73 magazine
for radio amateurs

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April 1974

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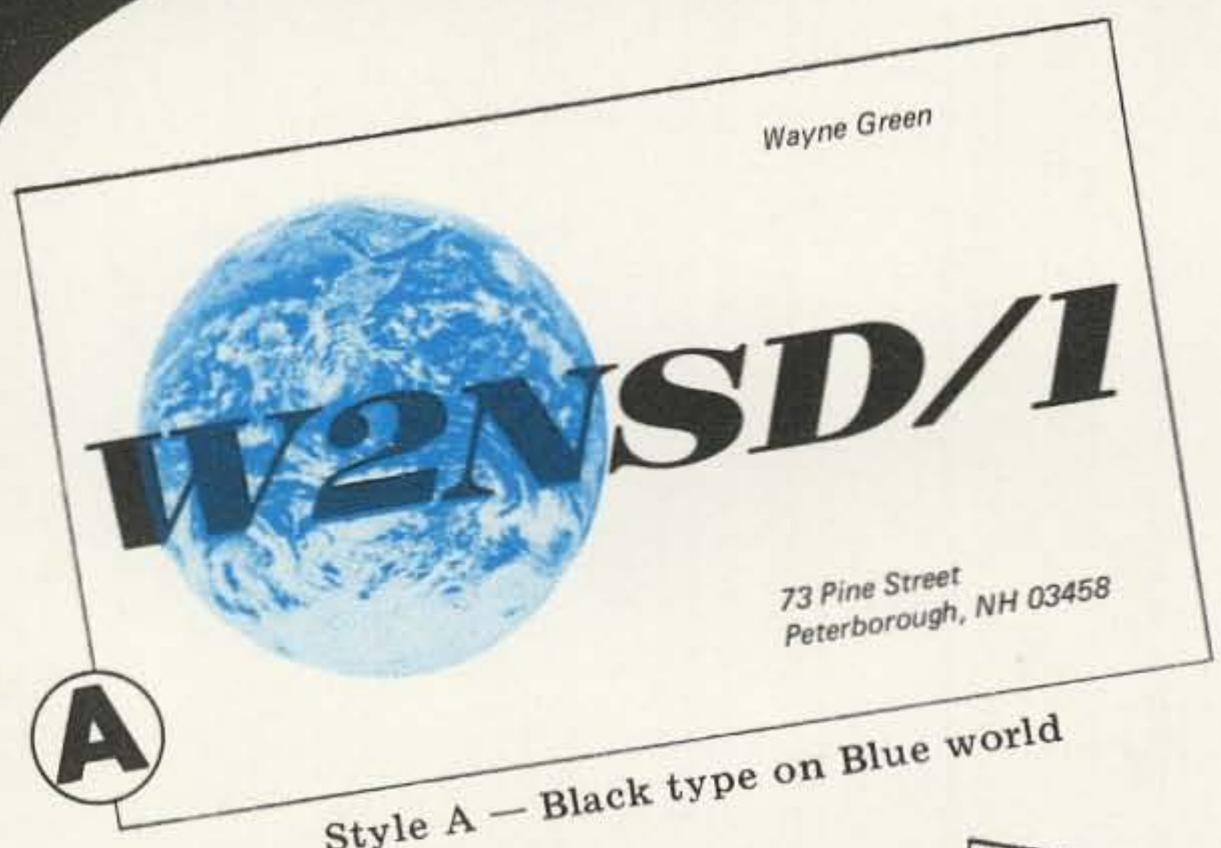

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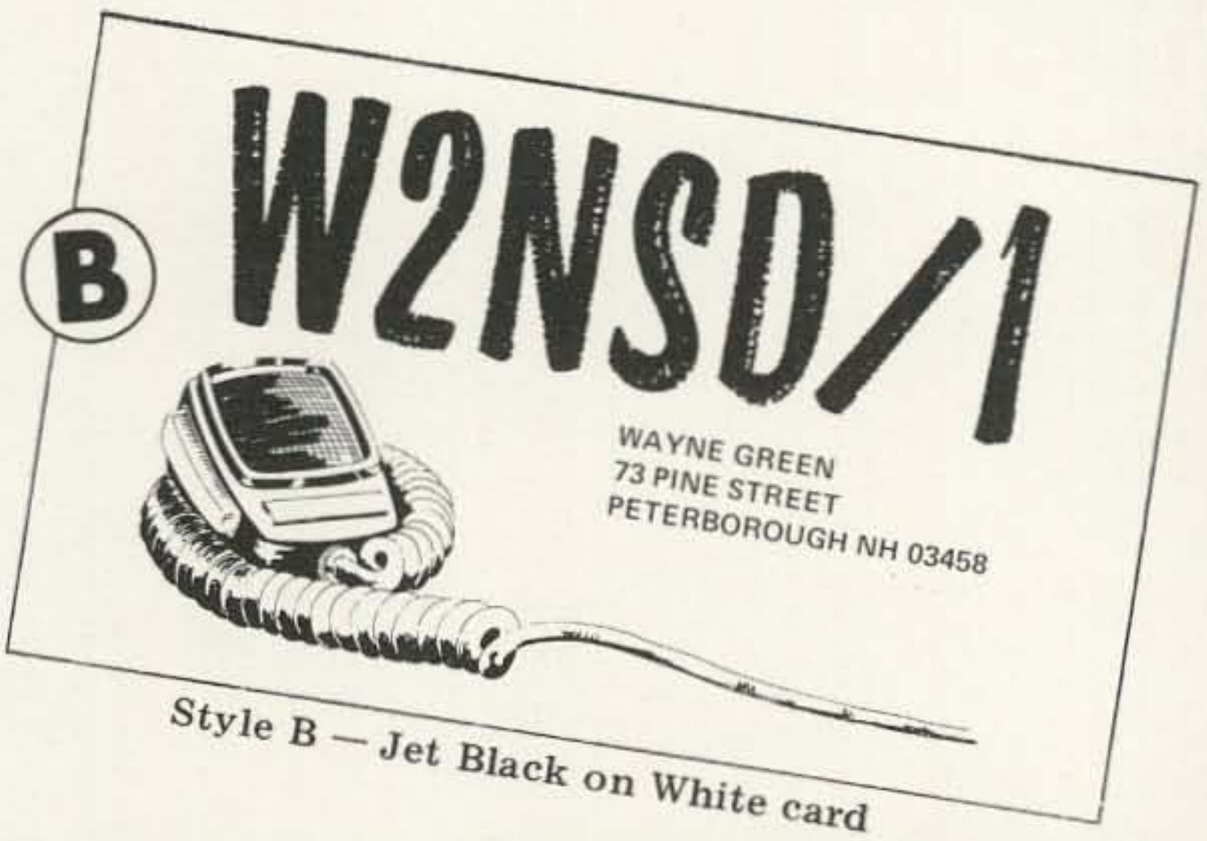

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73 magazine
for radio amateurs

163 APRIL 1974

CONTENTS

COVER: Dannine Trapp with WR6AAA, the first repeater in the U.S. to be licensed for remote control. (See cover story on page 93.) The repeater is on Catalina Island, 26 miles off Southern California and is one of the busiest repeaters in the world. The Standard RPT-1 repeater and TPL amplifier setup was sponsored by Ted Henry W6YEY.

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $7 for one year in North America and U.S. Zip Code areas overseas, $8 per year elsewhere. Two years $12 and $13 overseas. Three years, $15, and $16 overseas. Second class postage paid at Peterborough, New Hampshire 03458. Phone: During office hours 603-924-3873, other times there is a tape recorder for messages on 603-924-3883. Microfilm edition of 73 available from University Microfilms, Ann Arbor MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904.

NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

WHAT IS TAX REVOLT ALL ABOUT?

Why are thousands upon thousands of Americans — loyal Americans — risking troubles with IRS by refusing to fill out the 1040 return? And, more to the point, are they getting away with it or is the IRS moving in and confiscating their property and throwing them in jail?

There are several reasons why this is happening. Some people are fed up with the high cost of government, and their complaints have a lot of substance. Some object on constitutional grounds, and it seems likely that their objections would stand the test of the courts, if they could get a hearing. . . which is unlikely. Others are fighting the unfairness of the income tax system, which is riddled with tax loopholes for special interests, the result of which is that the tax falls almost entirely on the small taxpayer while big business and the rich go free.

So we have the scene of the IRS concentrating on the people not protected by special laws and large campaign contributions: the small businessman and the small taxpayer. The result is no contest. . .73,000 IRS employees spend over 1½ billion dollars a year and use every means at their disposal, fair or foul, to give the taxpayer the works. Compare that with the post office which has 618,000 employees and a smaller budget! Those are 1973 figures, by the way.

How much of a case do the people have who are opposed to government waste? There have been a lot of books on the subject, and many official studies (which have been largely ignored by the administration) of ways of cutting down government. One measure which might be of interest is the cost per capita per year for the federal government. In 1800 the cost was $2 per capita! In 1820 it went down to $1.90. In 1840 it was $1.85. By 1900 it was up to $7.50. 1940 saw it up to $41.10 each. Just five years later it had gone up to $320 per capita as the Roosevelt administration put hundreds of thousands on the government payroll. In 1960 it was up to $522 and last year it went up to $1365 for each person in the country!

That's quite a growth. . .reminds one of cancer. Unfortunately, firing people doesn't get many votes, so government grows and grows and grows.

There has been a basic change in who is paying the bill. It has gradually changed from industry picking up most of the tab (80%) to the middle income taxpayer, who is now shouldering 80% of the tab. This has been gradual as industry has been able to get Congress to rewrite the tax laws, bit by bit, via contributions to election campaigns, well heeled lobbyists, and payoffs. Unfortunately there has been no well paid lobbyist for the taxpayer, and the result is the present system, which takes about 50% of your income in taxes of one kind or another.

Now, what about that business of the constitution? The argument is that the income tax law violates several constitutional guarantees, the primary being the Fifth Amendment which is supposed to protect Americans against being compelled to bear witness against one's self. The 1040 return, which bears no Miranda warning, clearly violates that amendment. When you fill that out and sign it without crossing out the perjury clause at the bottom, you have born witness against yourself and the IRS can put you in prison. The mere threat of this has forced tens of thousands of citizens to pay whatever the IRS demanded of them, right or wrong.

A number of tax revolt believers have been submitting the 1040 with the perjury clause crossed out and no figures — just their name and address. One of these was taken to court by the IRS and, on September 28, 1973, he won the case. The IRS produced 155 witnesses to prove that the defendant had received an income of over $21,000 during 1968-69-70 and had filed no information other than his name and address. The jury deliberated 15 minutes and returned a verdict of not guilty. After the verdict the prosecuting attorney was reported to have said that if people discover that tax strikers are winning, it will cost billions in lost taxes.

The fourth amendment is supposed to protect you against search and seizure, yet the IRS has made it a practice to come in and seize records and property without court action. This can happen only if you don't know your rights. The IRS has no right to see your records, cancelled checks, etc., without a court order describing in detail exactly what they are to see. . .if it is a check the order should give the date, number, who it is made out to, and the amount, etc.

The IRS works on gall and fear. With the IRS code to back them up, agents feel free to void the constitution, including amendments IV, V, VI, VII, VIII, XIII. Many parts of the IRS code would never stand the test of a court showdown, so agents are very careful about which cases they permit to go to trial and which they settle out of court. As it stands now the taxpayer must bear the entire cost of a trial when the IRS prosecutes him, and that holds whether he is proven guilty or innocent! Even if the taxpayer sues the IRS to get back money taken illegally he must pay all court costs. Further, if the IRS decides to assess you, you are not permitted to take them to court to prevent the assessment. And this is despite the 7th amendment which states that in any matters where the controversy shall exceed $20 the right to trial by jury shall be preserved.

Well, this could go on — it is appalling. A new edition of "Tax Revolt: USA" is available from Liberty Lobby, 300 Independence Avenue, SE, Washington DC 20003 for $5 (unless there has been a price increase).

There is a growing literature of tax revolt. We'll try to keep you informed on what is happening in this field.

One of the basics of keeping the IRS off your back is to be informed about how they work and what their limitations are. Remember that when an agent contacts you to go over your records he could easily be a special agent looking for material to put you in prison. This is particularly important if you have any possible enemies in government or with good friends in government. Remember that sad experience has shown that there are agents who will use every dirty trick known to do you in. When you talk with them. . .if you really feel you have to. . .take along a witness or two and a tape recorder. They will probably drop the whole matter rather than let you make a recording. They have no right to stop you from making a recording. Remember, Miranda warning or no, when you talk with an agent you are confessing and can end up indicted for fraud.

The 1040 return is so complicated and backed up by so many contradictory laws that no two IRS agents can agree on what tax is due in most cases. This makes you a sitting duck, if you fill out the form and sign it, complete with perjury clause. The only law you

have on your side is the law of averages. . . unless you have a sizeable refund coming, the chances are you won't meet your friendly agent. But once you do meet him – watch out!

NEVER EXTEND

When the IRS came to me and asked for an extension, I in turn asked my local lawyer what to do. He said to sign the extension. I have now good reason to believe that I was seriously mislead. Had I had any understanding of the situation and not just depended upon my lawyer for counsel, I would never have signed the extensions.

Just recently there was a case where the Tax Court threw out an extension which was obtained under duress. A plumber won about $28,000 in the Irish Sweepstakes and his lawyer helped him file his tax return in which he averaged the income, a standard technique. Three years later, just two weeks before the time ran out for the IRS to audit the return, an agent called and said he wouldn't allow income averaging on the winnings of wagering. The plumber answered that the ticket was a gift from his brother and not a wager. The agent threatened the plumber with seizing his property if he wouldn't sign the extension, so he agreed.

The court ruled the extension invalid and the plumber didn't have to pay any extra tax.

If you are faced with a demand for an extension, consult a tax attorney, not a family lawyer. Beware of the IRS agents, they have no good things in store for you.

PUNISHMENT BY IRS

When the Justice Department was anxious to get a witness to testify before a grand jury they were apparently able to get the local IRS district director to assess the witness for $1,542,000 and immediately seize his home, automobiles and bank accounts. The witness went to the U.S. District Court and asked for an injunction to stop the IRS, charging the deficiency was a phony to harass him and coerce him into testifying on the other case. He got nowhere until he worked up to the Third Circuit U.S. Court of Appeals, where he finally got an ear. This court instructed the District Court to consider the complaint.

How can IRS get away with things like this? Apathy on the part of the people is responsible. If concerned taxpayers would raise hell – write to Congressmen, newspapers, and protest, these things would be stopped. We get mad when the military dictatorship in Greece pulls stunts like this, but we put up with it when it happens right here in the U.S.

RADICAL CHANGE NEEDED

Many people who have carefully investigated the whole tax setup believe that it is time to sit down and work out a whole new system – one that will be fair for the average man and small business. Is there any good reason why big business should be able to get out of paying taxes almost entirely? And how about the big salaried executives who pay little or nothing? If the load of taxes was split more equitably it would be a lot less strain on the average taxpayer, even without cutting down on the enormously overgrown government.

Most of the systems of taxing that have been proposed would enable the country to do away with the IRS. Getting away from the system that has developed where special interests have been able to sway legislation to protect themselves, leaving the load for the groups without the power, would be a good idea.

This is not to say that it would not be beneficial to cut back on government spending. Many top economists have estimated that the current budget could be cut in half and little in services would be lost.

MORE READER'S STORIES

Another 73 reader called with an IRS harassment story. Seems he was an employer at the time and got a call from the IRS. They claimed that he had not sent in his withholding tax collections for the quarter. He said that he had, and had the records to prove it. They said they had no record of it and if he didn't pay up imediately they would padlock his place. The withholding came to $4200 and the fine was $6100, a total of $10,300 they wanted right on the spot. . .or else.

He managed to come up with the money. Eventually the IRS did get their records straightened out and returned the money, but they left a lot of grey hairs behind them.

And how about the reader who decided the only way he could go was to pay off the IRS at so much a month -- it was just too expensive to fight. So he has to wait for the form to send in with his check each month. But the form often comes so late that it is not possible to meet the deadline, making him liable for a fine. If he sends in the check without the form the IRS does not post the payment and sends him a notice of default, with payment due within 10 days. . . or else.

IRS, CONTINUED

More and more readers are sending in stories of their brushes with the IRS. . .and some of the tales are truly frightening. You may be sure that these will be kept confidential, if you have any news of general interest to the readers along this line.

Several readers have brought this series on the IRS to the attention of their local papers and edited versions of the IRS editorials are being furnished for syndication. In these most of the references to 73 Magazine are removed since paper readers wouldn't understand what 73 is. The more outlets for this information there are, the more likely it is that the IRS will have to back down on the gestapo tactics. You can help.

CHOPPER ONE FLAP

The story in the TV Guide about the February 7, Chopper One program got the 73 phone ringing. It was about an invalid ham operator who bootlegged on the police band with false distress messages. Obviously we didn't need any bad PR like that. . .coast to coast and seen by millions of impressionable kids of all ages.

I tried calling the ABC network in New York and appealing to their better nature with helpful suggestions of multi-million dollar libel suits on behalf of all amateurs, international boycotts of participating sponsors' products, and things like that.

Then I got on 20m and got amateurs all around the country to call their local ABC station and put the screws on as tight as they could locally.

The program went on as scheduled, complete with bootlegging ham raising hob on the police band. It seems that there was this bored twelve year old ham, K6XEG, who found the ham bands dead during the daytime and thus was unable to prevent himself from tuning up on the police (and other bands) and putting in false alarms. His mother wrung her hands, explaining that he was a nice boy, but she couldn't do anything with him.

Guess what ham, after being given a sharp tsk-tsk by the police after sending Chopper One on a wild goose chase to an exploding refinery, just happened to overhear some crooks planning a heist using CB communications? Our ham hero, unable to bring himself to use the telephone when he can zap the police radios, passed the word along to Chopper One direct.

As per Aesop, the police were not all that anxious to buy the story until the kid patched the CB channel through on the police radio for them to hear for themselves. The baddies were caught and the kid given a Chopper ride. They should have thrown him out over Disneyland.

Come on you Californias, don't let these stupid things happen on television. The next time you hear that a ham episode is being put together

SSTV SCENE

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

Recently, I briefly described research being conducted on the Slow to Fast Scan converter by a group of U.S. hams. Since then I have also received word from Bill Montgomery VE3GZM, and John Vandenberg VE3DVV, on a similar scan converter unit they have been building for feeding Slow Scan into a regular (Fast Scan) TV. Although the two groups have not been in contact with each other the converters are quite similar. The Canadian version is shown in Fig. 1, considerably simplified, naturally. Logic Gating, 2 speed clocks, write/recirculate logic, etc. would be required.

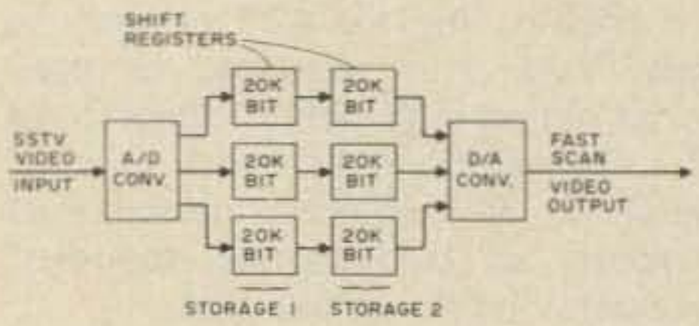

Fig. 1, Canadian version of the Slow to Fast Scan converter.

However, this gives you a fair understanding of how Slow to Fast Scan conversion can be accomplished. The picture is converted into binary code, loaded into "storage 1" at a slow rate, shifted into "storage 2" where it is read out and recirculated at a fast rate, while the next frame loads "storage 1." The D/A converter converts the binary code to Fast Scan video. The unit differs from the U.S. version in that a picture can be viewed from "storage 2" while the next incoming picture is loading "storage 1." Bill and John plan to have a working prototype at the Dayton Hamfest, and would like to hear from any interested parties. Possibly they will be able to furnish descriptive information to seriously interested individuals. Bill's address is 222 Park Row S. #6, Hamilton 24 Ontario, L8K-2K5. The day of the Slow Scan monitor, as we know it. . .with P7 crts and high voltage supplies, may well be on the way out with replacements being converter units that connect between your receiver and, maybe, (visualize this) a large "wall tv." But don't take this wrong. . .shift register storage units are still presently too expensive for commercial manufacturers to use. Hams can build these units using surplus memories because their units do not demand 100% reliability.

Incidentally, I have just heard over the air that WB9LVI, has a digital slow to fast scan converter working, and his unit interfaces to an oscilliscope, rather than a tv. This was sort of a surprise because very few people even knew he was working on a scan converter. His approach eliminates the need for generating a "channel 5" tv signal, at the expense of requiring an oscilliscope. . . interesting. I hope to have more information on his unit soon.

I wonder if you have considered using your camera as a common Slow Scan generator for other video sources like, for example, a Flying Spot Scanner? One suggestion for accomplishing this is shown in Fig. 2. Sync *pulses* could be taken from the camera to trigger the extra sweep circuits in the Flying Spot Scanner, and a SPDT switch added to the camera would select either the internal or external video input. The "output level" pot would be adjusted to equal the signal level from the camera's previous stage. High voltages (excluding accelerator and phototube voltages which could be obtained from a simple flyback oscillator unit) might also be obtained from the camera in some cases. Although I never ran into the problem of two sweep circuit inputs loading down a pulse generator, (sync circuits). If I had a simple one transistor dc amplifier with an input resistance of about 250KΩ for isolation, it would have overcome the problem. (It could even invert if you had the wrong phase polarity.) I rigged up an arrangement somewhat similar to this a while back when building my 12" monitor. I was not sure about how bright or sharp the picture would be, or if my yoke would line up properly. (Actually, I was too anxious to see a 12" picture!) So I paralleled my newly built sweep circuits with the ones in my W6MXV monitor, applied voltages from some other circuitry I was also testing, and it worked fine. In fact, the next time I have the 'MXV' monitor down, I plan to add "sync pulse output" jacks to the unit for testing future circuits or simultaneously running two picture tubes off one monitor. By employing the previously mentioned ideas, one should be able to expand his present Slow Scan gear at a minimum of cost and effort. After all, why build unnecessary circuitry, eh?

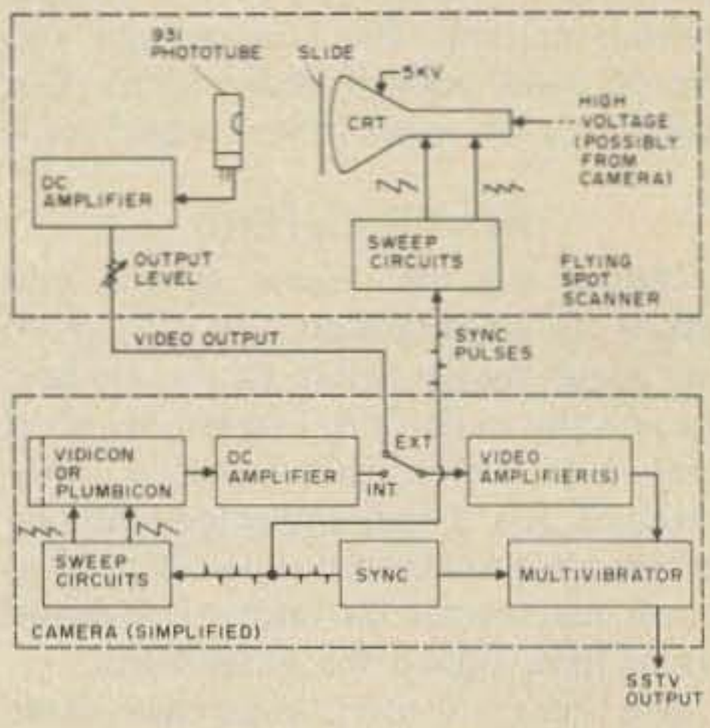

Fig. 2, Schematic of how you can use your camera as a common Slow Scan Generator.

The WØLMD Slow Scan TV Keyboard is really catching on, and quite a few of the fellows have presently built working copies. I understand VE7JA is producing pc boards on the unit for a reasonable sum, and that Meshna Electronics in Massachusetts has ASC11 keyboards. . .some as low as seven dollars. (Surplus. . .better check them before buying them at that price.) It looks like the keyboard is destined to become a real "biggie."

Don't forget the Dayton bash coming up later this month. There's quite a bit of Slow Scan activity planned and it looks like some revolutionary ideas may be revealed. In fact, I have *just* received word Robert, WØLMD, has his Slow to Fast Scan converter going and is watching Slow Scan pictures on a regular tv. The unit uses 130 ICs, and Robert will have it at Dayton!

K4TWJ

This month's picture shows the elaborate setup at W6KZL. Glen is an old DXer with a top country score and an impressive mobile DX record to boot. He, like many of us, has found Slow Scan TV the "most fascinating mode" of today. The Robot Camera is on the left and looks either at the operating position or into the box below the camera. The box houses four 60-watt lamps on a variac and an adjustable shelf. Next is the 10" W6MXV monitor and below it is the homebrew flying spot scanner on the left and 5" MacDonald monitor (note viewing hood) on the right. Moving on around is the Sony Cassette Deck, 75S-3 receiver and Swan 500-CX. The unit above the 75S-3 is a 4-1000 kw linear. Power supply is in his garage (!).

50 MHz BAND

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LOOKING WEST

A 34/94 repeater is on the air in L.A. – on 220 MHz, that is. While much of the planned activity for 1¼m came to a screeching halt when we heard that the upper part of the band was to become a citizens radio service, not everyone was scared off by the news. It is a fact that there is probably more 220 FM activity in L.A., than in the rest of the country combined. We have five open repeaters on that band, the latest of which is the proud work of Warren Andressen WA6JMM. Warren originally started the project with Bill Duhaime WA6NTW, of ICOM FM Sales in L.A. Due to an unexpected increase in his workload, Bill had to actively drop out of the machine's development for a while. But Warren carried it on and now has a working system that all reports say is top notch. By the time you read this the repeater will be installed in its permanent home some 1200' above the L.A. basin and open to all who wish to use it. Thanks to Warren's craftsmanship and Bill's site, another inroad has been made in the effort to keep 220 in the amateur service.

SOS can stand for more than just what we have become accustomed to having it mean. Recently, it became the unofficial name for a new simplex users group that is in the process of forming. *Save Our Simplex* is made up of those amateurs that feel repeaters are beginning to encroach on too much of the available band spectrum and feel that their voice has gone unheard in FM's development. The initial aim of this organization is to oppose the establishment of the disputed 34/94 repeater in the Los Angeles area. They have a further goal, though, of protecting well established simplex channels from being repeaterized. Again, it must be emphasized that there are almost as many hams on simplex out here as there are repeater operators; not all amateurs are repeater oriented. Simplex, as well as remote-base operation on simplex channels is a well established way of life in and around L.A., and many want it to continue. Though the organizational name may change, at present a committee is hard at work writing a charter and set of bylaws for the group. I suspect much more will be heard from them since they constitute a considerable part of the L.A. FM scene.

WA2HVK/6

WB4EOW wrote in mid-January inquiring as to where he might find an SB-II0 for sale. A week later I received another letter saying he had found one. Ron says the January contest was a failure from Huntsville, Alabama. He heard some good scatter but with only a single 6146 and four elements at 35' he couldn't make the grade. He did manage 11 groundwave contacts in four states. W8CCI was the high point of the contest, running S7 on groundwave into the converter/2B receiver.

WA7ECY writes from Gresham OR that he runs an SB-110 and 6 elements on SSB and also has AM and FM capability on 6m. Scott lists 40 contacts in 8 states during January. Best DX for the month was WB4GIJ in Memphis TN. Scott mentions excellent success in working Southern California on scatter during weekends. Neighbor K7ZCB is running a TR-6 and 6 elements. Newly active in the vicinity are WA7WVN in Portland proper and WA7RED across the Columbia River in Vancouver WA. It sounds like Portland is becoming a hot bed of activity.

The latest SPESM newsletter suggests that anyone interested in the passage of HR3516 (authorization for the FCC to require filtering in TV sets to eliminate interference from amateur and CB operating within their assigned allocations) write The Honorable Harley O. Staggers, Chairman, House Interstate and Foreign Commerce Committee, 2366 Rayburn Building, Washington DC 20515, to express their views. I have also received a copy of a petition calling for passage of HR 3516 from WA9UBI. If you want to put an end to the majority of TVI complaints by requiring manufacturers to design to a quality standard rather than a price this is your opportunity. Write your letter or petition, talk it up on the air, bring it up at club meetings. Only by massive reaction do we stand a chance of passage.

Ray K5ZMS/5, says SMIRK has grown to 62 members in 14 states and 2 foreign countries. When membership reaches 100 an additional awards program will go into effect for contacting 100, 250, 500 and 1000 members. The Texas SMIRK net meets at 8PM Central on 50.2 with 50.175 as alternate. Additional state nets are planned as membership allows. To become a member you must contact 6 current members and send their call, SMIRK number, date and time of contact along with $2 to cover printing and postage to Ray at 7158 Stone Fence Drive, San Antonio TX 78227. In return you will receive your membership certificate, SMIRK number and a copy of the club by-laws. There is no additional fee for the awards program.

Spectrum International, P. O. Box 1084, Concord MA 01742, distributes the Microwave Module Ltd line of converters for 50 through 1296 MHz. The manager of that organization was kind enough to provide a sample 6m receiving converter, the MMc 50, for evaluation. Over a 30-day period the converter was used on groundwave, scatter and Es. The results were very good in all cases. Sensitivity and noise figure were excellent when used ahead of a popular transceiver tuned to the 10m i-f. Dual-gate protected MOSFETs are used in both the RF and mixer stages while a bipolar is used in the oscillator. All the transistors are "made in U.S.A." types, should replacement ever become necessary there would be no problem in finding spares. The converter is housed in a die cast box with BNC fittings for RF connections and feedthroughs for the power supply. The printed circuit board quality and workmanship are as good as you will find anywhere. The entire design and construction are well carried out and leaves little to be desired.

There are several options available among which are an oscillator output for frequency measurement or use in a transmitting converter and special low noise figure units, though the latter would be gilding the lily for 6m where external noise predominates. I am told that Spectrum International measuring equipment which is put to work to wiring the last little bit from each unit.

The specs at a glance are:

Size	11.43cm x 6.35cm x 3.18cm
Power Requirement	12VDC @ 20mA
Impedance	50Ω in/out
N.F.	2.5dB
Gain	32dB
Price	$53.70 F.O.B. Concord MA

WAØABI

INTRUDER CHASE

Jonathan Tara WB8DBN
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Detroit MI 48235

In this month's column there are two Intruder Chase lists. The first list is of every Intruder except Radio Moscow. Radio Moscow's operations on the 40m band are so extensive that I have included a separate listing of them. If you know of any corrections to be made in either list, let me know so that I can update them.

The RM 7240 transmission is being jammed *very* effectively by someone. When I called the FCC to find out where the jammer was, they said that they "couldn't give out that information." I thought we stopped jamming back at the Bay of Pigs.

This is one of the big reasons for the Intruder Net. If the FCC won't tell us where they are, we can find out for ourselves. When we do, *someone* is going to be embarrassed. Jamming of this type won't help anything. Since RM knows that it is intentional, they will continue their transmissions on this frequency to protect their other ones. However, if they get complaints that SWL's are not hearing them through the hams, hopefully they will give up the entire 40m band. Unfortunately, during the early part of the transmission to the U.S. *all* of RM's non-40m frequencies are effectively jammed. Obviously, we will have to concern ourselves with these jammers, before we can convince them to give up 40. Except for the 7240 jamming (sweep type) and an occasional "noise" jammer on 7280, the 40m transmissions are clear. Possibly the others are done by VOA stateside transmitters which can't legally go on 40, so that's why they are so clear. This is purely conjecture, but the most likely country to jam transmissions to the U.S. is the U.S.

I tried the W2EEY active DF antenna from the October 1973 issue of 73, but was extremely disappointed with it. The antenna works better without the transistors than with them. . .I'll try a modification of the ARRL 80m DF antenna in the ARRL Antenna Handbook for 40, and report on it next month if it works well.

The Association of North American Radio Clubs has started up a frequency coordination committee. They will recommend frequency changes to broadcasting stations to avoid conflicts between interfering or potentially interfering stations. Hopefully they will be able to give us some help on 40m.

A new one I'd like some reports on is the Swiss Broadcasting Company on 3985, with an *omnidirectional* antenna. I think we have a case here, because of the antenna, even though broadcasting is legal between 3.9 and 4.0 MHz. The transmission I heard was in English from 0700 to 0730. Also, a new (as far as I know) intruder is now on 7095 from 0500 to 0530 Sunday UT (Saturday Local) in French with no interval signal. Maybe someone out there who knows French can identify this one. I have a tape if someone wants to translate it. However, it is quite loud. The only thing listed on this frequency is Tirana and Peking, and it doesn't sound like either one of these. Also, the 7064.5 transmission from R. Iran seems to have been discontinued. The numerous Chinese transmissions at the bottom of 40m are starting to come through on the East Coast. . .now I know what it's like on the West Coast.

Congratulations to the ARRL for their handling of the RTTY mess on 20m. I guess this was enough to push them over the edge into action for a change, rather than sitting there collecting information. This signal seems to have settled in around 5.8 MHz, a comfortable distance from 20m.

It seems that a lot (if not most) of Russian military communication is carried on in CW, much of it in ham bands. Quite often the stations are "disguised" as hams by using a call similar to U.S. ham calls. However, the Russian military is either incredibly stupid or else they don't deliver callbooks to Siberia. They can usually be distinguished by their "funny sounding" calls. Like, would you believe a two letter WB6 call. . .? If you work CW look out for this type of thing. Many times hams have been heard trying to QSO these stations, unknowing of what they really were. Needless to say, they won't answer! I have heard stories about hams learning enough about their net procedures to actually check in and send them on a wild goose chase, but I'm not recommending this!

