarized and broadside to the plane of the array (in and out of the page). The gain is about 4 dB in both directions. It can be fed directly from a coaxial line via a 1:10 balun at the base as shown.

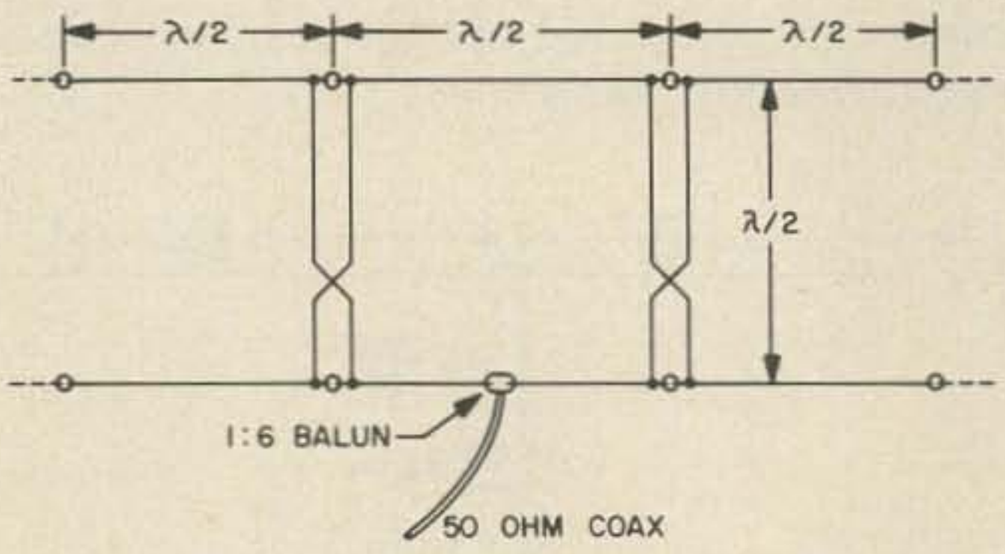


Fig. 6. The six-shooter array provides 7.5 dB of gain. Lower elements should be ¼λ high.

Super Loop

The array of Fig. 6, is just one small example of a curtain array including such types as Sterba, Bruce Arrays, etc. The gain that such arrays can provide become quite significant if one has the space to extend them one to two wavelengths. In this case, the array will provide a broadside gain of 7.5 dB in both directions. The antenna can be fed at the point shown via a 1:6 balun. The phasing line between the upper and lower set of elements can either be open wire line or 300Ω twinlead with a single twist.

Summary

Many other antenna forms which present a resistive impedance on a single band but of an awkward value can be fed via a properly constructed balun. Other antenna types which suggest themselves are V beams, rhombics, half rhombics and single tilted wire antennas.

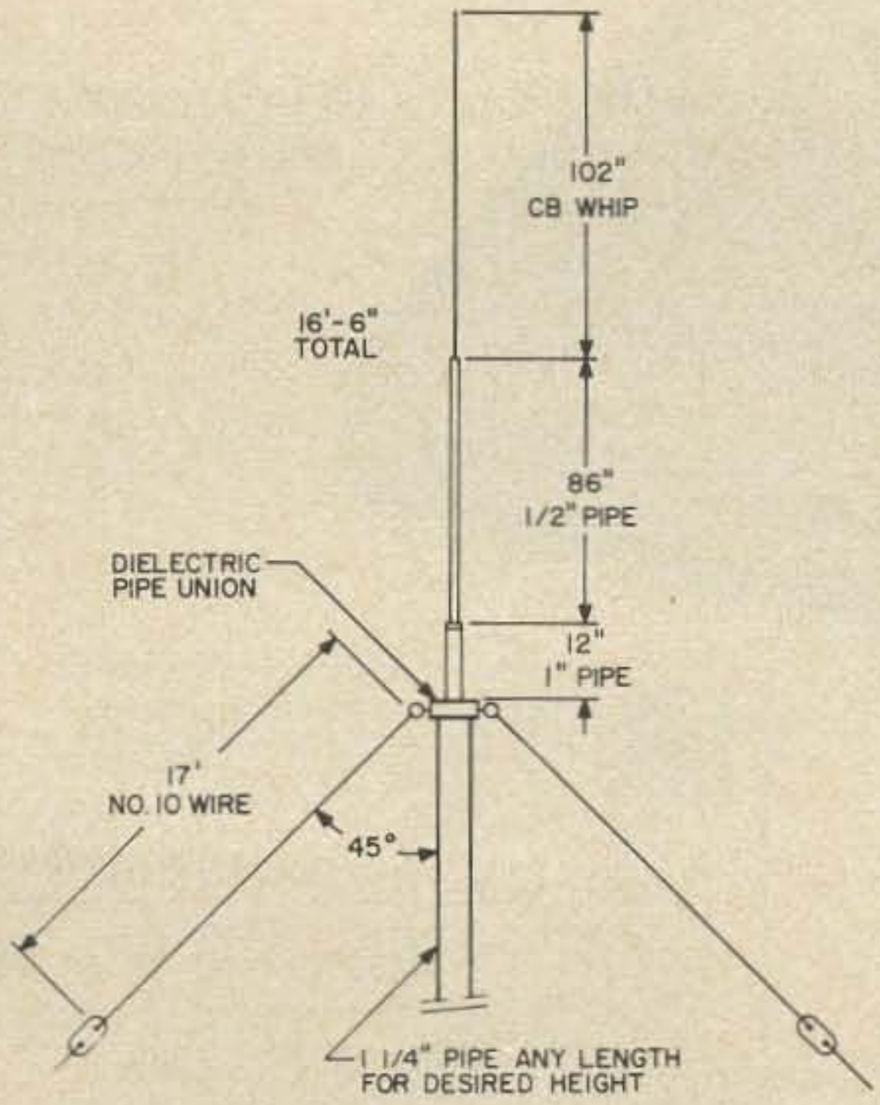
. . .W2EEY

Thomas Niedermier WA8IYL
Box 163
New Washington OH 44854

A MULTIBAND GROUND PLANE

The last time strong winds turned my homemade beam and removed the teeth from the rotor gears, I decided it *was* the last time. My financial situation would not permit procuring a good rotor, so an inexpensive homemade multiband ground plane seemed like the answer. Having had good luck with a water pipe as an antenna element and a dielectric pipe union as an insulator, I tried my luck at a plumber's ground plane.

The antenna is simple to construct, with a little plumbing ability or help. The top section is an old CB whip antenna. These are easy to come by. The whip is bolted to a one-half inch pipe cap by drilling a 3/8 inch hole in the center of the cap. This assembly is installed on an 86 inch section of one-half inch pipe. A coupler from one-half inch to one inch pipe is used to add the remaining 12 inch section of one inch pipe. The overall length of the vertical section is about 16 feet, but length is not critical.



LENGTH OF ELEMENTS NOT CRITICAL. FEED WITH 450 OHM OPEN WIRE FOR USE ON 10, 15, 20 METERS.

Prepare the dielectric union by welding four 3/16 inch eye bolts to it for attachment of the ground radials. I also added small eyes to solder the ends of the radials. Another small eye is welded or soldered to the base of the vertical section for the other side of the 450Ω feed line.

The mast itself is 1¼ inch pipe. The higher it is the better. The plane of the radials must be at least ¼ wave length above ground to be a true ground plane. The radials serve as guy wires and should be at a 45° angle to the mast. TV mast brackets were used to hold the mast to the house. The bottom end of the mast is buried and set on a steel plate. If you add some good all-weather paint, the antenna will stand for years.

By feeding the antenna with 450Ω open wire and using a match box and a swr indicator, this antenna will do a fine iob on 15, 10 and 20 meters. My SWR is less than 1.3 to 1 on these bands and the antenna can be used on 40 meters with an SWR of only 3 to 1.

. . .WA8IYL

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With the HAL MKB-1, you can send perfect CW as easily as using a typewriter. The all solid-state MKB-1 is a complete Morse keyboard codetyper, with code speed variable from 10 — 60 WPM. Dot-to-space (weight) ratio is also variable.

The MKB-1 is full of features, like a variable volume/tone oscillator with internal speaker. Plus its own power supply. Computer-grade key switches. And it drives cathode or grid-block keyed transmitters.

An available option is the HAL KB-ID automatic identifier. Touch a button and "DE," followed by your call is automatically transmitted. And you can add two 2-letter characters of your own, e.g., "73 OM."

Assembled, the MKB-1 costs $250; with the KB-ID option, add $40. (We'll program your call into the KB-ID for you.) The MKB-1 kit is $170; with the KB-ID kit, add $29. Come to the aid of your code today — and enjoy CW like never before.

HAL Communications Corp.
Box 365, Urbana, Illinois 61801
Telephone: (217) 359-7373

☐ Enclosed is $_____(MKB-1)
$_____ (KB-ID option)
Call letters _____
☐ Charge to my Master Charge # _____
☐ Charge to my BankAmericard # _____
☐ M/C Interbank # _____
Card exp. date _____
☐ Please send me the HAL catalog.
Name _____
Address _____
City/State/Zip _____
All prices include U.S.A. shipping. Add $5 for air shipment. Ill. res. add 5% sales tax. **L**

Frederick H. Vogel WN3QBK
500 23rd Street, NW #B-401
Washington, D.C. 20037

MOD QUAD

FOR FRUSTRATED CLIFF DWELLERS

If your landlord won't believe that that tower is actually a priceless Picasso sculpture — then read on . . .

This is another answer for the ham who has a luxury apartment complete with everything except permission to erect antennas on the roof or to run wires on the building exterior. The idea was born when I saw my clandestinely mounted mobile whip hauled down from the roof of my 12-story building, and 100 feet of my RG-58/AU feedline tossed to the sidewalk with a warning from the apartment manager. It was almost enough to drive a reborn ham off the air, but not quite enough.

I already knew that most makeshift antennas inside steel - reinforced concrete buildings are pretty poor rf radiators, and they are difficult to load without a good antenna matching unit. Even a shortened helical groundplane on a veranda suffers from inductance and capacitance effects of steel reinforcing and iron railings. At least, I couldn't make it work acceptably in my apartment.

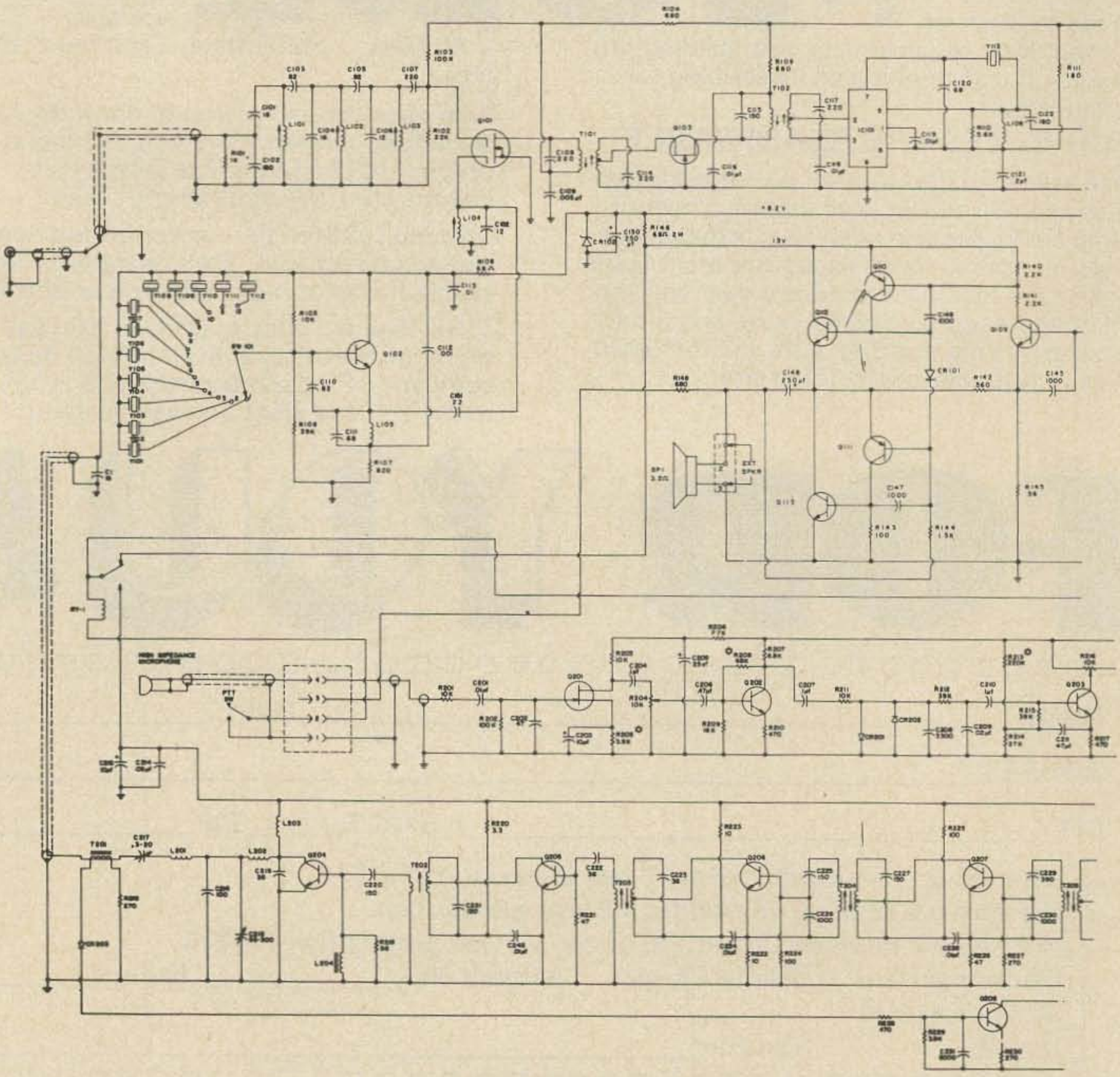
My experience with quad antennas in South America and Asia, however, had impressed me with the quad's ability to perform well near obstructions, so I decided to try some kind of modified quad on my balcony within the physical space limitations, the building regulations, and the XYL house rules.

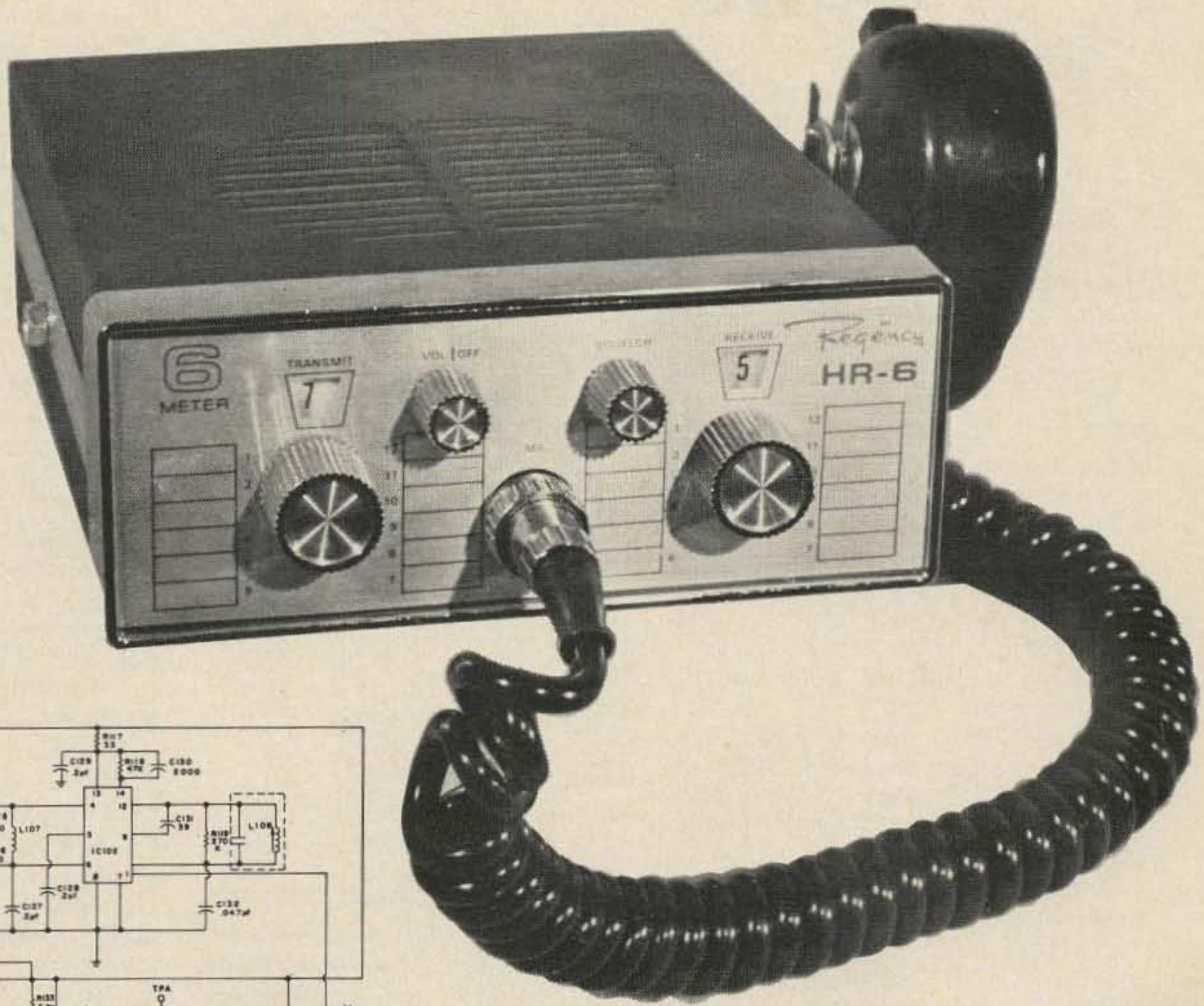
Many unsuccessful experiments and trials led me finally to the happy answer: a one-element rectangular quad using the metal porch door frame for a reflector. Its worth is attested by more than 200 CW novice contacts up to 5000 miles in distance, including 30 states and 22 foreign countries, all on the 15 meter novice band with my NCX-5 throttled back to a legal 70 watts input.