If you haven't tried a QSO zero-beat with a broadcaster (dubbed "carrier riding" by K6KA) give it a

INTRUDER LIST

Frequency Actual	Listed	Station	Time	Language
3952	X	BBC[1]	0545-	English
7050		R. Cairo (V. of the Arabs)	0300-0800	Arabic
7063	7065	R. Tirana	2200-2230	English
"	"	" "	2230-2300	French
"	"	" "	0000-0030	English
"	"	" "	0100-0200	Portugese
"	"	" "	0330-0400	Arabic
7064.5 (WC)	"	R. Iran	0200-2000	
7075		R. Cairo	2100-2355	Arabic
7090		R. Tirana	0430-	
7095 (WC)		R. Peking (Home Service)	2038-1615	
7100		R. Station "Peach & Progress"[2,3]	0000-0030	English
"		Trans World Radio[2]	0720-0850	English
7120		R. Peking[3,5]	0000-0055	Spanish
"		R. Peking[4,5]	0100-0155	English
"		R. Peking[3,5]	0200-0255	Spanish
"		R. Peking[4,5]	0300-0355	English
7150		BBC[1]	0545-0915	English
7240		BBC[1]	0545-0915	English
	7260	BBC[3]	2200-0015	Spanish
	"	BBC[6]	0015-0415	Spanish
21450		Voice of America[7]	1520-2000	Russian

1 "Australian" Service
2 Lower sideband extending into exclusive amateur portion
3 Latin American Service
4 North American Service
6 Tirana Relay
7 Beamed to Northern part of South America
8 Splatter to 21435 (SSB)

WC Most likely only heard on the West Coast.
X The transmission is not included on the stations schedule.
A blank under "Actual" means that the transmission is listed in the station's schedule but has not actually been heard.

RADIO MOSCOW

Time	Language	Frequencies	Notes
2300-0030	English	7105 (7100), 7150, (7160), 7185 (7180), 7205.02 (7200), 7240, (7260)	7240 jammed
0030-0100	Spanish	7105	
0030-0100	English	(7130), 7150, 7185 (7180), 7205 (7200), 7240	"Radio Kiev" 7240 jammed these xmsns only on Tue., Fri., and Sun. UT
0100-0300	English	7105 (7100), 7150, 7165 (7160), 7185, (7180), 7205 (7200), 7240, (7260)	7150 jammed starting at 0200 B2 0200 signals fading
0200-0300	Spanish	7100, 7150	
0300-0330	English	7130, 7260	Both freq's weak and covered B2 QRM "Radio Kiev"
0300-0400	English	7150, 7165 (7160), 7185 (7180), 7205 (7200), 7240	
0300-0400	Spanish	7100	Lower SB in exclusive amateur portion
0330-0730	English	7170, 7260	To W. Coast of U.S.
0600-0730	English	7110	

try. Some are skeptical about the interference potential of this on strong stations like Radio Moscow. The first hour or so of the RM transmissions are quite loud, but after that they go downhill, and you need an absolutely interference-free frequency to hear it after that. Radio Moscow repeats it's hour-long transmission to the U.S. four times, with the last three repeats on 40 being highly susceptible to QRM. Maybe we can at least get them to stop these redundant later transmissions. As far as communicating over the later transmissions of RM, it works quite well with locals and sometimes non-locals as long as you keep the RF gain down. I heard a W7 tearing up RM completely the other day. The important thing is to put these frequencies in use, instead of leaving them clear for the broadcasters to use.

WB8DBN

NOVICE THEORY CASSETTE COURSE

All the theory you need to pass the Novice exam is contained on four one-hour cassettes. The first three cassettes take you step by step through the basics of electrical and electronic theory, tubes, transistors and antennas. The fourth cassette has questions and answers – up to the minute questions and answers.

Since most people learn much better by listening than by reading, and since a cassette course such as this can be played while you are driving, eating lunch, or at any other time you have an ear open, you don't even have to sit down and work up a sweat over your books.

You can even play it in your sleep and let it soak into your subconscious!

The entire course is taught by Wayne Green, and it's ad lib, not read out of a book. The basic text used for guidance on the material covered is the 73 Novice Study Guide ($4).

This set of four one hour cassettes would cost $25 just about anywhere, but 73 is in the magazine business, and the more Novices there are the more 73 readers there will be. . .so the price for this four cassette set, complete with a copy of the full latest FCC regulations, is only $13.95!

If you got your ham ticket by memorizing the ARRL Q&A Manual, perhaps its time for you to take this easy road to learning the basics of electronics.

In the works are cassette study courses for the other classes of licenses. They'll be announced when they are ready. For the first time it will be possible to go way beyond even a college course in electronics via tape cassettes. . .and nothing could be easier to learn from.

COURIER MOBILE MIKE

Fanon/Courier has introduced a newly designed handheld microphone – the Courier Model CMM-1, human engineered for maximum convenience and for best mobile sound quality. The CMM-1 Mobile Mike, now standard on all new Courier rigs, is sculptured to fit snugly into the palm of the hand, but can alse be gripped and held "palmdown." "No-pinch" switching may be accomplished by the use of thumb or index and second fingers. Deep horizontal ribbing and extended edges act as acoustical barriers to background noise yet provide for the full use of directional voice sounds.

The CMM-1 Mobile Mike is constructed of high impact plastic in order to withstand shock and rough handling. It comes equipped with a standard double pole, double throw switch such as those used with most transceivers and with a coiled six foot cord. Wiring instructions are provided for use with equipment using other plugs and connectors or electronic switching. A microphone hanger is also included.

For further information contact: *Fana/Courier Corp., 990 South Fair Oaks Avenue, Pasadena CA 91105. 213-799-9164.*

1GHZ DATA SHEET AVAILABLE

An advanced line of 1GHz transistors is described in a data sheet available from TRW Semiconductors, an Electronic Components Division of TRW Inc. The improved line features gold metallization and reduced package parasitics that increase reliability, gain and power output over devices previously available.

Devices in the 1GHz series are rated for 1, 3, 5, 10 and 20 watts. Minimum gain at 1GHz is 5dB for the 1 and 20 watt devices and 6dB for the 3, 5 and 10 watt devices.

The new units are for use in the range 500 MHz to 1GHz and are intended for application in high frequency communications in aerospace, military and industrial equipment.

The 8 page data sheet provides complete ratings and electrical characteristics, package dimensions and representative power curves for each device. The data sheet also presents an extensive amount of applications information for circuit designers, including a discussion of metallization and reliability, input and output matching networks, and blocking and bypass capacitor selection. Schematic diagrams and parts lists are given for circuits used to derive performance data.

Further information and a copy of the data sheet are available from: *Sales Manager, TRW Semiconductors, 14520 Aviation Blvd., Lawndale CA 90260. 213-679-4561.*

NOISE CANCELLING NC350DM TURNER MICROPHONE

Turner's new NC350DM was designed specifially for use in mobile communications applications where traffic, equipment, motor or any other unwanted background noise presents a problem.

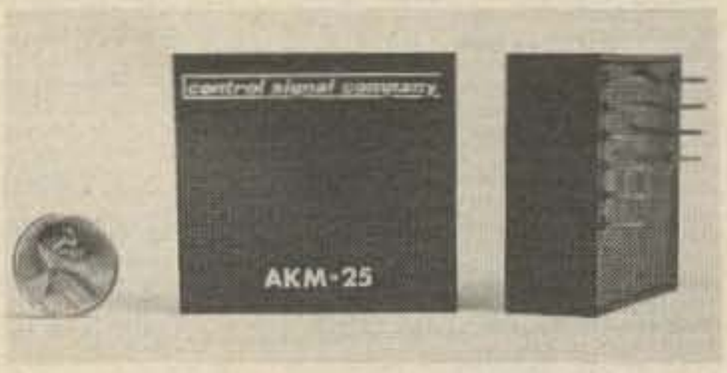
The Turner NC350DM has a frequency response of from 100-8000 Hz. Impedance is 2000 ohms for use with all transistorized equipment with input impedance from 600 to 5000 ohms. It has an output level of -60 dB.

The case of the Turner NC350DM is manufactured of black cycolac and has a steel mesh grille with a soft rubber lip guard. It has a neoprene, 3-conductor, (1 shielded) coiled cord which is strengthened by a telephone type, strain relief grommet.

The Turner NC350DM is wired for relay switching, but can be easily converted to electronic switching.

For more information contact: *Turner Division, Conrac Corporation, 909 17th St., N.E., Cedar Rapids IA 52402. 319-365-0421.*

AUTOMATIC KEYER MODULE



Control Signal Company of Denver has just announced the availability of the smallest, most complete automatic keyer module ever seen. QRP fans should note that this little critter draws less than 1 mA from a 9V battery when keying, and that the Company reports difficulty in measuring the infinitesimal current when the key is up. Any supply voltage from 4 to 15V dc may be used.

Homebrewers will be impressed that the module is smaller than a pack of cigarettes and weighs only 2 oz.

Modern technology has not forgotten the CW man! This bite-size dude has dot, dash and space memories for perfect jam-free keying, and has a 6 to 60 WPM speed range capability. And would you believe a sidetone monitor is squeezed in there too! For more information contact: *Control Signal Company, 5964 W. Columbia Place, Denver Co 80227. 303-794-7234.*

LOW LOSS COAXIAL CABLE

Antenna Specialists Co., entered into a joint development with one of the major cable manufacturers to find a good cable for UHF mobile installations that combined the low loss of RG8/U or ¼" Heliax with the flexibility and ease of installation of RG58/U. The result was Pro-Flex 450^{tm}. Because its diameter is larger than RG58/U it requires the same reducing adapter or connector types as RG59/U cable. However, it *is* a 50 ohm cable.

For more information contact: *Antenna Specialists Co., 12435 Euclid Avenue, Cleveland OH 44106.*

KIRLIAN PHOTO KIT

In the June 73 editorial a mention was made of Kirlian photography, about which little is yet understood. Some of the reported results are incredible. Systems Concepts, Box 417, W. Hyattsville MD 20782 has a kit available for $20 and includes a high voltage generator, discharge plates, print paper, developing trays, chemicals and detailed instructions. The partners in the concern are K3TJC and K3TIY. Here's a field just made for amateur experimenting.

NEW SOLID-TUBE

Electronic Devices Inc., has added a new model to their Solid-Tube line of silicon, solid state, plug-in rectifier tube replacements. The new model, Solid-Tube R-3DS3, replaces vacuum tube rectifiers types 3DR3 and 3ES3.

This new model joins the other Solid-Tubes in the EDI line in providing a number of advantages over the vacuum and gaseous tubes that they replace. The Solid-Tubes emit no X-radiation, create no heat, provide greater reliability, and since they have no filament they make ideal substitues in cases where the filament or flyback transformer is faulty.

For complete information on this new tube, as well as the full line of Solid-Tubes and a complete substitution chart write: *Sales Manager, Electronic Devices, 21 Gray Oaks Avenue, Yonkers NY.*

NEW 2m UNIT

PACIFICOM, makers of Marine Gear, is getting into the 2m ham business with the introduction of their Model 200 Hand Transceiver. It offers 6 channels, 100% solid state, "Signal Sampler" battery-saver circuit, Operates on batteries or from 12V external power, dual purpose antenna, instantly converts from fixed mounting to portable, plus many more features.

For more information contact: *PACIFICOM, 3939 Ruffin Rd., San Diego CA 92123. 714-565-7945.*

DUAL SOLID-STATE TIMER FOR $1.25

A dual electronic timer in the form of a monolithic IC has been designed and developed by Signetics Corp. for a wide range of uses, including replacement of time delay relays. Both halves of the NE/SE556 dual timer can operate independently as well as together. They will produce fully controllable time delays between one microsecond and one hour. Timing is adjustable over a ratio of 10:1. The dual timer can also be connected to run free, in which case each half can be set to oscillate at any frequency between 300 kHz and less than one pulse per hour. Duty cycles are adjustable from 50% down to 0.01%.

For more information write: *Signetics Corp., Sunnyvale CA.*

SEMICONDUCTOR MEMORY DESIGN AND APPLICATION

Semiconductor Memory Design and Application by Gerald Luecke, Jack P. Mize and William N. Carr presents a comprehensive guide to the application of semiconductor storage elements in the construction of larger memory systems (McGraw-Hill, $18.50).

The first text to analyze emitter-coupled logic (ECL) integrated circuits, it reviews the evolution of semiconductor technology through its present state. The ideas and techniques necessary in building electronically competitive, cost-effective memory units are systematically detailed. The probably direction of future developments is also discussed.

To order write: McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, New York 10020.

new

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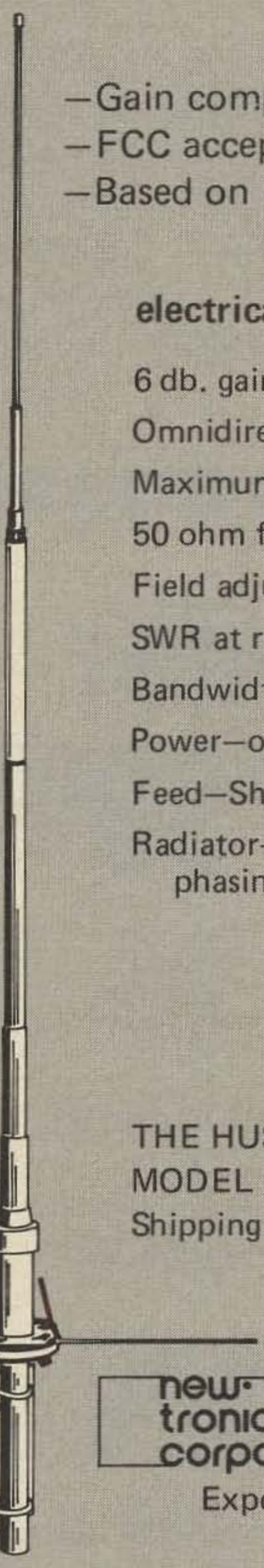

mechanical

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- **Leather Case for belt - LCL** **$12.00**

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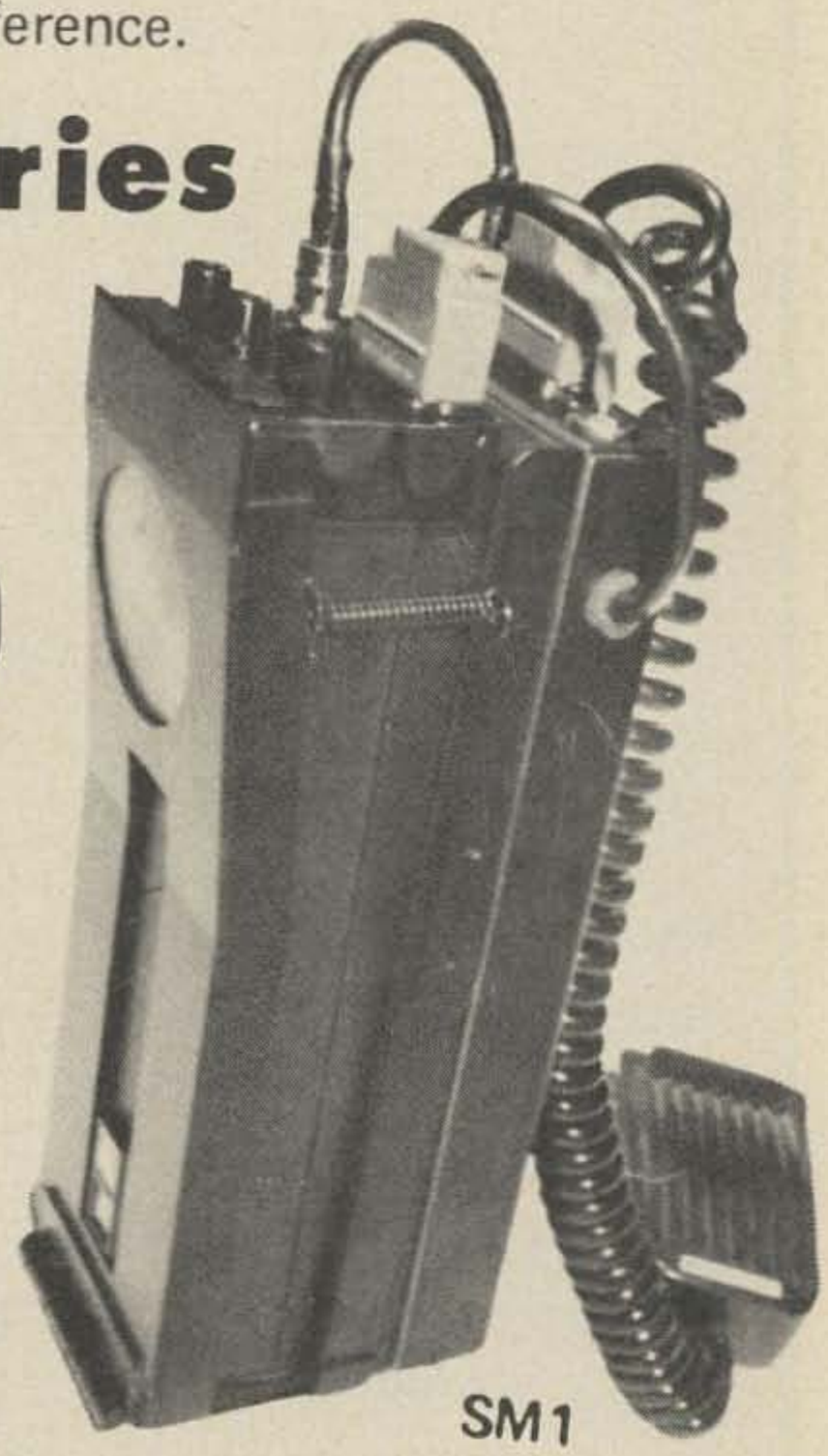
DEALERS – Call us about handling the Wilson Walkie-Talkies (commercial version avilable too), the Wilson beams, and other products.


SM1

WILSON ELECTRONICS

Box 794, Henderson NV 89015 (702) 451-5791/6650

Becoming /4X is very easy. After arriving in Israel you can go to the licensing office and ask for it, they will oblige you.

Of course there are a few formalities and one or two minor details to take care of first. Number one is to find the place. It is located in the Shalom Tower, one of the two tallest buildings in the city. If they put a repeater up there it could probably cover the whole Mideast. The other tall building is the diamond bourse located in Ramate Gan. If all other techniques fail, just remember that the number 12 bus drives through it, literally. The tall or high rise part of the building is built over two smaller shopping/office buildings, one of which is the only American bank in the country. The style is rather like a house made out of building blocks in which two blocks support the rest, and the busses drive through the gap.

When you get there take the elevator to the 9th floor. Ask at the information desk on the 9th floor for "amateur radio." You will be directed as to how to proceed to Room 8 on the 10th floor which is not as easy as it may sound.

Getting a license to operate /4X is simply a matter of filling out a form and then handing it over together with a photocopy of your license. In return you get a permit to operate /4X at no charge. Mind you, you have to specify each QTH and the equipment you will be operating. They are not set up as yet to issue permits for short periods, because as yet visitors do not bring equipment with them for short stays. There is a 2m repeater in Haifa, so it is possible that they will issue permits for VHF only operation in the future.

If you intend to visit Israel, I'd suggest that you write first and get the forms and a set of the rules and regulations, if for no other reason than that they might help you answer any problems raised at the airport when you try to bring gear into the country. The address is: Ministry of Posts-Engineering Services, Amateur Radio Licensing, 9 Achad Haam St., Tel Aviv, Israel.

If you are not going to take equipment with you, you might be interested in operating a station belonging to an Israeli amateur. In that case set it up before you go, because the Israeli whose station you want to operate handles all of the paperwork.

G3ZCZ

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

APR 12-15	County Hunters SSB Contest
APR 20-22	Zero District QSO Party
APR 27-28	Florida QSO Party
MAY 11-13	Georgia QSO Party
MAY 18-20	Connecticut QSO Party

THIS MONTH

County Hunters SSB Contest

From 2200Z April 12, to 0500Z April 15. Frequencies – low end of General Phone bands. No credit for contacts on the 3943, 7243 or 14336 nets. Exchange report, county and state (DX give country). Mixed mode contacts OK if one station on SSB. Scoring: Contact with (A) a fixed station – 1 point, (B) DX stations – 5 points, (C) Mobile stations on 14 MHz and up – 5 points, (D) Mobile stations on 7 MHz and below – 10 points. Multipliers: For fixed stations – total U.S. counties worked, for mobile stations – total U. S. counties worked plus number of counties given out. Logs must show: date/time, stations worked, exchanges, claimed points per contact, numbering of each new multiplier. A fixed station may be worked only once. Portables and mobiles changing counties may be reworked. Portable stations are considered fixed for scoring purposes. Mail logs to: James Willingham KØARS, Route 2, Bevier MO 63532. Deadline: June 1, 1974. Appropriate awards. Summary and log sheets free for SASE to above address.

Zero District QSO Party

From 2000Z April 20, to 0200Z April 22. Suggested frequencies: 70 kHz from low edge of HF CW bands, 3900, 7270, 14300, 21370, 28570 on SSB. Novices try 3725, 7125, 21125. Exchange RS/T, QSO number, section, and Zeros also send county. Stations may be worked once per band. Multiplier for Zeros: total sections, Zero counties and foreign countries. Multiplier for non-Zeros: total Zero sections and Zero counties. Appropriate awards. Logs by May 17, to TRA ARC, WAØTKK, Wilson Hall, Iowa State University, Ames IA 50010.

Florida QSO Party

April 27 and 28, 1500Z to 2000Z on the 27th, 0000Z to 0500Z and 1400Z to 2359Z on the 28th. Suggested frequencies: CW – 1808, and 80 kHz up from the edge of each 3.5 to 28 MHz band, SSB – 1818, 3980, 7280, 14318, 21380, 28580. Florida stations send RS/T and county, non-Florida stations send RS/T and State, Province or Country. Stations may be worked once per band/mode. *CW and Phone are separate entries and are to be summed for Florida Club Aggregate entries only.* Florida stations score 1 point per QSO. Maximum multiplier is 73 (49 states, 12 Provinces, and 12 DX countries). Florida clubs may total their member's single-op CW and/or Phone scores, and enter this total in the Club Aggregate category. A member's single-op score may also appear in the single-op CW and/or Phone categories. Non-Florida score 1 point per QSO times number of Florida counties worked (67 maximum). Appropriate awards. A summary sheet with your name, call, address, claimed score, category and customary declaration *must* be included. *No messy entries!* Mail logs and summary sheet to be postmarked no later than May 30, 1974 to: Florida Skip, Contest Chairman, P.O. Box 501, Miami Springs FL 33166. Enclose an 88¢ stamp for results.

Please remember that I must have all information on a given contest at least 3 months prior to the date of that contest. I have a deadline to meet, and lately I have just about finished doing the column and someone sends me their information late, and I have to start all over, causing *me* to be late. In the future, such late information will have to be discarded, because I have an obligation to the readers to meet my monthly deadline. Thanks.

KR6 CERTIFICATE AVAILABLE

The Radio Society of Okinawa still awards KR6 Certificates. To qualify for this Award all QSO's must have taken place prior to the reversion of Okinawa to Japan on May 15, 1972. Requirements for the KR6 Award: 5 IRC's or 1 U.S. Dollar. A signed log book extract of 5 QSO's with KR6 operators verified by two licenses amateur radio operators, or by an official of a recognized Radio Club or Society. Submit all applications to the Radio Society of Okinawa, P.O. Box 465, APO San Francisco CA 96331.

WB8KZD

Terry Fox WB4JFI
3612 Barcroft View #302
Baileys Crossroads VA 22041

THE ATV RASTER

First of all, I would like to bring everyone up to date on the ATV repeater. As you probably read last month in 73 the license came on January 25, and the first QSO through the machine was on January 27, while testing it. We still have some finishing touches to do on the machine but all in all it looks pretty good. During the tests I was able to transmit a snow free picture up to the repeater and copy its downlink back with a broadcast quality picture. I was able to do this because its signal was strong enough to override mine. I was using a UHF loop antenna on back of the converter. It looks like the repeater is doing better than we had expected.

I would like to bring A5 MAGAZINE to the attention of all ATVers and potential ATVers. This is the only U.S. magazine devoted entirely to Amateur Television, and is a must for anyone interested in this mode. Its subscription rates are $2.50 a year for six issues. Its available from A5 MAGAZINE, P.O. Box 6512, Philadelphia PA 19138. I know Wayne won't mind a plug for another magazine if it helps readers in their continuing quest for knowledge. Unlike another New England based outfit 73 seems to give credit when its due, like when it comes to referencing from other articles in other magazines. But enough politics and back to ATV.

Many hams interested in getting on ATV probably ask themselves, "How do I get started? Since it is television, I must need racks of equipment and a spare kilobuck." *Nonsense and bunk!* Even if you're not interested in ATV read on, we might convert you.

Probably the easiest way to receive ATV is to buy a UHF TV converter. They are available from most of the mail order houses at good prices. I got mine from Lafayette for under $25. Its a Blonder Tongue model BTX-111. They also make a BTX-999 for around $20, but its a little harder to convert. To convert the BTX-111 you first remove the unit from its plastic case by taking out the six screws for the antenna connections in the back, then gently push on the visible metal in the back until the chassis slides out. The next step is to remove the metal bottom by taking out the small screw with the hex head in the center of it. Now, if you hold the unit with its front toward you, you can see the power supply and output amplifier in the left half and the UHF converter itself in the right half. The converter section is broken up into three sections. Furthest away from you is the input filter section, next is the mixer and the front section is the converter's 1.0. In each section there is a semi-circle of metal with a sliding tab that shorts it out to ground as you tune the unit. These are the inductors in the tuned circuits. One end of each inductor is hooked directly to the chassis and the other is attached to a terminal strip. Right next to the terminal side of these inductors are little metal tabs that are soldered to the chassis and run parallel to the inductors. These tabs are capacitors that are used to tune the unit to proper frequencies. All that is required to put the converter on ATV is to bend these strips closer to each inductor. It is advisable to have a calibrated signal generator handy to check both frequency and sensitivity. If one is not available, try to find a ham running ATV in your area and tune the 1.0 capacitor while close to his transmitter, then adjust the mixer and filter trimmers when further away from him. If you can't find an ATVer around, as a last resort, find a commercial UHF TV station and then tune the 1.0 so this station appears approximately 15 channels higher than its actual number (example: channel 20 should be up around 35). Then you can peak the mixer and filter for maximum signal. Also, the metal bottom does affect the tuner slightly, so check it with the cover on before putting it all back together. Now the converter should be tuned up to cover the entire 420-450 MHz ham band. This full coverage is especially important if there is even the slightest possibility of an ATV repeater in your area. The only other thing you might need for receiving is a preamp. The best sensitivity that you can expect from a UHF converter alone is about -80dB for 10dB quieting of the audio in the TV receiver. In addition, the UHF converters usually don't use very good mixer diodes, so their noise figures are fairly poor and a good preamp would help this tremendously.

At the transmitting end, the best way to get on is to find a Motorola T-44 or RCA-CMU-15 450-470 MHz FM transmitter strip. These two are by far the easiest ways to transmit ATV. Both units pump out about 15 watts average when video modulated and they require next to no modification to get working. The only modulator that we have had luck with is the one described in the December 1972 and February 1973 issues of QST. All the other modulators require modification of the grid bypass capacitor to achieve proper bandwidth. Since this modulator has an extremely low output impedance no modification of the T-44's grid bypass is required. This is good because we have had several calls from around the country from hams that have modified their units, with resulting problems like wiped finals from oscillations in the output amplifier, low or no power output, etc. . .so please, *leave that bypass alone!* The WØMZL modulator is a very simple 4-transistor unit of the complimentary-symmetry design for low impedance. All the transistors cost less than one dollar each, so it's also rather inexpensive.

Incidently, if you do have a complete T-44 don't throw away the power supply or receiver. The receiver can be used as a UHF to VHF converter since its first i-f corresponds to TV channel 4. Shortly I will be showing you a one tube cathode follower circuit, so you can use the T-44 for your UHF converter. Also, the power supply is a good thing to keep, in case of emergencies you can run ATV mobile. The only problem with this is that you had better have a good battery and suspension, or the T-44 will show you otherwise very quickly. I will be describing more of the transmitting end of ATV later, for right now just try to find a T-44 or CMU-15 transmitter strip.

For those of you interested in putting up an ATV repeater, we will be making available copies of the application and some basics of how we got it up as soon as we can. Our repeater uses a T-44 transmitting strip exciting an AM-1178 amplifier with a 4CX-250K tube. The receiver starts with two interdigital filters to suppress the transmitters signal, then a preamp and then the T-44 receiver strip whose first i-f is coupled to a TV set modified for video output, which is fed back to the transmitter. The transmitter and receiver are connected to a ten dB gain Phelps-Dodge antenna through a diplexer. Later, we are going to replace the diplexer with a circulator, so we can pick up an additional six dB through the system. We have in our control circuitry a horizontal sync detector, so the repeater won't key up on just a carrier. In addition, we have both video and audio I.D. from a charactor generator and audio tape.

I think that I had better wrap things up for this issue, and continue next month. Till then, 73's & BCNU on 439.25MHz ATV.

WB4JFI

AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Most of this months column is a status report for (A-O-B), which from all indications should be launched sometime in July of this year.

A summary of operation results from OSCAR 6 is now available and an edited version will appear in this column over a 3 issue period starting next issue. Anyone who would like the complete summary which is quite detailed and covers in very minute detail all of the knowledge learned from the flight of OSCAR 6, can send 25¢ plus a SASE to me at the above address.

OSCAR 6 is a great achievement for the world of radio and radio amateurs in particular. It has shown that amateurs *are* dedicated and they *can* get together and combine their knowledge and produce something that has achieved success. OSCAR 6 has shown that the amateur community is not disgruntled and not ready to give into the ever growing idea that amateurs just sit around and take up the airwaves with useless gab. I hope that this satellite has shown those amateurs who are thinking of letting their licenses expire because they feel that nobody has any desire to join the amateur ranks, or feels that nothing is 'happening' in the amateur bands. Amateurs *are* doing something.

The only way we are going to make any action happen is to cause it ourselves. Get involved, like the members of AMSAT have in producing OSCAR 6 which has not only benefited us but has been useful in classroom education and has opened the eyes of a lot of people who two years ago probably didn't know amateur radio existed !

A-O-B STATUS

As of December 31, 1973, AMSAT-OSCAR-B (A-O-B) appears to be about two months behind schedule. The status system-by-system is as follows:

A) Wiring harness – Completed on schedule (Nov. 1).

B) Two-to-ten meter repeater – Completed, checked out, and now in burn-in.

C) Canadian 435.1 MHz beacon – Completed, delivered, and undergoing tests for possible minor modifications.

D) Sensor board, experiment control logic (ECL), and instrumentation switching regulator – All are completed, except the ECL, which is undergoing modifications to ensure against the transient switching encountered with OSCAR 6.

E) 2304.1 MHz beacon – Nearing completion by the San Bernardino Microwave Society. Delivery expected from California in the next few weeks. Quadrifilar antenna is being fabricated at APL and RCA. It should be available in the next month after pattern measurements at RCA.

F) 70cm-to-2m repeater – Delivered by DJ4ZC in February 1973 and still in storage.

G) Battery charge regulators and 28-volt power regulators – Shipment from AMSAT-Deutschland has been delayed to allow further testing and is now expected soon.

H) Teletype telemetry encoder – Completed and delivered by WIA-Project Australis and now checked out.

I) Morse code telemetry encoder – Completed and checked out.

J) Spacecraft structure – Fabricated and now being assembled.

K) Solar panels, brackets for array diodes – Completed, but wiring (including RFI filters) remains to be done.

L) Battery – Completed, but a leak has developed in one cell and is being checked out.

M) Antennas – Ten-meter antenna deployment mechanism is still under development. Combined 2m/70cm antenna has been designed along with the diplexer/ filter, but remains to be fabricated and tested by AMSAT-Deutschland in Germany.

N) Delta launch vehicle interface hardware – Fabrication of conical interface fitting (by AMSAT) is still required. McDonnell-Douglas, launch vehicle contractor, is now beginning fabrication of the Delta attach hardware.

O) Command decoders – One unit has been completed and checked out. The second redundant unit is completed but not yet fully working.

P) Two-meter bandpass filter (for two-to-ten meter repeater) – Wideband Engineering is reworking one of the filters they shipped to us and delivery is hoped for next month. VE3QB has volunteered to fabricate a backup filter for delivery in a short time frame if needed.

Q) Thermal design – NASA-Goddard has been assisting with thermal design, and they are currently refining the calculations. They have come up with a reasonable explanation for the unexpected thermal behavior of OSCAR 6, and we are now confident that the OSCAR 6 overheating problem won't reoccur with OSCAR 7.

R) Codestore – The last of the COS/MOS integrated circuits donated by RCA have now been received, and Codestore is now completed and checked out.

S) Stabilization system – The stabilization magnets have been received and their properties are now being measured. The permalloy hysteresis damping rods have been cut and annealed.

TIME SCHEDULE

With the successful launch of the ITOS-F satellite by NASA on November 6, 1973, it is now expected that ITOS-G, the mission we expect OSCAR 7 to fly on, will probably not be called up for launch until around July 1974.

Originally, it was expected that a launch opportunity for OSCAR 7 would exist around the beginning of 1974. The loss of ITOS-E during launch on July 16, 1973, caused a reshuffling of the launch schedule, with the result that we find ourselves with several months available for additional spacecraft testing.

Orbital Information

Orbit	Date (Apr)	Time (GMT)	Longitude of Eq. Crossing °W
6666	1	0023.4	53.6
6679	2	0118.3	67.3
6691	3	0018.2	52.3
6704	4	0113.2	66.0
6716	5	0013.1	51.0
6729	6	0108.0	64.7
6741	7	0008.0	49.7
6754	8	0102.9	63.5
6766	9	0002.8	48.5
6779	10	0057.7	62.2
6792	11	0152.7	75.9
6804	12	0052.6	60.9
6817	13	0147.5	74.6
6829	14	0047.5	74.6
6829	14	0047.5	59.6
6842	15	0142.4	73.4
6854	16	0042.3	58.3
6867	17	0137.3	72.1
6879	18	0037.2	57.1
6892	19	0132.1	70.8
6904	20	0032.1	55.8
6917	21	0127.0	69.5
6929	22	0026.9	54.5
6942	23	0121.9	68.2
6954	24	0021.8	53.2
6967	25	0116.7	66.9
6979	26	0016.7	51.9
6992	27	0111.6	65.7
7004	28	0011.5	50.6
7017	29	0106.4	64.4
7029	30	0006.4	49.4

WB8LPB

HAMBOREE

The greater Baltimore Hamboree will be held at Calvert Hall College, Putty Hill and Goucher Boulevard, Towson MD (one mile south of Exit 28 on Beltway I-695), on Sunday, April 7, 1974, at 10 AM. Food service, flea market, prizes. Registration $2. No table or percentage charges. For more information contact: Joe Lochte, 5400 Roland Ave., Baltimore MD 21210, or Brother Gerald Malseed, 8102 La Salle Avenue, Towson MD 21204.

P.H D.

The P.H.D. Amateur Radio Association invites you to attend its Fifth Annual North West Missouri Hamfest in Kansas City MO on Sunday May 5, from 9AM to 4:30PM. The location will be in the Kansas City North Community Center, one mile south of the Antioch Road, Highway I and I-35 Interchange. Address is 3930 No. Antioch Road.

FRIENDLY FESTS

Hamfest! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

DEKALB KOUNTY

The DeKalb County amateurs are sponsoring a Hamfest on May 5, from 7AM to 4PM at Notre Dame High School, 3 miles south of DeKalb off Route 23. Signs will be posted. Registration is $1.50 in advance, $2 at the door. For more information contact: Crawfords Electronics, 301 Main St., Genoa IL 60135.

KENTUCKY HAM-O-RAMA

The Northern Kentucky ARC Ham-O-Rama will be held Sunday May 26, 1974 at Boone County Fairgrounds, Burlington KY, from 8AM to 5PM, 10 minutes south of Cincinnati OH on I-75. Features prizes, indoor exhibits, forums, flea market, food. Tickets $1.50 advance, $2 at the door. For tickets and details write: W4PII, 601 Rosemont Ave., Covington KY 41011.

DAYTON HAMVENTION

The expanded Dayton Hamvention will be held this year on April 26, 27 and 28 at HARA Arena and Convention Center. Open House on Friday to exhibits with technical sessions to run on Saturday and Sunday. Included are: DX, ARRL, VHF, FM, RTTY, MARS, Antenna, Space-Com., Transmitter Hunts, Ladies Programs and others. Giant Flea Market for 2 days. Free bus service from downtown Dayton via motels and hotels. Free parking at the Arena with self-contained trailors and camper units permitted to park in designated area overnight. Saturday banquet at 7PM with Senator Barry Goldwater K7UGA, as guest speaker. Registration in advance is $2.50 and $3 at the door; Banquet is $4.50. Advance registration closes April 25. For additional information write for program and map to Dayton Hamvention, P.O. Box 44, Dayton OH 45401.

ERIE HAMFEST

The Erie Amateur Radio Society will hold their semi-annual Amateur Equipment Auction on Sunday Afternoon May 5, at 1PM, at Laborers' Union Hall, 1205 West Perkins Avenue, Sandusky OH. Refreshments, cash prizes, door prizes. Talk-in on 94/94 and 52/52.

MESILLA BEAN FEED

The Mesilla Valley Radio Club of Las Cruces, New Mexico, cordially invites you to its "Annual Bean Feed and Swap Meet," to be held April 28, 1974, at La Mesa Park. Prizes/Food/Beverages/Family Fun. Information on 16/76 and 3940 MHz. For more information contact Whitey W5ECQ.

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.

CENTRAL MASS AUCTION

The Central Massachusetts Amateur Radio Associations annual auction is April 20, at the Knights of Columbus Hall, Rt. 9, Spencer MA, beginning at 1:00 PM Talk-in on .94 and 37/97. For further information write: WA1FIH/1, 1622 Worcester Rd., Apt. 421B, Framingham MA 01701.

ROCK RIVER HAMS

The Rock River Radio Club of Dixon IL announces their 8th annual Hamfest on April 28, at the Lee County 4-H Fairgrounds, one mile east of the junction of US 30 and IL 52, in Amboy IL. Tickets $1.50 in advance, $2 at the gate. Talk-in on .94.

SEE YOU IN DES MOINES

The Des Moines Radio Amateur Association invites you to participate in the Des Moines Hawkeye Hamfest at the Iowa State Fairgrounds in Des Moines, Sunday, June 16, 1974, 8:00 AM to 6:00 PM CDT. Booths available for rental. For further information contact: Alan V. Harris, KØOOD, P.O. Box 88, Des Moines IA 50301.

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.

HUMBOLDT HUMBOLDT

The annual Humboldt ARC Hamfest is Sunday May 19, at Shady Acres City Park, Trenton TN. Flea market, ladies activities and a playground for the children. For information contact Hugh Wardlaw WB4SLI, 2678 Cole Drive, Humboldt TN 38343.

BLUE RIDGE

The Blue Ridge Radio Society of Greenville SC will hold its annual Hamfest on May 5, at the Recreation Building in Cleveland Park, Greenville SC. Flea market, prizes, fun from 9AM til 3PM. For information contact Don Rose W4ZKH, 11 Ivanhoe Circle, Greenville SC 29607.

IRVINGTON HAMFEST

The Irvington Radio Amateur Club will hold it's annual hamfest on Sunday May 19, 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.

MOULTRIE KLUB

The Moultrie Amateur Radio Klub will hold its 13th Annual Hamfest April 28, 1974 in Wyman Park, Sullivan IL. Indoor – Outdoor Market. Ticket donation $1 in advance – $1.50 at the door. For information write M.A.R.K. Inc., P.O. Box 327, Mattoon IL 61938.

WALTHAM AUCTION

The Waltham Amateur Radio Association will hold their annual auction April 6 at 1:00 PM at the Kennedy Memorial Junior High School, Lexington St., Waltham MA. Talk-in 04/64 and 52.

REPEATER OWNERS

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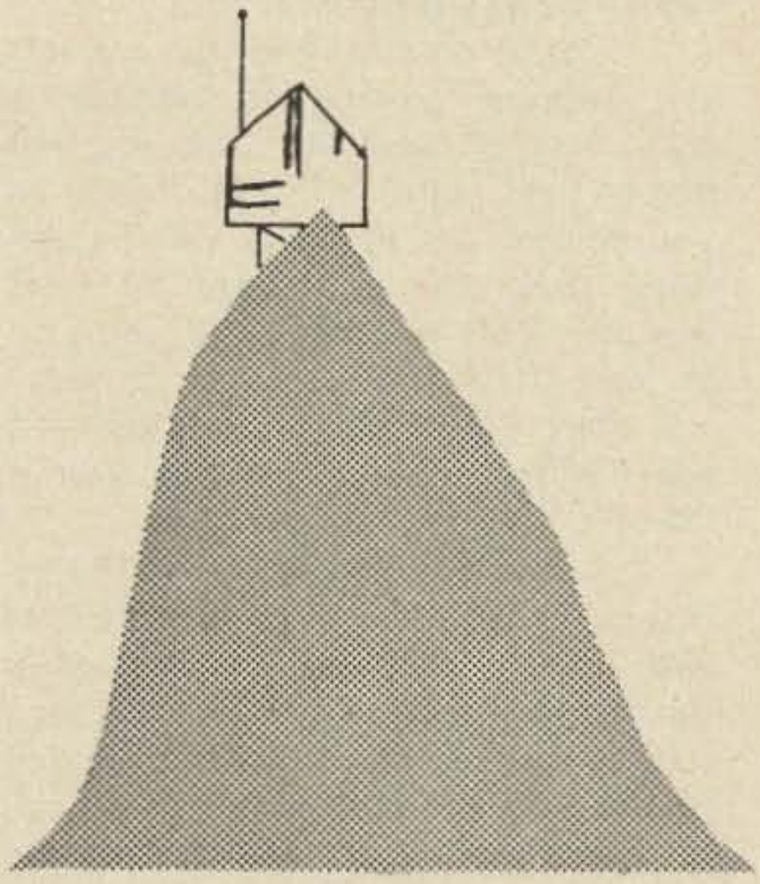

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TWX-910-830-6425

By: Gus M. Browning, W4BPD
Drawer "DX"
Cordova, SC 29039

According to the latest I can find out the sun spots have not got to the bottom of the eleven year cycle. Even though the sun spots are not "with us" plenty of good DX still seems to come through, but you have to be on when it's coming through. Many DX'ers seem to think that DX should come through at hours that's convenient to them, never thinking about hours that is convenient to DX station they want to work. If I was chasing those rare ones I would first try to place myself in their shoes and more or less assume that the DX station probably gets off from their work at 5 P.M. (the DX stations time) and that it probably takes him one hour to get home from his job, another 30 minutes to "freshen up" and get the rig on the air. After trying this time for a number of days I would then more or less assume that the DX station comes home, freshen ups, mows his lawn, do a few more chores around the house for his XYL (or himself), then gets on the air. Another way it may be with the DX station is that he does all the above and then has his dinner and then gets on the air. I would try to figure out the various possibilities of his hours of operation and hunt for him at those hours. Then when you work someone in his part of the world I would do a lot of "inquiring" as to what times that they have maybe heard or worked the fellow you need. Of course, inquiring what band, mode, etc. the fellow uses or seems to like best. You can get a lot of good DX info on the rare ones from fellows in nearby countries. If you can get real, "buddy, buddy" with a few of the DX chasers overseas they can fix you up with a few schedules with the fellow you need for that "new country" you always seem to "miss" ! Working DX is no problem if you are on the air when he is and even easier when you have things "fixed up". Try it, it WILL WORK and and save you from being "stomped to death" in the big pile-up.

Do you know that you can check if ten meters are open by listening for these beacon stations:
DLØAR on 29000 kHz
GB3SX on 28185 kHz
VE3TEN on 28175 kHz
VP9BA on 28165 kHz
and 3B8MS on 28190 (that's over in Mauritius you know)

You might try these and see what's coming through.

MELLISH REEF CARDS are to start counting towards DXCC on April 1, 1974. They now have been approved by the ARRL.

NEW PREFIX FOR PAPUA AND NEW GUINEA: It's just P2 from now on. The P2 takes place of the VK in their calls. VK9XYZ would become P29XYZ with their new prefix of P2. Good news for WPX boys.

VQ9HCS on Astove Island (counts same as Seychelles) is active and will be there until about June 1975. He was not too active a few months ago, but had hopes that he could get more gasoline soon, hope he has plenty by now. Name is Harry and the rumor that he has an orchestra composed of fiddler crabs, squaking Boobie Birds, whooping cranes and turtles are now true according to Robbie, 5Z4ERR of Nairobi, Kenya (lion Country, you know). Knowing Robbie like I do I know he probably works Harry every day about 30 minutes BEFORE the band opens to "W/K land" ! He used to work me when was all over the Indian Ocean and brother you "hear" 5Z4ERR down there !

Thank goodness winter has left and antenna putting up weather is again with us, and this year you had better "get with it" right away or you (if you are like me) will be still using that darn helf-wave all next winter. This summer I am going to at least "try". It's so easy to say I will start "next week" and then it's again winter time and another year is "shot".

I always say it's not the world that is wrong - it's YOU ! You gotta "get with it" Ole Buddy or you are lost in the storm. Those little IC's are here to stay and you had better be trying to learn all about them that you can or you are going to be "lost" in the future years. As for myself, I am right "in there" building up stuff with them like mad. You can put a lotta stuff in very small spaces, too. and they WORK and HOW !

IF you are going to Okinawa I suggest that you first write to 5AF/DCO—AMRS, APO San Francisco 96525 telling him your story and after hearing from him and only then would I pack up my gear. It seems that you can only get a license if you are actually living on US military bases, and houses on these bases are as scarce as "hen's teeth".

WANNA REPORT NON-AMATEUR QRM in our bands ? Just jot-down this telephone number on front of your receiver: (202) 632-6975 that is the phone number of the FCC Monitoring Watch and you can phone them anytime, day or night,

HAVE YOU BEEN USING AMSTAT ? If so, how about sending them a full report. They have a questionnaire thay will send you and also a data sheet. Address very short: Box 27, Washington, D.C. 20044

DX'ERS ARE THE ELETE OF ALL HAMS ! That's right, we spend much more money on our gear, about 5 to 10 times as much as the "run of the mill" ham (big beams cost more than ½ wave dipoles), multi rigs cost more than single ones, big rigs cost more than small ones, we spend more money with the electric company (the electric meter turns faster with big rigs, you know), we put up our antennas much higher than most others and towers (tall ones) cost much more than telescoping TV masts, and on top of that we are usually better fellows (except when there is a big, fat, pile-up) then it's dawg eat dawg ! Now hold your head up a little higher fellow DX'ERS ! hi. Life is a bowl of cherries and I am eating mine and enjoying every little minute of it. I am dumb enough to just "keep smiling" all the time" Why not do the same and MAKE EVERYONE "HAPPY" ?

NEED EITHER MONACO (3A2) OR SYRIA ? Keep in mind that most all stations worked in Monaco are screened by mountains, and the same goes for stations operating from the city of Damiscus, Syria. You might more or less expect your best chance of a QSO is when the bands are open via the long path. Otherwise you might expect their signals to be on the weak side if the path is the short one. When you are practically right up against a mountain that's between you and who you want to work.

Guess that's it for this month,

HB9J, Jean Lips, the well known European DX'er passed away in late December. His well known signal will be missed in the pile-ups by all of us. I am sure he deserves all the various honors that the DX world had bestowed upon him, I personally met Jean in Europe a few times and he impressed me as a very fine gentleman and scholar. We all pass our condolences to his fine family.

WANNA WORK XU1AA ? You might rey talking to "The Pot", Gud Ole Bill, W7PHO who skeds them now and then. Bill "might" help you arrange "something" with the boys at XU1AA, but, don't try to rush him, kinda "sneak up on him" ! Guess this covers the situation for now CU next month, Gus BPD

Joe Everhart WA3VHX
Lynnebrook Apts. 18D
Millersville PA 17551

A DELAYED VOX FOR REPEATERS

This device could help bring order to your repeater and also aid you in fulfilling your logging requirements.

While eating lunch at a local hamburger stand a few of us associated with the Lancaster repeater were mulling over a problem we'd experienced. Though usually the machine is pretty quiet, there are times when the repeater is ker-chunked for no logical reason. (For those who may not know, kerchunking is keying up a repeater with a short, unidentified carrier, and just letting it drop). Most often it is due to locals with itchy mike button hands or far-off repeater users who are using another machine though bursts of carrier reach our mountain-top site.

Finally, we want our repeated signals to have call sign identification on our tape for logging purposes.

From our viewpoint, this is at very least annoying. It makes for wear and tear on both our equipment and on our ears. The FCC, too, requires:

a) Transmissions be identified by call signs
b) No retransmission of signals unless desired by the originating station.

So, we kicked around various means of fulfilling the above goals. Several methods of limiting repeater keyup to intentional users are in common use. Two of these involve the transmission of audio tones.

PL (a Motorola trademark) is the common name for continuous transmission of a precise "sub-audible" tone below 300 Hz. A repeater equipped for PL use will not respond to any received signal without the proper tone. Also used is the "tone burst" system, which requires the transmission of a short burst of audio tone at the beginning of each transmission. Further information on these two systems is given in the FM Repeater Circuits Manual" available from 73 Magazine. Both schemes were rejected since they discriminate against the casual repeater user or transient who does not have either the proper equipment or knowledge of frequencies necessary. Then, too, their use is no insurance against unidentified transmissions.

A simpler method was possible, as used on the Philadelphia 16-76 machine. This is the use of a timer which requires three

now available ...TPL VHF-UHF power amplifiers

TPL brings you the finest amateur RF amplifiers for VHF FM available today. Only state-of-the-art techniques in circuit and semi conductor technology make an amplifier of this quality possible.

The amplifying transistors are of the balanced emitter silicon power type. Each one is individually checked for power output and reliability during mismatch conditions. They are operated well within the factory's suggested limitations for added reliability and life. Most circuitry is of micro-strip technique for stability and broadband characteristics. Antenna switching is accomplished through the use of a specially selected RF relay . . . activated by only one watt of RF power through an RF sensing circuit. During receive, the antenna by-passes the amplifier and is fed through the relay to the transceiver. Also of note is a reverse voltage protection diode which protects the power transistors from destruction in the event the amplifier is connected to the wrong polarity. TPL amplifiers are simple to install and fool-proof to operate. With proper care, they will provide a lifetime of dependable service.

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TPL commercial amplifiers are used and recommended by every major manufacturer of commercial communication equipment.

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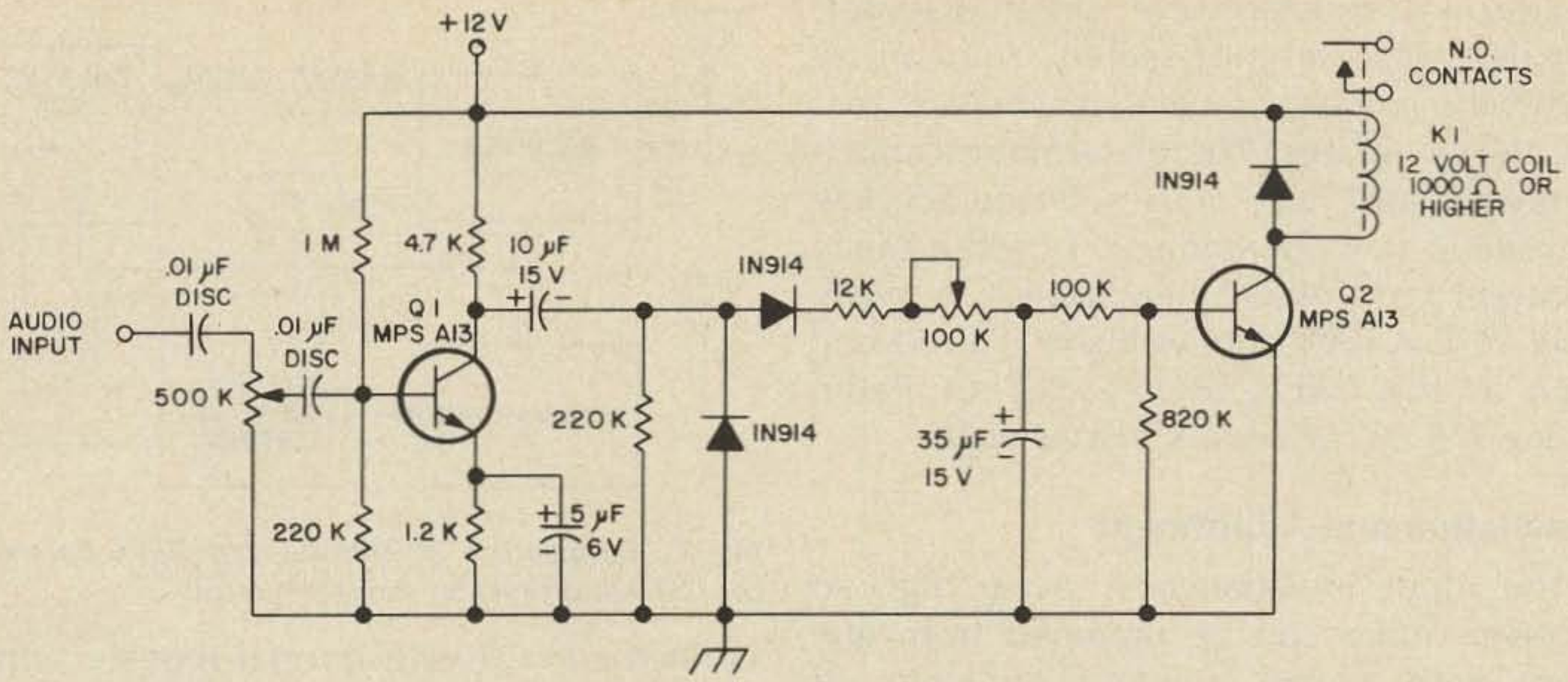


Fig. 1. Schematic diagram of the delayed VOX.

seconds of continuous carrier on the input receiver to turn on the transmitter. After the initial turn on delay, the repeater is controlled by its COR until a 20 second lapse in transmission occurs. After this, the system requires another three second carrier to return to normal operation. Though this method is simple to use, it still does not guarantee that the user will identify himself.

The scheme we came up with is a timer with a little more sophistication in the form of a voice-operated relay. To key up the machine, both carrier and audio must be present for a preset period of time. Hopefully, the station desiring to use the machine will identify himself, thus providing the necessary audio. The circuit then has a long enough turn-off delay to allow normal repeater use.

Circuit Description

Fig. 1, is the circuit schematic. In the interest of simplicity both transistors shown are really darlington transistors. Though they come in the same package as a regular plastic transistor, they are two cascaded NPN transistors on the same silicon chip. With their higher gain and input impedance, they make the two transistors do the job of four. Q1 is a simple common emitter amplifier whose over-all gain is adjustable with the 500K input potentiometer. It supplies a high ac gain and high input impedance. The input coupling capacitors were chosen to minimize low frequency ac (below 300Hz) response to make the circuit less sensitive to hum or PL tones.

Audio peaks from Q1 are coupled to a full-wave detector through the 10μF electrolytic capacitor. The series resistance to the 35μF electrolytic controls its charge-up time to delay relay pickup. By adjusting the 100K potentiometer turn-on delay is adjustable from a fraction of a second to about four seconds.

The resulting dc is applied to the relay driver Q2 through a resistive divider. These two resistance values were chosen for a relay drop-out delay of about 15-20 seconds. In operation, the 35μF capacitor is kept charged after the turn-on delay by repeater audio. The long turn-off delay is required to keep the VOX circuit from dropping out the repeater during lapses in speech or while letting the COR drop out to reset the repeater timer. The relay contacts are used for repeater control.

Construction

Because the circuit operates at audio, layout and construction are very non-critical All parts were mounted on a 8x8 cm piece of perforated board and hand wired.

The parts, too, are pretty much run of the mill. Transistors Q1 and Q2 are Motorola MPS-A13, but other darlington pairs such as the Motorola HEP S9100 or GE 2N5306 may be substituted. Alternatively, those without a well-stocked junkbox may make their own darlingtons as in Fig. 2. Ten percent

quarter-watt resistors were used throughout, but the values are not sacred. You can try substituting what you have, just be sure that the VOX operates. The electrolytic capacitors were junk box units selected for low leakage (a few microamps). I used a fancy printed circuit mount relay for K1, but any relay with a 1000 ohm or higher 12 volt coil such as the CALECTRO D1-967 or Radio Shack 275-003 will work just as well.

Installation and Adjustment

The input impedance is quite high so receiver audio can be obtained from any point with a few hundred millivolts of audio. We had plenty of audio across the 8 ohm loudspeaker of the receiver loudspeaker used for local monitoring. The 12 volt dc supply must be fairly clean but should be easy to find since less than 20mA is required. Naturally, the VOX should be shielded from the repeater transmitter rf. The normally open relay contacts are wired in series with the COR as in Fig. 3.

Adjust the 500K input potentiometer for full swing (about 10V peak to peak) at the

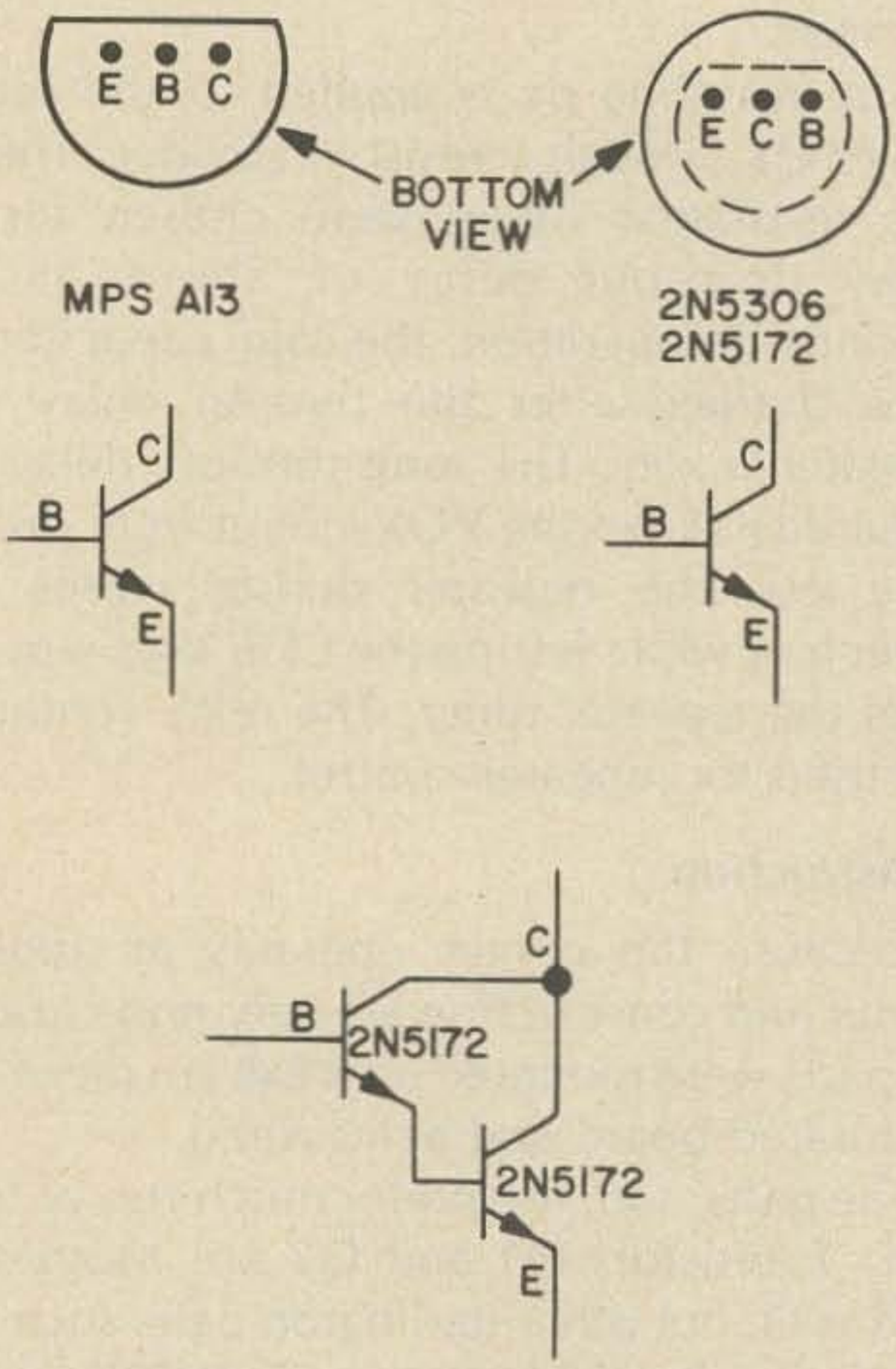


Fig. 2. Transistor connections. Two 2N5172 or other NPN silicon transistors with a gain of 100 or more can be used in place of MPSA13 when connected as shown.

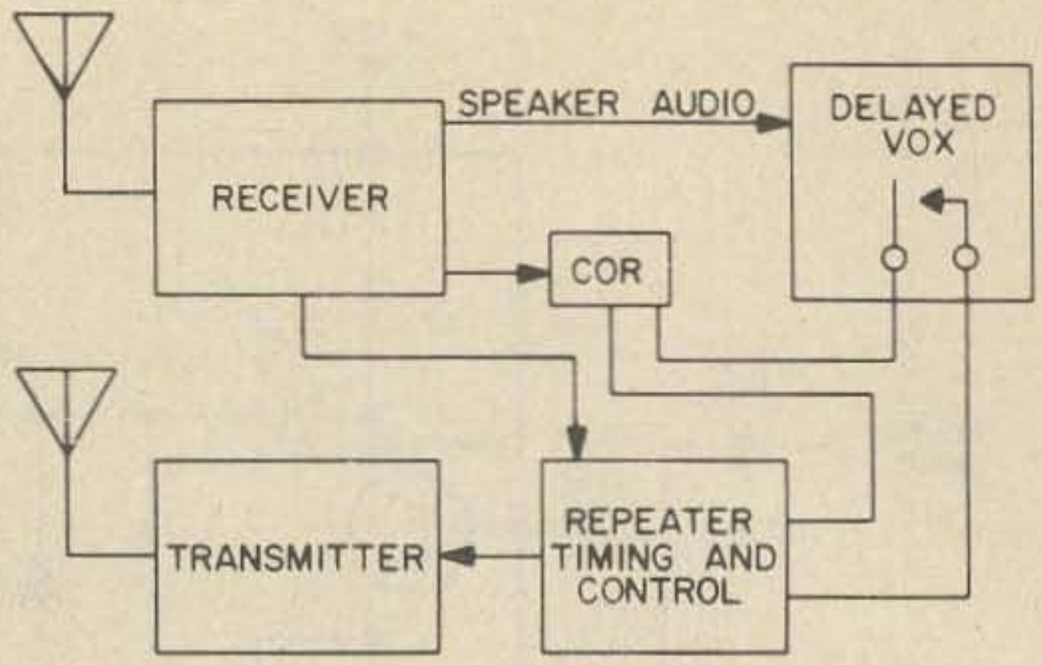


Fig. 3. Connection of the delayed VOX between the COR and repeater control circuits.

collector of Q1 with normal repeater input audio. Then tweak the 100K timing pot so that the relay does not pickup until audio is present for the desired length of time. To insure a fresh start up, momentarily short the 35 microfarad timing capacitor before applying audio to set the timing. Hang on delay is fixed at about 15 to 20 seconds once the relay has been actuated.

Our VOX board was adjusted to delay repeater pick-up until an average voice recited the repeater call letters WA3KXF through the input receiver, with somewhat less than full deviation.

Remarks

We spent several weeks trying to educate users to operate the new system. A suggested turn-on identification goes like this: "WA3KXF this is WA3VXH mobile three." The repeater automatically identifies itself and the repeater should be activated by the time the operator identifies himself. Thus the identification criterion is satisfied.

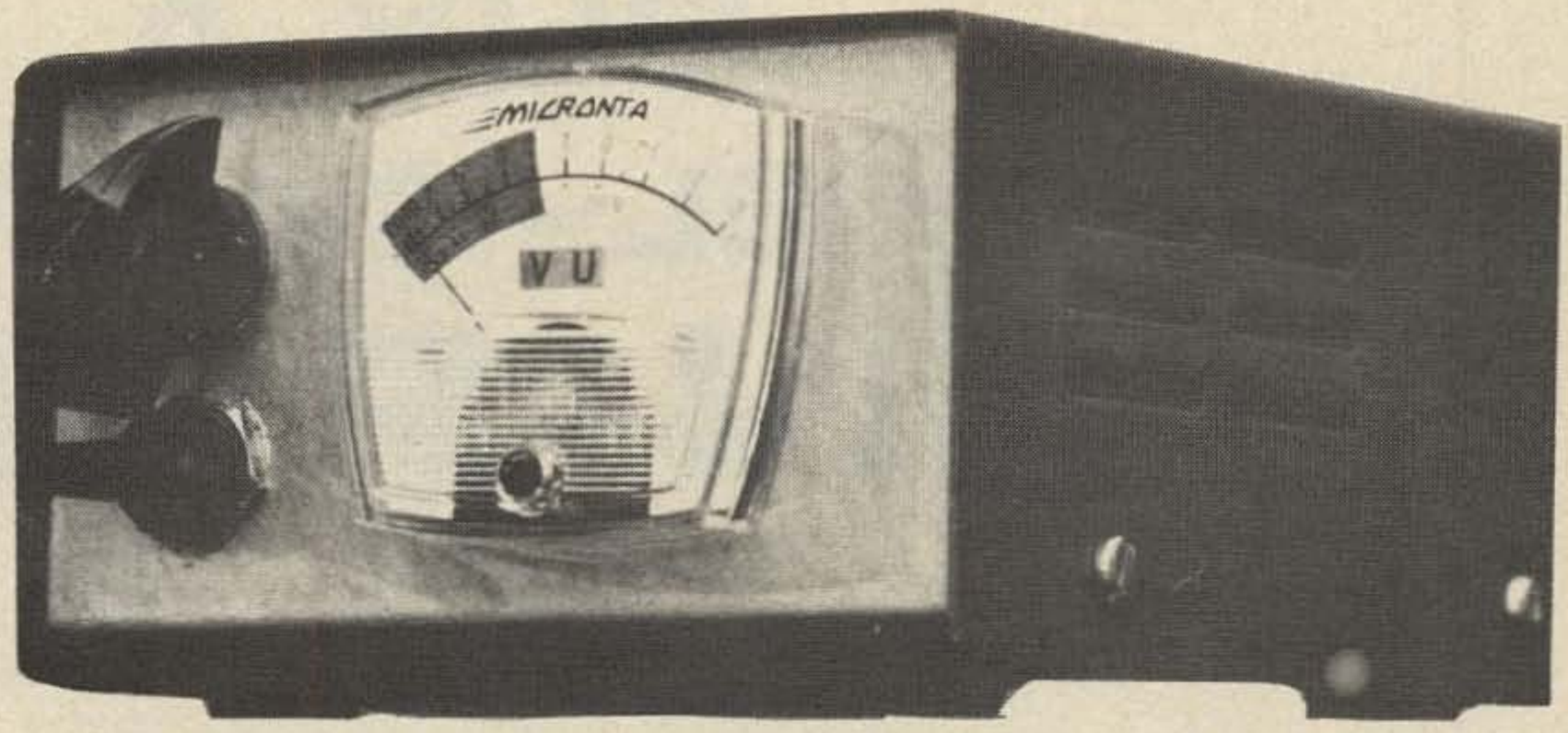
This mode of operation has been well accepted by the local group. With the incentive it provides to identify, everybody becomes conscious of proper usage procedures. A few persist in trying to defeat the system, but you can't stop somebody who has the guts for a three second belch. The delayed VOX is not, of course, a cure-all, but our repeater has been much more orderly since its installation.

This article would not be complete without thanks to Bob K3VAX and Allan K3HQC for the VOX timer concept and prodding to write this article.

. . . WA3VXH/3

Robert Perlman WB2VRW
3 Joslen Places
Hudson NY 12534

THE F.M. "AUTO-START"



Refer to section 97.91 of the Amateur Rules and Regulations for the proper usage of one-way communication.