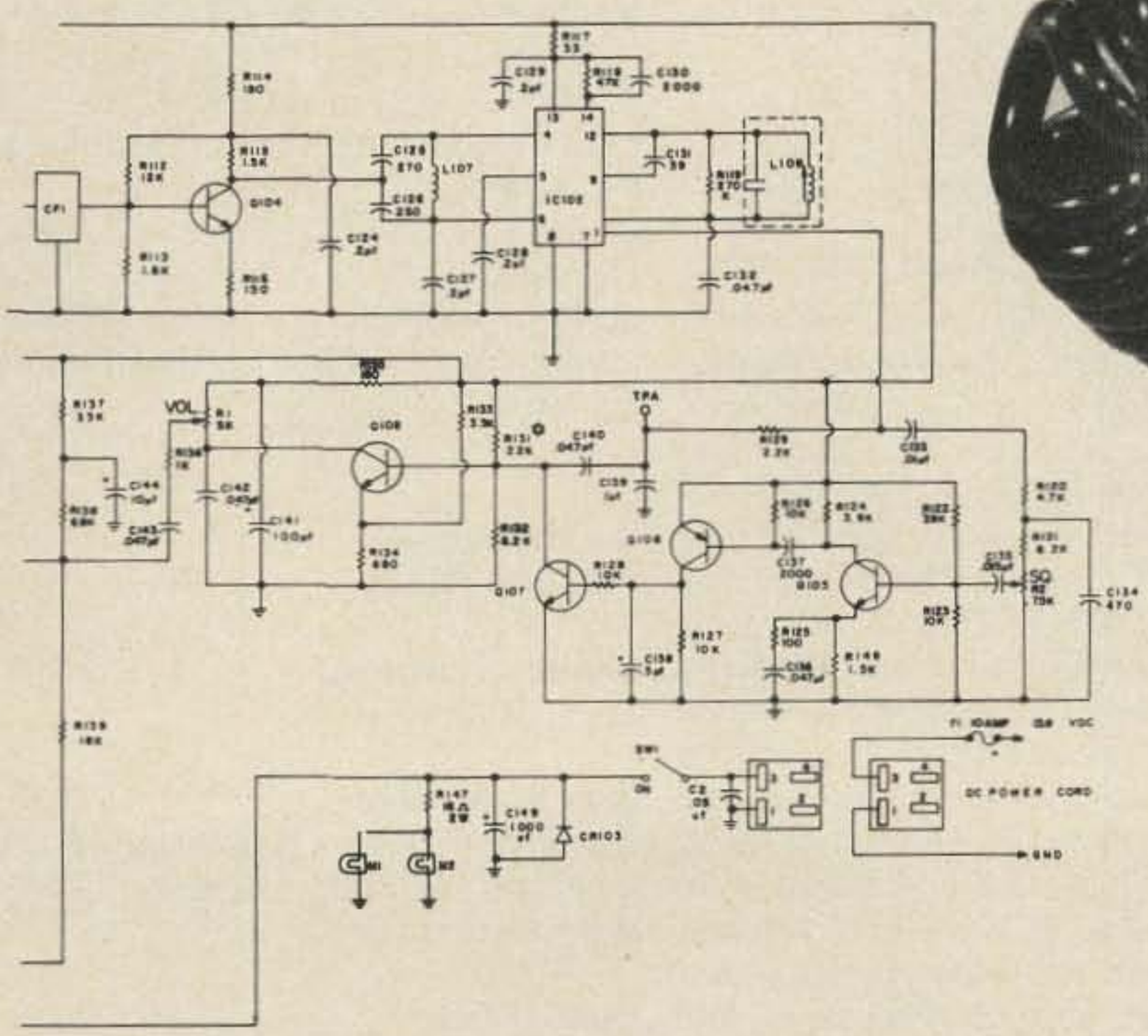
I am unable to explain the radiation pattern of my Mod Quad. While my balcony faces east and the quad loop is wholly or partially shielded in other directions, nevertheless I get good reports from almost all around the azimuth circle, as if the radiator were a half-wave vertical in the clear. Several hams have told me of similar radiation

Schematic Of The Month

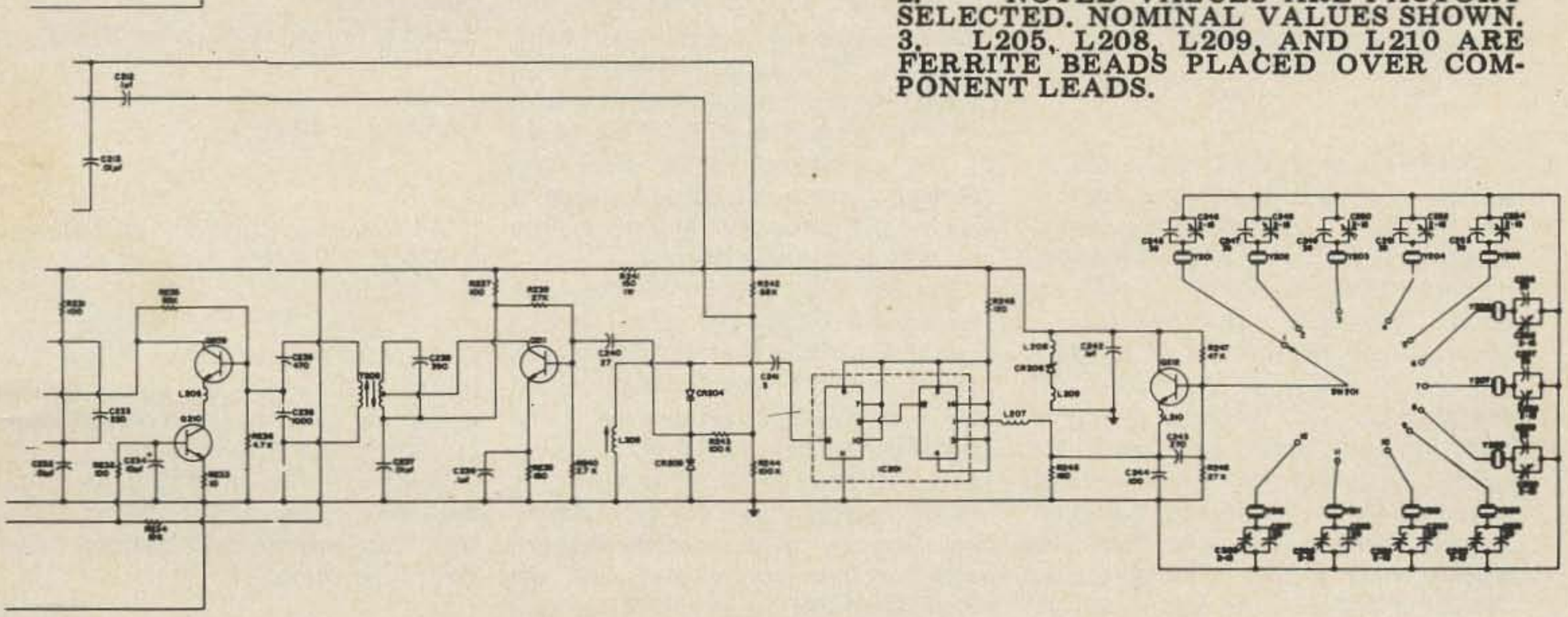
REGENCY HR-6







NOTES:
1. ALL CAPACITOR VALUES NOT SPECIFIED ARE PICO-FARAD.
ALL RESISTOR VALUES NOT SPECIFIED ARE OHMS, 1/4 WATT.
2. * NOTED VALUES ARE FACTORY SELECTED. NOMINAL VALUES SHOWN.
3. L205, L208, L209, AND L210 ARE FERRITE BEADS PLACED OVER COMPONENT LEADS.



AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

"Space Science Involvement" a 64-page curriculum supplement intended for secondary school teachers, is now available from ARRL Headquarters. Produced by educators at the Talcott Mountain Science Center, Avon CN under contract from AMSAT, this curriculum source material illustrates how AMSAT-OSCAR 6 can be used as a classroom instructional tool.

For your free copy of the book write: Bill Dunkerley, c/o ARRL, 225 Main Street, Newington CN 06111. Be sure to specify how and where you expect to use OSCAR 6 for educational purposes.

The OSCAR 7, two 10m repeater passbands (±3dB points) are: UPLINK 145.850-145.950 MHz DOWNLINK 29.40-29.50 MHz, BEACON 29.50 MHz.

Amateurs who have qualified for AMSAT-OSCAR 6 W.A.S. Award are:

W3TMZ	WØLER
K4TI	DJ6RD/W9
W9OII	K2GUG
W8DX	W6EJJ
W5VY	WØNQQ

Orbital Information

Orbit	Date (Jun)	Time (GMT)	Longitude of Eq. Crossing °W
7430	1	0039.2	57.6
7443	2	0134.1	71.3
7455	3	0034.1	56.3
7468	4	0129.0	70.0
7480	5	0028.9	55.0
7493	6	0123.9	68.8
7505	7	0023.8	53.7
7518	8	0118.7	67.5
7530	9	0018.7	52.5
7543	10	0113.6	66.2
7555	11	0013.5	51.2
7568	12	0108.4	64.9
7580	13	0008.4	49.9
7593	14	0103.3	63.6
7605	15	0003.2	48.6
7618	16	0058.2	62.3
7631	17	0153.1	76.1
7643	18	0053.0	61.1
7656	19	0148.0	74.8
7668	20	0047.9	59.8
7681	21	0142.8	73.5
7693	22	0042.8	58.5
7706	23	0137.7	72.2
7718	24	0037.6	57.2
7731	25	0132.6	70.9
7743	26	0032.5	55.9
7756	27	0127.4	69.7
7768	28	0027.4	54.6
7781	29	0122.3	68.4
7793	30	0022.2	53.4

Joe Kasser G3ZCZ
1701 East West Highway, Apt. 205
Silver Spring MD 20910

When I was writing about the repeaters in the Pittsburgh area, back in the February column, I apparently forgot to mention the 22/82 Repeater. K3ISO wrote in to tell me about WR3ACH. This repeater is accessible on the turnpike from mile marker 30 (west of Warrendale) to mile marker 100 (between Somerset and Donegal). Mobile coverage of the greater Pittsburgh area lies within a 35 mile radius of Churchill Borough, however when driving in that area, one is either in the valley or on the top of a hill so that signals can get noisy at times. The equipment consists of Motorola Sensicon Receiver and Transmitter Strips with homebrew power supplies. The IDer, timer and six cavity duplexer are also homebrew. 25W of rf is fed to the four pole antenna for about 100W of erp. The reason that WR3ACH did not get a mention in the column was probably because I didn't have 22/82 in the rig at the time, after all there is a limit to how many pairs of crystals one can put into any one rig at any one time.

A few miles from Pittsburgh in Philadelphia there is a 19/79 repeater. The repeater has wide coverage over the southern part of New Jersey and features a free autopatch or local calls. Access to the autopatch is by the use of the * button on the touchtone pad, while disconnect is achieved by means of the # button. Since everything between * and # is recorded, please, if you use the autopatch, identify before and after and during the call.

Mobile VHF activity in the USA seems to be 99.9% FM. That is not so over in England. There, 2m SSB is also popular and is helped by readily available commercial Japanese rigs. These rigs feature channelized communications (10 kHz) with VFO tuning to get in between the 10 kHz points. Commercially made transverters also exist for base station use, and the resulting simplex range well exceeds that of FM. The rig is called the Liner 2. A somewhat similar rig is advertised in the USA for 6m use. That does not mean that FM is not popular, one repeater has been on the air for over a year now, and more are planned. There is a lot of simplex activity as well as I found when I was in London for a very brief stay in January.

Prices of ham equipment in England are very different to those in the USA, for example: Yaesu FT 101B $649, in the US. It is $760 in the UK. 2m FM crystals, $3.75 in US, $8.20 in the UK. Robot SSTV monitor – $295 as compared to $506 over there, and so on. One day it will be interesting to compare the cost of ten popular pieces of ham gear in different countries, then compare salaries, and see for example how many hours of work are required to purchase a Flibber 450 DX special.

VK3ZML wrote in with some up-to-date information on the Australian scene. For the latest information write: Wireless Institute of Australia, P.O. Box 150, Toorak, Victoria 3142, or telephone (03)-248-6521 in Melbourne, (02)-435-7951 in Sydney, (08)-261-4814 in Adelaide or (072)-48-6142 in Brisbane. He also passes on a list of repeaters as follows:

Victoria
Bendigo 20/80; Geelong 40/00; Horsham 10/70; Labrobe Valley 20/80; Melbourne 10/70; Mildura 40/00; Mount Macedon (Melbourne) 30/90.

South Australia
Adelaide 40/00;

Western Australia
Perth 10/70;

New South Wales
Gosford 10/70; Newcastle 40/00; Orange 10/70; Sydney 40/00; Woolongong 10/70;

Queensland
Brisbane 40/00; Gold Coast 10/70;

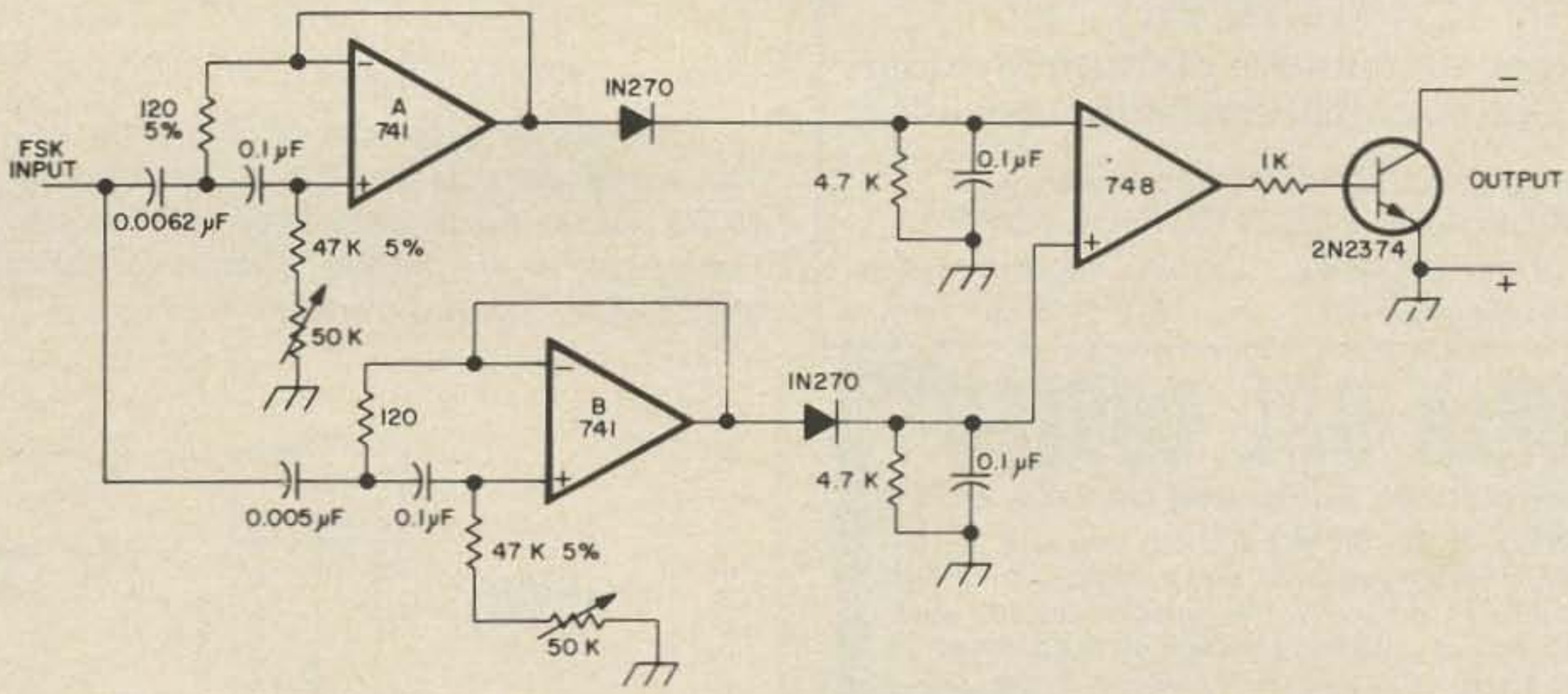
Tasmania
Launceston 40/00;

All repeater channels lie between 146 and 147 MHz. Simplex channels are 145.85, 146.00, 146.15, 146.50 and 146.55 MHz. If you wish to order such nonstandard US channels, I've found that Savoy can supply them within two weeks and that was without any special rush request.

Well, this month we've gone round the world. Keep those letters coming and this column will become even more interesting.