There is a rumor going around in repeater circles to the effect that any ham worth his license should continually monitor the local repeater. It's a nice thought, but unless you're a control station and *have* to listen, continuous monitoring is inconvenient, if not downright impossible. After all, most of us have to eat, sleep and (sigh) work, not to mention quite a few other things. This inability to monitor continuously is annoying; if you want to send a message to W1XXX, it's a sure bet that W1XXX will be in the bath-tub or some other equally inaccessible place (this is a corollary of O'Brien's Law, which, simply stated, says "Murphy was an optimist."). What to do? The solution, I've found, is an inexpensive ($10-$15) device which I call the FM Auto-start.

The auto-start concept is simple. Suppose you want to send a message to a buddy of yours; after giving him a few calls with no reply, you key an audio encoder on your transmitter, which turns on a tape recorder attached to your friend's receiver. The tape recorder remains on for about thirty seconds or so, allowing you to transmit a short message, which in turn is recorded. Not only is it a useful gadget, but it's a lot of fun, as well.

The Circuit

The auto-start is built around the Signetics[1] 567 tone decoder, which has got to be the greatest invention since stretch socks. The receiver audio output is attenuated and fed to pin 3. Whenever a tone of the proper frequency makes its way into the I.C., pin 8 goes low. The decoder frequency is determined by R_3, R_4, and C_2; in the con-

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figuration shown in the schematic, the frequency is equal to $1.1/(R_3 + 2{,}500)C_2$ with R_3 in ohms and C_2 in farads. This formula assumes that the 5K trimmer is set mid-way The values shown in the schematic are for a frequency of approximately 1kHz. Should you decide to select another frequency, be sure to make $(R_3 + R_4)$ fall between 1kΩ and 20 kΩ. Bandwidth is determined by C_3. The value shown gives a bandwidth of approximately 10% for an input frequency of 1kHz. The bandwidth may be decreased

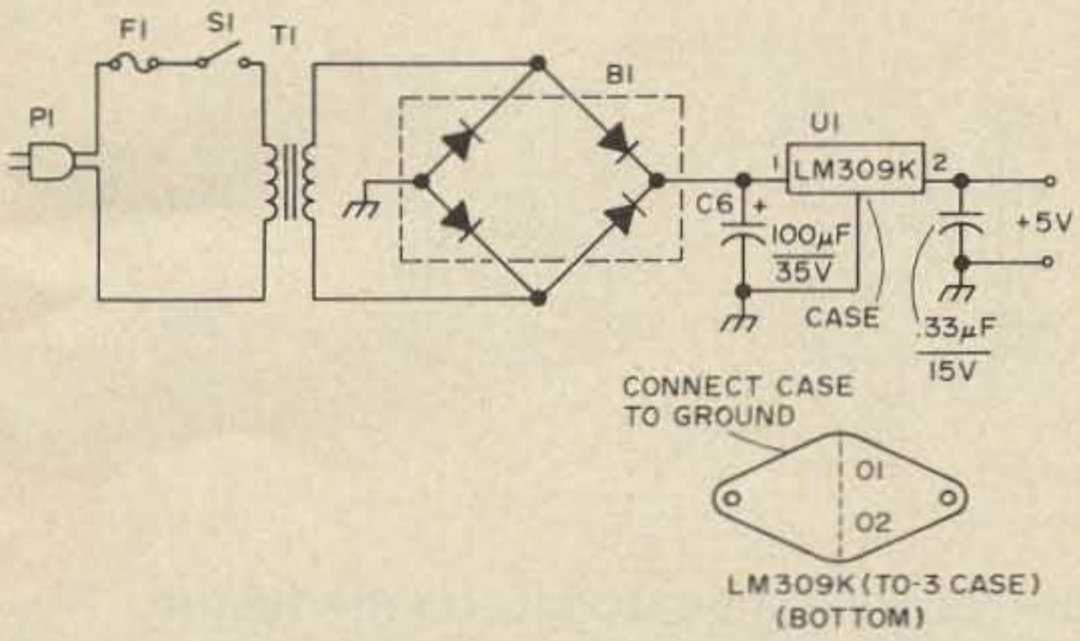

Fig. 1.

by using a larger value of C_3, but I've found the 10% bandwidth to be sufficiently selective to avoid false starting. For those more adventurous souls who wish to experiment, the formula for the bandwidth is

$$\%\ BW = 1070\sqrt{\frac{V}{f.C_3}} \quad \text{where } V = 200\ m\ V$$

where C_3 is in μF, f is the decoder frequency in Hz., and V is the input voltage in millivolts.

R_6 and C_5, along with a 741 operational amplifier, form a timer. When pin 8 of the 567 goes low, C_5 discharges through R_5, thereby lowering the voltage on the 741's inverting input. As long as the inverting input's voltage remains below the non-inverting input's voltage, the 741's output remains high, pulling Q_1 into conduction, which in turn pulls the relay. The normally open relay terminals close, turning on the tape recorder—just how they do this will be explained a little later on. Once C_5's voltage goes above 2.2 volts, the approximate voltage on the non-inverting input, the op amp output goes low, and the relay opens up, turning off the tape recorder. With the values of R_6 and C_5 shown, the timing period is about thirty seconds long. To increase or decrease the length of the timing period, raise or lower the value of R_6.

Little need be said about the power supply; if you use an alternate source, however, be sure it's well-regulated, as the 567 can get a bad case of the "funnies" with a poor power supply.

Construction

The circuit, as one might expect, is not critical and may be constructed to meet the aesthetics of the builder. I built mine on Vector board with holes spaced the spacing of DIP I.C. pins, so drilling the board is eliminated.

In the way of a chassis, Radio Shack puts out a line of "deluxe" cabinets at reasonable prices, in case you're tired of chassis that look like they're made out of surplus aluminum siding.

The Tape Recorder

When I started out to build this project, I vowed not to deface my tape recorder. Happily, no modification was necessary, and there's a good chance that you won't have to deface yours, either.

Most small recorders, both cassette and reel-to-reel, have a sub-miniature phone jack labeled "remote." In normal use, a small SPST switch on the microphone is connected to the jack, allowing the operator to turn the recorder on and off while holding the mike. When the input to the jack is a short, the tape recorder is turned on, and when the jack's input is open, the tape recorder quits. If your tape recorder has such a jack, you're in luck; just take P_2 and plug it into the remote jack. If your tape recorder has no such jack, the best bet is to sever one of the wires going to the capstan (the little shaft that rides against the rubber idler wheel) motor and attach each end to the normally open contacts of K1.

Before using the auto-start, you'll have to buld audio encoders for all the people from whom you wish to receive messages; fortunately, this poses no problem. *73* has published numerous articles in past

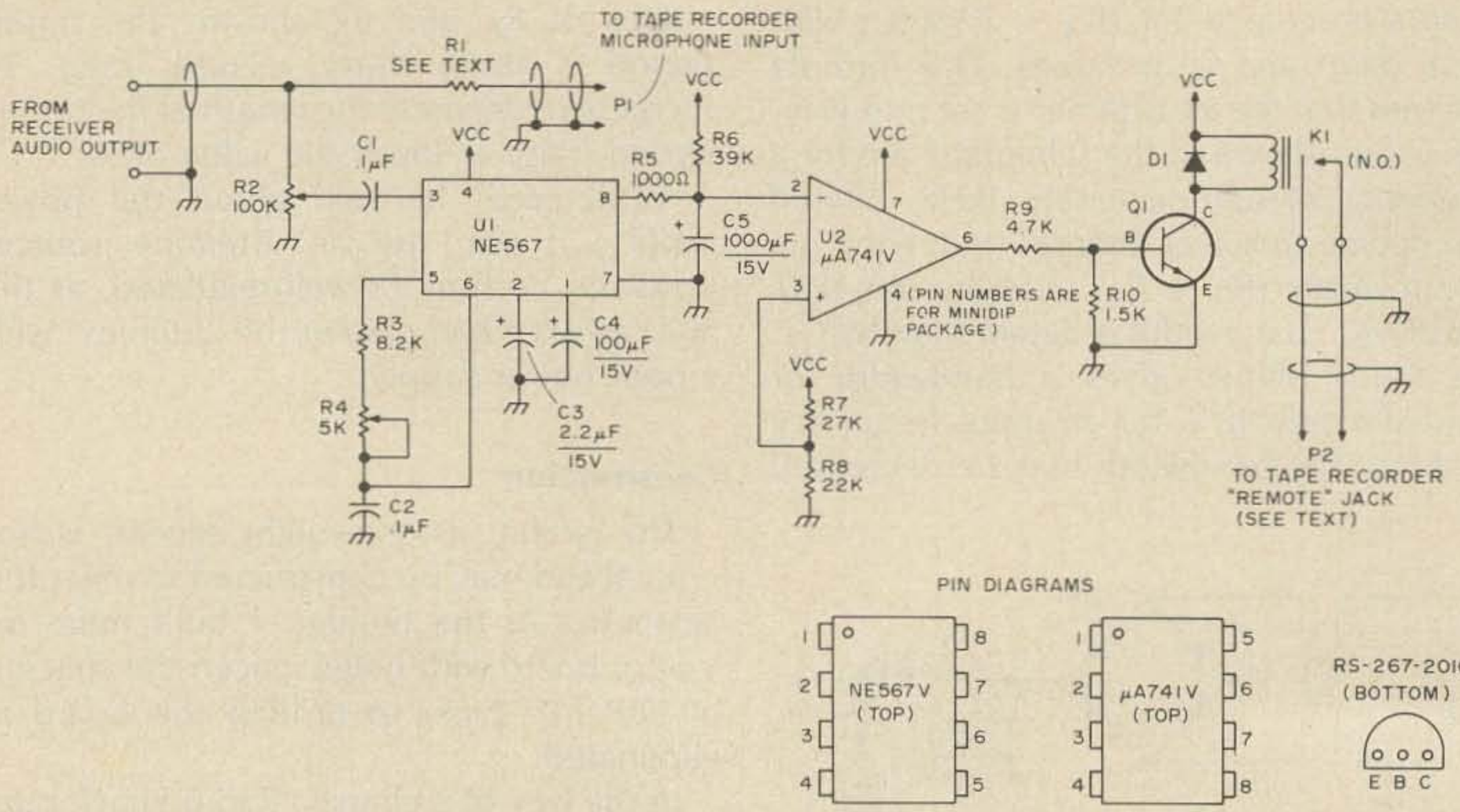

Fig. 2.

issues[2,3,4], and as long as the encoder you choose is relatively stable, things will be smooth sailing.

After assembling the encoders, measure the frequency of the 567 by feeding the output of pin 5, a square wave, into an oscilloscope or frequency counter. Next, tweak the encoders until their frequencies are reasonably close to that of the 567.

Now the real test: have a buddy hook up an encoder to his transmitter, and attach the auto-start input across your receiver's speaker terminals (the speaker should be left connected). Have your friend key the encoder in cycles of three seconds on (about the time needed to totally discharge C_5) and ten seconds off. Adjust R_2 until the encoder just barely triggers the auto-start, and leave it at that position, or slightly higher. If the auto-start doesn't trigger, it may be necessary to (a.) turn up the receiver's audio gain, or (b.) adjust R_4 slightly.

After you have the auto-start working nicely, plug P_1 and P_2 into your tape recorder, and set it in the *record* position. Since P_1 feeds the audio output of the receiver directly into the mike input of the tape recorder, it will be necessary to attenuate the signal with R_1, starting with about 220kΩ and working *down*, so as not to blow the recorder input to bits on the first try. My recorder, an old Lafayette cassette, works nicely with R_1 equal to 27kΩ.

A word of caution: Any formal message transmitted into the auto-start must be treated as any other piece of traffic, i.e., it must be kept on file.

Once you have your system working, the possibilities are endless. I use mine to leave messages at home while commuting to and from school—it's a real boon on those days when I encounter poor traffic conditions and want to leave a message that I'll be late getting home. Often the system is handy for recording another fellow's signal if his audio goes sour, so that he can get some idea of his problem's nature (how often have you tried to explain to a fellow ham just what his ailing transmitter sounds like?). But best of all, when I explain just how the system works, hams and non-hams alike are intrigued, which is nice.

. . . *WB2VRW*

REFERENCES:
1. 811 East Arques Avenue, Sunnyvale, California 94086.
2. "Squeaker for Tone Burst Entry," *73*, August, 1973, pp. 27-30.
3. "The MOS-Tone Encoder," *73*, December, 1972, pp. 29-31.
4. "Customized AFSK-MCW and Code Practice Oscillator," *73*, April, 1972, p. 36.

W. Niel Coward K2PMM/DL4
c/o 73 Magazine
Peterborough NH 03458

THE NEW BREED ON 2 METER FM

The following is a true story. Only the names have been changed to protect the guilty. The story is about my old friend, Mac. Mac has been in the two-way service business for over fifteen years. His ham license and commercial 1st Telephone and 2nd Telegraph tickets go back even farther. In case you didn't know, a two-way service business is no gold mine. Mac words hard and long to feed his large family.

One day a well-dressed fellow walks in his shop, introduces himself as Frank, a Technician class ham, and asks Mac to install his new 13-channel 2 meter Hashifisti in his Cadillac. Mac quotes the regular price for a two-way commercial installation and the guy doesn't bat an eyelash. "OK," says the obviously well-heeled Frank, "But don't drill any holes in the roof." At which point he brings out one of those fancy CB-type no-hole trunk lid mounts that go on the rear deck. Mac thought of his No. 6 kid needing shoes, No. 2 kid needing braces for his teeth, etc., so he only shrugs and says, "Just as you say."

After the job was finished, Frank paid Mac – in cash. As Mac pocketed the money his curiosity got the better of him. "By the way," he asked, "How come I haven't seen you around the radio club?" "Just moved into town last week," Frank answered. "Used to live in Center City. Was on CB there. Joe Blue gave me the Technician exam. Do you know him? Mac said, "Just slightly," but under his breath he said to himself, "Holy cow! That crook! He'll do anything for a buck."

A few days later Mac crawled out from under a car as one of those foreign sports cars roared up the drive to his shop. Out stepped a young man in brightly colored flared slacks. "I'm Bruce," he announced, "A friend of Frank." Mac didn't reply, as he slowly wiped the grease from his hands. "I'm interested in getting one of those 2 meter FM sets so I can use the repeater to talk with Frank." Mac still didn't say anything. "Frank says you can give me that Technician exam, like Joe Blue did for him in Center City." Mac's eyes narrowed at the mention of Joe Blue. "How is your code?", asked Mac. "Oh, I've got it pretty well memorized, except I get a bit mixed up on A and N," said Bruce. "Well, I haven't got time now to set up the code practice oscillator to give you the test," Mac said curtly. "Shucks," Bruce says, "Frank said you would take my word on knowing the code and you would fill out the exam papers for me if I made it worth your while." Bruce then pulled out a roll of bills and started peeling off twenties. He was so busy with the money he didn't notice the change in Mac's color, which had gone from white to red to purple.

Mac, who is a very large guy, carefully folded up the bills Bruce handed him, shoved them into the breast pocket of Bruce's flowered shirt without saying a word, then spun him around, grabbed him by the seat of the pants with one hand and the shirt collar by the other, propelled him swiftly through the door and threw him right into the seat of his sports car – without bothering to open the car door. Mac then went back into the shop, closing the door gently. He went straight to the refrigerator, pulled out a beer and silently opened it. Jack, who works for Mac, had observed the whole thing. He didn't say a word either but noted that Mac's color was slowly returning to normal. Later in the day Mac said laconically to Jack, "Two meter FM has sure gone to hell."

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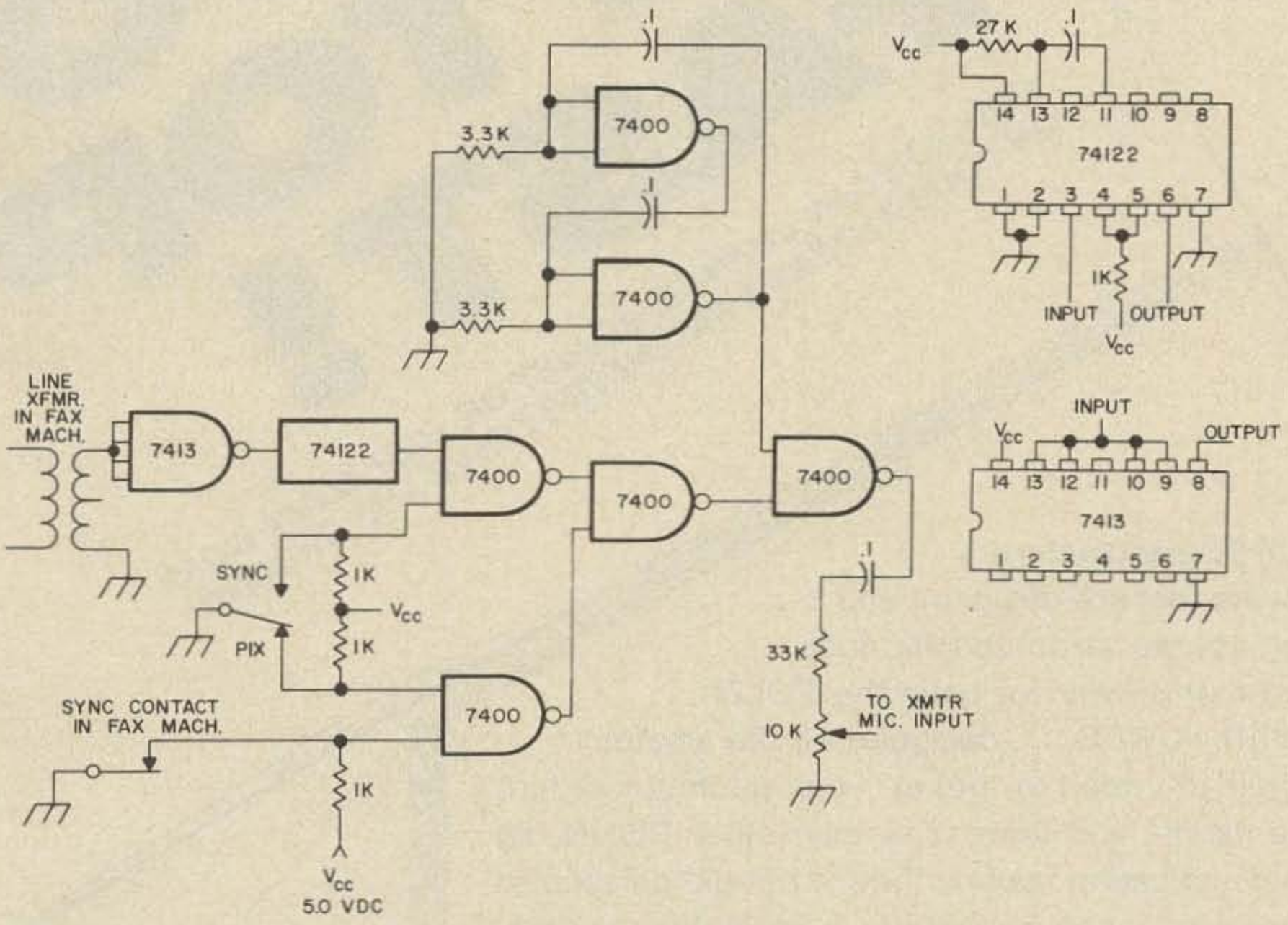

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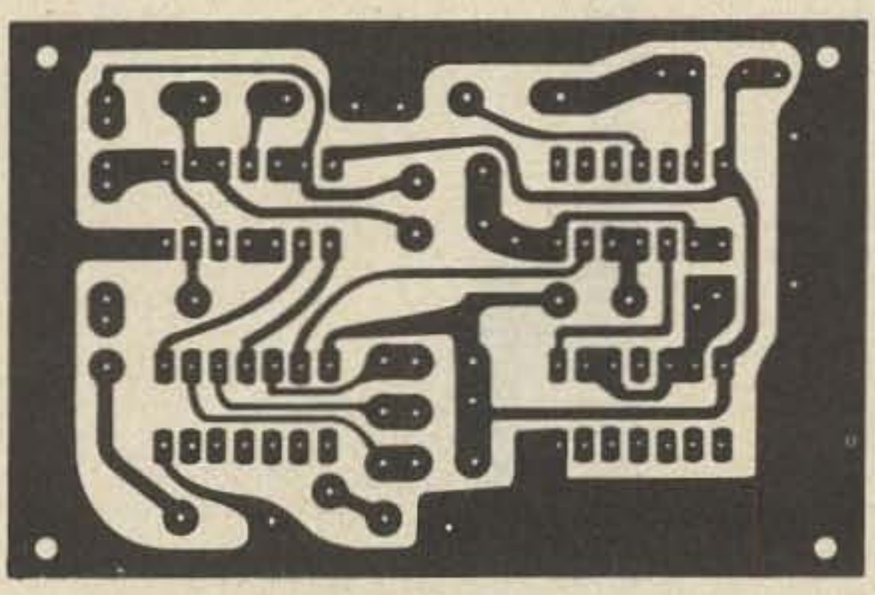
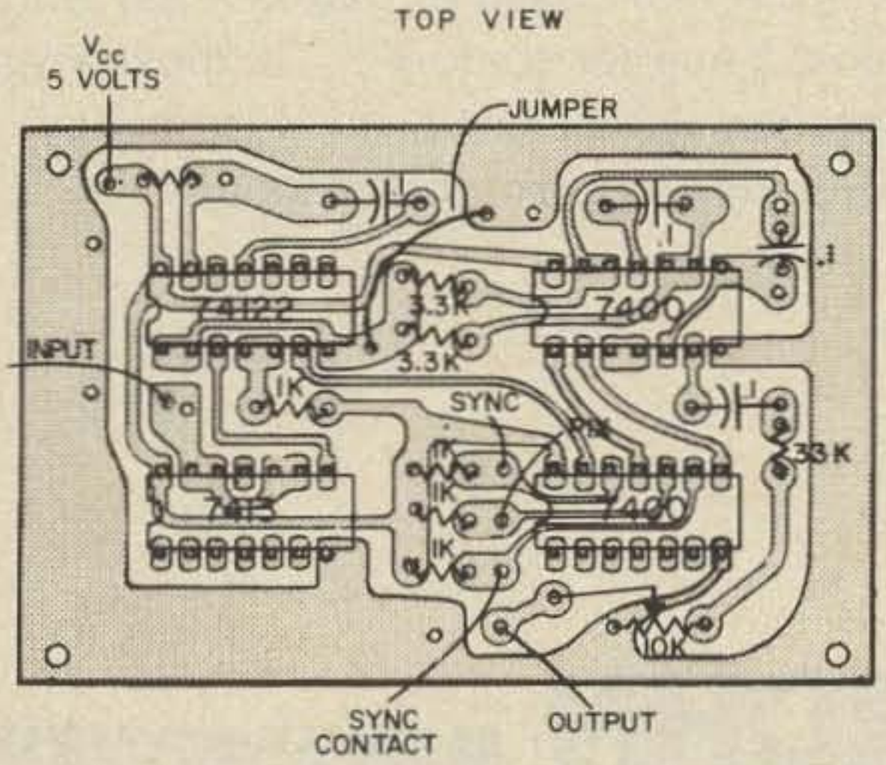


TOP VIEW



ELECTRONIC POSITIVE FAX CONVERTER

For 6500 Deskfax Machines

All resistors are ½ watt, mounted vertical. Radio Shack has PC type capacitors which work well. The board is designed for a multi-turn type pot. The circuit is designed to also send electronic sync. bars. Best results will be had with board mounted in machine. A half wave-zenered supply connected to the exciter lamp will power the converter. Make careful adjustment of the "P2" Pot for proper operation of converter. Frequency outputs will be about 1500 – 1600 Hz. Set 10K pot for proper input to transmitter. Thanks to WBØFVL for submitting this circuit.

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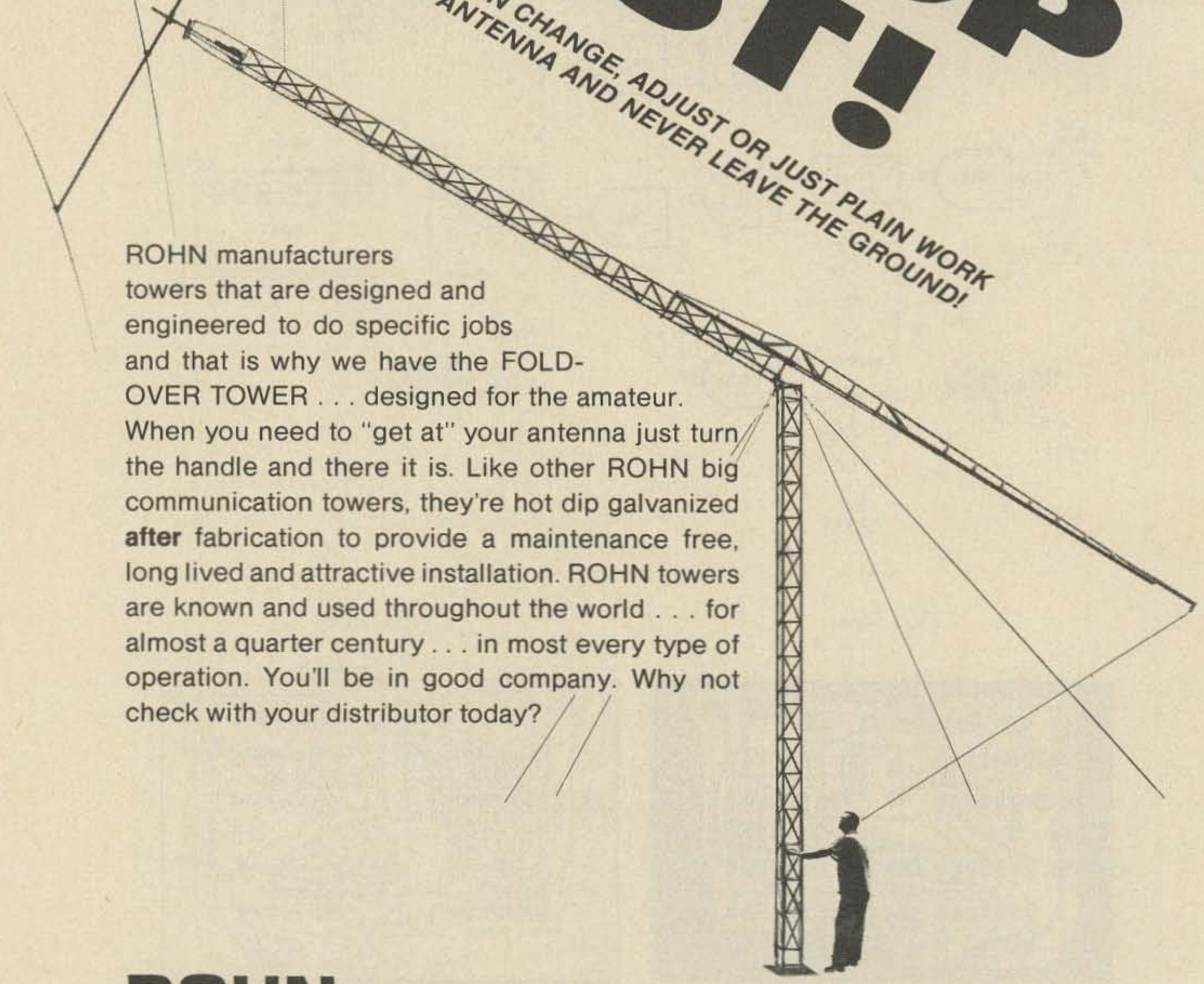

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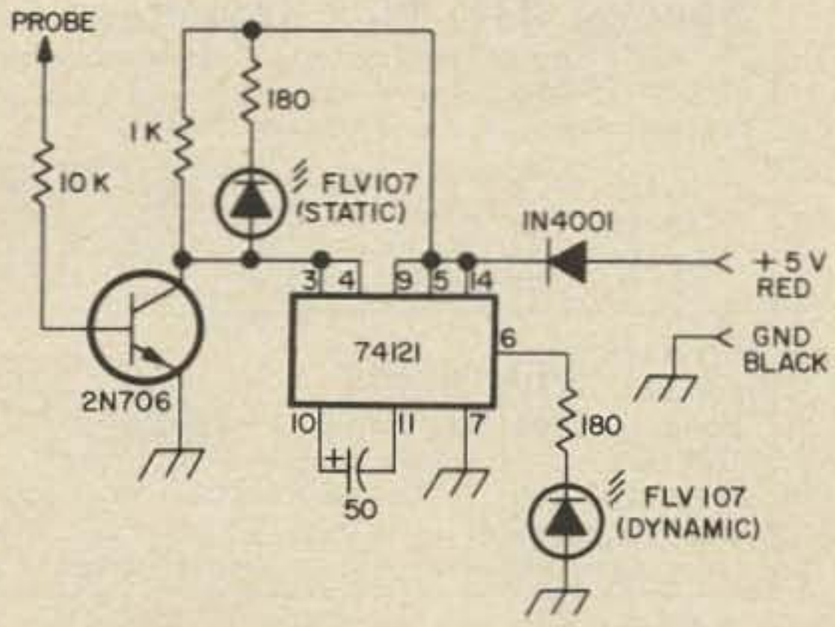
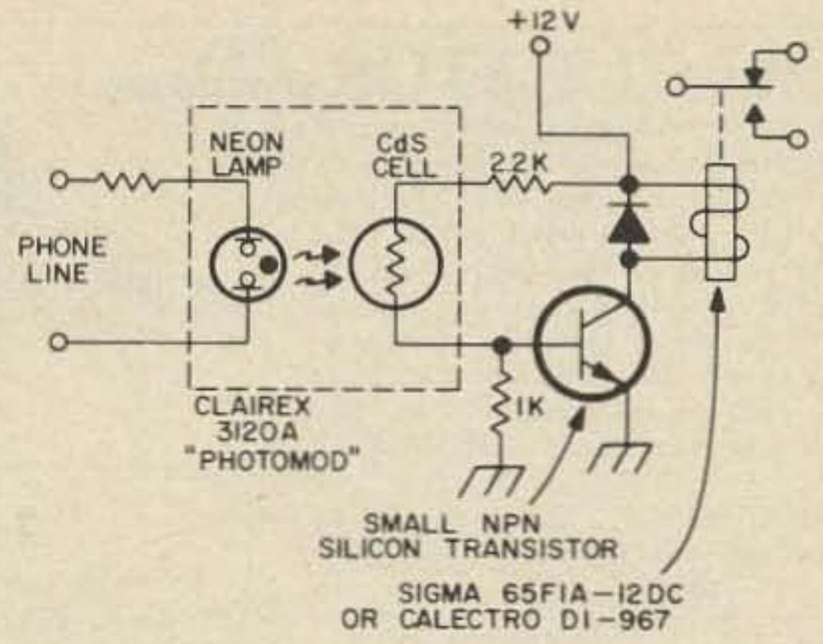


PULSE SNIFFER LOGIC PROBE

RTL/TTL logic probe (static) LED indicates logic level at probe tip on = "1." "Dynamic" LED will indicate presence of "1" pulse at probe tip, pulse is stretched to about 50μs to be easily visible. A 100ns 4V pulse will trigger pulse stretcher. Total cost about $2.50 with all new parts from 73's ad's. 1N4001 "Idiot Proofs" against reversed power leads. Uses +5V from circuit under test. Transistor and LEDs are not critical, basically any high speed switch and indicator LED will work. Thanks to R. Widmer WWBØITA, for this circuit.



SOLID STATE TELEPHONE RING RELAY

Ring signal from telephone company lights neon lamp, which causes drop in resistance in CdS cell, turning on transistor, which closes the relay. Circuit has two nice advantages – since there is no direct connection from telephone line to power supply circuit, you don't have to worry about inducing hum into the line. Also, neon lamp acts like an open circuit when not lit (below about 65V), and above that voltage has a resistance quite high (in series with 220K) – all this means is that the phone company has to stand on its head before they can detect this on your line. Instead of Clairex lamp/photocell module, you can use NE-2 neon bulb taped against a cheap CdS cell. Thanks to Peter Stark K20AW, for this circuit.