G3ZCZ

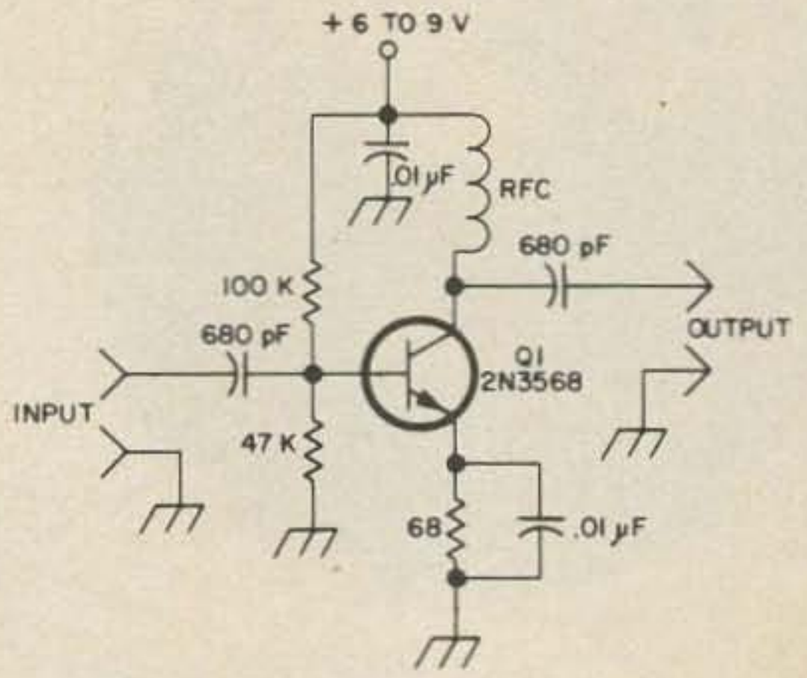
CIRCUITS. . .



MARK/SPACE DEMODULATOR

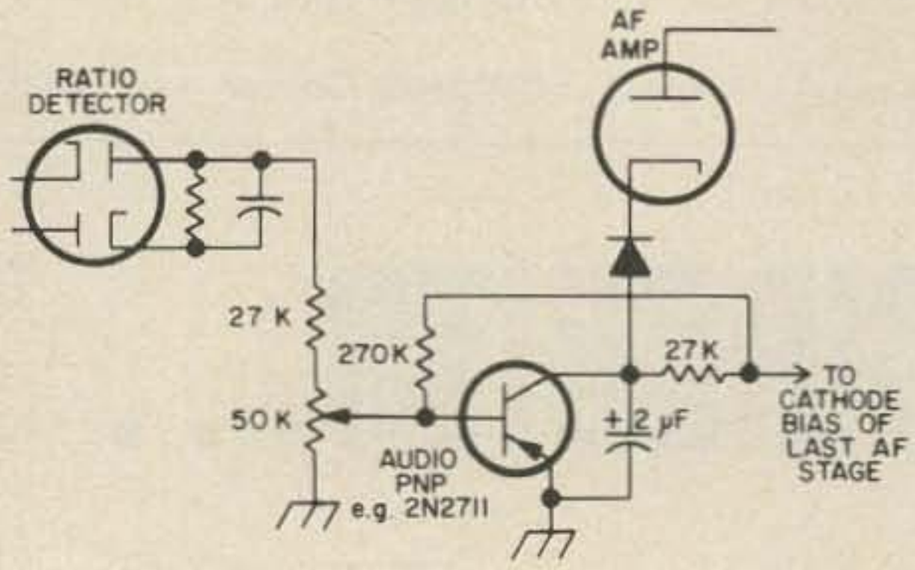
FSK demodulator contains 2 active filters, saving space and improving performance over designs that use conventional LC-tuned circuits. Filter A passes the space frequency of 2,025 Hz, while filter B passes the mark frequency of 2,225 Hz. The op amp operates open loop, summing the filter outputs. For a mark input, the output transistor saturates so that circuit loop closes. This circuit works fine on a breadboard. Thanks to F. C. Hervey K4ETZ, for submitting this circuit from the July 19, 1973 issue of Electronics Magazine.

CIRCUITS...



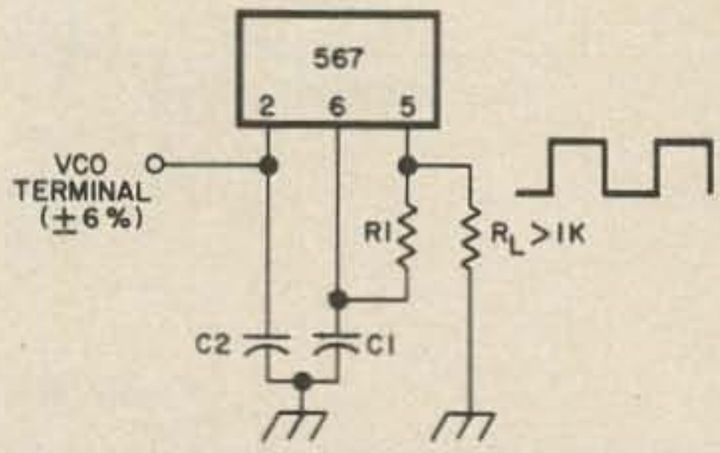
RF PREAMPLIFIER

This unit offers 12 – 15 dB gain on 10m, and about 20dB or more from 15m and down. All leads should be as short as possible. Building it on a PC board should give good results. Q1 can be any type of transistor. The Beta should be around 150+. f_t should be 60MHz or better. Thanks to Mark Chun KH6HPQ, for this circuit.



SIMPLE SQUELCH CIRCUIT

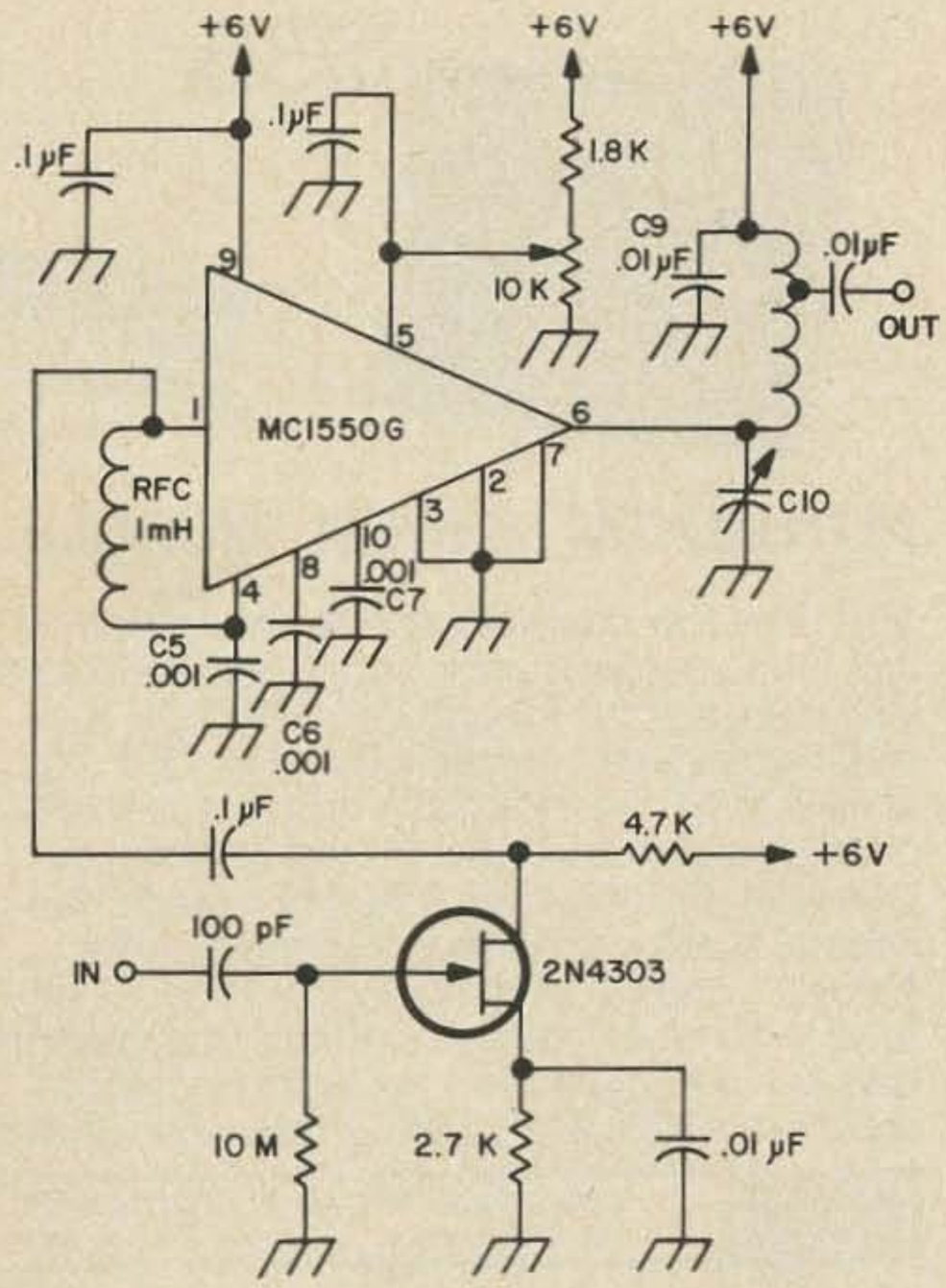
This circuit is for use with a tube FM receiver. The transistor acts as a switch to turn on the first audio stage. Parts not listed are in the receiver. Labled parts are added. Thanks to Lael Nagurney WA3EEC/1, for this circuit.



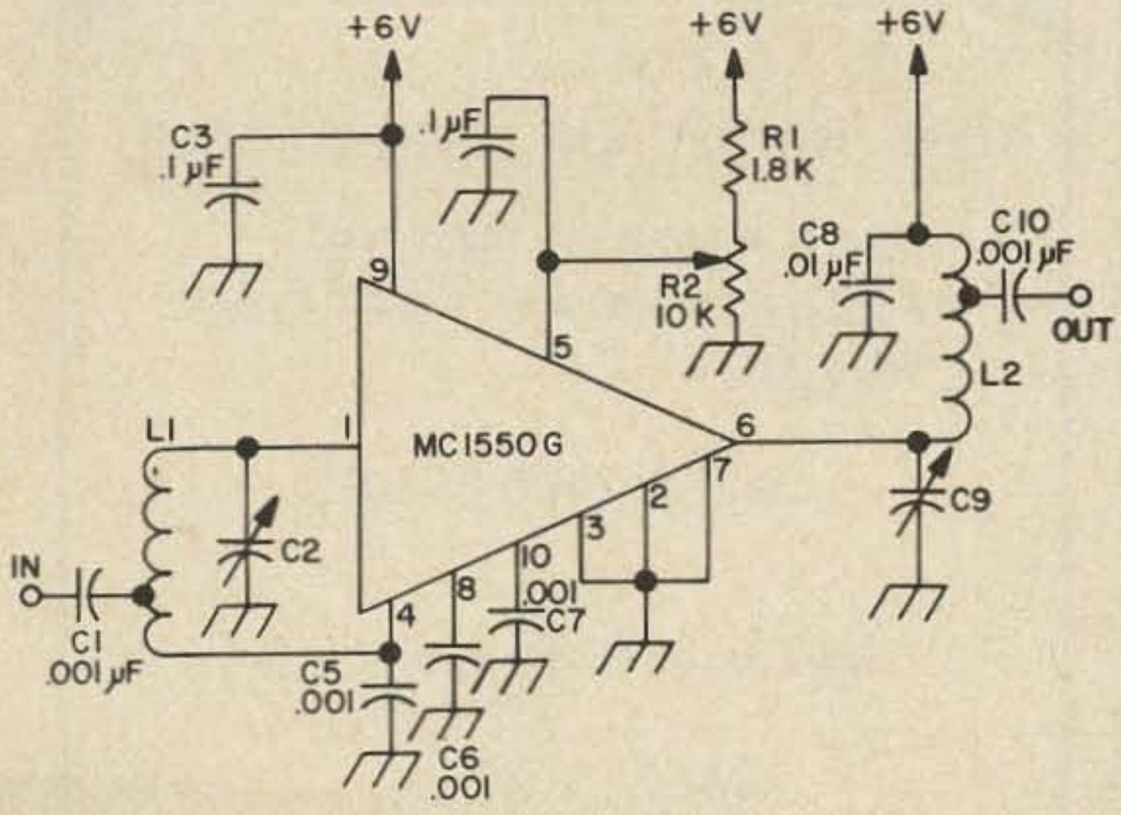
PRECISION OSCILLATOR with 20 nsec SWITCHING

Courtesy of Signetics Catalog

CIRCUITS . . .



If you cannot install a good big receiving antenna, try this substitute. It adapts the very weak signal from a piece of wire, a lamp post, or a mattress to the common 50-ohm receiver input terminal.



This rf preamplifier is easily adapted to any range under 30 MHz simply by choosing appropriate input and output tuned circuits.

IT ONLY HAPPENS ONCE IN A LIFETIME!

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AC POWER SUPPLY AND SYNC GENERATOR FOR THE ABOVE...NEW: **$65.00**

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7400	$ .25	7447	$1.45	74123	$1.15
7401	.25	7448	1.50	74125	.69
7402	.25	7450	.29	74126	.95
7403	.25	7451	.32	74141	1.25
7404	.29	7453	.32	74145	1.25
7405	.27	7454	.45	74150	1.25
7406	.55	7455	.32	74151	1.05
7407	.53	7460	.30	74153	1.45
7408	.29	7461	.30	74154	1.75
7409	.29	7464	.45	74155	1.35
7410	.25	7465	.45	74156	1.50
7411	.35	7470	.50	74157	1.50
7413	.95	7472	.45	74161	1.65
7415	.50	7473	.55	74163	1.80
7416	.50	7474	.55	74164	2.95
7417	.50	7475	.95	74165	2.95
7420	.25	7476	.55	74166	1.95
7421	.32	7478	.89	74173	1.95
7422	.32	7483	1.25	74175	1.95
7423	.37	7485	1.20	74176	.95
7425	.39	7486	.55	74177	.95
7426	.35	7489	3.25	74180	1.15
7427	.39	7490	1.25	74181	4.25
7430	.25	7491	1.40	74182	1.10
7432	.30	7492	1.05	74190	1.65
7437	.50	7493	1.05	74192	1.65
7438	.55	7494	1.10	74193	1.65
7440	.25	7495	1.05	74194	1.65
7441	1.25	7496	1.05	74195	1.15
7442	1.15	74100	1.65	74196	1.35
7443	1.25	74105	.55	74197	1.15
7444	1.30	74107	.55	74198	2.50
7445	1.25	74121	.65	74199	2.50
7446	1.45	74122	.55		
Low Power TTL					
74L00	$ .40	74L51	$ .40	74L90	$1.75
74L02	.40	74L55	.60	74L91	1.50
74L03	.40	74L71	.60	74L93	1.75
74L04	.40	74L72	.60	74L95	1.75
74L06	.40	74L73	.80	74L164	2.95
74L10	.40	74L74	.80	74L165	2.95
74L20	.40	74L78	.80	85L52	2.95
74L30	.40	74L85	1.25	86L75	2.95
74L42	1.75	74L86	.95		
High Speed TTL					
74H00	$ .40	74H21	$ .47	74H60	$ .45
74H01	.40	74H22	.47	74H61	.45
74H02	.40	74H30	.40	74H62	.45
74H04	.45	74H40	.40	74H72	.60
74H08	.45	74H50	.45	74H74	.70
74H10	.40	74H53	.47	74H76	.70
74H20	.40	74H55	.47		
8000 Series TTL					
8504	$ .45	8200	$2.95	8554	$2.95
8060	.30	8210	3.95	8750	2.95
8091	.69	8214	1.95	8600	1.15
8092	.69	8219	1.95	8810	.95
8093	.69	8220	1.95	8812	1.25
8094	.69	8280	.95	8830	.69
8121	1.05	8288	1.75	8831	2.95
8122	1.05	8520	1.45	8832	2.95
8123	1.75	8551	1.95	8836	.69
8130	2.50	8552	2.95	8830	1.50
8182	1.75				

Please specify which data sheets are required with order. Add $ .50 per data sheet for items priced less than $1.00 ea. All of above are Dual-In-Line packages.

CMOS

74C00	$ .85	74C76	$1.70	74C163	$3.25
74C02	.85	74C107	1.50	74C164	3.50
74C04	.95	74C151	2.90	74C173	2.90
74C10	.85	74C154	3.50	74C192	3.25
74C20	.85	74C157	2.25	74C193	3.25
74C42	2.15	74C160	3.30	74C195	3.00
74C73	1.70	74C161	3.25	80C97	1.50
74C74	1.50	74C162	3.25		

Specify Specs required with order

4000 Series — RCA Equivalent

CD4001	$ .65	CD4012	$ .65	CD4022	$2.75
CD4002	.65	CD4013	1.50	CD4023	.65
CD4009	1.00	CD4016	1.50	CD4025	.65
CD4010	.65	CD4017	2.95	CD4027	1.35
CD4011	.65	CD4019	1.35	CD4030	.65
				CD4035	2.85

Specify Specs required with order

MEMORIES

1101	256 bit RAM MOS (2501)	$2.50 ea.
1103	1024 bit RAM MOS	7.50 ea.
5260	1024 bit RAM 16 pin Low power consumption	6.95 ea.
7489	64 bit RAM TTL	3.25 ea.
8223	Programmable ROM	6.50 ea.

LED

MAN 3M type		3 or more $1.25
MAN 5 type Green 7 segment	$4.75 ea.	4/$15.75
MAN 7 type (SLA-1) Red 7 segment	$2.50 ea.	4/$7.95
MAN 8 type Yellow 7 segment	$5.50 ea	4/$18.95

CMOS

74C00	$.55 ea	74C20	$ .65 ea.
74C02	.65 ea	74C42	1.75 ea.
74C04	.75 ea	74C73	1.25 ea.
74C10	.65 ea	74C107	.99 ea.

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- MM5736 - 18 pin calculator chip - four function - 6 digit
- MM5736 - 18 pin caluculator - four function - 6 digit
- A pair of 3-in-1 dip paks (6 digits) LED similar to DL-33
- One 75492 Hex Digit Driver

Data supplied on above items. You supply switches, resistor, keyboard and battery for complete calculator. $11.95/kit

8038	Volt controlled oscillator	DIP	$7.95 ea.
555	Timer	MINI-DIP	1.15 ea.
7489	64 bit RAM TTL	DIP	2.75 ea.

CALCULATOR CHIPS

5001 LSI (40 pin) Add, subtract, multiply & divide 12 digit
Data supplied with chip ..... $6.95 ea.
Data only - Refundable w/purchase ..... 1.00 ea.

5002 LSI Similar to 5001 except designed for battery power
Data supplied with chip ..... $8.95 ea.
Data only - Refundable w/purchase ..... 1.00 ea.

5005 LSI (28 pin) Full four function memory. 12 digit display and calc. 7 segment multiplexed output
Data supplied with chip $10.95
Data only - Refundable w/purchase ..... 1.00 ea.

DIGITAL-CLOCK CHIPS

MM 5311 (28 pin) Any readout 6 digit BCD with spec. sheet ..... $11.95 ea.
MM 5312 (24 pin) Any readout 4 digit 1 pps BCD with spec. sheet ..... 8.95 ea.
MM 5313 (28 pin) Any readout 6 digit 1 pps BCD with spec.sheet ..... 10.95 ea.
MM 5314 (24 pin) LED-incandescent readout 6 digit with spec. sheet ..... 10.95 ea.
MM 5316 (40 pin) Normal alarm, snooze alarm, sleep timer 12 or 24 hr. operation with spec. sheet ..... 15.95 ea.

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MV108 Visible red SUPER SPECIAL	$ .25 ea.	
MV50 type red emitting	.25 ea.	5/$1.00
MV5020 type large red	.35 ea.	3/$1.00
ME 4 Infra red TO18	.69 ea.	
MAN 1 The original	3.95 ea.	
MAN 3 type	1.95 ea. 3 or more	1.49 ea.
MAN 4 type	2.75 ea. 3 or more	2.50 ea.
Data-Lite 707 (MAN 1 repl)	3.25 ea.	

OPTO ISOLATORS

MCA 2-30	Darlingtr -	$ .95 ea.
MCD 2	Diodes	1.95 ea.
MCT 2	Transistor	1.45 ea.

UNTESTED IC's

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2502 2506 2509 2510 2511 2518 2519 2521 2522
Untested seconds 4/1.00

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15 Assorted TTL's (dips) $1.00/bag
25 Assorted DTL's (dips) $1.00/bag

LINEAR INTEGRATED CIRCUITS

300	Pos V Reg (super 723)	TO-5	$ .95 ea.
301	Hi performance AMPL	MINI-DIP	.45 ea.
302	Voltage Follower	TO-5	.95 ea.
304	Negative Voltage Regulator	TO-5	1.25 ea.
305	Positive Voltage Regulator	TO-5	1.25 ea.
307	Op AMP (super 741)	MINI-DIP	.45 ea.
308	Micro Power Op Amp	MINI-DIP	1.25 ea.
309H	5 V Regulator	TO-5	1.25 ea.
309K	5 V 1A Regulator	TO-3	1.95 ea.
310	Voltage Follower Op Amp	TO-5	1.45 ea.
311	Hi perf. Voltage Comparator	MINI-DIP	1.25 ea.
319	Hi Speed Dual Comparator	DIP	1.65 ea.
320	-5.2 V Negative Regulator	TO-3	1.95 ea.
320	-12 V Negative Regulator	TO-3	1.95 ea.
320	-15 V Negative Regulator	TO-3	1.95 ea.
324	Quad Op Amp	DIP	$2.25 ea.
339	Quad Comparator	DIP	2.50 ea.
340T	Positive Voltage Regulator (6V, 8V, 15V or 24V)	TO-220	2.25 ea.
370	AGC/Squelch AMPL	TO-5 or DIP	1.29 ea.
372	AF-IF Strip-detector	DIP	.85 ea.
373	AM/FM/SSB Strip	DIP	3.60 ea.
376	Pos. Volt Regulator	MINI-DIP	.65 ea.
377	2W Stereo amp	DIP	2.75 ea.
380	2 Watt Audio Regulator	DIP	1.75 ea.
380-8	.6W Audio amp	MINI-DIP	1.75 ea.
382	Low Noise Dual Pre-Amp	DIP	2.25 ea.
550	Precision Voltage Regulator	DIP	.95 ea.
703	RF-IF Amp	MINI-DIP	.59 ea.
709	Operational AMPL	TO-5 or DIP	.39 ea.
711	Dual Differential Comparator	DIP	.39 ea.
723	Voltage Regulator	DIP	.75 ea.
739	Dual Hi Perf. Op AMP	DIP	1.25 ea.
741	Comp. Op AMP	MINI-DIP	.45 ea.
747	Dual 741 Op AMP	TO-5 or DIP	.95 ea.
748	Freq Adj 741	MINI-DIP	.45 ea.
1303	Stereo Pre-Amp	DIP	.95 ea.
1304	FM Multiplex Stereo Demod.	DIP	1.50 ea.
1307	FM Multiplex Stereo Demod.	DIP	.95 ea.
1458	Dual Comp. Op. Amp.	MINI-DIP	.75 ea.
2111	Dual LM211 Volt. Comp.	DIP	2.95 ea.
3065	TV-FM Sound System	DIP	.75 ea.
3075	FM Det. — LMTR and Audio Pre-Amp.	DIP	.85 ea.
3900	Quad Amplifier	DIP	.75 ea.
3905	Precision Timer	MINI-DIP	.75 ea.
7524	Core Memory Sense AMPL	DIP	1.95 ea.
7525	Core Memory Sense AMPL	DIP	.95 ea.
7534	Core memorysense amp	DIP	2.75 ea.
7535	Core memory sense amp	DIP	1.25 ea.
9601	Retriggerable One Shot	DIP	.95 ea.
75451	Dual Peripheral Driver	MINI-DIP	.49 ea.
75452	Dual Peripheral Driver	MINI-DIP	.49 ea.
75453	(351) Dual Peripheral Driver	MINI-DIP	.69 ea.
75491	Quad seg driver for LED readout	DIP	1.60 ea.
75492	Hex digit driver	DIP	1.75 ea.

Please specify which data sheets are required with order. Add $ .50 per data sheet for items priced less than $1.00 each

PHASE LOCKED LOOPS

560	Phase Locked Loop	DIP	2.95 ea.
561	Phase Locked Loop	DIP	2.95 ea.
562	Phase Locked Loop	DIP	2.95 ea.
565	Phase Locked Loop	DIP	2.95 ea.
566	Function Generator	MINI-DIP	2.95 ea.
567	Tone Generator	MINI-DIP	2.95 ea.

ON ORDERS OVER $25.00 DEDUCT 10%

All items are new, unused surplus parts — tested functional. Satisfaction is guaranteed. Shipment will be made via first class mail—postage paid—in U.S., Canada and Mexico within three days from receipt of order.
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Adjustable dual tracking regulated power supply parts kit. Output ±.1v to greater than ±.17v. Regulation better than 0.5%. Output current up to 215 mA back side. Kit includes line filter and internally shielded transformer to provide excellent rf and line noise rejection. Output is short-circuit protected. **For June only — $9.95. Orders placed after June 30 — $10.95**

TTL SPECIAL 9601 Monostable — $.65. 9602 Dual Monostable — $.90

DTL SPECIAL Type 988 Monostable similar to 74121 ..... **4/$1.00**

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MOS DYNAMIC MEMORY 1 x 1024 bit MM5260 ..... **$5.00**

12 Volt Power Supply **$17.95**

LM 309K 5V 1A REG **$2.00**

LM 320K NEG Reg available in 5V 12V & 15V **$2.25**

LM 340K POS Reg available in 6V, 8V, 12V, 15V, 24V **$2.25**

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8008 PROCESSOR 8 bit on a chip **$50.00**

ICs, most TTL & LINEAR in stock — Send stamp for FREE catalog

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74C00	.60	CD4011	.60	CD4042	2.95	741M	.45
74C02	.60	CD4012	.60	CD4044	2.95	741T	.50
74C04	.85	CD4013	1.25	CD4049	1.25	741 Mini	.45
74C10	.60	CD4014	4.00	CD4050	1.25	747D	.90
74C20	.60	CD4015	4.00	CD4116	1.50	748M	.65
74C73	1.65	CD4016	1.25			1595	1.50
74C74	1.25	CD4017	3.20	**LINEAR**		1596	1.75
74C76	1.75	CD4018	5.00	LM318	1.75	3900	.75
74C107	1.75	CD4019	1.35	LM339	2.00	4136	4/2.00
74C151	3.30	CD4020	5.50	LM370	1.25	4250T	2.25
74C160	3.25	CD4021	4.00	LM371	1.25		
74C161	3.25	CD4023	.60	LM372	1.25	CA3028	.75
74C162	3.25	CD4024	3.00	LM374	2.00	CA3065	.75
74C163	3.25	CD4025	.60	LM380	1.75	CA3086	.45
74C195	3.15	CD4027	1.75	LM381	2.00	5558	.90
CD4001	.60	CD4029	6.00	LM382	1.75		
CD4002	.60	CD4030	1.20	555	1.00		
CD4008	4.00	CD4035	2.95	556	1.60		
CD4009	.95	CD4037	2.95	723T	.95		
CD4010	.95	CD4040	5.00	723D	.75		

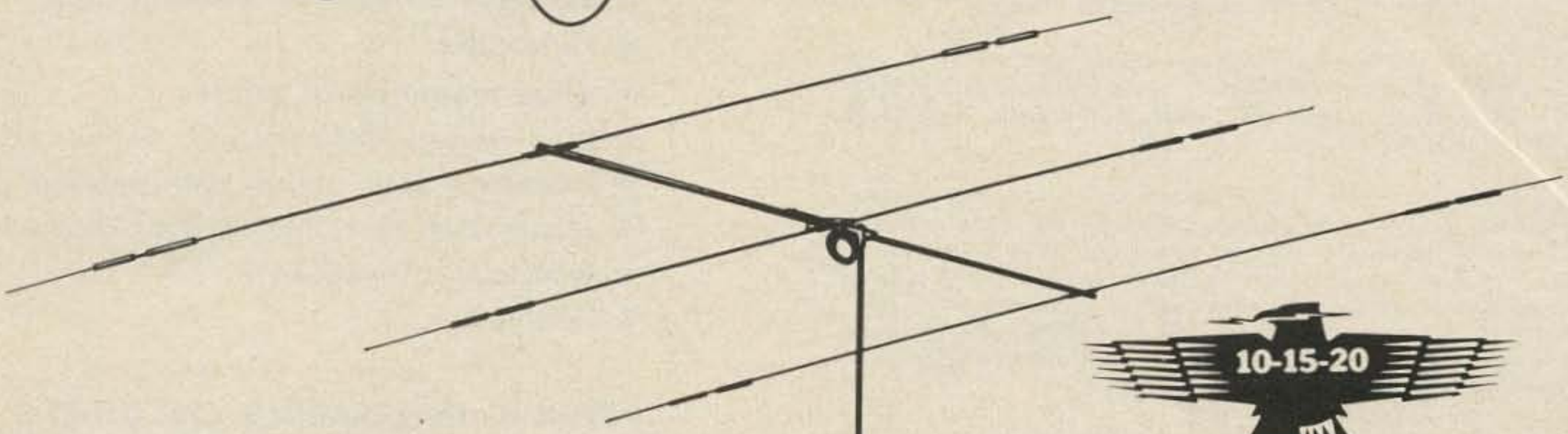
ALL ITEMS IN STOCK and will be shipped within 24 working hours of receipt of order!

Include 50¢ postage and handling on orders under $10.00

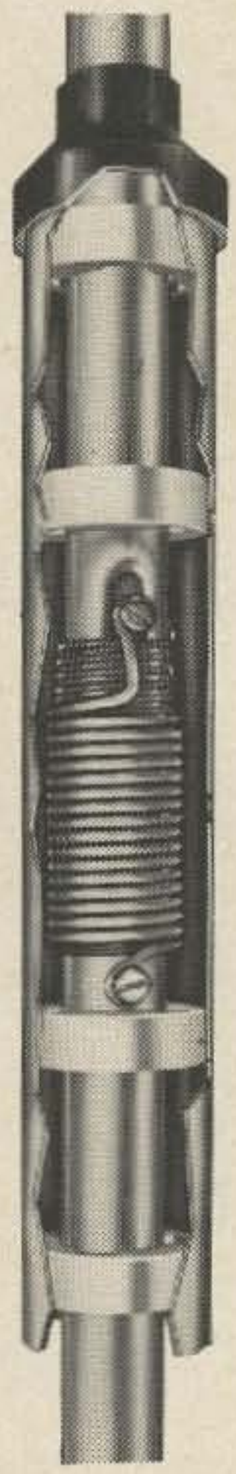
Sorry, NO C.O.D.'s. CALIFORNIA RESIDENTS ADD sales tax.

The most popular three band beam in the world!

hy-gain TH3Mk3



INTERNATIONALLY superior | RESPECTED for performance



Superior construction and performance make the difference in Hy-Gain's popular 3-element Thunderbird.

- Thunderbird's "Hy-Q" traps provide separate traps for each band. "Hy-Q" traps are electronically tuned at the factory to perform better at any frequency in the band—either phone or CW. And you can tune the antenna, using charts supplied in the manual, to substantially outperform any other antennas made.
- Thunderbird's superior construction includes a new, cast aluminum, tilt-head universal boom-to-mast bracket that accommodates masts from 1¼" to 2½". Allows easy tilting for installation, maintenance and tuning and provides mast feed-thru for beam stacking.

  Taper swaged, slotted tubing on all elements allows easy adjustment and re-adjustment. Taper swaged to permit larger diameter tubing where it counts! And less wind loading. Full circumference compression clamps are mechanically and electrically superior to self-tapping metal screws.
- Thunderbird's exclusive Beta Match achieves balanced input, optimum matching on all 3 bands and provides DC ground to eliminate precipitation static.
- Up to 8 db gain
- 25 db front to back ratio
- Power capability 1Kw AM, 2Kw PEP
- SWR less than 2:1
- Extra heavy gauge, machine formed, element to boom brackets with plastic sleeves used only for insulation. Bracket design allows full mechanical support.

Model 388 $169.95

Other tri-band beams to choose from:

• 6-element Super Thunderbird TH6DXX	**Model 389**	**$199.95**
• 3-element Thunderbird Jr. TH3JR	**Model 221**	**$119.95**
• 2-element Thunderbird TH2Mk3	**Model 390**	**$109.95**

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402/464-9151, Telex 48-6424

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NOW AVAILABLE FROM SOLID STATE SYSTEMS, INC.
LOW-COST FIELD EFFECT TRANSMISSIVE AND/OR REFLECTIVE LIQUID CRYSTAL AC DISPLAY

DESCRIPTION

Only one liquid crystal display provides excellent contrast and readability in diffused light: FELIX. Field Effect Liquid Crystal from Ilixco.

FELIX liquid crystal displays produce superior optical properties than other liquid crystal systems because of their bi-level characteristic. The Felix display system has two distinct optical states, so that display segments are fully off at 3 volts and completely on at 7 volts.