SCHEMATIC DIAGRAM OF DELAYED LIGHT TURN-OFF

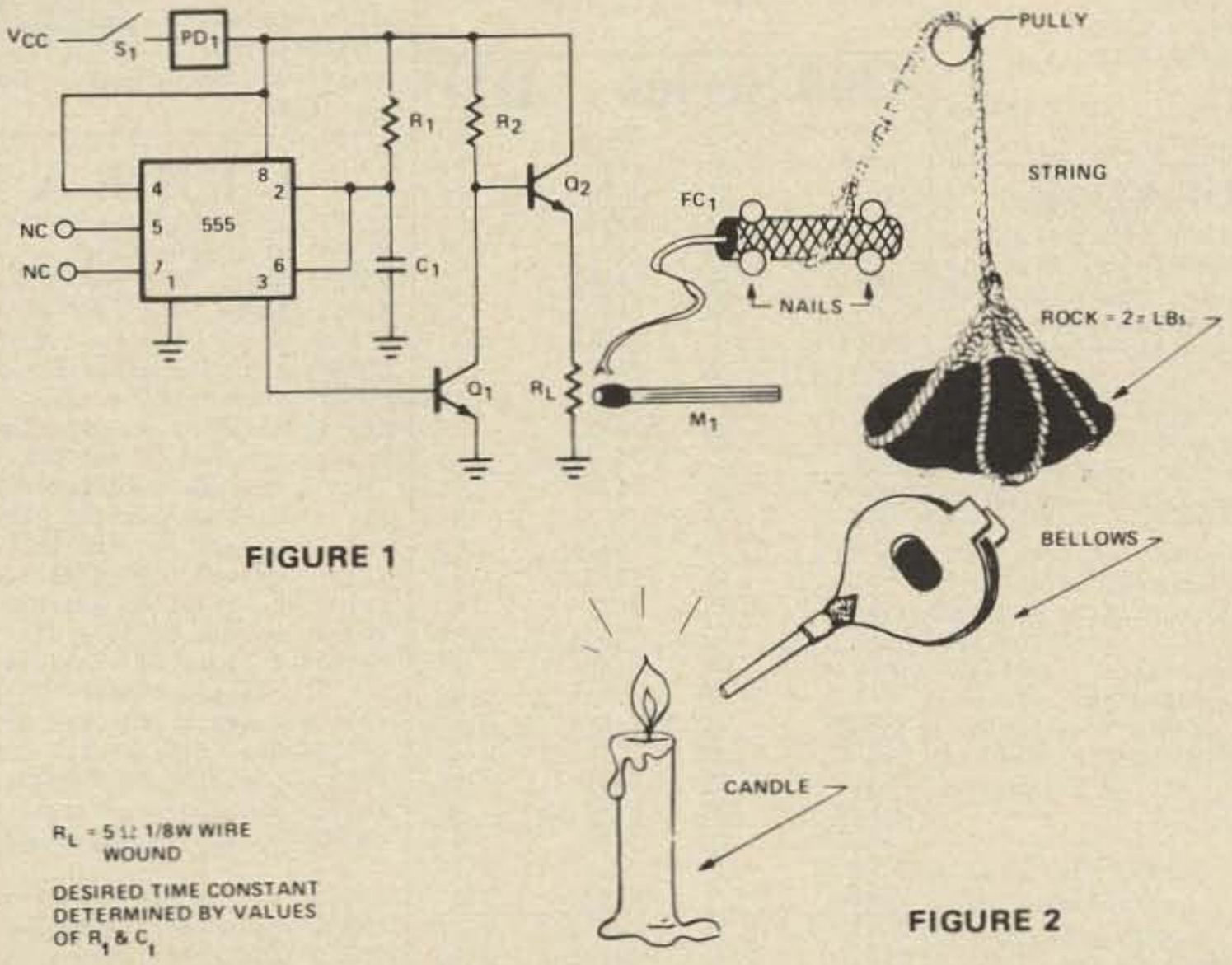


FIGURE 1

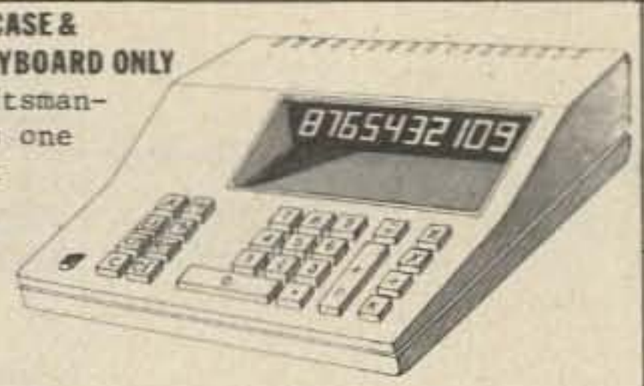
R_L = 5 Ω 1/8W WIRE WOUND

DESIRED TIME CONSTANT DETERMINED BY VALUES OF R_1 & C_1

FIGURE 2

Circuit courtesy of Signetics Timers catalog.

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

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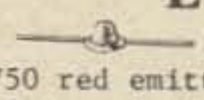

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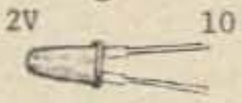

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74H08	.35	7474	.65
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74L10	.35	74H74	.80
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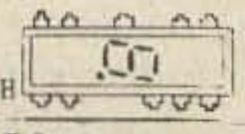

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This kit provides a highly sophisticated display section module for clocks, counters, or other numerical display needs. The unit is .8" wide and 4 3/8" long. A single 5-volt power source powers both the ICs and the display tube. It can attain typical 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
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JUGE

Let's take a close look at the FM-27B. Skip over the technical specifications. . .you can find them in any of our competitor's ads or the factory's advertising. Let's talk about what the radio will do for you.

First of all, your experience will back up the fact that our Cushman CE-3 says the FM-27B is the most sensitives2-meter rig it has checked. On the Cushman, it fully quiets at about .25μv and the next best has been about .4μv, with the average radio we check running .5 to .7μv. The accuracy of the readings should be good, but the comparison is the important thing, because all of the radios tested were checked on the same equipment. As most of you know, many fellows operating on simplex frequencies are slightly off frequency. The FM-27B allows you to fine-tune all received signals, and its meter shows you when the signal is centered into the discriminator. This usually means the difference in a noisy or fully-quieting signal, and coupled with the extreme sensitivity many times means the difference in contact and no contact.

The FM-27B's frequency control system allows you to tune *continuously*, throughout the operating range of 146 to 148MHz, and doesn't restrict you to 30kHz steps or standard repeater spacing. The last digit you dial in is tuneable, not stepped, so you can dial up 146.525 if you wish, and there is no connection between transmitter and receiver frequencies, so you can listen to 146.94, and transmit on any frequency between 145 and 146MHz at the same time (or any other combination of frequencies). "Oddball" repeater spacings are as easy to get as "standard" frequencies.

For those of you who are naturally nosey like I am, you can tune in on any frequency you wish and see what is really going on in your area, and you may find as I have that there are repeaters operating that you didn't know were on the air.

The "B" model of this fine radio is exceptionally stable, and the markings on the frequency dials are almost never more than half the width of the pointer off actual center. (If you ask, we'll check this for you and be sure before we ship your unit.)

If your club has a "club frequency" in the 145 to 146MHz range, and you have no use for 147 to 148MHz, we'll deliver you a unit at no additional charge which will cover 145 to 147MHz, if you will allow us about 2 weeks for shipping. Standard units we can usually ship the day your order arrives.

Couple this with a 28 to 30 watt nominal output, and you're going to make mobile-to-mobile contacts which you had thought were impossible with your new FM-27B, and the price of $479.95 (no crystals to buy) is a bargain. Think it over, and order yours today. Even at the $479.95 price, the FM-27B is now the most popular radio we have with our local customers who have found out what we're telling you here. Not one customer has failed to come back to us and tell us that the FM-27B exceeded his expectations, and was the best performer he has ever seen. (Incidentally it is American made, and service turnaround time the few times it's needed, has averaged 24 hours both with us and the factory.)

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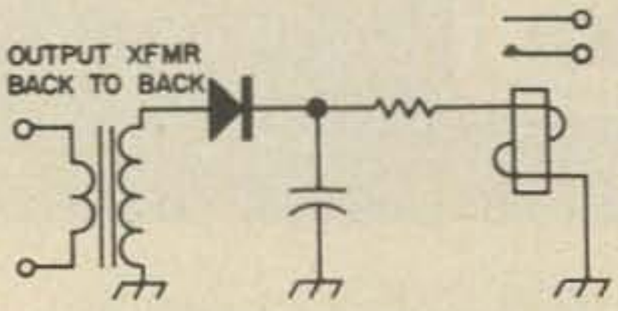
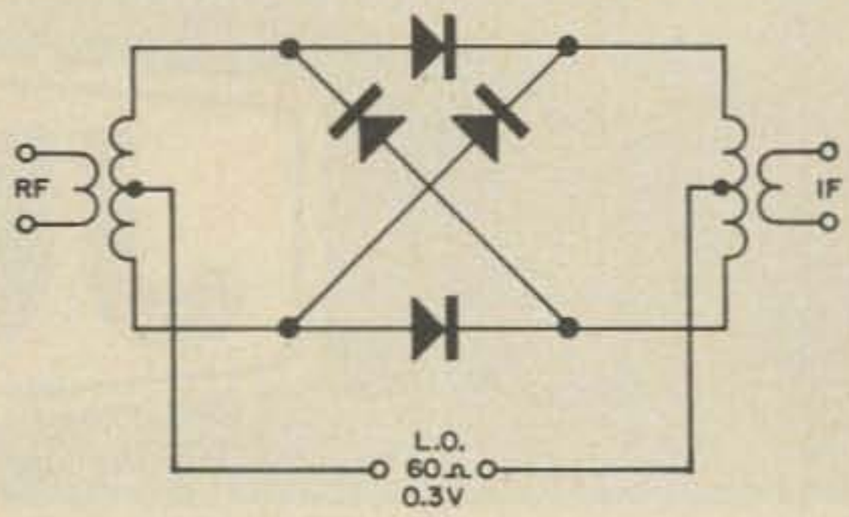
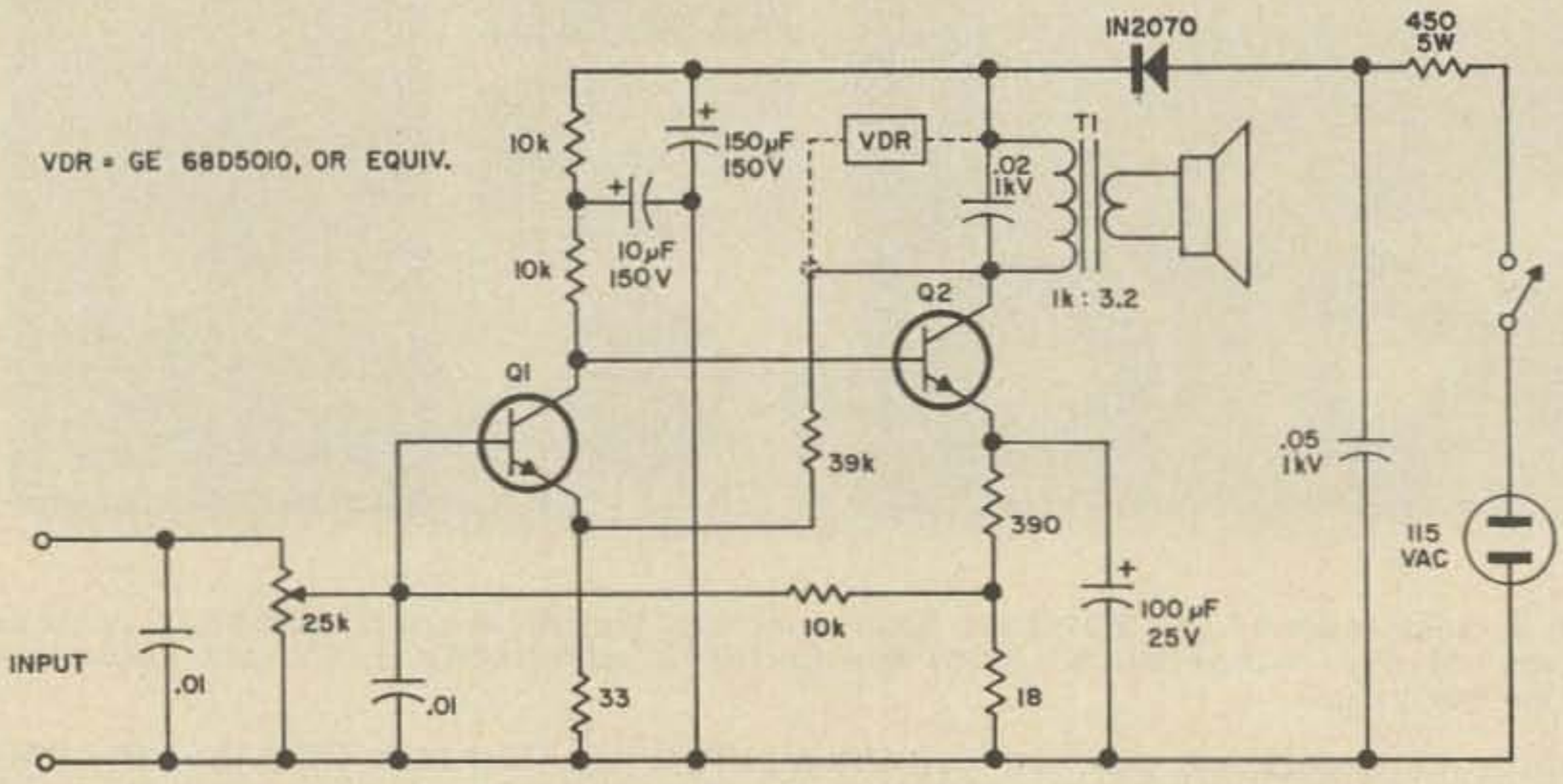


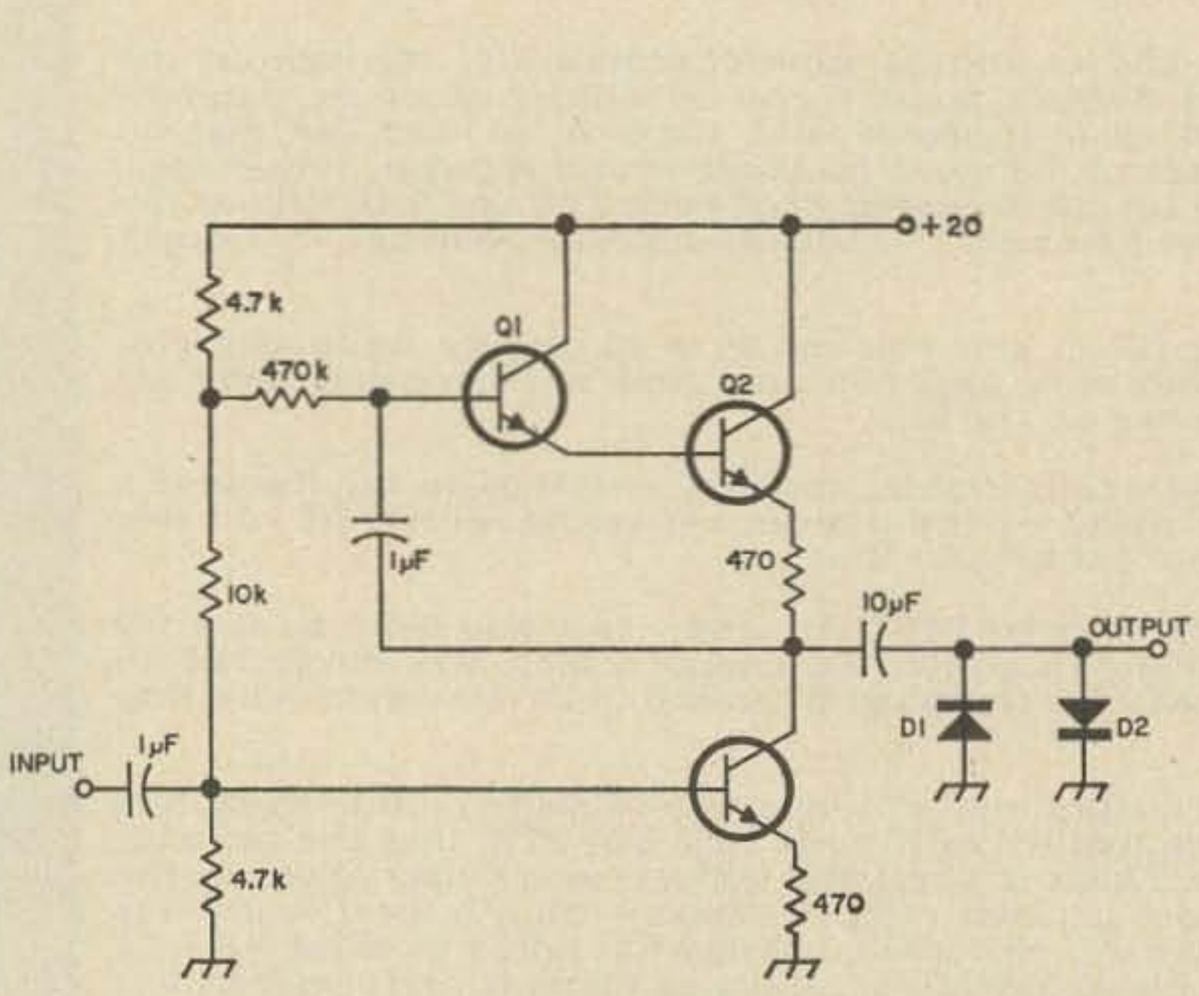
A transmitter can be keyed by a tape recorder for automatic code practice with this circuit.

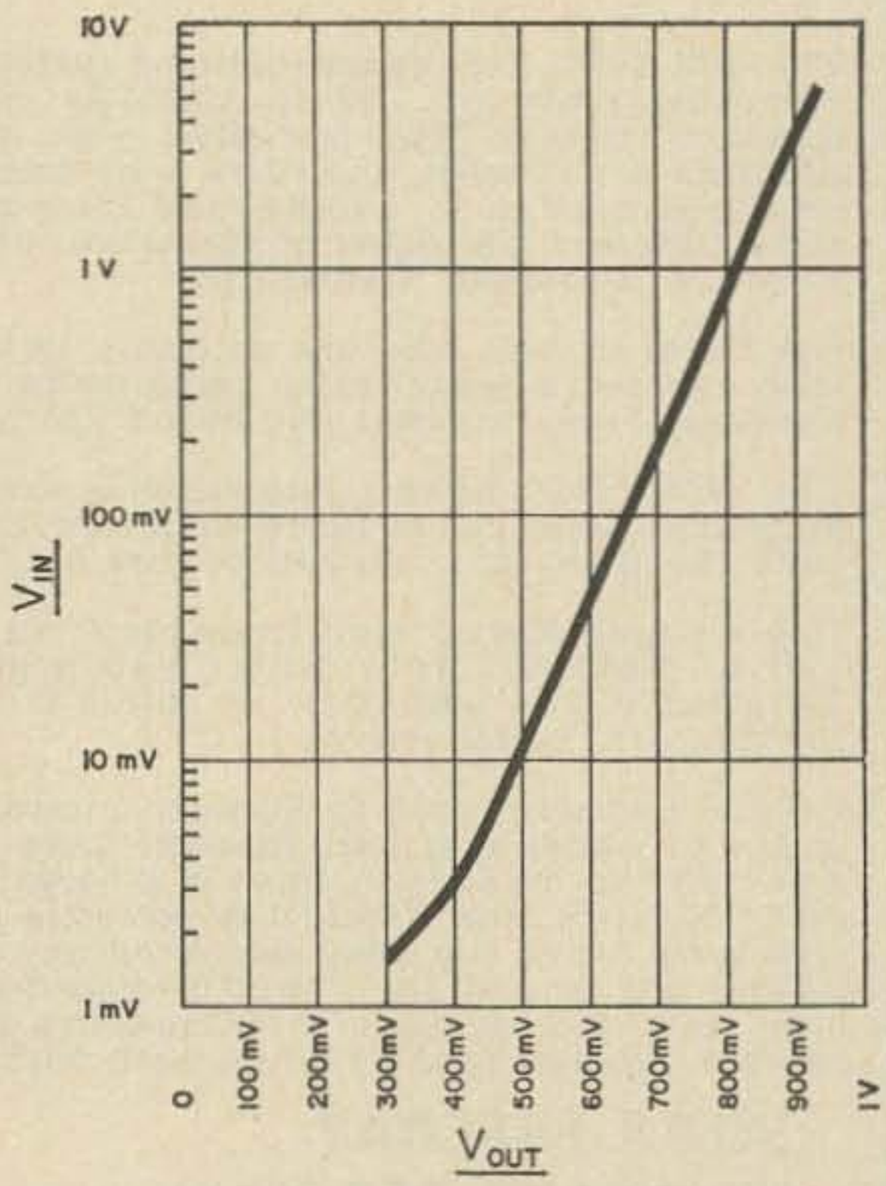


A diode ring balanced modulator.



This line operated audio power amplifier provides about 500 mW output with an 80 millivolt input signal. Q1 is a 2N3565, SE4002, SK3020 or HEP-54; Q2 is a 2N3916 or SE7005.





This logarithmic amplifier makes use of the fact that when two back to back diodes are driven by a current generator, they exhibit a logarithmic output of the input signal.sWith the circuit constants shown, this amplifier follows a nearly perfect logarithmic curve over a 60 dB range; selected diodes will increase this to 80 dB. Q1, Q2 and Q3 are 2N2924, SK3019, GE-10 or HEP-54; D1 and D2 are IN914.

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A BLACK BOX FREQUENCY CONVERTER

This black box is a very tame beast, one that you can hang on to the output of just about any conventional transceiver and operate on another frequency. There are many other types of frequency converters, but none of these has the unique advantages of this black box.

Why call it a black box? Because, once tuned, you can set it aside, switching it (with a DPDT relay) into the antenna circuit of your transceiver only when you want to make a frequency excursion to some outlandish frequency not within the range of your basic equipment. It requires no internal connections within your transceiver, which means no butchering a valuable piece of gear to bring out low-level rf.

You can design it for going to VHF from HF, for going to MF (1.8 MHz) from HF, or for hitting those non-amateur-band frequencies used by MARS, CAP, or the Disaster Communications Service. You can even use it for putting a CB SSB transceiver on a MARS or an amateur frequency!

It has one disadvantage: You can't use it for heating your shack in the winter! It doesn't have any power-dissipating resistors to sap up the rf power that you generated so expensively in your transceiver. All that power is put to good use.

Principle of Operation

Its basic principle is founded on the sound concept that frequency conversion and modulation (or demodulation) fundamentally are the same, both being addition of sinusoids in a nonlinear circuit.[1] With this concept accepted, the supposition that frequency conversion can be accomplished only at low signal levels no longer limits circuit design. After all, in the late 1930's WLW, under a special experimental license, operated a high-level plate-modulated transmitter of 500,000 watts! As frequency conversion is practicable at such power levels, there's no need to be hesitant about performing it at the level of a hundred or more watts.

The next concern is that of insertng a signal of such a level into a mixing circuit. The control grid of a vacuum tube can be ruled out, for you want to use full power without any dissipating resistors, and it'd require an outlandish tube to accommodate 200 Watts into its grid! The screen grid can be used, as was described in my article in the March 1962 issue of 73. This, however, still required the use of resistors, although their purpose, in this instance, was to develop a voltage ($E=\sqrt{PR}$) for excitation of the screen grid. Cathode injection has been used, but one is reminded of the statement made, truthfully, of cathode modulation: *Cathode modulation combines all the faults and shortcomings of control grid, screen grid, suppressor grid, and plate modulation without offering any of their advantages.* These same hard facts apply also to cathode signal injection; so let's

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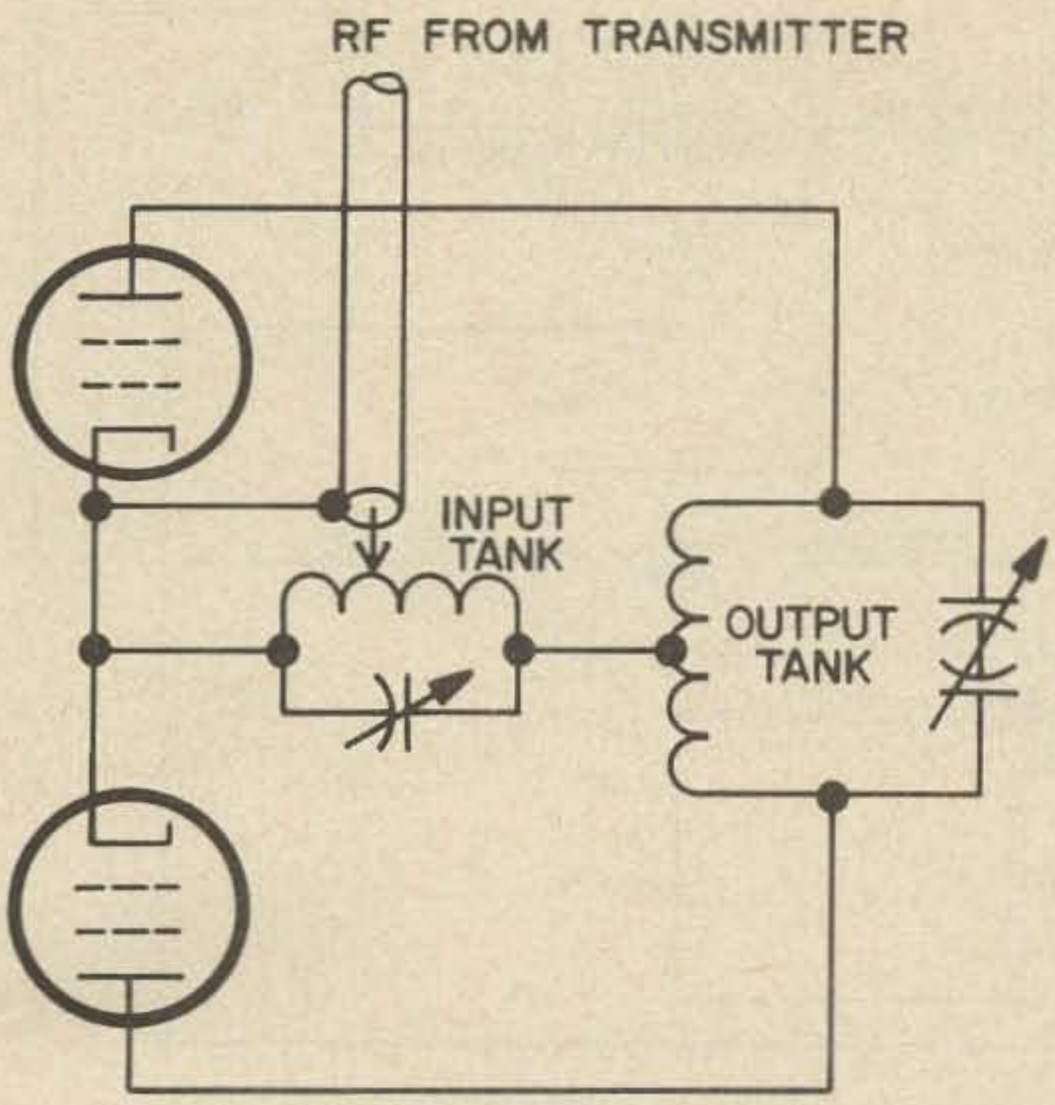

Fig. 1a. Basic circuit for providing plate power from an rf source.

reject it. That leaves only the plate circuit, and there's where complications set in! In that one circuit there will be two radio frequencies, two frequencies that you desire to keep isolated except when they are combined in the nonlinear element: The vacuum tubes. Two rf tanks in series have been tried, but the interaction between these is very discouraging.

One way of having two frequencies, unmixed, in a common circuit, is by using a variety of the hybrid circuit. Fig. 1a shows one possible way of doing this. It's a circuit that has a push-pull configuration for one frequency and a single-ended configuration for another frequency. It's not just what you'd like, though, for the halves of the split plate inductor act as effective rf chokes, isolating the single-ended tank from the plates. The circuit in Fig. 1b places the capacitive reactance of each half of the split-stator variable capacitor in series with the single-ended tank, but this is not serious, as the reactance is low at the frequencies and the capacitances involved. Note that this configuration does not, in itself, provide a path for the direct current component of the plate current to return to the cathode; so an rfc is placed from the center of the coil (a low potential point) to ground. Ground? Why not to B+? For the very excellent reason that no "B" supply is used; that is, none other than the rf power brought into the circuit by way of the single-ended tank!

I can see the cocked eyebrows! Relax! It works. And it's not original with me. The same idea was used in the "first detector" circuit of a very early superheterodyne produced around 1923. Later, and in a higher-power form, it was used in the "Sideband Generator," a part of the Localizer portion of the Instrument Landing System, a ground-based aid to aerial navigation. In this case, the alternating current power fed to the tube plates consisted of discrete (not mixed) 90 Hz and 150 Hz signals coming from special alternators by way of a hybrid circuit. One question that was sure to be asked (I was teaching that subject some 25 years ago) was "Won't the sine-wave 90 Hz and 150 Hz waveforms be distorted?" The answer is no. (And this can be demonstrated with a wave analyzer to the full satisfaction of the most skeptical.) Another sure

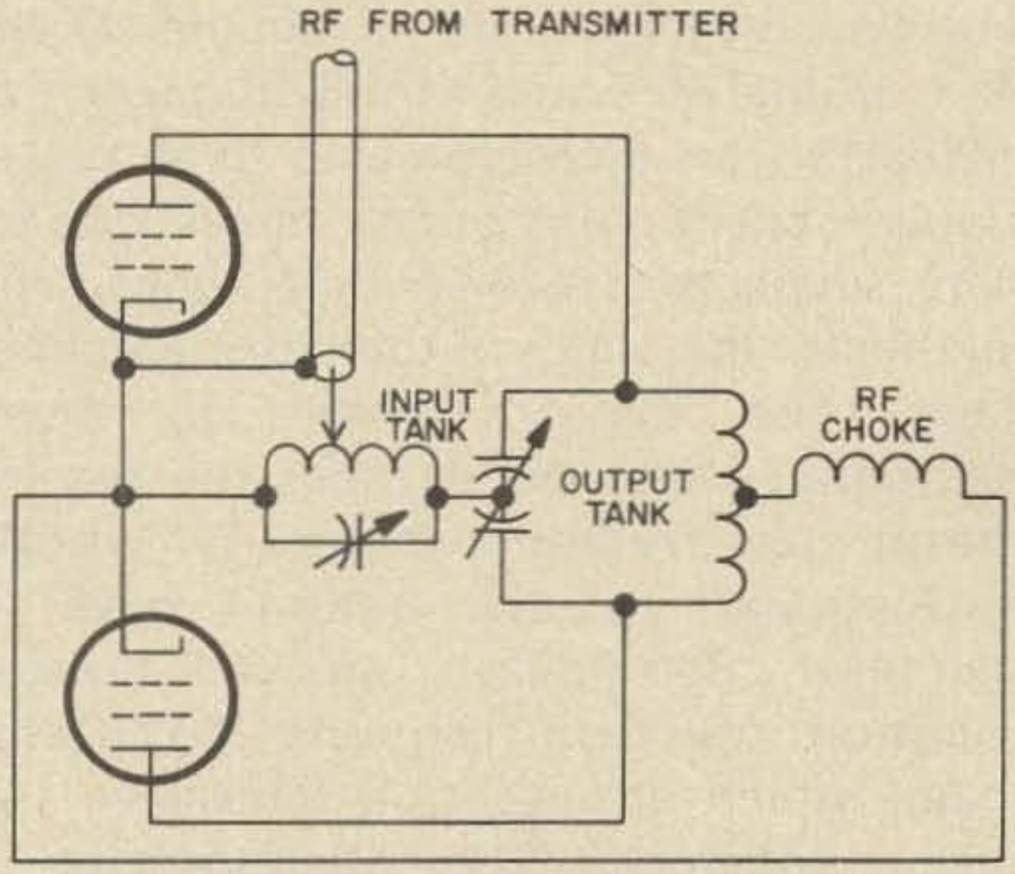

Fig. 1b. Modification required in order to avoid rf choke effect of output tank.

question was "Why not use some dc on the plates and get more power out?" You don't get more power out by this measure; you merely get redder plates in the tubes! Again, this is a matter that can be demonstrated quite readily. The grids of the tubes in the "Sideband Generator" were excited with VHF CW; only the sidebands appeared in the output circuit. The sidefrequencies of these sidebands, ±90 Hz and ±150 Hz, demodulated into pure and undistorted sine waves. So what more could you ask?

Now that you're convinced that the principles involved are factual, and not

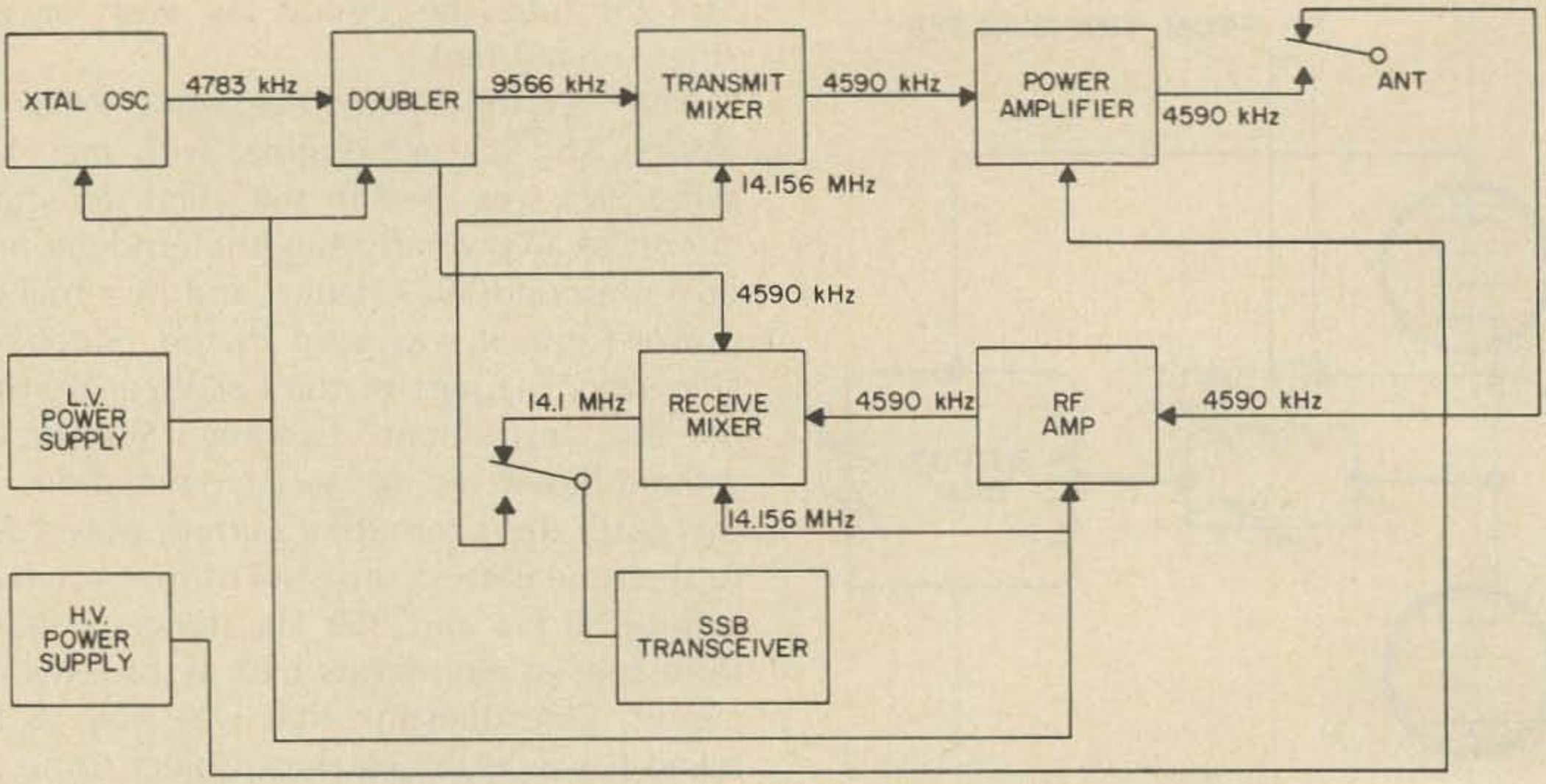

Fig. 2. Block diagram for "black box" high-level frequency converter.

some hare-brained fantasy, let's take a look at Fig. 2, which shows the block diagram. The frequencies indicated are those of the prototype which I built to put my Drake TR-4 on the Air Force MARS frequency of 4590 kHz. This prototype uses three power supplies, one for bias and for relays, one for plate supply for receiver-type tubes, and another for the plates of the linear amplifier stage. The transmit chain of stages incorporates a mixer; so does the receive chain. The receive mixer is wholly conventional, but the transmit mixer is high-level. Both mixers are fed from a common injection-frequency oscillator chain, which ensures true transceive frequency coherence. The SSB transceiver is transferred from the output of the receive mixer to the input of the transmit mixer by one half of the DPDT send-receive relay; the other half transfers the antenna.