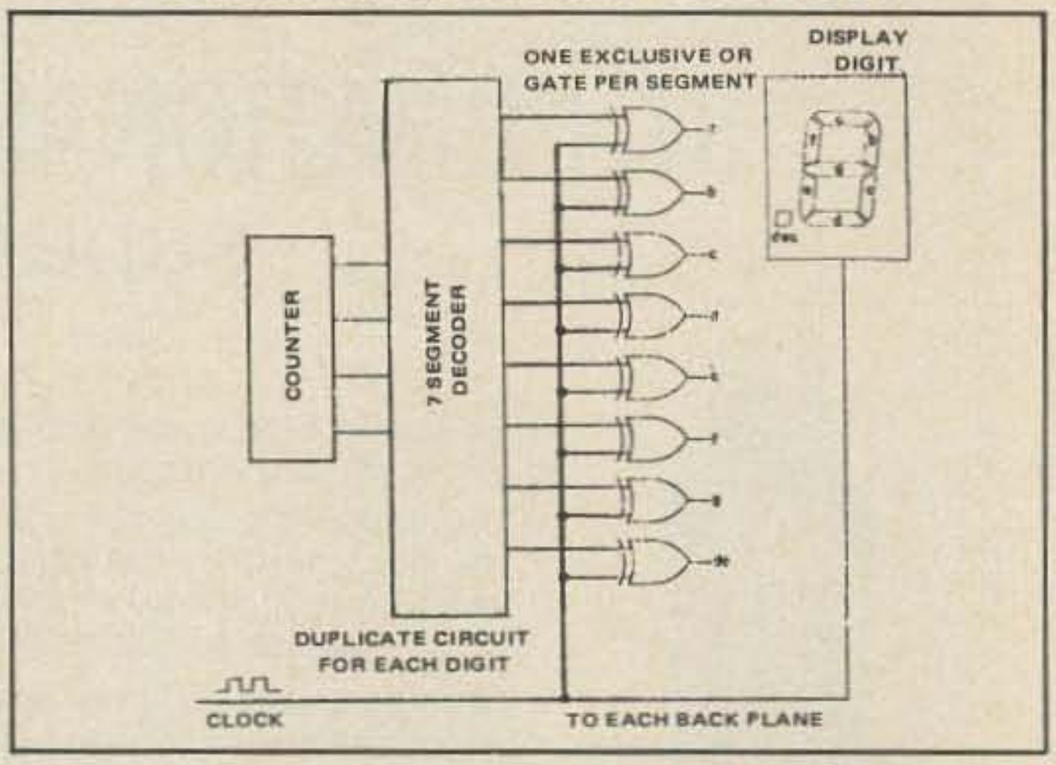
Bi-level refers to the two levels of optical activity present in specially organized liquid crystals. In the quiescent state, the level is referred to as a 90° rotation of the plane of polarized light. That is, when a liquid crystal organized in this manner is inserted between a polarizer and an analyzer which are parallel, the light transmission will be at a minimum. The other level of the bi-level system is zero degrees rotation of the plane of polarized light, which occurs upon the application of a well defined voltage, giving maximum transmission.

Extremely low voltage threshold provides full compatibility with TTL and MOS devices. The power consumption of the ON segment is less than ½ microwatt.

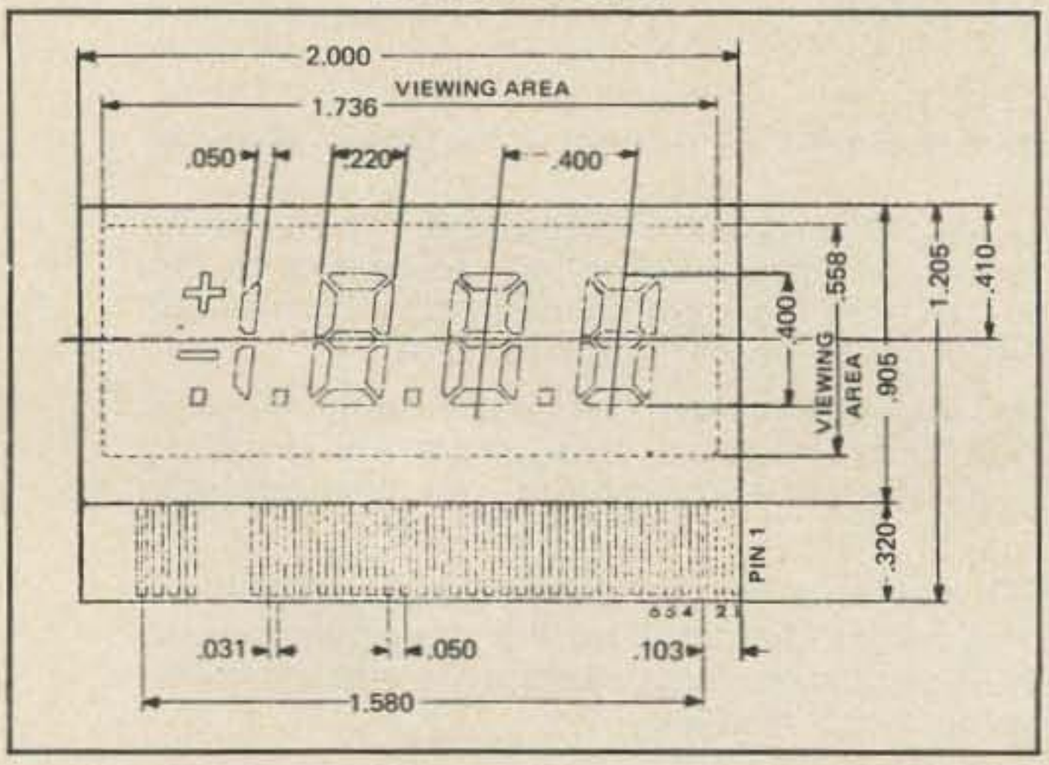
FEATURES

- ★ Excellent contrast in ambient light
- ★ Field effect
- ★ Wide temperature range
- ★ Low voltage operation (7 volts)
- ★ Extremely low power consumption
- ★ Transmitted or reflected light displays
- ★ Operates 60—10 KHz
- ★ Plugable

TYPICAL INTERFACING CIRCUITRY



DIMENSIONS



ASSEMBLED COUNTING BOARDS

Completely assembled and tested counting board, consisting of above display and connector, three decade to 7-segment decoder (7448), seven AC pulse drive generators (7486), and tin plated glass-epoxy PC board with edge connector pattern is available as part number 94-06051.

PRICES

Catalog Number	Description	1-4	5-9	10-24	25 Up
94-06051	Complete Assembly	15.50	14.50	13.50	12.50
84-06051	Display & Connector Only	9.75	9.00	8.25	7.50

PIN CONNECTIONS

PIN	SEGMENT	PIN	SEGMENT
1.	---	21.	b
2.	---	22.	g
3.	b	23.	c
4.	g	24.	d
5.	c	25.	B.P.
6.	d	26.	e
7.	B.P.	27.	f
8.	e	28.	a
9.	f	29.	DEC.
10.	a	30.	1
11.	DEC.	31.	DEC.
12.	b	32.	-
13.	g	33.	+
14.	c	34.	B.P.
15.	d	35.	---
16.	B.P.	36.	---
17.	e	37.	---
18.	f	38.	---
19.	a	39.	---
20.	DEC.	40.	---

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P. O. BOX 617
COLUMBIA, MISSOURI 65201

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800—325—2595 & 800—325—2981

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7400 S	.25	7440	.25	7496	1.00
7401	.25	7442	1.10	74107	.60
7402	.25	7446	1.45	74121	.60
7403	.25	7447	1.45	74122	.60
7404	.30	7448	1.45	74123	1.10
7405	.30	7450	.25	74125	.65
7406	.50	7451	.25	74126	.65
7407	.50	7453	.25	74141	1.25
7408	.30	7454	.25	74151	1.10
7409	.30	7473	.50	74153	1.40
7410	.25	7474	.50	74154	1.70
7411	.30	7475	1.00	74157	1.40
7413	.90	7476	.65	74164	2.00
7416	.50	7483	1.25	74165	2.00
7417	.50	7485	1.40	74166	2.00
7420	.25	7486	.50	74181	4.50
7430	.25	7489	3.25	74192	1.75
7432	.30	7490	1.00	74193	1.50
7437	.50	7492	1.00	74195	1.15
7438	.50	7493	1.00	74200	9.00
		7495	1.00		

DIGITAL LOGIC TESTER
Will test CMOS, TTL, DTL; check out your digital ICs before you solder them in. Find out what that stuff you order through the mail really is! Needs 5V power supply similar to our PS 5-1 kit.
Kit of parts with schematic **$19.95**

FEEL AMBITIOUS THIS MONTH?
BUILD A COMPUTER!

8008 CPU chip	**$50.00**
2102 1024-bit static RAM, NMOS +5V supply	**$16.50**
1702A Reprogrammable ROM, 256 x 8	**$40.00**

Data sheets included.

SPECIAL OFFER – THIS MONTH ONLY:
Buy the basis of a minicomputer with 1024 8-bit words of RAM and 256 8-bit words of ROM, and get 10% off regular price.

One 8008, eight 2102s, and one 1702A, with data sheets – THIS MONTH ONLY – $199.80

1N914 EQUIVALENT DIODES – $.10 or $8/100

¼ WATT RESISTORS – $.05, $4/100
We have many 10% values . . .

WIRE WRAP SOCKETS

14 pin	$ .50
16 pin	.60
24 pin	1.25
28 pin	1.35
40 pin	1.80
wire-wrap socket pins	.05
100 or more,	.04

LEDS
LED 10R – Pack of 10 discrete red lens LEDs, various MV5020-series types. $1.50
LED 10C – Pack of 10 discrete clear lens LEDs, various MV5020-series types. $1.50
Application note included.

JUNCTION FETs, TO-18 case

N-CHANNEL:	SIMILAR TO:	
NJF10	2N4416, MPF102	3/$1.00
NJF11	2N4091-93	4/$1.00
NJF12	2N4338-41	4/$1.00
NJF13	2N3089	3/$1.00
NJF14	2N4221-22	4/$1.00
P-CHANNEL:		
PJF11	2N3382-86	4/$1.00
PJF14	2N2608	4/$1.00

All FETs come with data sheets.

OP AMPS

301T	$ .40	709T	$ .20	748M	$ .40
301M	$ .45	709M	$ .25	747/	
307T	$ .40	739D	$1.00	5558T	$ .90
307M	$ .45	741D	$ .35	5558M	$1.00
318T	$1.50	741T	$ .35	4131M	$1.25
709D	$ .20	741M	$ .45	4132M	$1.25

LEGEND
T = TO-5
D = DIP
M = miniDIP

TRANSISTORS

NPN TO-18 general purpose silicon	.15
10 or more,	.10
PNP TO-18 general purpose silicon	.15
10 or more,	.10
2N2222 (NPN) TO-18	.25
10 or more,	.20
2N2907 (PNP) TO-18	.25
10 or more.	.20

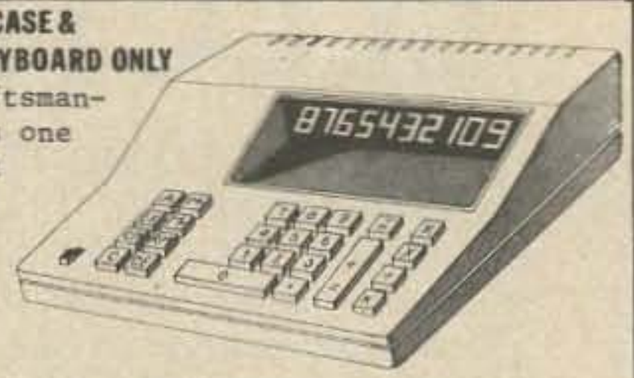
POWER SUPPLY KIT PS5–1
5 volt 1 amp regulated power supply kit with p/c board and instructions. Board measures 2" x 6"; completed kit is 2" high. Transformer has internal rf shield. **$8.00**

RGS ELECTRONICS (408) 247-0158
3650 Charles St., Suite K, Santa Clara, CA 95050

We sell many ICs and components not listed in this ad. Send a stamp for our free flyer. TERMS OF SALE: All orders prepaid; we pay postage. $1.00 for handling charge on orders under $10.00. California residents add sales tax. Please include name, address and zip code on all orders and flyer requests.

TABLE TOP CALCULATOR

CASE & KEYBOARD ONLY



Attractively designed! Excellent craftsmanship. Case and keyboard (designed as one unit). Cabinet is made of high-impact plastic beige color with black bezel and amber window. Keyboard consists of a 3-position slide switch and 25 keys, 5 of which are used for memory function. 20 keys gray, 5 keys orange. All keys mounted on one printed circuit board. This modular unit is well suited for our calculator chips. Ideal for the CT5005. Case and Keyboard Complete: ONLY $15.95

RCA NUMITRON

EACH.....$ 5.00

SPECIAL: 5 FOR $20.00

DR2010

Potter & Brumfield

TYPE KHP RELAY 4 PDT 3A CONTACTS

24 VDC (650 coil)....$1.50

120 VAC (10.5 MA coil).... 1.75

CMOS

CD4001	$ .75	CD4011	$ .75
CD4002	.75	74C20	.75
CD4010	1.00	74C160	3.25

CT5005 CALCULATOR

This calculator chip has a full four-function memory, which is controlled by four keys, +M (adds entry into memory), -M (subtracts entry from memory), CM (clear memory, without clearing rest of registers), RM (read memory or use as entry).

- 12-Digit display and calculate
- Fixed decimal at 0, 1, 2, 3, 4, or 5
- Leading zero suppression
- 7-Segment multiplexed output
- True credit sign display
- Single 28-pin chip

CHIP AND DATA.....ONLY $14.95

DATA ONLY (Refundable)..... 1.00

5001 CALCULATOR

40-Pin calculator chip will add, subtract, multiply, and divide. 12-Digit display and calculate. Chain calculations. True credit balance sign output. Automatic over-flow indication. Fixed decimal point at 1, 2, 3, or 4. Leading zero suppression. Complete data supplied with chip.

CHIP AND DATA.....ONLY $9.95

DATA ONLY (Refundable).... 1.00

All ICs are new and fully-tested; leads are plated with gold or solder. Orders for $5 or more will be shipped prepaid. Add 35¢ for handling and postage for smaller orders; residents of California add sales tax. IC orders are shipped within 2 workdays--kits are shipped within 10 days of receipt of order. $10.00 minimum on C.O.D.s (phone in).

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MV50 red emitting 10-4 ma @ 2V	$ .20 10 FOR 1.25
MV5024 red TO-18 high dome	$ .35 10 FOR 2.95
MV10B visible red 5-7 ma @ 2V	$ .30 10 FOR 2.50

Memory IC 74S206

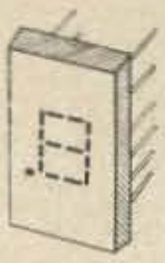
1x256 Bipolar TTL RAM (45 ns). One bit wide by 256 deep random access memory. Three-chip enable lines. Output is complement. Complete data supplied.

$3.95 ea. 10 for $32.00

3-Amp Power Silicon Rectifiers Marked Epoxy Axial Package

PRV	PRICE	PRV	PRICE
100.....	$ .10	800.....	$ .30
200.....	.15	1000....	.40
400.....	.18	1200....	.50
600.....	.23	1500....	.65

MAN 1



7-Segment, 0-9 plus letters. Snaps in 14-pin DIP socket or Molex. Operates with IC voltage requirements. Long operating life.

ONLY $3.25

7400	$ .25	74L51	$ .30
74H00	.35	74H51	.35
7401	.20	7453	.20
74H01	.35	7454	.25
7402	.35	74L54	.35
7403	.30	74L55	.35
7404	.28	7460	.20
74H04	.35	74L71	.30
7405	.28	7472	.40
7406	.70	74L72	.50
7408	.35	7473	.60
74H08	.35	74L73	.75
7410	.25	7474	.65
74H11	.35	74H74	.80
7413	1.25	7475	1.40
7417	.40	7476	.60
7420	.25	74L78	.80
74L20	.35	7480	.65
74H20	.35	7483	1.00
74H22	.35	7489	4.00
7430	.25	7490	1.20
74H30	.35	7492	.90
74L30	.40	7493	1.15
7440	.25	7495	1.15
74H40	.35	74L95	2.00
7441	1.25	74107	.70
7442	1.20	74121	1.25
7446	1.75	74154	2.30
7447	1.50	74163	2.00
7448	1.50	74192	2.50
7450	.25	74193	1.50
74H50	.35	74195	1.00
7451	.25		

7400 Series DIP

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VARO FULL-WAVE BRIDGES

V5447	2A	400V	$ .90
V5647	2A	600V	1.10
MR810 Rect.	50V	1A	.10

Special 811: Hex Inverter

TTL DIP Hex Inverter; pin interchangeable with SN 7404. Parts are brand new and are branded Signetics and marked "811."

Data Sheet Supplied

EACH.....$ .30
10 FOR..... 2.50
100 FOR.... 23.00
1000 FOR... 220.00

MAN 3

0-9 plus letters.

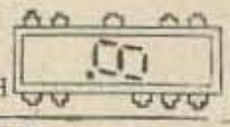
Right-hand decimal point. Flat-pack type case. Long operating life. IC voltage requirements. Ideal for pocket calculators!

EACH $1.25
10 OR MORE 1.00

MAN4

Seven-segment, 0-9 plus letters. Right-hand decimal point. Snaps in 14-pin DIP socket or Molex. IC voltage requirements. Ideal for desk or pocket calculators!

EACH.....$2.75
TEN OR MORE 2.50 EACH

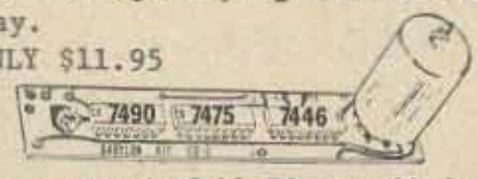


CD-2 Counter Kit

This kit provides a highly sophisticated display section module for clocks, counters, or other numerical display needs. The unit is .8" wide and 4 3/8" long. A single 5-volt power source powers both the ICs and the display tube. It can attain typical count rates of up to 30 MHz and also has a lamp test, causing all 7 segments to light. Kit includes a 2-sided (with plated thru holes) fiberglass printed circuit board, a 7490, a 7475, a 7447, a DR 2010 RCA Numitron display tube, complete instructions, and enough Molex pins for the ICs . . NOTE: boards can be supplied in a single panel of up to 10 digits (with all interconnects); therefore, when ordering, please specify whether you want them in single panels or in one multiple digit board. Not specifying will result in shipping delay.

COMPLETE KIT, ONLY $11.95

FULLY-ASSEMBLED UNIT $15.00



Boards supplied separately @ $2.50 per digit.