Let's look into circuit details. For the local oscillator, you'll note that a crystal-controlled oscillator is used, as it's vital to have a stable output from this chain. For the prototype, an output in the vicinity of 9500 kHz was needed to mix with the SSB signal in the 14 MHz band. My junkbox yielded a crystal on 4783, which was used in a straight Miller oscillator circuit. Its output was capacity-coupled to a 6L6 doubler stage. That stage had its output split two ways, one going through a coaxial cable to a small variable coupling capacitor and on to the injection grid of a 6BE6 mixer in the receive chain, the other being link-coupled to the push-pull input of the transmit mixer state. This circuit, plus the transmit mixer, is shown in Fig. 3.

Perhaps this is a good spot to put in an "aside" remark, one that might help to explain why certain construction practices were followed: The entire black box project was constructed solely from the contents of my junkbox; the total cash expenditures for parts were zero dollars and zero cents. Later in this article I'll tell you how I'd built it if new parts were to be used. It would weigh less, have fewer power supplies, look much better . . . but it would work no better.

Looking at the transmit mixer stage in Fig. 3, you'll note that gridleak bias is used. The value of the gridleak resistor is controlled by a relay in such a manner that 271 kΩ is used for receive and 21 kΩ for transmit. The higher resistance limits grid current when no plate voltage is being applied. There are other ways of accomplishing the same results, but this is the easiest.

On the plate side of the stage, as previously mentioned, the output tank is of push-pull configuration, differing from the conventional only in having the centerpoint of the inductor grounded for dc through an rfc. The inductor and capacitor were

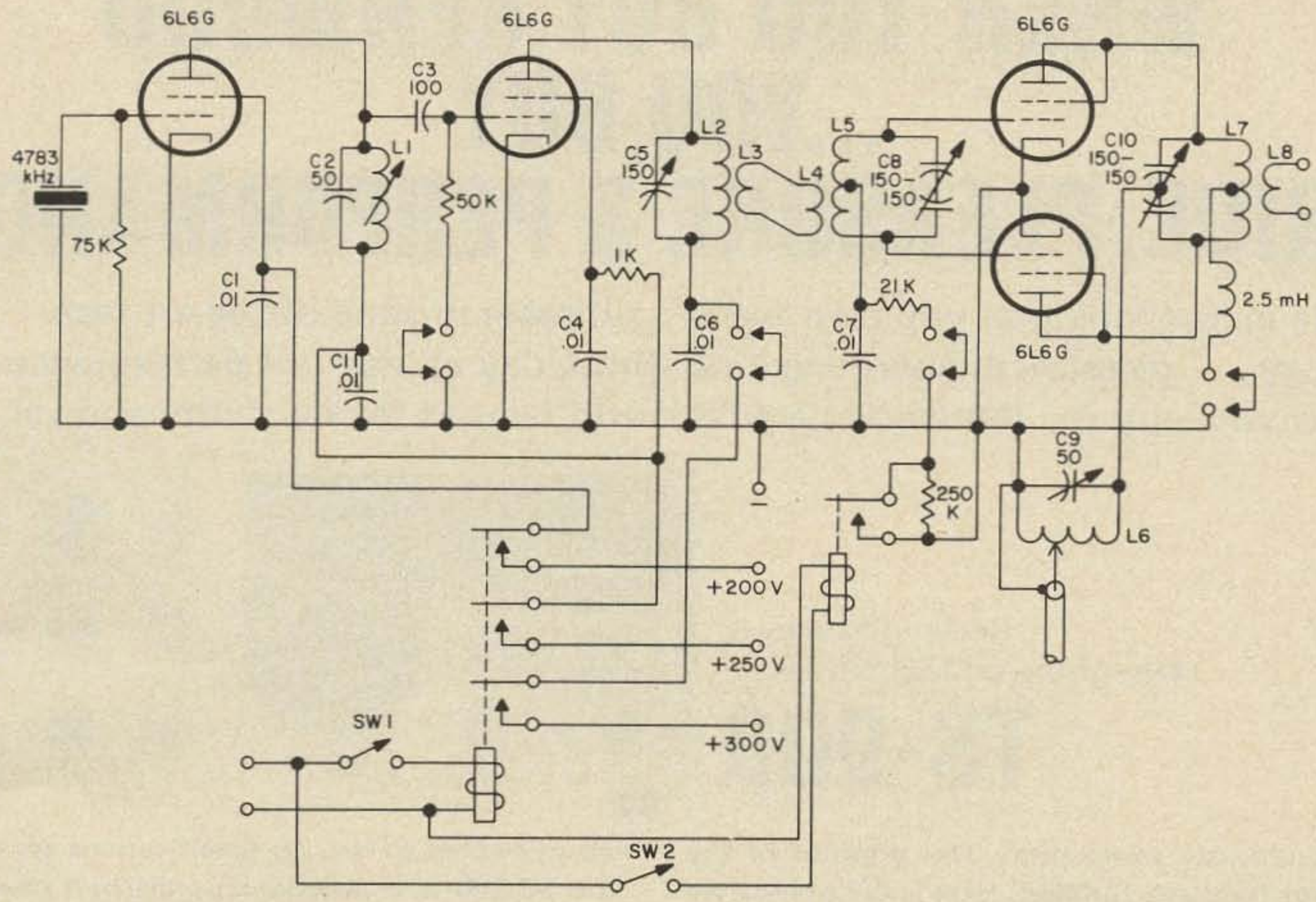

Fig. 3. Local oscillator chain and transmit mixer.

selected so that a very considerable amount of capacitance is in use when the combination is resonated at 4590 kHz. This is done so that the reactance of each half of the split-stator tuning capacitor, which is seen as a series load by the "plate power supply," is held to an acceptable value. (A grid dip meter is of great value in presetting LC circuits; it would have been difficult to build the black box without the services of a good grid dip meter.) Plate power, you will recall, is furnished by rf at 14.156 MHz, coming from the SSB transceiver to the single-ended tank by way of a coaxial cable connected to a tap one turn up from the cold end of the coil.

After the single-ended coil circuit has been grid dipped to the approximate frequency, the transceiver loads into it with the same degree of readiness and steadiness as though it were loading into a conventional dummy load. Remarkably enough, the push-pull tank also tunes and loads just as though it were in a conventional circuit. For those who built and used transmitters with push-pull finals back in the 30's and 40's, its behavior will bring back pleasant memories!

Moving on to the final amplifier shown in Fig. 4, a preword is advisable: Don't be tempted to economize on tuned circuits between the mixer and the antenna. That mixer is not like a double-balanced modulator; its output contains many undesired

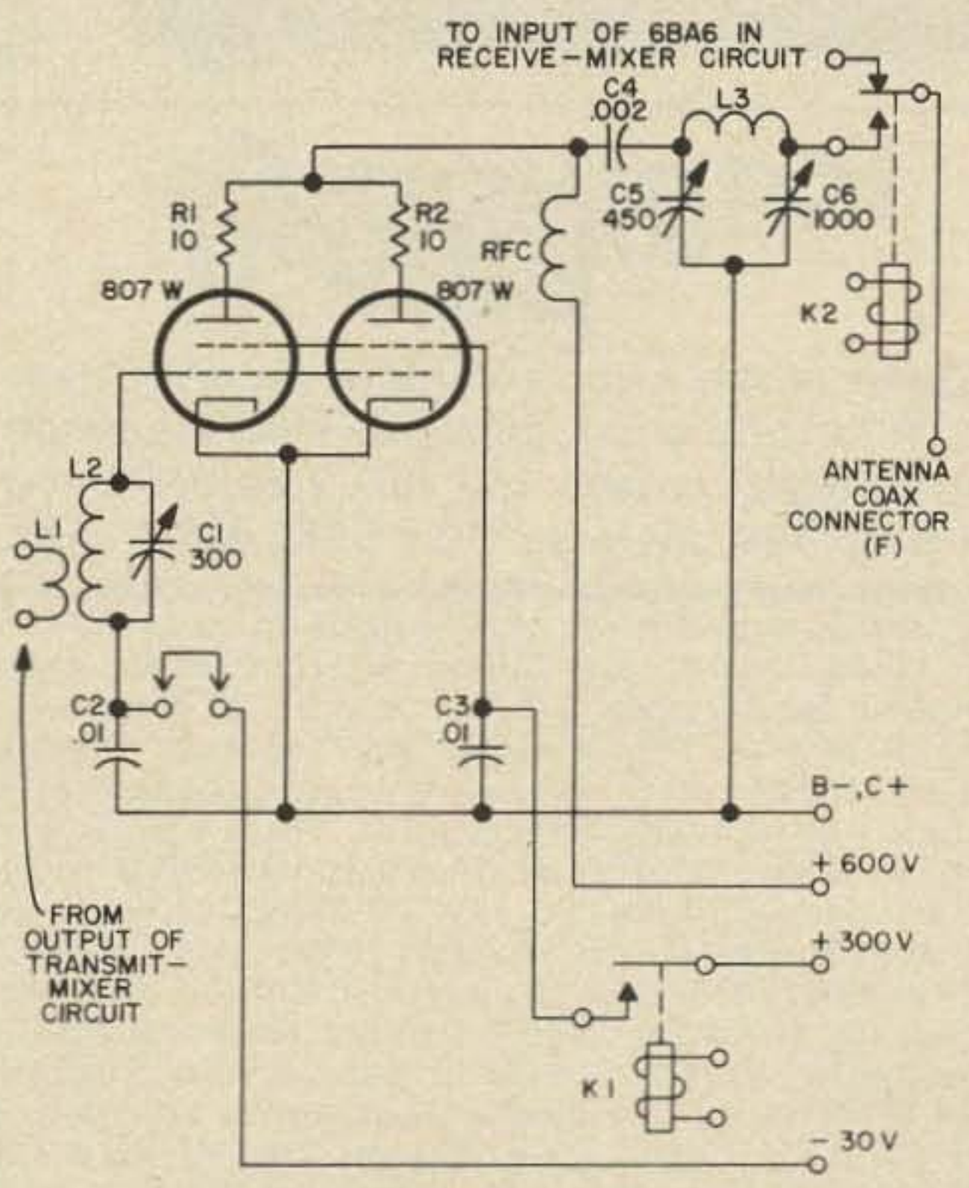

Fig. 4. Linear power amplifier.

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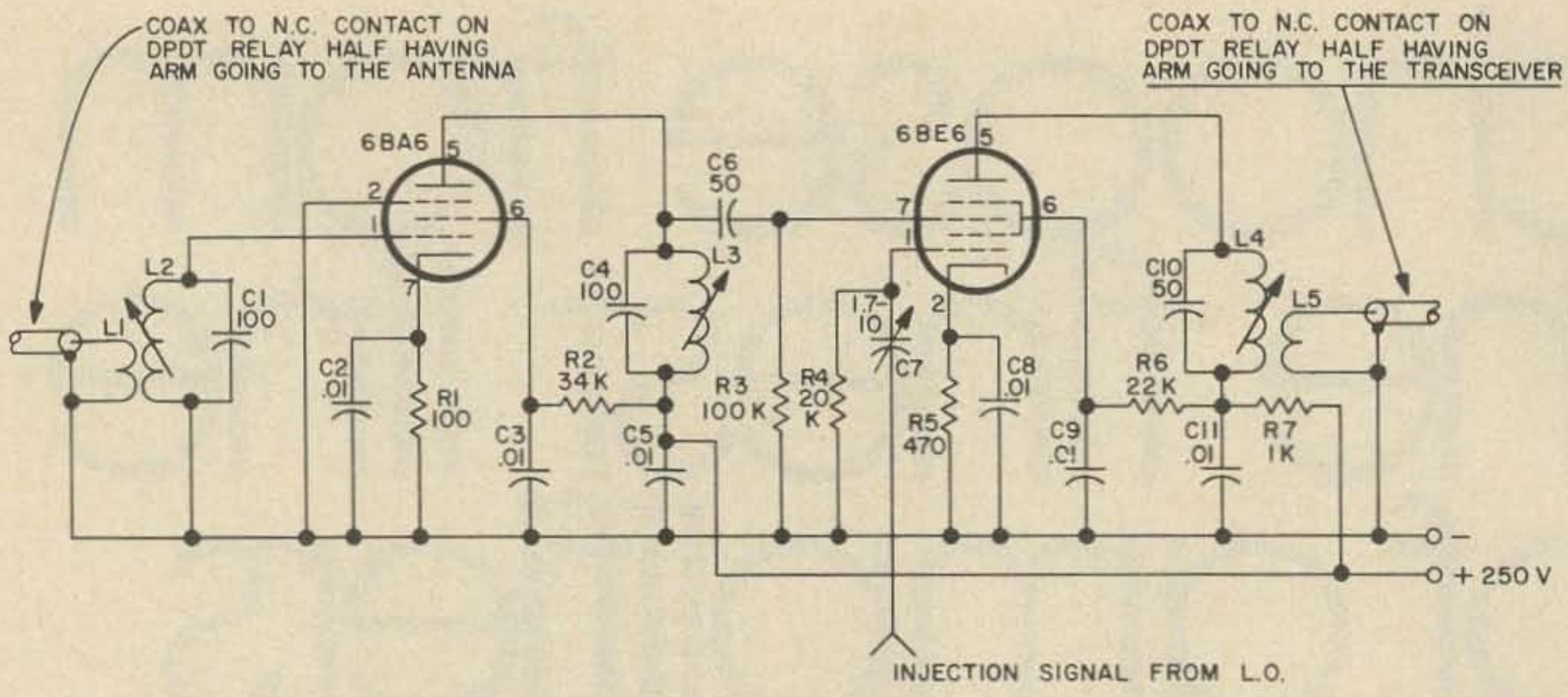

Fig. 5. Receive-mixer stages.

signals. Use several tuned circuits between it and the antenna.

You'll note that the parellel 807s are not neutralized. Maybe it's pure dumb luck, but I've built many amplifiers using 807s and never had one display any signs of instability. I laid out this circuit so that neutralization could be added readily, but, as it was not required, it was not included.

Your attention is invited to the relay breaking the screen grid power circuit. Don't omit it. Or, if you do, be sure that you include some means of ensuring that you don't have the unfortunate combination of screen voltage applied when the plate voltage is off. Both the input tank and the output pi-net were designed to have an inordinate amount of capacitance in effect at resonance, and it is recommended that you follow this practice in your construction. No gridleak bias is used in this stage, as it is designed to run in Class AB_2 and therefore all series resistance is to be held to a minimum. Bias is taken from the relay power supply through an additional filter section. In order to have sufficient bias voltage, the relay power supply develops far more voltage than is needed to actuate the 24 Volt relays used. Those relays close with a royal clang, and you can be assured that they'll not chatter because of being too near their drop-out voltage!

In the prototype, with the exceptions of the two pi-net variable capacitors, all controls were made "screwdriver adjust." Once set, they need no fiddling. Probably the output controls too, could have been preset and left, but it's a comforting feeling to know that a stage is properly resonated

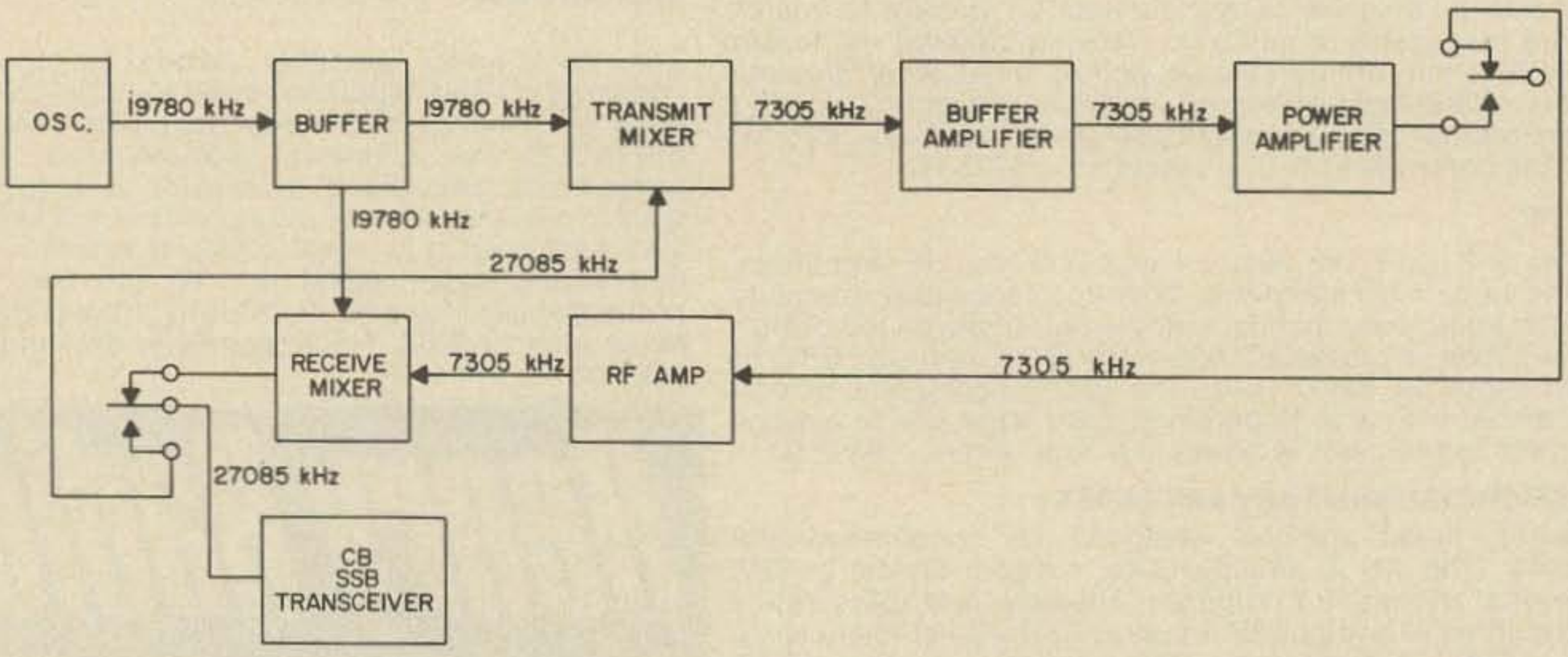

Fig. 6. Block diagram for cb to mars conversion.

and properly matched to the antenna feedline.

For reception, a plain bread-and-butter system is used. From the antenna half of the DPDT send-receive relay, the normally-closed (receive) terminal feeds through a coax to a two turn link at the cold end of the rf amplifier input tank. That stage uses a 6BA6 tube and is capacitive-coupled to the signal grid of the 6BE6 mixer in the next stage. As mentioned before, the local oscillator signal is brought from the 6L6 doubler stage output to the injection grid. A

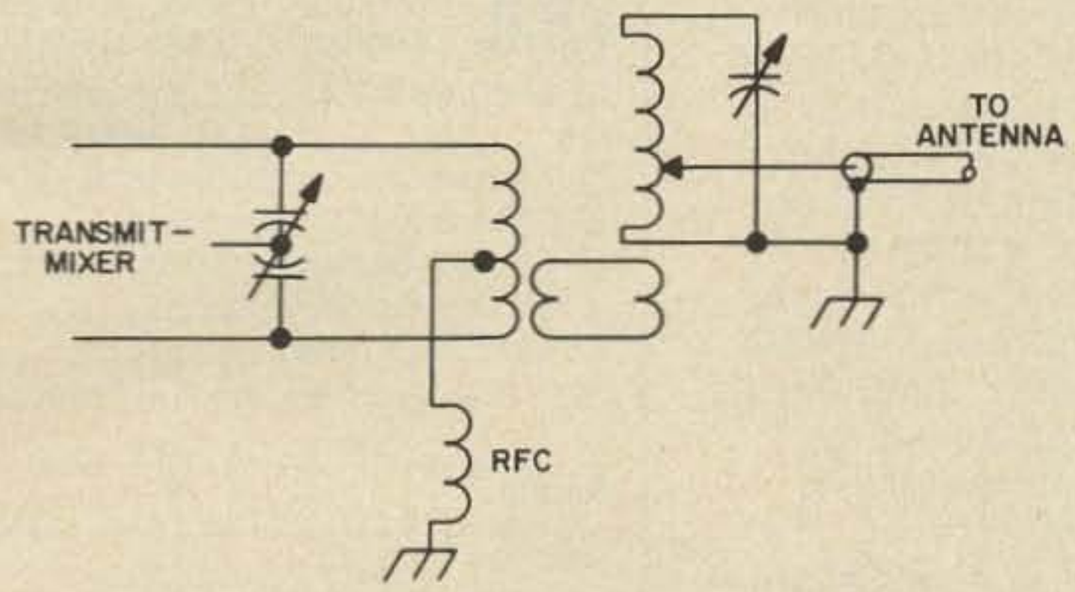

Fig. 7. Harmonic reducing antenna coupling circuit for output of transmit-mixer.

small (1.9 to 10 pF) variable capacitor enables adjusting the inserted rf voltage to a value that'll give one milliampere current through the 20 kΩ gridleak. The circuit appears in Fig. 5.

No unusual practices are involved in the receiving section. The usual precautions are to be observed in the rf amplifier stage so as to prevent oscillation.

In both Figs. 3 and 4, you'll note metering points, sockets are provided so that after the removal of a shorting dual plug, meter prods can be inserted for measurement of current. As the black box is a "tune it and leave it" device, there is no point in having meters permanently installed.

Adjustment and Tuning

As in usual practice, the logical place to start the tuning sequence is at the crystal oscillator stage. Old timers need no instruction for this operation, but there's a whole crop of new radio amateurs who've been reared on vfo transmitters, so I'll mention a few basic procedures. The stage uses no plate metering, as the grid current of the following doubler stage provides a much better indication. Tune the oscillator plate

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tank for maximum grid current, then tune to either side; you'll note that grid current falls off more rapidly on one side. Avoid that side of maximum grid current, and detune slightly to the other side. Then snap the plate voltage off and on. The probabilities are that the oscillator will not come back on. If it doesn't, detune a bit further and trv

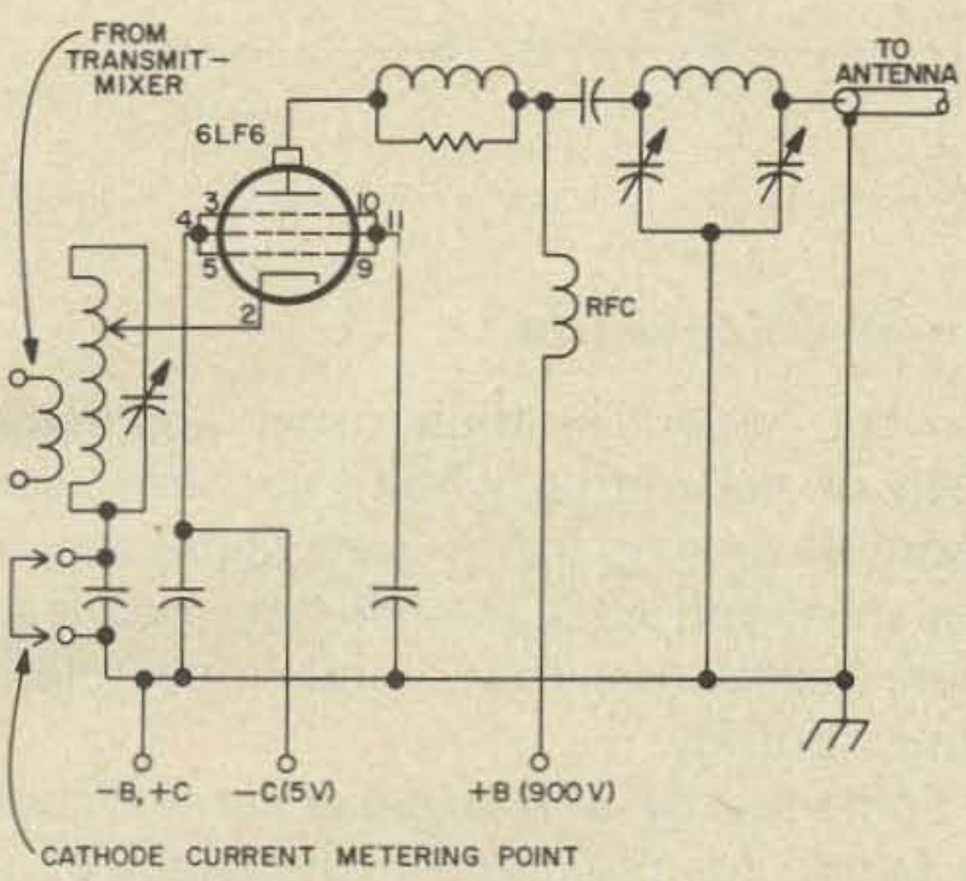

Fig. 8. Alternate rf linear power amplifier.

again. Continue this sequence until the oscillator restarts oscillation every time the plate voltage is applied.

Because of the use of link coupling to the next stage, the doubler must be tuned by noting minimum plate current. It's quite possible that the oscillator stage may need a bit of touch up tuning after the doubler has been resonated.

Input tuning for the transmit mixer stage is conventional, with the push-pull grid circuit being resonated for maximum grid current. You'll probably want to short out the additional 250 kΩ grid resistor and measure the current through the 21 kΩ portion only. The two 6L6 tubes used in the transmit mixer stage need between 4 and 6 mA grid current (though 21 kΩ), but this is not critical at the initial tune up. If the resonance current runs much higher than this, you may want to back off the coupling link from the cold end of the doubler tank. Remember, too, that the whole sequence very probably will demand touch up tuning after the two plate tanks of the circuit have been adjusted.

You're ready now to pipe in some rf from your SSB transceiver. As a preliminary move, it's wise to set the transceiver on 14,156 kHz and tune and load it into a dummy load. Then reduce the rf drive so that only a very low power output is on tap. Next, remove the dummy load and connect the transceiver to the tap on the single-ended tank. With a milliammeter between the cold end of the rfc and ground, feed rf into the coil and resonate the circuit for maximum current. Go back and reresonate and reload the transceiver, remembering to keep its rf output low enough to hold the mixer plate current to no more than approximately 250 mA. Only a tiny fraction of that much power will be needed to excite the Class AB_2 807s in the linear power amplifier.

The tuning and loading of the linear amplifier follows familiar procedures, being

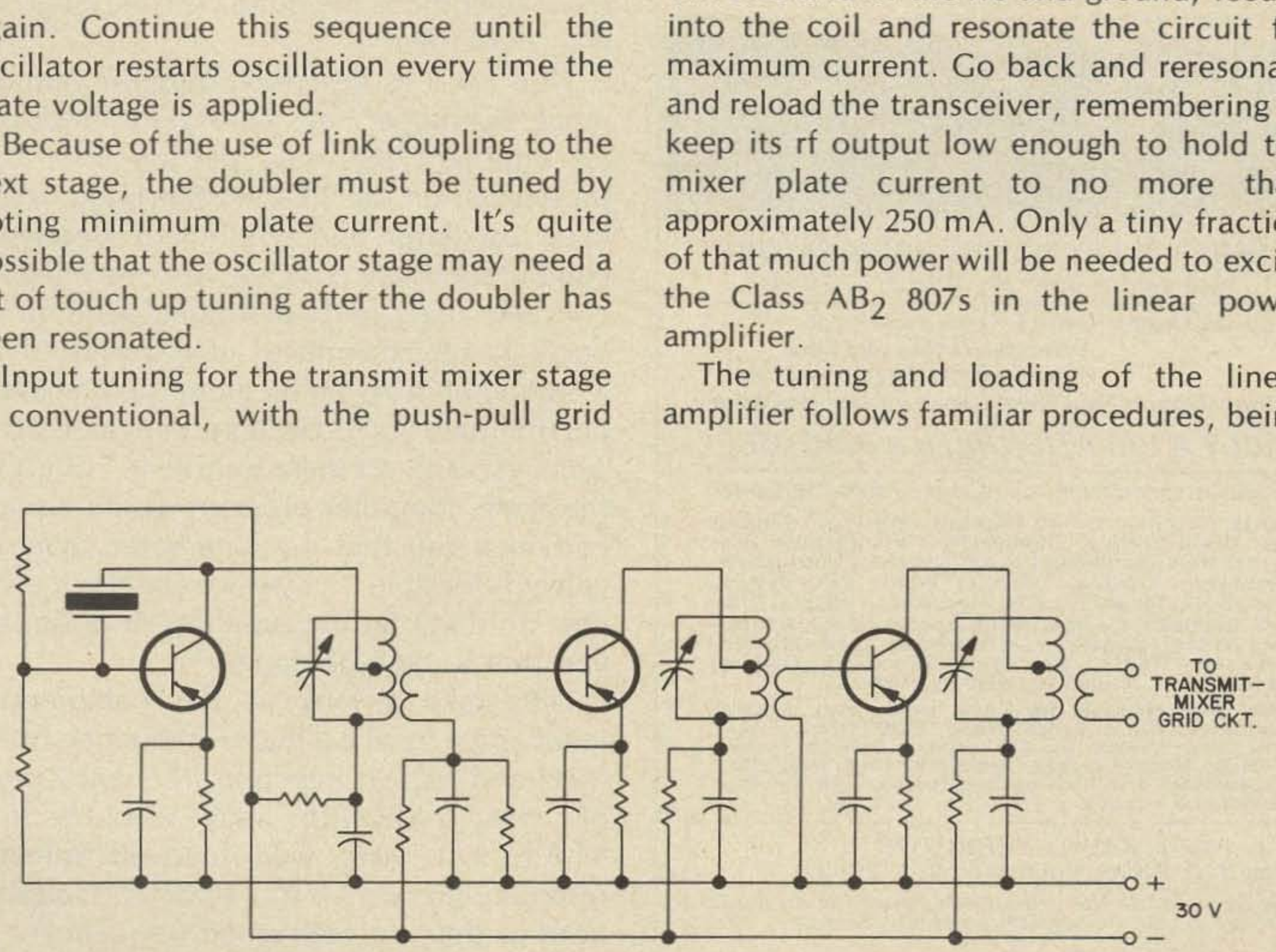

Fig. 9. Possible oscillator-driver circuit for driving transmit-mixer. Component values will depend on individual transistors used.

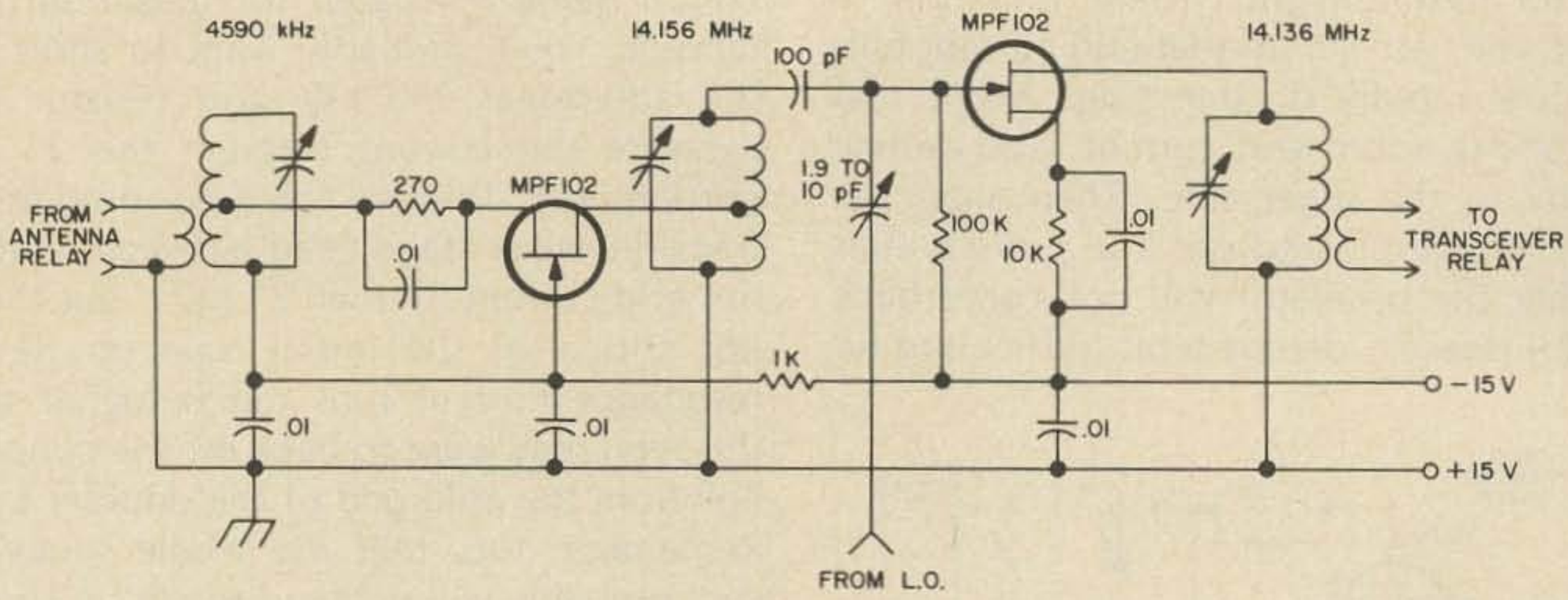

Fig. 10. Alternate solid-state receive mixer section.

the same technique you employ with your transceiver. Although the prototype has provision for metering the plate current, this is for preliminary adjustment and for assuring that maximum currents are not exceeded. Final loading should be done with the aid of some sort of power, voltage, or current indicator in the antenna circuit. The too-popular swr meter serves well in this application. Although I have no brief for swr meters in their usual application (that of generating wholly needless worry about illusionary losses in feedlines that are not absolutely *flat*), they do have one legitimate field of use: That of indicating relative power output.