LINEARS

NE540	70-Watt power driver amp.....	$2.00
NE555	Precision timer.....	1.50
NE560	Phase lock loop DIP.....	3.25
NE561	Phase lock loop DIP.....	3.25
NE565	Phase lock loop TO-5.....	3.25
NE566	Function generator TO-5.....	4.00
NE567	Tone decoder MINI DIP.....	4.00
NE567	Tone decoder TO-5.....	3.00
NE5558	Dual 741 op amp MINI DIP.....	1.00
709	Popular Op Amp DIP.....	.45
710	Voltage comparator DIP.....	.75
711	Dual comparator DIP.....	.40
723	Precision voltage regulator DIP.	1.00
739	Low noise op amp DIP unmarked...	1.00
741	Op amp TO-5/MINI DIP.....	.55
747	Dual 741 op amp DIP.....	1.00
748	Op Amp TO-5.....	1.00
CA3018	2 Isolated transistors and a Darlington-connected transistor pair...	1.00
CA3026	Dual differential amp.....	1.00
CA3045	5 NPN transistor array.....	1.00
LM100	Positive DC regulator TO-5.....	1.00
LM105	Voltage regulator.....	1.25
LM302	Op amp voltage follower TO-5....	1.25
LM308	Op Amp TO-5.....	2.00
LM309H	5V 200 MA power supply TO-5.....	1.00
LM309K	5V 1A power supply module TO-3..	2.00
LM311	Comparator TO-5.....	1.75
LM370	AGC amplifier.....	2.00
LM380	2-Watt Audio Amp.....	1.75
LM1595	4-Quadrant multiplier.....	2.00
8038	Sine square triangle function generator.....	4.95
MC1536T	Op Amp.....	2.00

HOLD IT!

TWO WATTS

4 CHANNELS

GENERAL INFORMATION:

- Anodized aluminum case 1½ x 2½ x 9¼
- All tunable coils are prewound
- Transceiver is on one G–10 predrilled board
- Parts layout silk-screened on boards for easy construction
- Crystal deck is separate predrilled board
- Weight less batteries – approximately 15 oz.
- Battery case is AA size – accepts alkaline or nicad
- External battery charging/power supply jack furnished
- 1 dual gate mosfet 1 I.C. 18 transistors 7 diodes
- Antenna – collapsible 17" whip
- Can be tuned to any 2 MHz segment between 140 and 170 MHz
- Plenty of room in case for add ons (PL and tone)

HT–144 TRANSMITTER SPECIFICATIONS: OUTPUT 2 watts minimum. 3 dB BANDWIDTH 2 MHz typical. STABILITY .002 typical (depends on crystal). SPURIOUS outputs down 30 dB or better. MODULATION true FM with varactor in crystal circuit. NETTING separate trimmers for each channel. DEVIATION adjustable to 5 kHz. AUDIO limiter and active low pass filter. MICROPHONE speaker type. CRYSTAL 18 MHz parallel at 20 pF. MULTIPLICATION FACTOR frequency times 8. CURRENT DRAIN 500 mA typical.

HT–144 RECEIVER SPECIFICATIONS: SENSITIVITY better than .5μV for 20 dB quieting. SQUELCH THRESHOLD better than .3μV. STABILITY .002 typical (depends on crystal). ADJACENT CHANNEL REJECTION 60 dB. SPURIOUS RESPONSES down 70 dB. FIRST IF 10.7 MHz. SECOND IF 455 kHz. BANDWIDTH 15 kHz at 3 dB points. CRYSTAL 45 MHz parallel at 20 pF. CRYSTAL FORMULA receive frequency minus 10.7 divided by 3. HC25U crystal holders, wire leads. AUDIO OUTPUT .5w typical. CURRENT DRAIN 15 mA squelched, 100 mA on voice peaks.

Battery charger $4.95
"Rubber Duckie" antenna with male & female BNC connectors $12.95

ORDER YOURS NOW !

HT–144 KIT . . . . only **$99.95**
complete less batteries & crystals

PS–12

12 Amp regulated 2%
50 mV Ripple Max.
Adjustable 11–15 VDC

WIRED $79.95
KIT $59.95
Shipping Weight 12 lbs.

PS–24

24 Amp regulated 2%
50 mV Ripple Max.
Adjustable 11–15 VDC

WIRED $89.95*
KIT $69.95*
Shipping Weight 21 lbs.

** PS–24 SHIPPED with BASE PLATE – LESS CASE, AS SHOWN*

BANKAMERICARD

VHF ENGINEERING

– DIV. of BROWNIAN ELECT. CORP. –

320 WATER ST. POB 1921 BINGHAMTON, NY 13902 607-723-9574

See you at the New York Hamfest – METRO NEW YORK – July 19, 20, 21

RT-70/GRC $20 each, 3/$50

Latest government release. Transmitter-Receiver RT-70/GRC covers 47 to 58.4 mc FM. Requires only 90 Volts dc and 6 volts dc. Used, visually OK, supplied with schematic.

1 MC crystal used for calibration $4.00

116 page maintenance manual for GRC $2.00

TRANSFORMERS

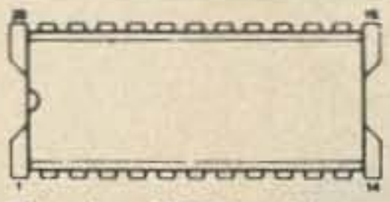
BRAND NEW, 115 volt AC input. OP - AMP XFMR, out puts: 16 VCT ½ amp, 17 VCT ½ amp. $3.50

FILAMENT or BTRY CHARGER XFMR

output of 18 volts at 4.5 amp $3.50

CALCULATOR KEYBOARD $5.00 2/$9.00

Brand new keyboards for hand held calculators. Two styles available.
One for use with calculator chip CAL TEX 5001-5002-5012 or MOSTEK 5010-5012.
Another for use with Gen. Inst. chip C500.
Priced at $8.00 each or two for $15.00.



CT 5005 CALCULATOR CHIP

Single MOS chip with all logic required for 12 digit 4 function desk top calculator with extra storage register for memory or constant. Multiplexed 7 segment outputs for LED, Incandescent, Fluorescent, or Gas Discharge displays. Brand new, bargain priced, with specs.
$8.00 each, 2 for $15.00

AM-FM RADIO $5.50

Due to the West Coast ship strike they came in too late for the customer. Now it's your bargain. Use it as is or build it into your own cabinet, desk, wall, etc. All built, ready to use, with AC supply. To make it portable all you do is power it with a couple of "D" cells. Fully assembled solid state chassis with AC power supply, less speakers. Covers full AM as well as FM broadcast. The price. . .an astounding meager $5.50

313,344 CORE MEMORY $125.00

From SPECTRA computer, visually OK. 64 x 68 x 4 x 18 core stack. Figures out to 35K Byte.

CLOCK/CALENDAR ALARM CHIP

These large scale integrated (LSI) chips eliminate literally thousands of components or hundreds of chips in the construction of a clock. For most applications only a single supply and a minimum of components are required.

☐ 7001 Chip – Features 28/30/31 day calendar, 12/24 hour clock, 24 hour clock, 24 hour alarm, snooze alarm, 6 digit display, direct drive to luminescent anode tubes or LL gments, single transistor interface with Sperry displays. Segment and digital outputs can be "wire or 'D" to share calculator displays. ..... **$9.95 each, 2/$18.00**

IC SALE YOUR CHOICE 3 for $1.00

μl 900 BUFFER TO-5
μl 914 DUAL 2 INPUT GATE TO-5
μl 923 JK FLIP FLOP TO-5
μl 926 Hi speed JK FLIP FLOP TO-5
μl 931 JK/RS FLIP FLOP (DIP)
10 pin socket for TO-5 IC 3/1.00

GIANT NIXIE B7971

Used $1.00 Brand New $2.00
With schematic for GIANT clock.

COMPUTER TAPE DECK $75.00

Takes ½ inch tape, made by Computer Entry Systems. Visually ok, with electronics, no data available.

Calculator Chips

5001 LSI (40 pin) Add, subtract, multiply, divide 12 digit. With data $6.95
Data alone .....50 cents

CMOS 4814 HEX INVERTER

CMOS HEX INVERTER, dual inline package. 3-18 volt range, dual diode protection against static charge. Dielectrically isolated complimentary MOS. $1.00 each 12 for $10.00

DUAL 16 BIT MEMORY

Dual 16 bit memory, serial MOS by Philco TO-5 case, brand new with 2 page specs.
#PLR 532 $1.00 each $10/12

2048 BIT MOS MEMORY

2048 bit MOS LSI random access memory NEC 6003. All inputs except clock are TTL compatible. 2048 word by 1 bit. 22 pin ceramic dual-in-line. With specs.
$5.00 EACH $9.00 each 2 for **$9.00**

RCA INJECTION LASER DIODES

Another SUPER SCOOP by Meshna. Brand new RCA packaged, considered obsolete by RCA but what an exotic opto-electronic device for the sophisticated experimenter. Only several hundred on hand. Values shown are approx. as each diode characteristic varies. Each is marked with correct value.

6 WATT $10.00
10 WATT $15.00

Meshna

Postage extra on above. **MESHNA PO Bx 62 E. Lynn Mass. 01904**

COMPLETE MEMORY SYSTEM

Measures 12 x 7 x 1 inches. Utilizes TTL ICs. 10240 memory cores. 9 installed sense amps, addressed as 1024 locations. I/O lines include 9 data-in, 9 data-out, 10 address-in, powering status and control. Only 40 systems on hand. Schematics included.

 # DCU $150pp

AUTOMOBILE REVERB

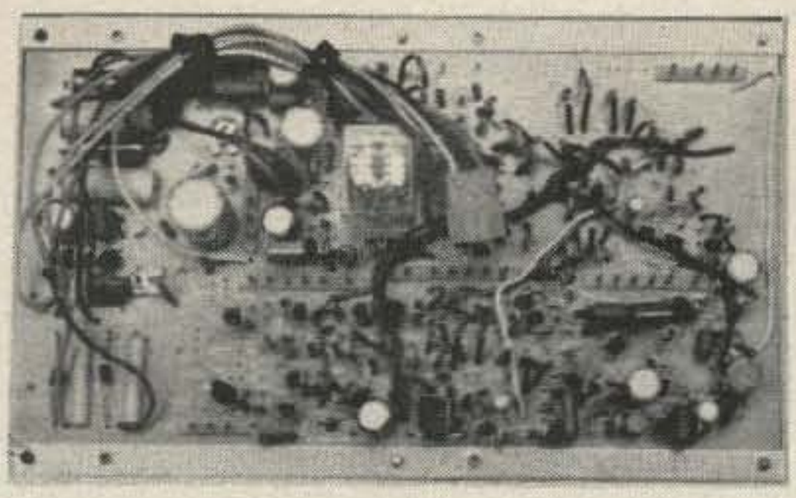
Brand new fully assembled, ready to install in your car to give 3rd dimension concert hall effect. Complete with instructions, rear seat speaker, grill, wires, plugs.

 # 05 ..... $7.00

15 AMP BATTERY CHARGER

Brand new GE transformer, 25 amp fullwave bridge. Output approximately 15 volts up to 15 amps. Ideal battery charger or DC source for general use. With instructions , assembled in minutes.

PK–4 $10.00



TV POWER SUPPLY & TRANSPORT CIRCUIT

A complete assembled PC board, spares from a video tape machine. Many many fine components to be found. One section of the board used as a 12 volt and 24 volt regulated power supply. You add the transformer and output will be 24 volts transistor regulated as well as another output of 12 volts transistor regulated. 3 amps on the 12 volts and 1 amp on the 24 volt section. Full schematic of the complete board included. These are unused and cost in excess of $200.

 # B74-1 ..... $6 or 3/$15

8 TRACK STEREO TAPE DECK

With built-in stereo pre-amp, 115 volt drive motor, channel indicator lamps. Unused, original boxed, less cabinet. Customize your stereo music center with one of these tape decks.

 # 46 ..... $14.00

UNDERWATER LISTENING

Brand new by OLIN. Use it for a swim pool monitor-alarm, use it on lake or ocean listening to underwater noises, fish, etc. Complete with hydrophone, 50 ft. mike cable, speaker-amplifier console. Operates from 115 volts AC or 15 volt dry cells. 12 lbs.

$25.00

RCA TD-2 TUNNEL DIODE

Original packaged, each factory marked, with spec sheet.

$1.25 each, 5/$5.00.

CALCULATOR KIT

Includes 8 digit LED readout, Keyboard, Calculator Chip – **all for $15.00**

RCA INJECTION LASER DIODES

Another SUPER SCOOP by Meshna. Brand new RCA packaged, considered obsolete by RCA but what an exotic opto-electronic device for the sophisticated experimenter. Only several hundred on hand. Values shown are approx. as each diode characteristic varies. Each is marked with correct value.

6 WATT $10.00
10 WATT $15.00

2N2152	45 volt	170 watt	PNP-G	$1.00
*2N3713	80	170	NPN-S	1.00
*2N3789	60	150	PNP-S	.75
2N5301	40	200	NPN-S	1.25
*2N5301	40	200	NPN-S	1.00

*Removed from used equipment

Postage extra on above. **MESHNA PO Bx 62 E. Lynn Mass. 01904**

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NEW 96 PAGE CATALOG NOW READY

CALCULATOR KIT

Kit contains NORTEC calculator chip 4024, 21 driver transistors, 8 LEDs, 7 segment readout by EXITON, 3 LED for overflow, low btry, over-range, a keyboard by FLEX KEY.$45 value.

$16.50 each, 2/$27

BASIC CLOCK KIT

We furnish clock chip CT 7001 and 4 first line LED readouts .3 inch hgt. You furnish the misc. minor parts. $35 value.

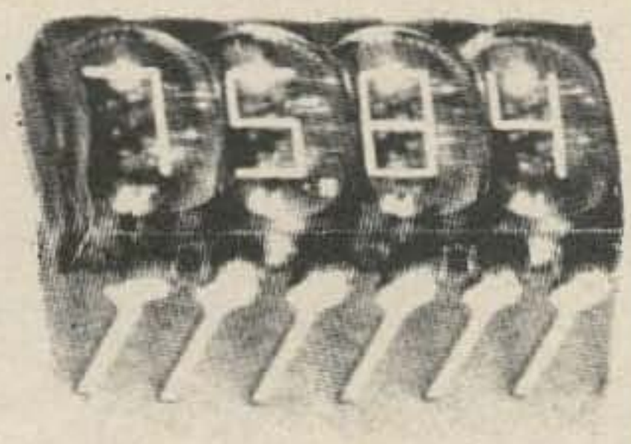
$19.95

LIQUID CRYSTAL WATCH

Build a wrist watch or desk clock with this liquid crystal display. Recently written up in several magazines. Display with special socket reads hours and minutes.

$15.00 each, 2/$25.00

HP LED DISPLAYS



Brand new 4-on-strip LED display. End butt two strips and come up with 8 digit readout. An unheard of SUPER VALUE at $5.00 per strip of 4 digits. Two strips (8 digits) $9.00. Another strip . . . this one a clock readout. The strip has 2 digits . . . space . . . 2 digits. Perfect for reading hours & minutes.

$5.00 per strip, 2/$9.00

CMOS 4814 HEX INVERTER

DIP with operation 3–18 Volts. Dual diode protection against static charge destruction. Dielectrically isolated complimentary MOS.

$.50 each, 12/$5.00

DUAL 16 BIT MEMORY

Serial MOS by PHILCO in TO–5 case. Brand new with 2 page specs.

#PLR 532 **$1.00 each, 12/$1.00**

PHONE PATCH KIT

Includes all parts, instructions, cabinet.

AM PATCH – $5.00 **SSB PATCH – $9.00**

2048 BIT MOS MEMORY

MOS LSI random access memory =NEC 6003. All inputs except clock are TTL compatible. 2048 word by 1 bit. 22 pin ceramic DIP. With specs.

$9.00 each, 2/$17.00

VOLTAGE CONTROLLED OSCILLATOR

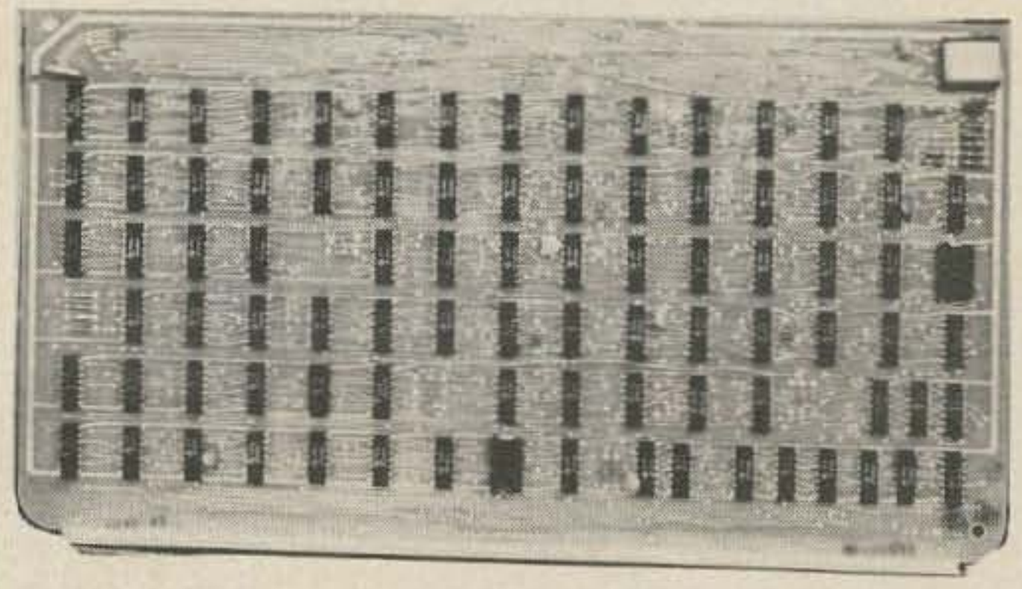
Rare item. See Pop. Elect. Mag. Oct. 1973 for uses. In 14 pin DIP package.