Some sort of an rf signal generator comes in handy for preliminary alignment of the receive rf amplifier and mixer. I like to make final touch ups with off-the-air signals. As these operations are quite conventional, I'll not cover them.

Thus far, I've described only the limited-range prototype. Let's consider a black box for another, like, say, putting your SSB transceiver on the 1.8-2.0 MHz band. Many local oscillator and SSB inject frequency combinations are possible, but one needs to consider undesired intermodulation products, beats, and images. If you were to run a computer program on all of the unwanted possibilities, you'd become convinced that "you just can't get there from here." Cheer up; the same computer program would equally convince you that no superheterodyne receiver is feasible . . . yet we use them every day. So don't let the prophets of doom tell you that it can't be done!

Let's take a look at the combination involving a local oscillator frequency of 4.8 MHz and an SSB injection frequency range of 7.0 to 7.2 MHz. The image would be from 11.8 to 12.0 MHz, well removed from the resonant circuit (1.8 to 2.0 MHz). Doubling both of the two concerned frequencies, to see what their harmonics would produce, gives us a difference frequency of 4.4 to 4.8, again well within the safe zone. No

harmonic of the local oscillator will fall within the transceiver's receiving range (7.0 to 7.2 MHz.). So, it would appear, the proposed combination is practicable.

For getting on the 50 MHz band, a local oscillator frequency of 29 MHz offers possibilities. By using an SSB injection frequency of 21.0 to 21.45 MHz, the portion of the 6m band most used for SSB can be covered. To avoid undesired harmonics, it's advisable to use an overtone crystal and generate the LO frequency directly on 29 MHz rather than to multiply up from a lower frequency. Because of the dual tuned circuits, the potentially-troublesome harmonic of 29 MHz (at 48 MHz) is greatly attenuated.

Although SSB transceivers for the Citizens Radio Service are crystal-controlled on channelized frequencies, they have some useful possibilities for use on spot frequencies such as amateur nets, MARS, CAP, etc.

The black box can be used for putting the CB rig to some use other than hello-ing "Hot Lips," "The Green Dragon," and other such luminaries. Let's consider, for instance, putting such a transceiver on the AF MARS frequency of 7305 kHz. Fig. 6 gives the block diagram with the suitable frequen-

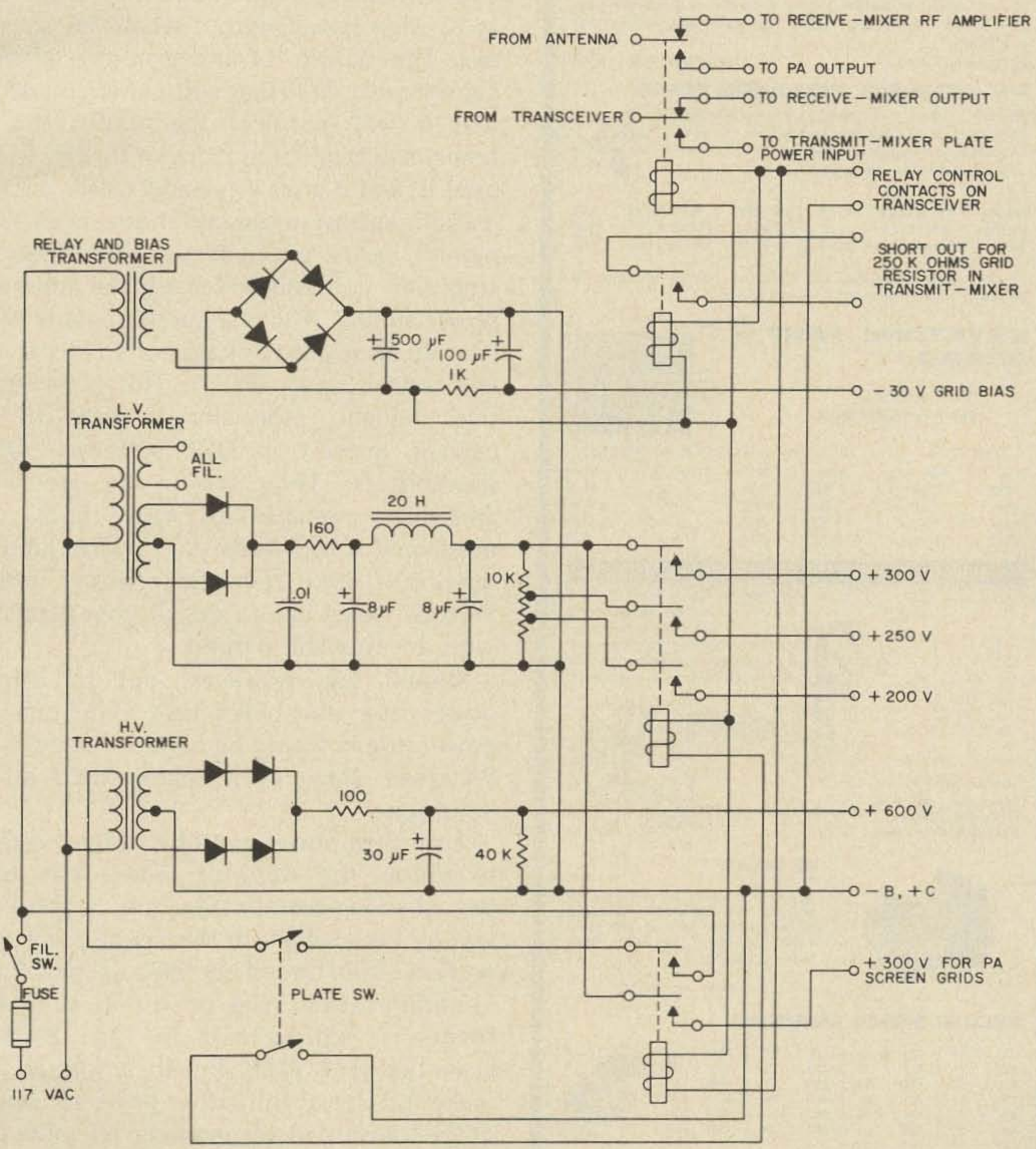

Fig. 11. Power supply for black box high-level frequency converter.

cies. Note that it shows two amplifying stages after the transmit mixer. For moderate power, only one of these would be needed, but if you're one of those whose souls expand only upon reception of "40 over 9" (whatever that may mean!) reports, you may desire an additional stage. The block diagram does not repeat information given in text or diagrams shown earlier, as you can readily adapt such data to the new situation.

Now, let's think of how one might want to build a black box using modern components.

The first step would be to make a decision as to what power output would be acceptable. The output of the transmit mixer is considerable. Will that suffice? If you decide that it will, consider the output and antenna-matching circuit drawn in Fig. 7. I've used it, and it gives very satisfactory discrimination against undesired frequencies (harmonics, beats, etc.). By deleting the power amplifier, you also delete a bulky and heavy power supply. The relay power supply could provide all needed voltage for solid-state LO and receive mixer chains. This is an attractive thought, especially in light of the current interest in QRP and even QRPP transmitters. Then too, there are linear amplifiers available (or easily built) that need only a few watts of rf power input to develop a quite respectable power output. Perhaps you'd like to design your black box with this thought in mind.

Should you however, opt for higher power from the black box, only one HV power supply would be needed, that for the PA stage. Low level stages could all be solid state.

A modern power amplifier stage, suitable to follow the transmit mixer, has been described in several magazines. A good one was by Pat Hawker in the Technical Topics section of the December 1972 issue of *Radio Communication*. The circuit in simplified form, is reproduced in Fig. 8. This grounded-grid 6LF6 linear amplifier can make full use of the rather powerful output of the transmit mixer and even iet some of it feed through to the antenna. No values of components are shown in the circuit, as they are conventional. Just remember to use

plenty of capacitance in the tuned circuit and to use low-inductance bypass capacitors. Some persons worry about high circulating in a tank with high C, but it's better to have that rf heating a tank coil than burning the ears of an FCC monitor a thousand miles away!

Harking back to the solid-state theme, Fig. 9 suggests a circuit for the local oscillator portion. This is one I've used in a small transmitter while experimenting with QRPP rigs. No component values are given. This omission is deliberate. Other than for the decoupling resistors, R_4, R_8, and R_{10}, which can have any value between 100 and 1000 Ohms, each resistor needs to have its value determined by the characteristics of its associated transistor. To a lesser degree, the same considerations apply to C_1, C_2, and C_3, as well as to the position of the tap on each inductor and the number of turns in the associated secondaries. Transistors do not lend themselves to "cookbook" construction practices. The builder needs to know how to (and have the necessary equipment to) do a bit of experimental determination.

For the receive mixer portion, Fig. 10 presents a standard circuit[2], modified only to permit the use of a grounded-positive power supply. This is done so that bias and relay power supply can be used for the solid-state sections. A resistor and a zener diode can perform the double duty of dropping the voltage to a suitable figure and also holding it to that value.

The last illustration, that of Fig. 11, is the rather complex power and relay circuit I used in the prototype.

The uses of a black box are many and varied. It's easy to build and even easier to use. Build one and increase the versatility of your equipment.

. . . W5JJ

FOOTNOTES

1. Ralph S. Carson, Chapter 10, Principles of Applied Electronics, McGraw-Hill Book Co., Inc., 1961.
2. Doug DeMaw, "The DC 80-10 Receiver," May 1969 QST.

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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
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Now that the economy is on the down-turn, it behooves us to turn-up our equipment on a "do-it-yourself" basis. No more heavy cash outlays for the outrageously expensive components such as are advertised in 73 Magazine. Build it yourself, men!

I have found over the years that dealing with the obvious ramifications of microfarads vs ohms that when you have a mho situation, the correct way to solve the problem is to look in your junkbox (every last right-thinking, God-fearing, lover-of America *has* a junkbox, right?). As you delve into the junkbox, be alert for stray units of line-to-ground, since there *is* a potential danger there over a period of time.

First, take your microfarad and place it in its proper perspective to the reactance of 4.86 MHz. Now that it is lined up, it is time to take stock of the main transmitter. The network tuning capacitor and the loading capacitor have filament chokes on the secondary leads to the windings.

Now it is time for the second step . . . tread carefully, for here we run into resistors across the coils in parasitic oscillations. The propagation velocity in deciduous areas has a greater units of measure than integrated voltmeters. Try out your resistor, then short out the rf and eliminate the drive. If you have no power supply to the audio stage, the transmit switchboard will give you a functional transformer.

Centertap the ac line to the low voltage circuit on the lead-in relay and attach your diodes.

Eureka!

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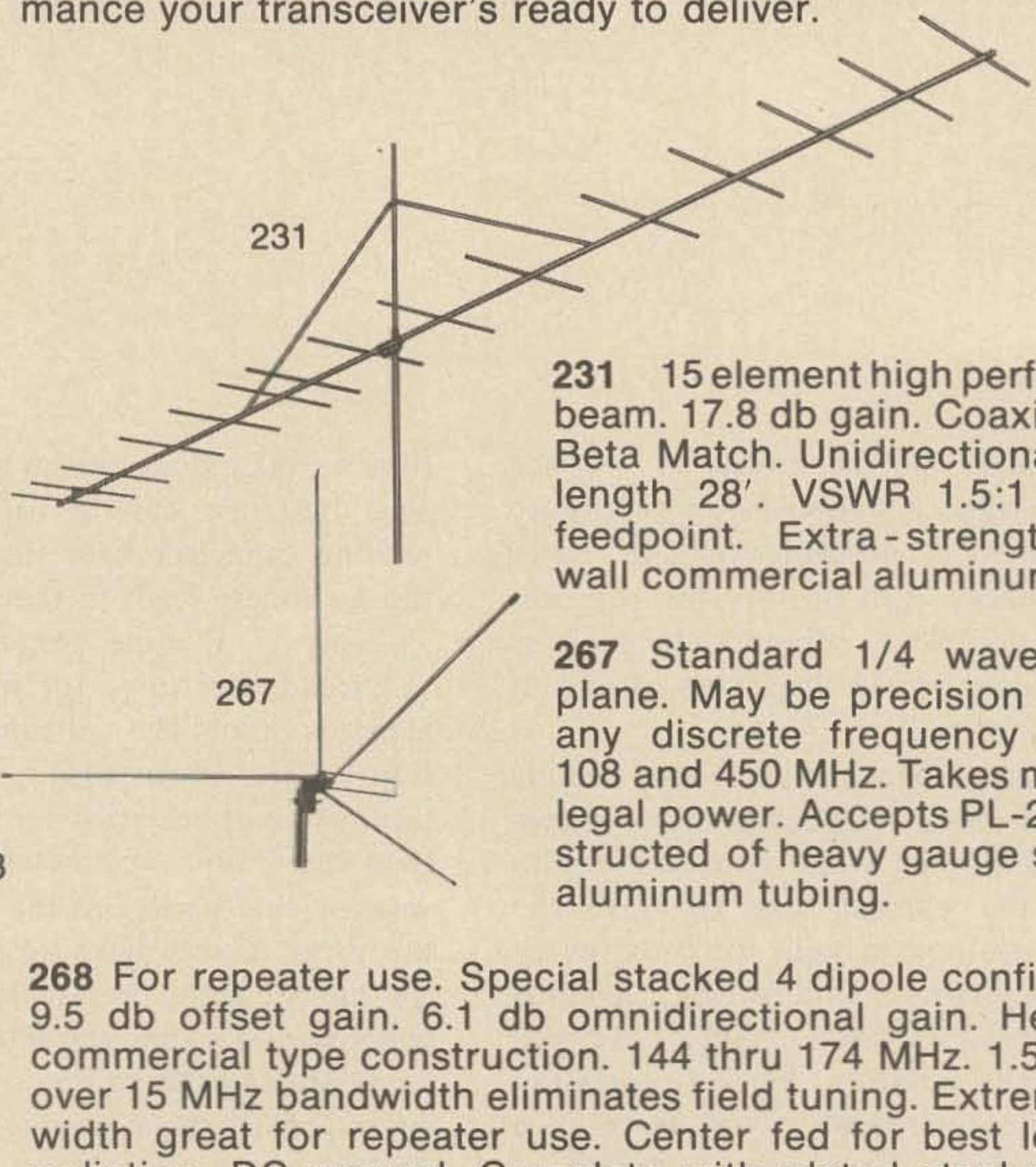

231 15 element high performance beam. 17.8 db gain. Coaxial balun. Beta Match. Unidirectional. Boom length 28′. VSWR 1.5:1 52 ohm feedpoint. Extra-strength heavy wall commercial aluminum tubing.

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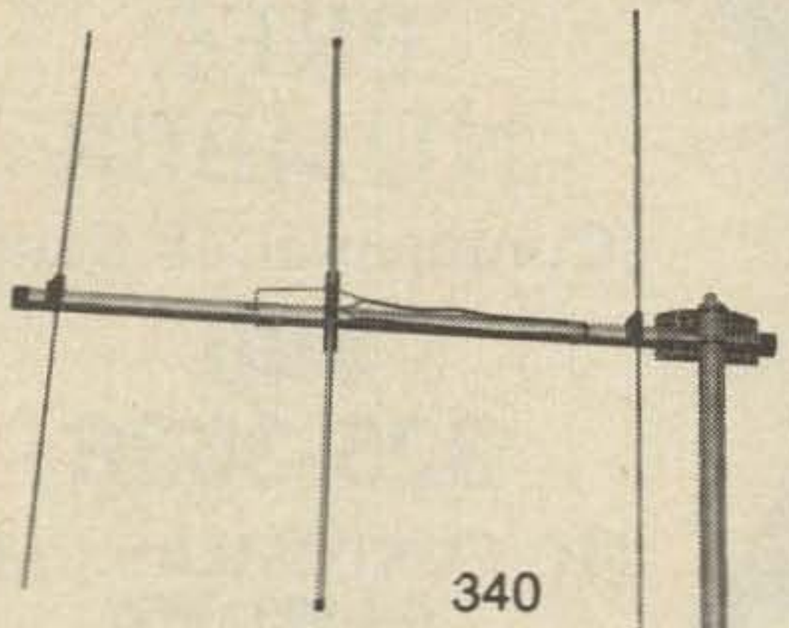
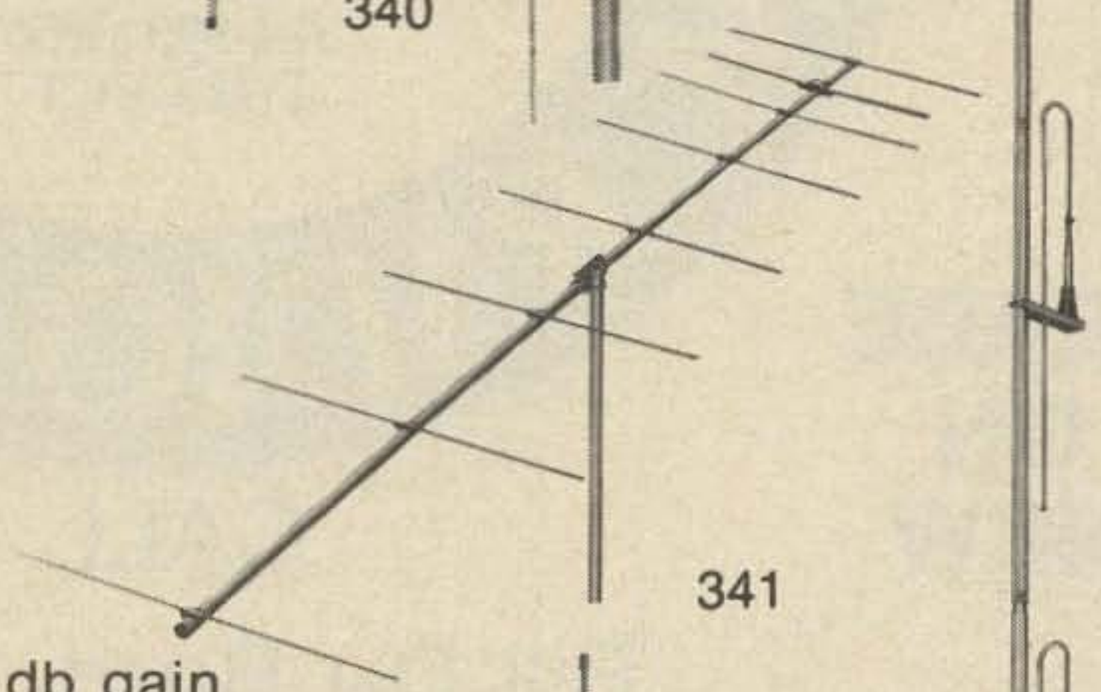
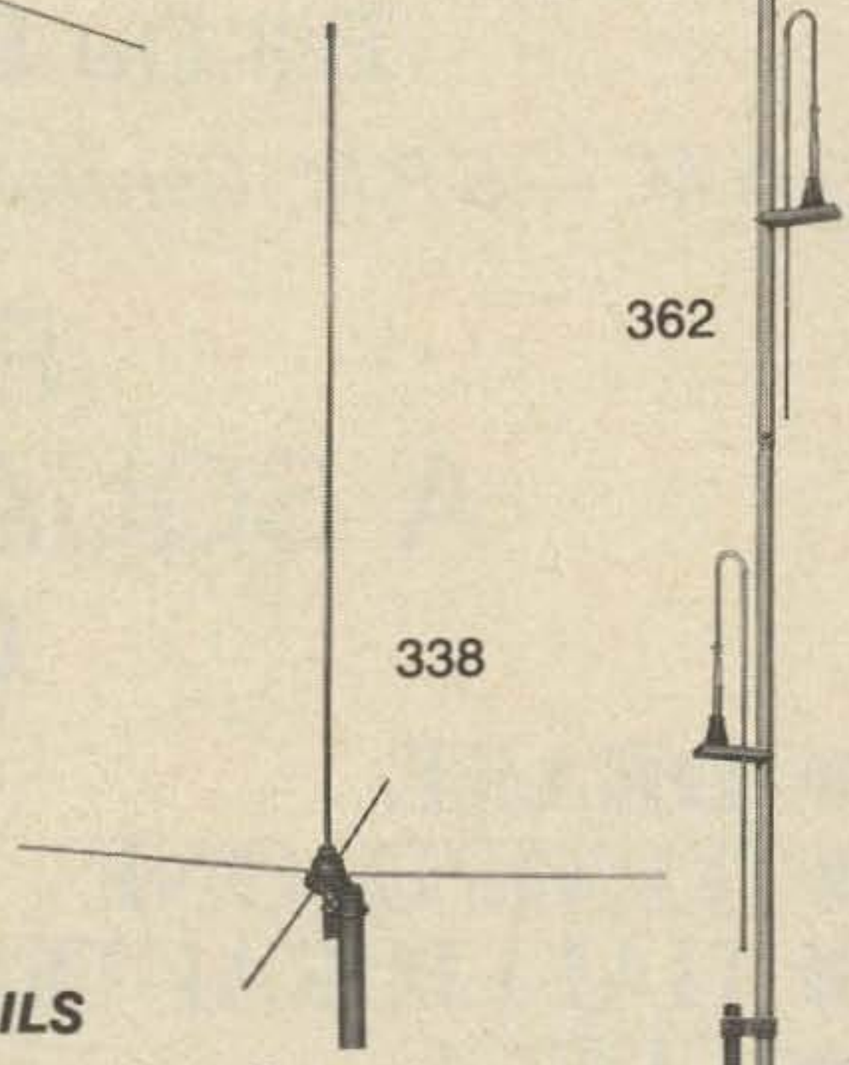


341 8 element high performance beam. 14.5 db gain. Coaxial balun. VHF Beta Match. Unidirectional. Boom length 14'. VSWR 1.5:1. 52 ohm feedpoint. Heavy gauge commercial type aluminum construction.



338 Colinear ground plane. 3.4 db gain omnidirectionally. Vertically polarized. 52 ohm match. Radiator of seamless aluminum tubing; radials of solid aluminum rod. VSWR less than 1.5:1. All steel parts iridite treated. Accepts PL-259.



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A TWO METER HYBRIDIZED TRANSMITTING CONVERTER

Day by day, single sideband (SSB) becomes increasingly popular on the hf bands, and yet SSB is slow in coming to the 2m band, probably due to the lack of commercially built equipment. With a well-provisioned junkbox, a few dollars and a week end or so, you can come up with a gizmo which will confuse and amaze your fellow hams – 2m SSB. By selecting the proper functions on your 10m SSB transmitter, you can transmit carrier controlled AM, SSB or whatever your transmitter is capable of producing. For the power mad, the output of the 2m transmitting converter can be connected to a linear amplifier. Here's what to do.

Principle

Heterodyning is the basis of all frequency conversion, and it occurs when two frequencies (F1 and F2) are combined in a non-linear device. Four frequencies result – the original two, and two new frequencies, F1 + F2 and F2 – F1. If we take a 28 MHz SSB signal (F1) and mix in a 116 MHz crystal controlled signal, these four frequencies appear:

28 MHz/SSB (F1)
116 MHz (F2)
88 MHz/SSB (F2 – F1)
144 MHz/SSB (F2 + F1)

Because of the high-Q mixer plate tank circuit, the only signal present at significant strength is 144 MHz. This transmitting converter can be modified to up-convert from other bands by retuning L1/C9, L3/C10, L4/C11, L10/C4 and L5/C6 resonant circuits, and altering the crystal frequency (Fx) using the formula:

Fx = 144 – SSB frequency from exciter/2

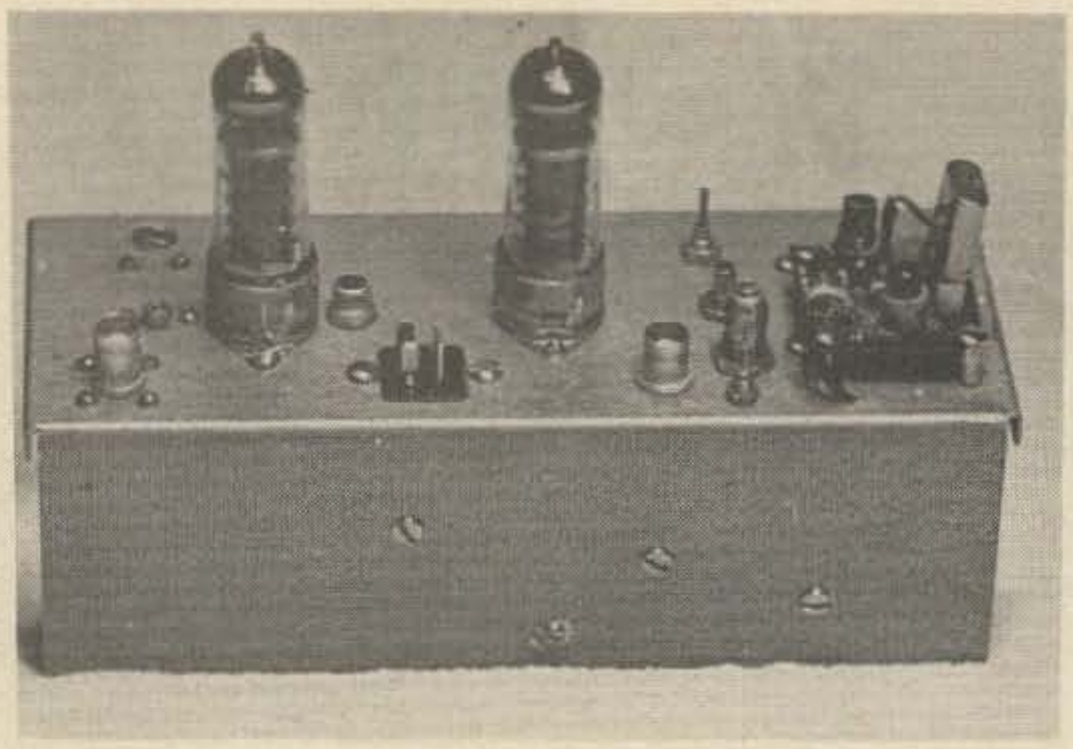
In all cases, though, good circuit design dictates that the image frequency should be sufficiently removed from the desired frequency to achieve sufficient attenuation. (Consider the hypothetical up-conversion from 75m to 2m. The separation of the desired frequency and the image frequency is only 8 MHz and both signals would be passed into the output jack.)

The Circuit

Now let's consider our transmitting converter in three parts: (1) local oscillator-injection circuit, (2) mixer circuit and (3) linear amplifier circuit. Although other tubes could have been used for the mixer, a 6360 dual tetrode was chosen for its efficiency and relatively high output. With a certain amount of redesign, a 5763, 6AR11 (compactron) or some other VHF tube could be used with reduced output or possibly increased distortion. The mixer circuit itself is, in reality, only a non-linear amplifier with the local oscillator signal injected into the control grids, and the SSB signal injected into the cathode. If a pentode (such as a 5763) is used, and if the absolute minimum distortion is required, the SSB signal may be injected into the suppressor grid[1]. But be careful – the suppressor grid can be easily saturated with too much SSB. It is for this reason the design incorporates cathode injection.

The International Crystal OX-HI kit was selected for the local oscillator because of its dependability and its price advantage[2]. The output of this oscillator is doubled and amplified in an RCA 40236 transistor. The 40236's emitter-base junction is biased to act as a diode doubler, and the base-collector junction is biased so that the whole unit amplifies the doubled signal. But why not experiment a bit and try using the RCA CA 3028A integrated circuit as the frequency doubler? One possible circuit configuration is shown in Fig. 1. The output of the 40236 is amplified by two 2N706A's, which provide sufficient grid drive to the mixer tube.

Closeup of printed circuit board which contains frequency multiplier, driver and voltage tripler.



Side view of transverter. Tube shields removed. OX-HI crystal oscillator at right side of photo. Note RCA type phono jacks used for cathode current monitoring.

These transistors tend to become a bit warm, and if you are sensitive about your transistor's health, place a 22Ω resistor in series with the emitter lead. Remember to bypass.

The price of VHF rf power transistors is dropping, so soon it should be economically feasible to construct a completely solid-state transverter. Some transistors that are already reasonably priced are Motorola's 2N3375, 2N3553, 2N2632 and 2N3961 and RCA's 40280[3].

Construction

The 2m transmitting converter has been constructed with compactness, considerable shielding and short lead length in mind. It can be easily built in a 8x3x2½ in. minibox (LMB 137). As shown in the photographs, there is plenty of room, so parts layout is not critical as long as good VHF construction practices are followed.

The 6360 mixer radiates 28 MHz like crazy, so a tube shield is required. Unfortunately, the 6360 is a tall tube, so some sort of a homebrew tube shield must be made; for this purpose Reynolds *do it yourself* aluminum works well. The tube shield tends to detune the mixer, so perhaps a better method is to make an enclosure from perforated aluminum sheet, and place this enclosure over the top of the minibox. Also note the RCA phono jacks that are used to monitor cathode current. After alignment, shorted phono plugs should be inserted into these jacks.

In order to simplify construction, a 22.5V battery is included inside the transverter cabinet to provide both mixer and

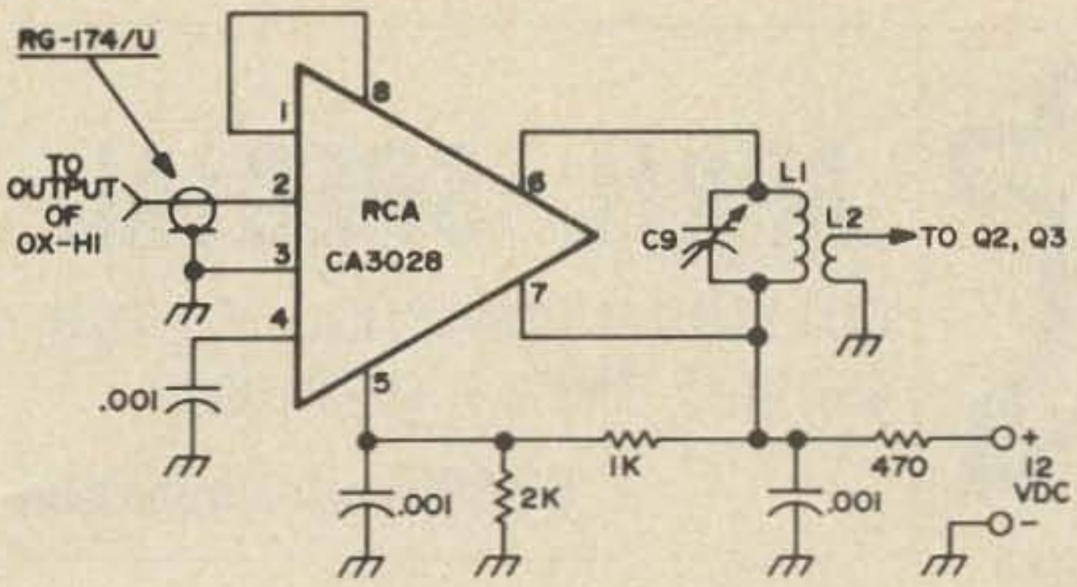
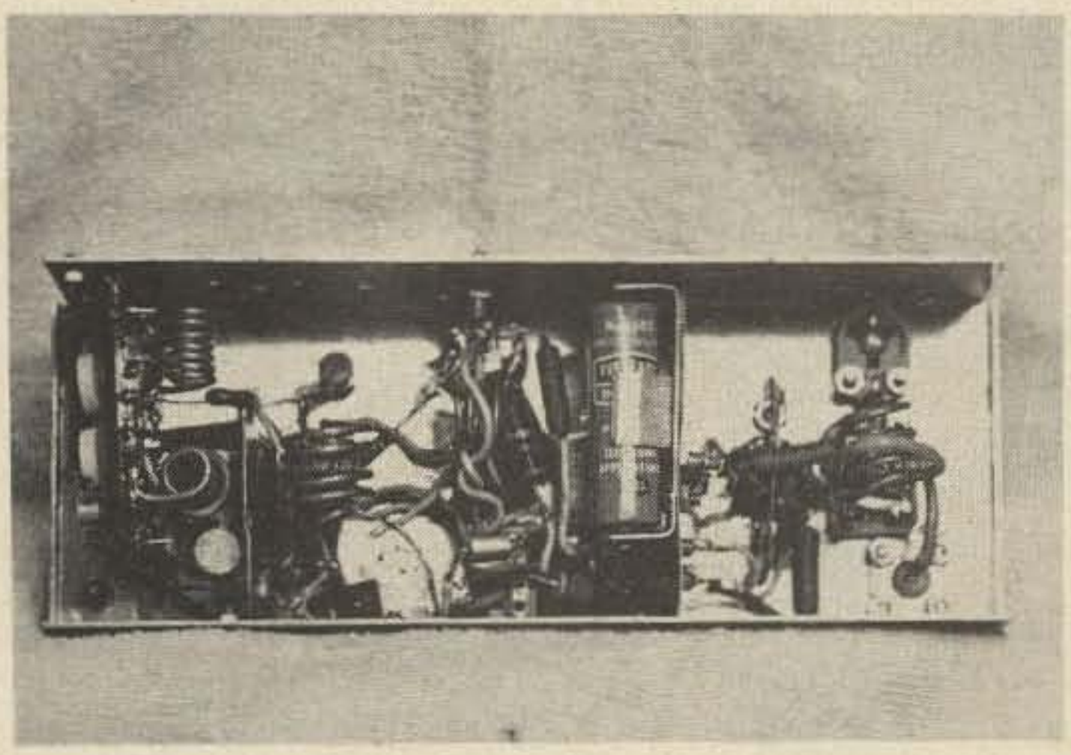


Fig. 1. Integrated circuit doubler-amplifier.

linear amplifier bias voltage. By mounting a 1000 pF feedthrough capacitor (C22) on the minibox wall and clipping off the external lead, battery condition can be checked periodically without having to dismantle the unit. Because grid current is low, the battery should last a long time. Skeptics may prefer to use an external bias supply. Located inside the transverter cabinet is a full wave voltage tripler, which provides the various operating voltages for the transistors. The voltage tripler, frequency doubler, and driver stages can be preassembled on an etched printed circuit board, and then mounted inside the converter cabinet.