#8038C **$5.00 each, 2/$9.00**

ASCII KEYBOARDS W/ENCODER

From Raytheon, new or like new. 5 extra function buttons each side. Open faced, no cabinet. Schematic provided. Price is postpaid world wide.

$46.00



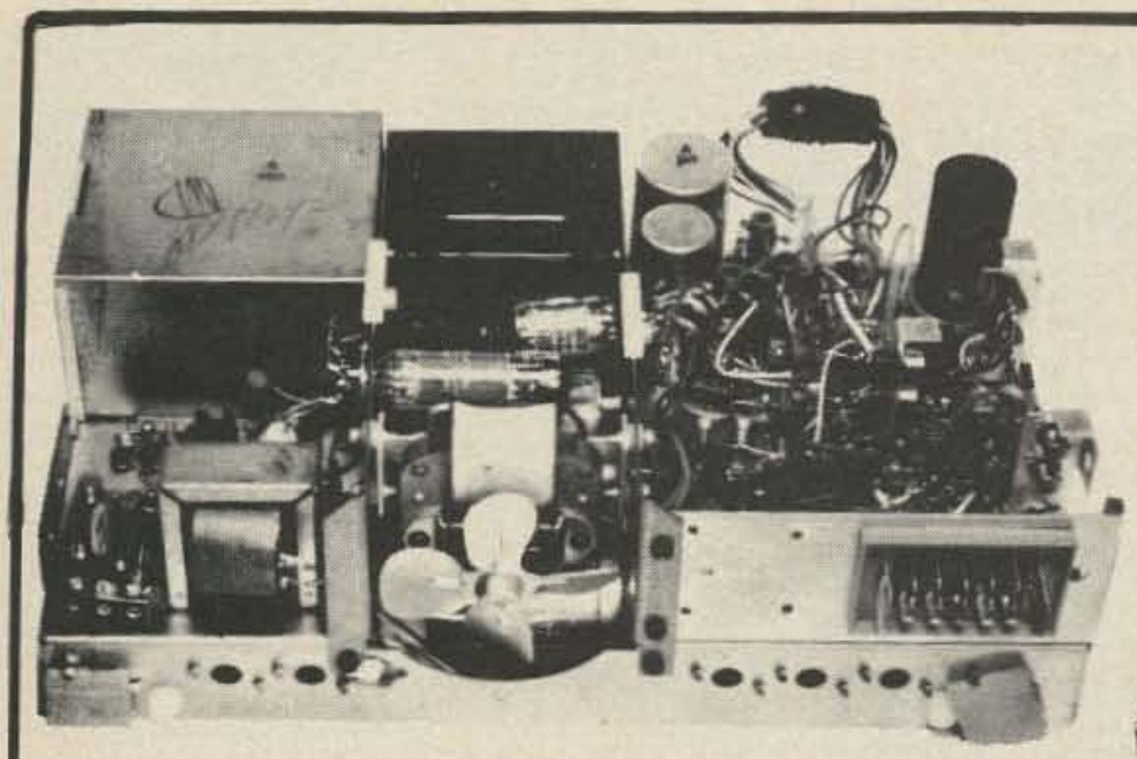
DTL SERIES ICs

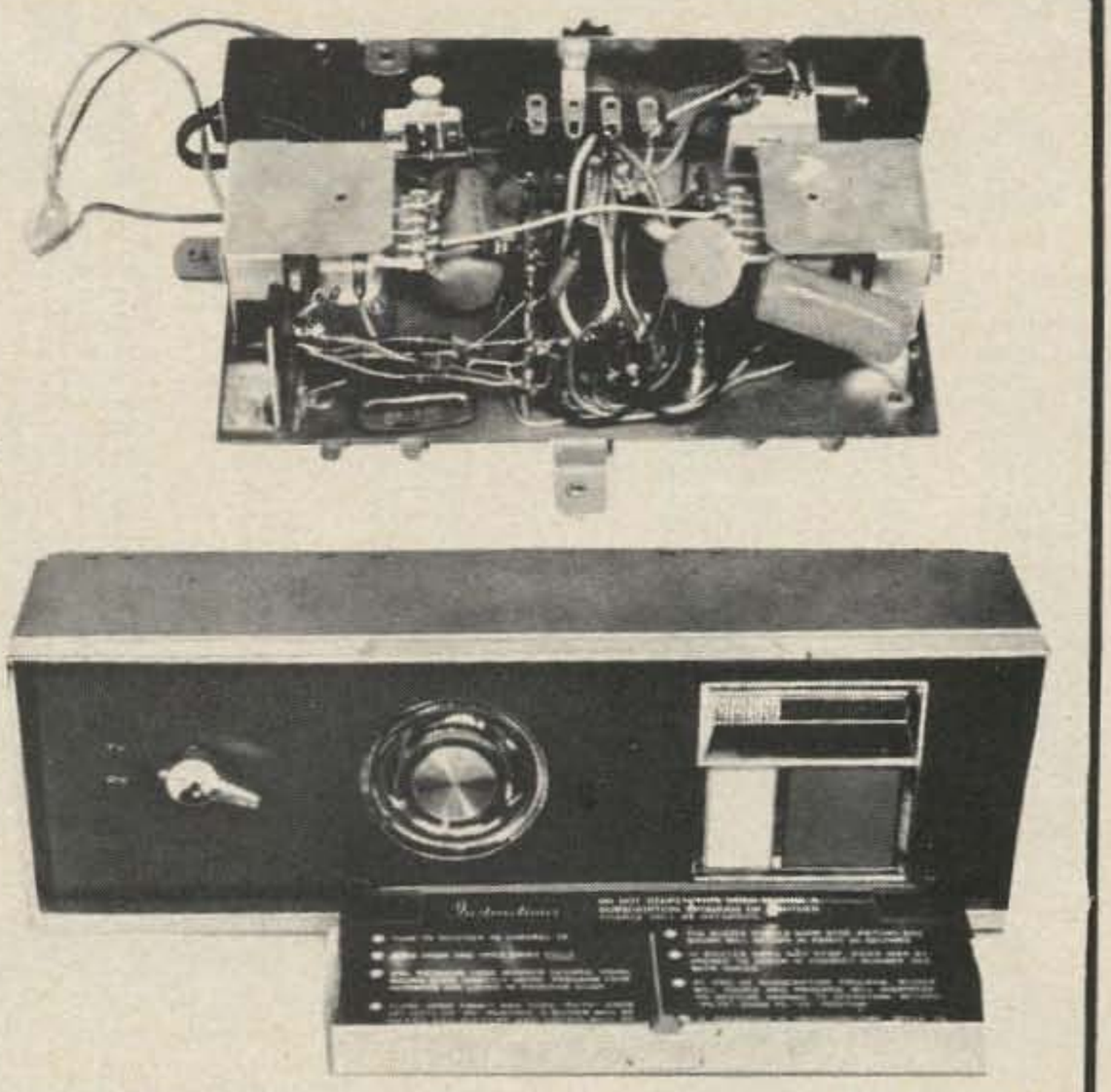
Talk about bargains . . . this is a whopper. Due to quantity on hand, we are reducing this item to a new MESHNA MESHU GINA deal. About 100 devices, all marked and easily removed. With shrinking supplies and upward direction of prices, this makes it well worth going into the salvage business. This Super Mother Board can be stolen for $6.00 each or 6 for $25.00. We have these in ST 600 series DTL.

#SAN–D **$6.00 each, 6/$25.00**

Meshna

Postage extra on above. **MESHNA PO Bx 62 E. Lynn Mass. 01904**





PAY TV ASSEMBLY $15.00

A "Super Value" for the gadgeteer. A complete Pay TV installation made for ZENITH and all in original packing (3 cartons – wgt 36 lbs) and all unused. Operates on regular 115 volt 60 cycle power. A wealth of parts, easily removed due to long leads on components, most over one inch long. The 3 units consist of Translator, Adapter, Decoder. Transistors, tubes, solid state bridge power supply, geared clock motor, 35mm geared transport, time recorder, solenoid, relays, hundreds of small parts such as resistors, caps, etc. Our estimate as to cost to Zenith, approx $1,000 per set. Schematics with each purchase. One set of 3 units $15.00 wgt of 36 lbs. Special . . . 3 sets $30 wgt of 108 lbs. All unused, original boxed.

AUDIO OSCILLATOR TS-382

Military surplus. 20-200,000 CPS in 4 bands. Amplitude variable 0-10 volts. Freq. response 20 CPS to 150,000 CPS. Operation from regular 115 volts. Ship wgt. 75 pounds.

Government cost . . . . . **.$224**
Our low price . . . . . **.$49**
Buy three for . . . . . **.$125**

TELETYPE CONVERTER CV 278/GR

From the military. Standard 455 kc IF. A rare item. Power input 24-28 volts DC. Ship wgt. approx 20 lbs.

Government cost . . . . . **.$496**
Our low price . . . . . **.$49**
Buy three for . . . . . **.$125**

RECEIVER BC 348

An old friend amongst the surplus buyers, but long gone from the market. Once again available as surplus. Covers 1.5-18 MHz tuneable in 6 bands. Also covers 200 kHz–500 kHz. Crystal phasing, MVC, AVC, BFO,etc. 60 lbs.

#348 . . . . . **.$55**

RECEIVER BC 312

Similar to BC 348,this is the Army version. A little heavier in construction. Covers 1.5 MHz–18 MHz. Ship wgt. approx. 60 lbs.

#312 . . . . . $49

TWO COLOR LED RED/GREEN

Bidirectional, reversing polarity reverses color, the same diode emits red or green depending on polarity. Limited quantity.

Two color LED . . . . . $1.50 each,12/$15

UNBELIEVABLE?????

Silicon diode stacks at amazing ratings. Good for 50 Ma.

45,000 PIV	$4.00
37,500	$3.50
30,000	$3.00
22,500	$2.75
15,000	$2.00

Meshna

Postage extra on above. **MESHNA PO Bx 62 E. Lynn Mass. 01904**

Brand New "DIP" Packages

POLY PAKS SMASHES IC PRICES

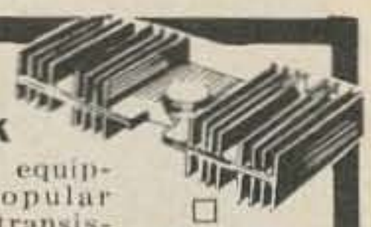
Buy 3 or more, 10% discount — LIMITED OFFER!

• Factory Marked — Order by type number! Spec sheets on request "ONLY" — Buy 100 — Take 20%

	Type	Sale
☐	SN7400	$0.30
☐	SN7401	.30
☐	SN7402	.30
☐	SN7403	.30
☐	SN7404	.35
☐	SN7405	.35
☐	SN7406	.45
☐	SN7407	.55
☐	SN7408	.35
☐	SN7409	.35
☐	SN7410	.30
☐	SN7411	.35
☐	SN7413	.95
☐	SN7415	.55
☐	SN7416	.55
☐	SN7417	.55
☐	SN7420	.30
☐	SN7421	.55
☐	SN7422	.35
☐	SN7425	.50
☐	SN7426	.55
☐	SN7430	.30
☐	SN7432	.55
☐	SN7437	.55
☐	SN7438	.55
☐	SN7440	.30
☐	SN7441	1.40
☐	SN7442	1.50
☐	SN7443	1.50
☐	SN7444	1.50
☐	SN7445	1.50
☐	SN7446	1.65
☐	SN7447	1.45
☐	SN7448	1.50
☐	SN7450	.30
☐	SN7451	.30
☐	SN7453	.30
☐	SN7454	.30
☐	SN7455	.55
☐	SN7460	.30
☐	SN7461	.35
☐	SN7462	.35
☐	SN7464	.30
☐	SN7465	.50
☐	SN7470	.50
☐	SN7471	.55
☐	SN7472	.50
☐	SN7473	.55
☐	SN7474	.55
☐	SN7475	1.00
☐	SN7476	.65
☐	SN7478	.95
☐	SN7480	.65
☐	SN7481	1.25
☐	SN7482	.99
☐	SN7483	1.25
☐	SN7485	1.41
☐	SN7486	.55
☐	SN7489	3.50
☐	SN7490	1.49
☐	SN7491	1.35
☐	SN7492	1.35
☐	SN7493	1.35
☐	SN7494	1.35
☐	SN7495	1.35
☐	SN7496	1.35
☐	SN74106	.95
☐	SN74107	.70
☐	SN74108	.95
☐	SN74112	.95
☐	SN74113	.95
☐	SN74114	.95
☐	SN74121	.60
☐	SN74122	.95
☐	SN74123	1.20
☐	SN74125	.71
☐	SN74126	.71
☐	SN74139	4.50
☐	SN74140	1.25
☐	SN74145	1.55
☐	SN74148	4.50
☐	SN74150	1.61
☐	SN74151	1.25
☐	SN74152	4.95
☐	SN74153	1.60
☐	SN74154	2.10
☐	SN74155	1.55
☐	SN74156	1.45
☐	SN74157	1.55
☐	SN74158	1.55
☐	SN74160	1.95
☐	SN74161	1.95
☐	SN74163	1.95
☐	SN74164	2.95
☐	SN74165	2.10
☐	SN74166	2.05
☐	SN74173	2.50
☐	SN74174	3.20
☐	SN74175	3.20
☐	SN74176	2.10
☐	SN74177	2.10
☐	SN74179	2.10
☐	SN74180	1.20
☐	SN74181	3.95
☐	SN74182	1.20
☐	SN74185	2.50
☐	SN74192	1.95
☐	SN74193	1.95
☐	SN74194	1.95
☐	SN74195	1.25
☐	SN74196	2.50
☐	SN74197	2.50
☐	SN74198	2.65
☐	SN74200	9.95

OVER 1,000,000-PC INVENTORY

HIGH POWER TRANSISTOR WITH HEAT SINK

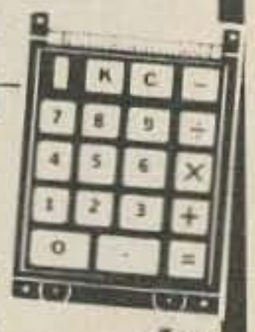


Removed from new equipment! Includes popular 2N174 'doorknob' transistor TO-36, germanium, PNP, 150 watts, VCBO 80V, 15 amps, 40 hfe. For ignition, high power transmitters, etc. Mounted on heat sink 5 x 2½ x 1¼".

☐ $1.49
3 for $3

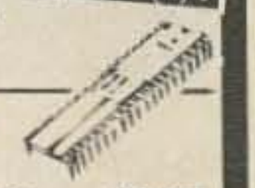
POCKET CALCULATOR KEYBOARD ☐ Only $6.95

3 for $18.



For hand-held units, properly multiplexed for chip CT-5001, 2, 12 or Mostek 5010-12, 18 feather-touch keys, by FLEX-KEY.

CALCULATOR CHIPS ON A "DIP"

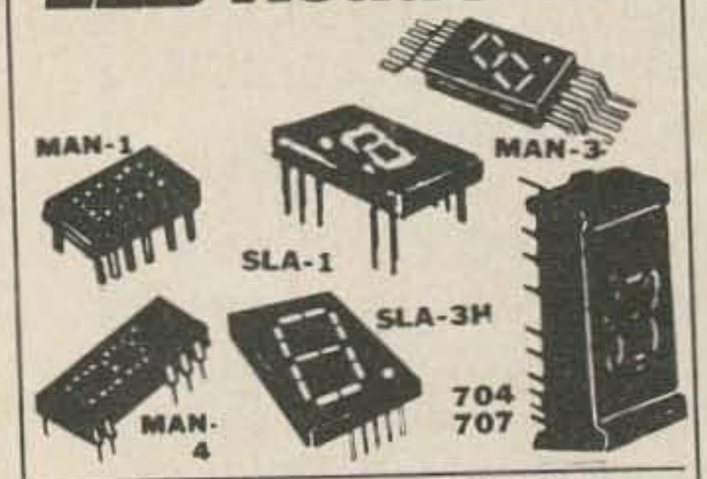


☐	CT5001 12-digits 40-Pin	$6.95
☐	CT5002-9 Volt version of 5001	8.88
☐	CT5005 12-digits 28-Pin with 3-function memory	9.95

CLOCK CHIPS ON A "DIP" as Low as 8.88

☐	MM5311	6-digit 28-Pin	$ 8.88
☐	MM5312	4-digit 24-Pin	8.88
☐	MM5313	6-digit 28-Pin	8.88
☐	MM5314	6-digit 24-Pin	8.88
☐	MM5316	4-digit 40-Pin, Alarm	13.50

7-SEGMENT LED Readouts



(All "LED" TYPES)

	Type	Char.	Each	Special
☐	MAN-1	.27	$3.75	3 for $9.
☐	MAN-3	.12	1.49	3 for $3.
☐	MAN-4	.19	2.50	3 for $6.

REFLECTIVE BAR TYPES

☐	707*	.33	2.50	3 for $6.
☐	704*	.33	2.50	3 for $6.
☐	SLA-1**	.33	2.10	3 for $5.
☐	SLA-3**	.70	4.95	3 for $13.
☐	SLA-11**	.33†	3.50	3 for $10.
☐	SLA-21**	.33††	3.95	3 for $10.

*By Litronix. **By Opcoa, equal to MAN-1 or MAN-4 specs. Color - RED. †Green. †† yellow

LINEAR Op Amps

• FACTORY GUARANTEED • FACTORY MARKED FACTORY TESTED

☐	531 Hi slew rate op-amp (TO-5)	$2.50
☐	532 Micro power 741 (TO-5)	2.50
☐	533 Micro power 709 (TO-5)	2.50
☐	536 FET Input op amp (TO-5)	2.95
☐	550 Precision 723 voltage reg. (DIP)	1.17
☐	555 Timer 2 u Seconds to 1-hr. (A)	1.25
☐	556 5 Times faster than 741C	2.10
☐	558 Dual 741 (A)	1.00
☐	560 Phase lock loops (DIP)	2.95
☐	561 Phase lock loops (DIP)	2.95
☐	562 Phase lock loops (DIP)	2.95
☐	565 Phase lock loops (A)	2.95
☐	566 Function generator (TO-5)	2.95
☐	567 Tone decoder (A)	2.95
☐	702C Hi-grain. DC amp (TO-5)	.49
☐	704 TV sound IF system	1.50
☐	711C Dual diff. comp (A)	.33
☐	723C Voltage regulator (A)	.69
☐	741CV Freq. comp 709 (Mini DIP)	.44
☐	748C Freq. adj. 741C (A)	.44
☐	753 Gain Block	1.75
☐	739-739 Dual stereo preamp	1.98
☐	741-741 Dual 741C (TO-5)	.89
☐	PA265 5-Watt voltage regulator	1.00
☐	ULN2300M Op amp with SCR	1.00
☐	CA3065 Video Audio system	1.00
☐	4136 Quad 741's (DIP)	1.95

Buy 3 or more, 10% discount

(A) TO-5 or DIP dual in line pak

EPOXY FULL WAVE SILICON BRIDGE RECTIFIERS

Code: 2 amp TO-5 case

PIV	2 Amp	6 Amp
50	☐ $.69	☐ $.88
100	☐ .79	☐ .99
200	☐ .95	☐ 1.25
400	☐ 1.19	☐ 1.50
600	☐ 1.35	☐ 1.75
800	☐ 1.59	☐ 1.95
1000	☐ 1.79	☐ 2.25

6 Amp ½ x ½ x 1/16 sq

NATIONAL LINEAR OP AMPS

Buy any 3 — Take 10%

☐	LM-300 POS V.R. (super 723) TO-5	$ .91
☐	LM-301 Hi-performance op amp (A)	.41
☐	LM-302 Voltage follower TO-5	.91
☐	LM-304 Neg. Voltage Regulator TO-5	1.19
☐	LM-305 Pos. Voltage Reg. TO-5	1.19
☐	LM-307 Super 741 op amp (A)	.41
☐	LM-308 Hi-Q fet type op amp TO-5	1.19
☐	LM-309H 5V Volt-Regulator TO-5	1.19
☐	LM-309K 5V Volt.-Reg. 1 Amp TO-3	1.85
☐	LM-310 Voltage-Follower TO-5	1.25
☐	LM-311 Hi-perf. Volt. Comp. (A)	1.19
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☐	LM-320 MINUS 5, 12 or 24V V.R. TO-3	1.50
☐	LM-322 Precision Timer	1.75
☐	LM-339 Quad Comparator. DIP	1.75
☐	LM-324 Quad (4-741's in DIP)	2.50
☐	LM-350 Dual peripheral driver	.41
☐	LM-370 AGC Squelch op amp, TO-5	1.19
☐	LM-371 RF, IF op amp, TO-5	1.25
☐	LM-373 AM-FM SSB I.A.D, TO-5	3.50
☐	LM-374 AM-FM SS IVAD TO-5	3.50
☐	LM-377 Dual 2-watt audio amp	3.00
☐	LM-380 2-watt audio amplifier TO-5	1.69
☐	LM-381 Low noise dual pre amp DIP	1.95
☐	LM-382 Low noise dual pre amp DIP	1.95
☐	LM-703 RF-IF amp, TO-5	.55
☐	LM-709 Operational amplifier (A)	.36
☐	LM-710 Differential amplifier (A)	.45
☐	LM-711 Dual Differential Amp (A)	.36
☐	LM-723 Voltage Regulator (A)	.69
☐	LM-725 Instrument Op Amp	.95
☐	LM-733 Differential Video	1.75
☐	LM-741 Freq. Comp. 709 (A)	.41
☐	LM-741CV Mini DIP 741C	.45
☐	LM-747 Dual 741 (A)	.89
☐	LM-748 Freq. adjustable 741C (A)	.44
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☐	LM-1305 FM Multi. Stereo Dem. DIP	1.25
☐	LM-1307 FM Multi. Stereo Dem. DIP	.91
☐	LM-3028 Differential RF/IF amp	1.50
☐	LM-3900 Quad "current mirror" amp	.95
☐	LM-4250C Programable op amp	2.50
☐	LM-75451 Dual peripheral driver	.44
☐	LM-75453 Dual peripheral driver	.44
☐	LM-75492 Quad seg. driver, LED (DIP)	1.65
☐	LM-75492 Hex digit driver, 250ma, DIP	1.85

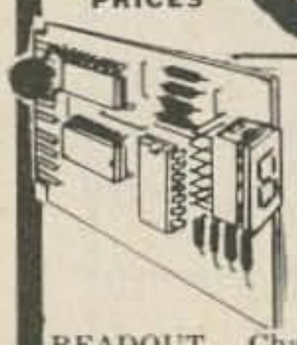
(A) TO-5, Dip or mini Dip

BRAND NEW LOWEST PRICES

GENERAL ELECTRIC 3-WATT AUDIO AMP 3 FOR $6.00 ☐ $2.50

Delivers 3. watts continuous, 10 watts peak. With heat sinks; micro-mini size: ¾x½x½", 9 to 30V supply. High sensitivity, 8 to 16 ohms. For mono and stereo phonos, tape, FM, AM, TV, servo.

LED MITY DIGIT "DCM'S"



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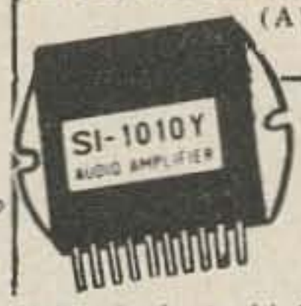
☐ MAN-4	.19 h.	Monsanto
☐ 707*	.33 h.	Litronics
☐ 704**	.33 h.	Litronics
☐ SLA-1*	.33 h.	Opcoa

* Pin-for-pin MAN-1, ** Pin-for-pin MAN-4, elec. char. same



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Mfgr's Type	Watts	Sale
☐ SI-1010Y	10	$ 8.88
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- ☐ Control Signal 80
- ☐ Cornell 78
- ☐ Cushcraft 79
- ☐ DA Products 68
- ☐ Data Eng. 44
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- ☐ Freck 49
- ☐ Gateway 31
- ☐ Glade Valley 62
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- ☐ Godbout 83
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- ☐ Jan 41
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J.H. Nelson

Good (open) Fair (□) Poor (O)

June - 1974

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7	7	7	7A
ARGENTINA	14	14	14	7A	7	7	14	14	14	14	14A	14
AUSTRALIA	14	14	7A	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7A	14	14	14	14	14
ENGLAND	14	7	7	7	7	7	14	14	14	14	14	14
HAWAII	14	14	7A	7B	7	7	7	7	7A	14	14	14
INDIA	7	7B	7B	7B	7B	7B	14	14	14	14	14	7A
JAPAN	14	14	7	7	7	7	7	7	7	7	7	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	7	7B	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	7	7	7	7	7	7	7	7A	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	14	14	14	14	14	7B	7B
U. S. S. R.	7	7	7	7	7	7	7	7	14	14	14	7A
WEST COAST	14	14	7A	7	7	7	7	7	7A	14	14	14

CENTRAL UNITED STATES TO:

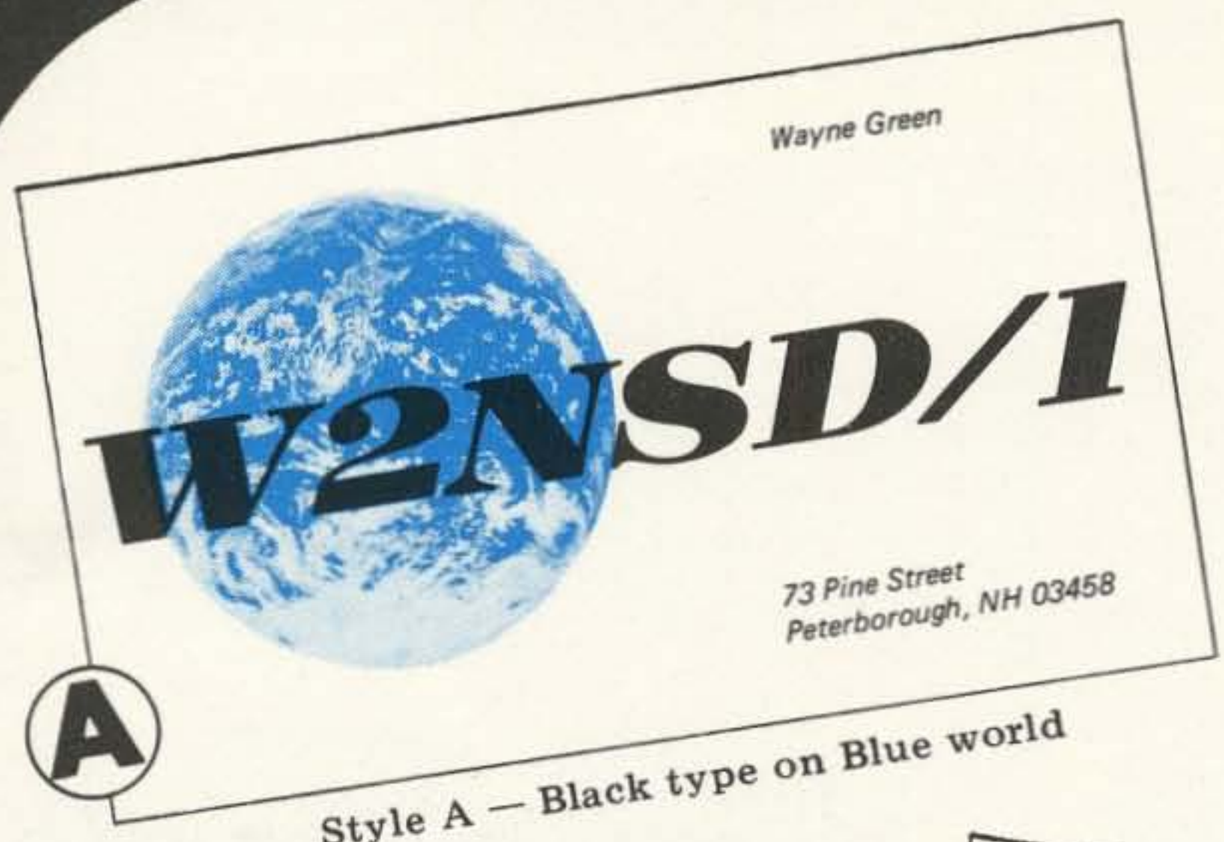
ALASKA	14	14	14	7	7	7	7	7	7	7	7	14
ARGENTINA	14	14	14	14	7	7	7A	14	14	14	14A	14
AUSTRALIA	14	14	14	7A	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7	7	7	7A	14	14
HAWAII	14	14	14	7A	7	7	7	7	7A	14	14	14
INDIA	7A	7	7	7	7B	7B	7B	7	14	14	14	14
JAPAN	14	14	14	7	7	7	7	7	7	7	7	14
MEXICO	14	14	7	7	7	7	7	7	7	7	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	7	7	7	7	14
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	7B	7B	7A	14	14	7	7
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7A	7	7

WESTERN UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7	7	7	7
ARGENTINA	14	14	14	14	7	7	7	7A	14	14	14	14
AUSTRALIA	21	14A	14A	14	14	7	7	7	7	7B	14	14
CANAL ZONE	14	14	14	7	7	7	7	14	14	14	14	14
ENGLAND	7A	7	7	7	7	7	7	7	7	7A	14	14
HAWAII	14	14A	14A	14	14	7A	7	7	7	14	14	14
INDIA	14	14	14	7B	7B	7B	7B	7	7	7	7	14
JAPAN	14	14	14	14	14	7	7	7	7	14	14	14
MEXICO	14	14	7	7	7	7	7	7	7	14	14	14
PHILIPPINES	14	14	14	14	14	7B	7B	7	7	14	14	14
PUERTO RICO	14	14	14	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	3A	7	7B	7B	7B	7B	7A	14	7A	7
U. S. S. R.	7	7	7	7	7	7	7	7	7A	7	7	7
EAST COAST	14	14	7A	7	7	7	7	7	7A	14	14	14

A = Next higher frequency may be useful also.
B = Difficult circuit this period.

QSLs for 1¢



Style A — Black type on Blue world

- two styles
- QSO info back
- two colors
- LOW PRICES

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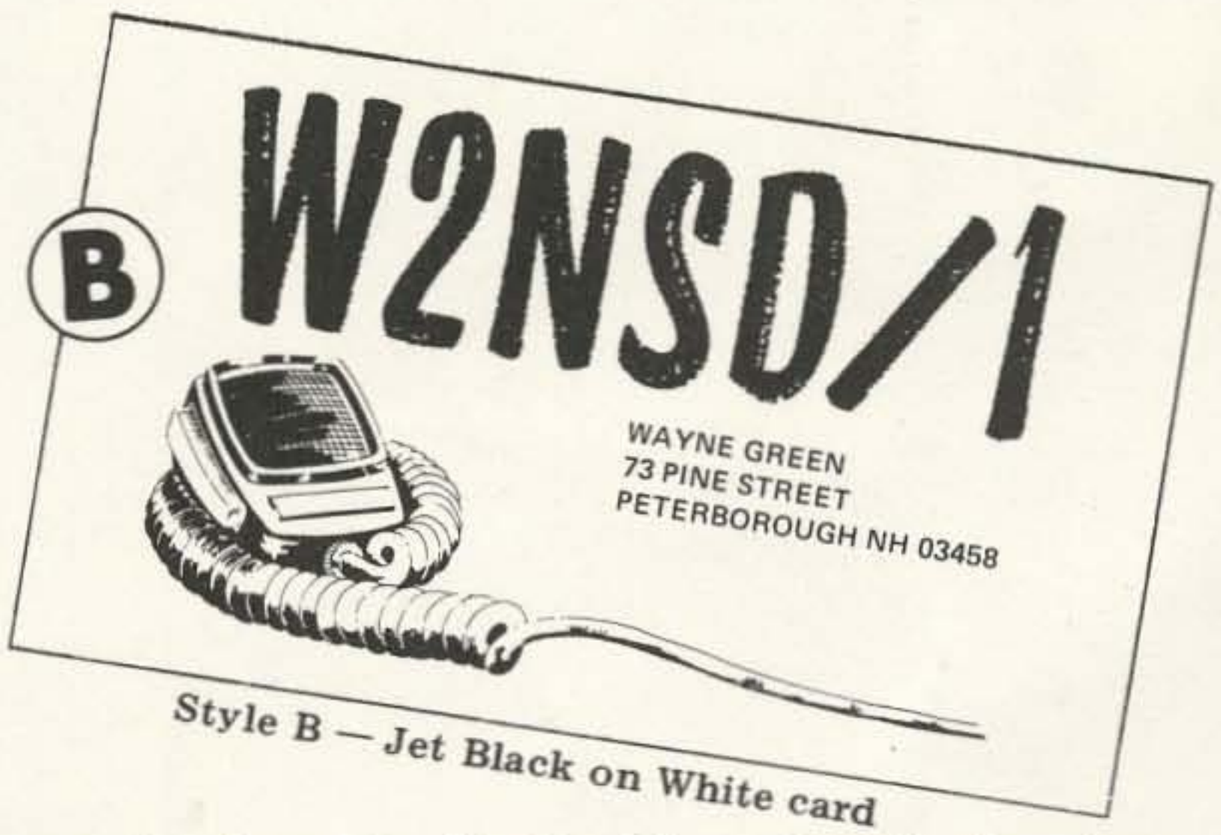

Style B — Jet Black on White card

ORDER — AND PAY
250 . . . . . **$6** (2.5¢ ea)
500 . . . . . **$10** (2¢ ea)
1000 . . . **$15** (1.5¢ ea)
2000 . . . . . **$20** (1¢ ea)

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☐☐☐☐☐☐☐☐☐☐☐☐☐☐ *ORDER BLANK* ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name _____ Call _____
(First and last name is most friendly)

Address _____
(as brief as possible and still get through the mail)

City _____ State _____ ZIP _____ County _____
(a must) (if desired on the card)

Awards to be listed on card _____
(if desired)

Style
A ☐
B ☐

☐ **250** ☐ **500** ☐ **1000** ☐ **2000** cards

Amount enclosed $_____

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WITH PRIORITY CHANNEL FEATURE

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