Interior view of transverter.

Input SSB Signal

Because the power output from most hf exciters is in the 200–500W (PEP) range, the 28 MHz/SSB signal level must be drastically reduced before it is injected into the mixer. There are two methods of doing this, each of which has merit. Method one (perhaps the best) is to remove the plate and screen voltages from the final amplifier tubes in the exciter. Then the rf injection can be

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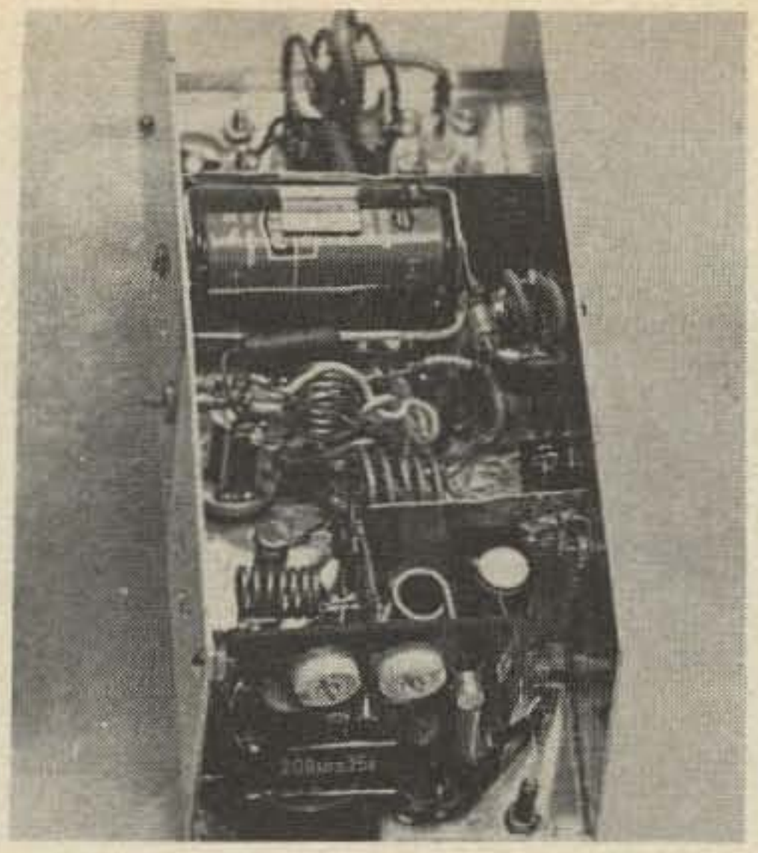


End view of transverter. Note feedthrough C22 on minibox wall where battery voltage can be checked.

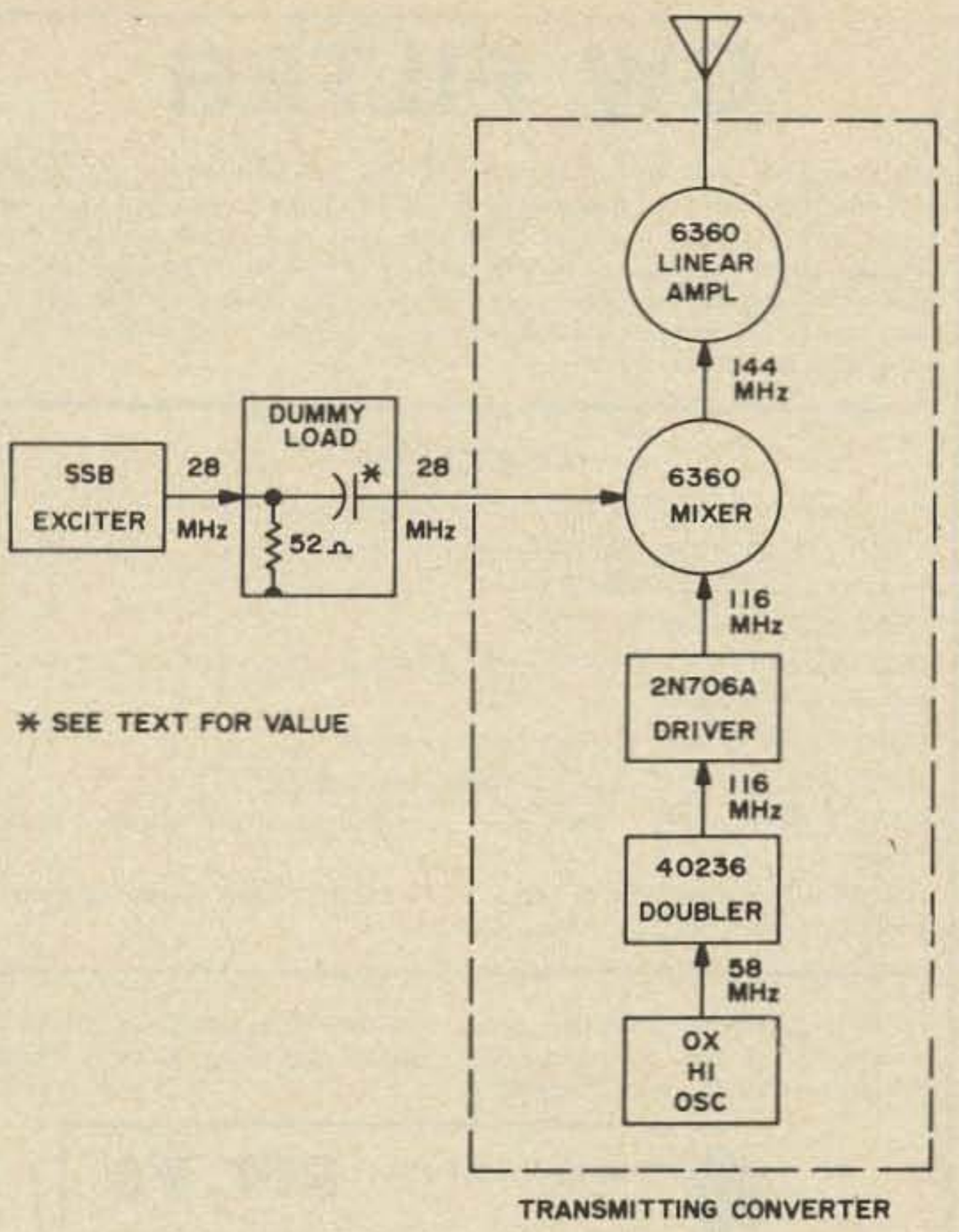


Fig. 2. Block diagram.

taken from the exciter driver stage through a small (say 100 pF) capacitor. To be really tricky , the screen and plate voltages used to power the finals can now be used to run a medium power 2m linear amplifier. But the main disadvantage of this method is that the modification to the exciter is cumbersome to perform, and gives rise to method two (presently used by me). Here, excess power is dissipated in a dummy load (such as a Heathkit Cantenna). Drive is taken from the dummy load through a small fixed silvered mica capacitor, roughly 50 pF. This value is a bit critical, and it depends on the power output of the SSB exciter; the exact value must be chosen by trial and error so that *maximum* mixer cathode current is about 40 μA. For a rough approximation, there should be enough 28 MHz/SSB signal to light a No. 47 pilot lamp to full brilliance

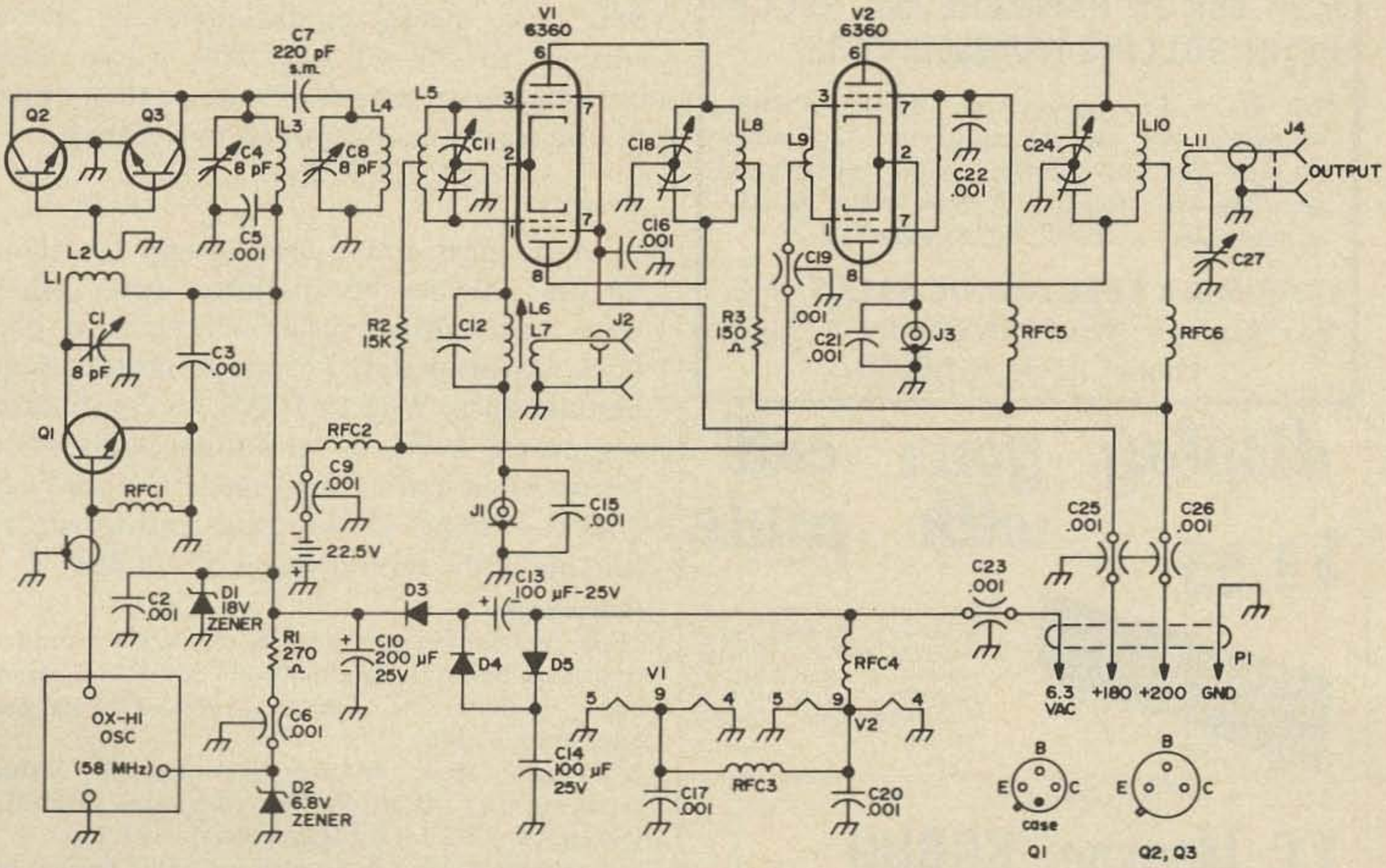
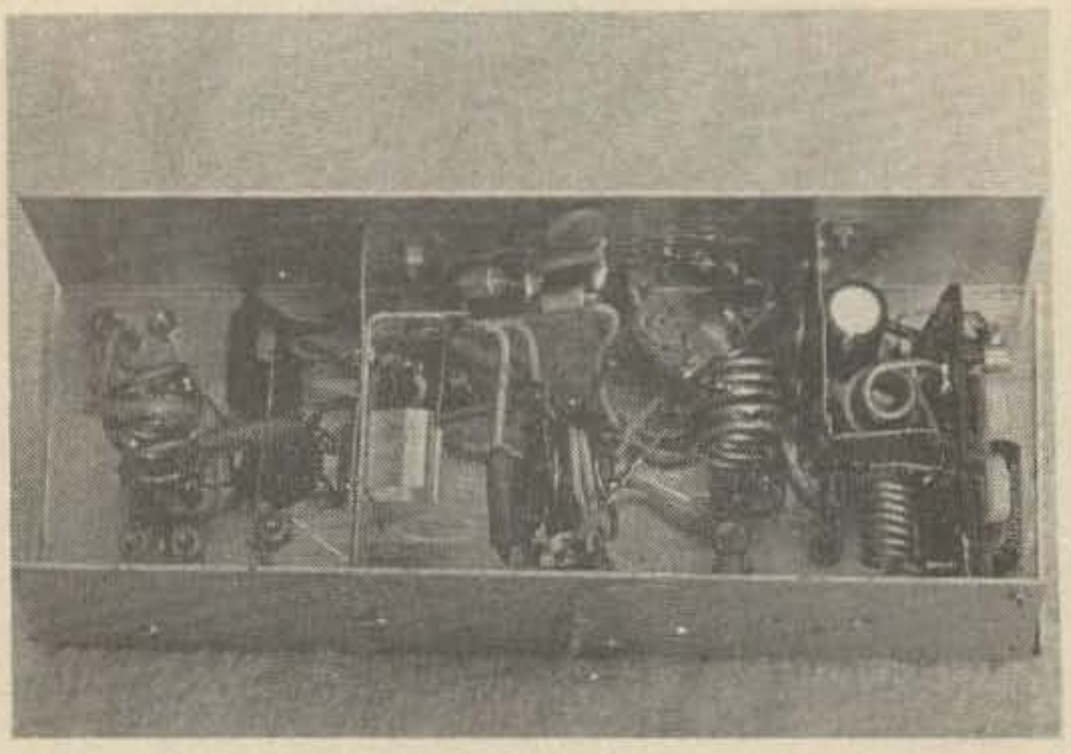


Fig. 3.



Bottom view of transverter.

(2–3W PEP). A resistive L pad should also work well[4]. This method is wasteful and somewhat brute force, but it does allow the immediate switching of the SSB exciter from the hf bands to 2m.

Tuneup

All circuits are first adjusted to approximate resonance using a grid dip meter. If the doubler and driver stages are assembled on the printed circuit board, they can be peaked before this module is incorporated into the minibox. The mixer cathode current is monitored using an RCA phono plug, and should be approximately 10 μA (no signal). SSB voice peaks should drive the mixer current to 30–40 μA. The whole unit, including linear amplifier stage, is then tuned to give maximum output on two meters.

Results

Most construction articles end by telling of the unbelievably fantastic feats which were accomplished using the finished product. Unfortunately I cannot report working moonbounce, WAS or DXCC on 2m. In fact, for now I have to be content with often transmitting carrier controlled AM until I can convince some of the local enthusiasts to join me in the far-out world of 2m SSB.

References

[1] For further information on distortion productions and heterodyning methods, see *Radio Handbook*, William Orr, Editor. c1967, Editors and Engineers, p. 346.

[2] Available from International Crystal Manufacturing Co., 10 North Lee, Oklahoma City OK. OX-HI kit – $2.35, 58 MHz crystal – $3.75.

[3] For design ideas, see *Transistor Circuit Design*, by the Engineering Staff of Texas Instruments Inc.

c1963, Texas Instrument, Inc. pp. 321–328 and 345–359.

[4]See "Heterodyne Transmitting Mixers for Six and Two Meters" by D. W. Bramer, in April 1969 *Ham Radio*, p. 12 and,

"A Step Type R.F. Attenuator," by Eugene A. Hubbell, in *Single Sideband for the Radio Amateur*. c1965 American Radio Relay League, p. 228.

Parts List

B1 – 22.5V battery (similar to Eveready 505)
C10 – 200 uF/25V dc
C13 – 14 100 uF/25V dc
C12 – 47 pf Silvered mica
C27 – 40 pf trimmer (like Centralab 822AJ)
C11 – 11 pf butterfly capacitor (like E.F. Johnson 160-211)
C18, C24 - 20pf butterfly (like E.F. Johnson 148-202)
C1, C4, C8 – 1-8 pf Trimmer (compression, piston, etc. 2-12 pf works just as well.
C2, C3, C5, C15, C16, C15, C20, C22 – 0.001 ceramic disc capacitors
C6, C9, C19, C23, C25, C26 – 1000 pf feed-through capacitors (like Erie 362-000X5U0-102M or Erie 2404-000-X5U0-102P)
C7 – 220 pf silvered mica
D3 – D5 – 2 A silicon diodes with piv rating greater than 50 V
D1 – 1 Watt 18 V Zener diode
J2, J4 – UG 625/U BNC connector
J1, J3 – RCA phono plug, chasis mount
L1, L3 – 7 turns 14-gage tinned bus-bar wire wound around a wooden pencil (roughly ¼ in. i.d.) 5/8 in. long
L2 – 1 turn hookup wire wound around cold end L1
L4 – 9 turns 14-gage tinned bus-bar wire wound around a wooden pencil 7/8 in. long
L5 – 5 turns 14-gage tinned bus-bar wire ¾ in. i.d. x 7/8 in. long (center tapped)
L6 – 4 turns 14-gage tinned bus-bar wire ½ in. i.d. x ½ in. long (center tapped)
L7 – 1 turn hookup wire center tapped around center of L6
L10 – 4 turns 14 gage tinned bus-bar wire ½ in. i.d.x ¾ in. long (center tapped)
L9 – 1 turn hookup wire around center of L8
L6 9 – turns 22-gage enameled wire close wound on Miller 4500-4 coil form. Tune to SSB injection frequency (28-29 MHz)
L11 – 1 turn hookup wire around cold end of L10
P1 – Cinch Jones 4 connector chassis mount plug (P 304 AB)
Q1 – RCA 40236
Q2, Q3 – 2N706A
R1 – 270Ω 0.5W 10%
R2 – 15 KΩ 0.5W resistor
R3 – 150Ω 2W 10%. Can be replaced by a ferrite bead rf "choke," but *not* by 1.72 uh choke such as Z-144.
RFC1-5 – Ohmite Z144 or Miller RFC 144. 1.72 uh choke
RFC6– Ohmite Z50 or Miller RFC 50 8.2 uh choke
V1, V2 – 6360

. . . WAØPFC

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TESTING RF PROPERTIES OF SOME COMMON INSULATORS

In the source of designing an rf bandwidth for a high powered amplifier, I needed to know the rf dielectric properties of certain materials.

A simple way to determine this is to insert a sample in the common microwave cooking oven. A poor rf insulator will heat up whereas a good insulator will not. To test this method, five sample materials of about the same bulk were placed in the microwave oven for 30 seconds with the following results:

Laminated linen – Blistering with high heating

Bakelite – Considerable heatint but not blistering.

Polyvinyl Chloride (PVC) pipe – Some heating.

Acrylic – No heating

Unknown clear plastic – No heating.

To make the test more quantitative, wrap up the sample in a paper napkin and take temperature reading by inserting a thermometer into the napkin after the sample has been removed from the ovèn.

To determine the carbonizing tendency of the sample, burn it in an open flame. The first two samples charred, the third became soft and charred, and the last two samples melted.

. . .KH6IJ

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KP4AMU W7ROM VP7EA AH2CV
and
Dr. Joe C. Bryant W4YYF WR4ABT
2135 S. Boulevard
Charlotte NC

OPERATING FROM A SAUNA BATH

" . . . real fine for punching holes in a frog jar lid, but won't stand up in a sauna."

The secret of the sauna bath is the dry heat that is a veritable fountain of youth. The impurities are baked out of your system and you are given a wonderful, tingling glow of health. The sauna has enjoyed intense popularity in Finland for centuries. But it has been only in recent years that this marvelous health treatment was introduced to America and its rise to heights of popularity is nothing short of sensational.

The dry sauna heat is easier to tolerate than steam and is unmatched for relaxation, rejuvenation and relief from tension. It helps to establish normal weight, relieves hangovers and cleanses the body more thoroughly. The beautiful and radiant complexion of the Scandinavian women are attributed to regular sauna baths.

The sauna room is insulated, lined with redwood and heated to a temperature of 250°. There are redwood benches, but a towel must be placed on them before sitting down. It's hot in there. The world record is twenty minutes at 400°.

Several people may take a sauna together, talking or reading to pass away the time while the dry heat does its magic work. One problem is how to pass the time when in the sauna alone. Reading seems to be the most popular.

The sauna reader should pay attention to three important qualities in selecting reading material: binding, paper and subject matter.

The binding holds the pages in the book and a poor binding will let the pages come out at 250° sauna temperatures. The best bindings are metal staples and cord or lace. With this type of binding the pages are impossible to remove and will last for several sauna baths. Examples of this type of binding are *The First National Bank Book of Checks* and *The United States Post Office Book of Eight Cent Stamps*. Examples of poor bindings are the *ARRL Handbook*, *73 Log Sheets* and *The FCC Rules and Regulations*. The worst binding is glue, which will melt and spread hot sticky glue all over the place.

Paper quality is important as to how long the pages will last. Example of good paper are *Scientific American*, *73*, *National Geographic* and *Playboy*. This paper is resistant to moisture. Pulp paper will absorb drops of

sweat and render the paper useless after one sauna. Examples of poor paper are the *Bell Telephone Directory*, *FCC Rules and Regulations* and *Popular Electronics*.

Subject matter is important in that there should be a variety. To start with, I select technical material, and since it is 250°, a little of this goes a long way. About ten minutes of this is enough. As the time passes, it becomes harder and harder to concentrate on even minor technical literature such as the *Henry Radio Catalog.*. After more time passes, even the pictures in *Playboy* become fuzzy, and this means it is time to do something besides read.

I have tried several other things to pass away the time in the sauna. At one time I had a telephone installed so I could call up people. The handset would become too hot to hold, then the dial froze up from the heat and I could only receive calls. Later the heat got into the handset elements and put them out of commission.

After I had the phone removed I tried drinking in the sauna. But after five minutes the heat raised the temperature of any drink hotter than boiling coffee. I tried exercise, running in place, working puzzles. Finally I got a brainstorm: A SAUNA HAM STATION!

Hams have operated from remote islands, mountain tops, submarines, airplanes, jail and why not a sauna?

This became an interesting problem. I wondered how long could one carry on a QSO from a sauna, could one sauna work another and would any awards be given such as WAS (worked all saunas). A complete exchange would require QTH, Time, Report and Temperature. Perhaps length of time at temperature would be important for sauna contests. How about WASS (worked all states from a sauna) or WAC-S etc. Here's one DXCC-S! And DXCC-S both ways!

Then I realized I was putting the cart before the horse. Why not see if a ham sauna would work? To start with, I had to have antenna and electric power available inside the sauna – also accessories such as log book, operating aids, clock, call book and radio equipment.

Electricity was obtained from the light bulb socket already inside the sauna and the

antenna coax feedline was snaked through with the 220V wiring to the electric heater, which runs 10 KW.

I decided to have all band capability installed. There is nothing as disconcerting as opening a door to a sauna room and letting the cold air in from outside. Once in with the radio equipment, I didn't want the door to be opened until I made some contacts.

I decided on a Collins KWM-2 transceiver, Gladding 25 and a Clegg FM-27-B. A Standard walkie talkie was available also for requesting any items that were not thought about in the planning.

The first item to be carried into the heat was the Gladding 25. The next item was the Collins, but I stopped short when I saw the innards of the Gladding bright and shiny at the operating position, and its case melting away and dripping onto the floor like the wicked witch of the west in The Wizard of Oz. Its loudspeaker wrinkled up and tore loose from the core as I threw it out the door. So, we didn't use the Gladding.

Then I noticed the dial on the Collins transceiver bubbling and smoking. When I tried to lift it up I found it was stuck fast. The rubber feet had melted and stuck to the surface. Since I couldn't move it, I decided to go ahead and use it, but as I tuned the band the dial mechanism melted and stuck. Luckily it was in the band so I decided to go ahead and make a contact.

I looked at the clock to get the time to enter in the log and found the plastic clock had melted. John Cameron Swazey should test his Timex in here!

I picked up my Bic pen to make a log entry and found it was also melting. They are real fine for punching holes in a frog jar lid, but won't stand up in the sauna.

I picked up the Standard walkie talkie to call for a pencil but found its case had melted and the antenna rod fell off.

When I finally got a pencil and made the log entry everything happened at once. The eraser melted, coax melted and shorted out, transistors melted, fuses blew and I decided I was ready for a cold shower.

As I was taking a shower I wondered "has anyone ever operated ham radio from a shower?"

WA4NXC and W4YYF

Cassette Code Courses

With these Code Courses from 73, the average person can learn the International Morse Code fast enough to pass FCC code exams from Novice thru Extra Class in a few painless hours! One of the beauties of cassette tapes is that you can take them with you anywhere – at work for lunch break (code on rye is great) – even in the car while you are driving (or what's more likely, moldering away in line at a service station *trying* to get gas). With the help of these tapes passing the code portion of the various exams is a gas . . . *er* . . . snap!

My class was so enthused over your code cassette tapes that after hearing the 13 word per minute cassette every student in the class decided to get one for home practice. Enclosed is an order for 23 of the 13 word per minute tapes.

K6MLC

After about a week of playing your 13 word per minute cassette (which I timed out at 14 words per minute, incidentally!), I went down and passed the General exam with no strain. The plain language of the FCC exam seemed so slow that I lost all fear after the first few letters and made perfect copy from then on. It's fear that gets you, and your tape gave me confidence. Thanks!

WN9JGQ

I've been teaching code for over twenty years now and I've tried every record and tape and other gadget that has come out. Let me say that the 73 MAGAZINE code course is by far the finest that I have ever heard. I never thought I would learn new tricks, but you've taught me a lot about teaching code. Suffice it to say, I am recommending that every student of mine get your tapes.

K1IF

My wife, who has been almost totally resistant to the code, breezed through your 5 word per minute beginners cassette and was ready for the Novice exam in one day.

WB8JON

---

1 **Basic 5 WPM Code** – this cassette code course will teach the IMC at five words per minute, all letters, numbers and punctuation. The tape not only gives all these characters, but gives them in a very simple order so you can start copying code within one minute of hearing it. This has got to be the easiest way to learn code ever invented. The cassette actually has the code being sent at 6 WPM, allowing a margin for operator panic when the chips are down and the real exam is at hand.

Basic Code 5 WPM – 60 min. **$3.95**

2 **6 WPM Practice Tape** – (also known as The Back Breaker) this is a toughie – five character code groups sent in no particular order, so there is no way to memorize the tape. It is sent at six words per minute to give you that margin for error you'll need when faced with a stern examiner at THE EXAM. Practice in your head or on paper wherever you are, whenever you have a minute or two.

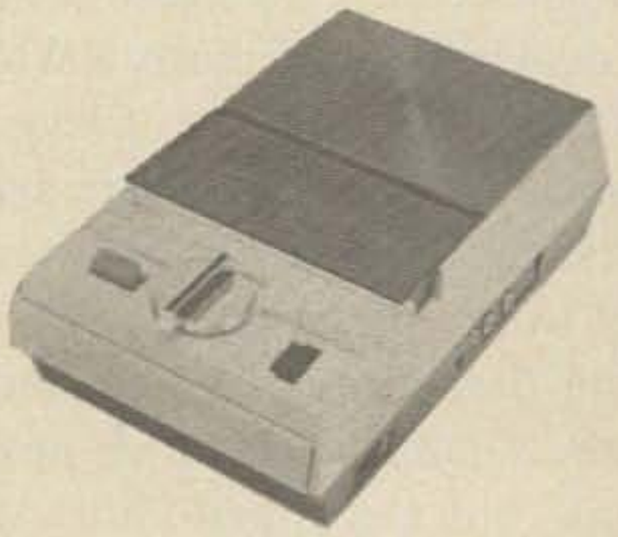
BB-6 WPM – 60 min. **$3.95**

3 **13 WPM Practice Tape** – This tape will take anyone over the hump which exists when you have to stop translating the dits and dahs, and go to an automatic recognition system where you "know" what the character is without thinking, thus enabling you to pass the general or advanced code test. This very nasty tape is really at 14 wpm, to give you that added edge when taking the exam.

BB-13 WPM – 60 min. **$3.95**

4 **20 WPM Practice Tape** – This cassette has been fiendishly designed to get you through the FCC Extra Class code test with flying colours. The code on this actually runs about 21 words per minute, though it starts out at a lazy 18 per for the first few minutes. The intermix of letters, numbers and punctuation instead of plain language will give you such an edge when you sit down to take the exam that you should be able to breeze through. Though much of your practice with this cassette can be just copying in your head – after all, the important object of practice is to train your brain to convert code into letters – be sure that you exercise your pencil too. The cassette will make your code practice portable, available to you whenever you have a few minutes to spare – even while driving.

BB-20 WPM – 60 min. **$3.95**



Cassette Recorder

Here is a cassette recorder that is ideal for use with the code courses since it can be operated anywhere.

Comes complete with four "D" batteries, AC power cord, earphone and mike and is useful for dozens of ham applications. Cassette tape recorder is available for only **$23.95** (plus $1.00 for shipping and handling).

Deluxe Recorder

Key operated – and the keys lock for easier rewind and fast forward operations, which you will appreciate if you have a recorder that doesn't do this – as most don't. Records with mike or from line input (telephone, receiver, etc.). Has monitor output. AC or built-in batteries - comes with batteries supplied. Has automatic gain for recording so you don't have to watch the recording level all the time.

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BANKAMERICARD

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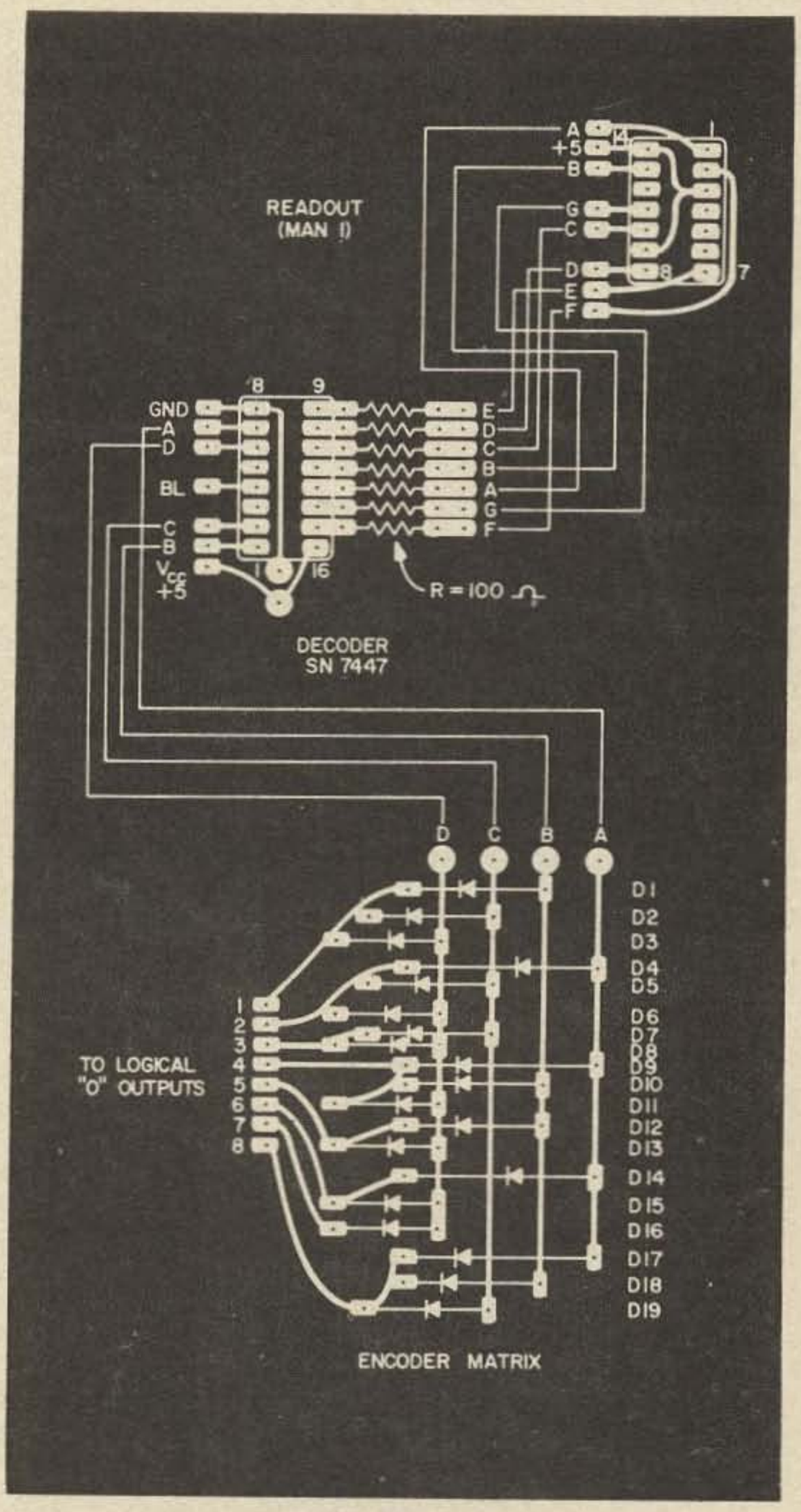
CONTROL PANEL FOR YOUR SCANNING TRANSCIEVER



Printed circuit layouts showing interconnections (bottom foil view). Scanning receiver modifications.

Scanning receivers are becoming quite popular with hams due to the simplicity with which they may be converted to transceiver or multifrequency FM operation. In metropolitan areas where there may be a total of 20 or 30 police and fire frequencies, or there are several repeater and simplex ham frequencies, scanners are almost a necessity. Since certain channels may be locked out, a busy ham rag-chew repeater may be scanned over during periods of long QSO's.

Today's cars are not suited to the addition of much add-on equipment however. First, there are problems of finding a surface on which to mount the equipment. Many cars have curved mouldings and consoles placed in such a way that no one else can get in the car if even one small radio is mounted. There is also the fact that stealing is widespread in today's society and sometimes the best way to lose a radio is to mount it in an automobile.

My car has an FM stereo radio, 2M FM

control head and four channel adapter which take up all of the available space. Since two more scanners were desired, it seemed most practical to utilize the wasted room in the trunk. This meant less room required for the equipment in the front, and less chance of break-in although there is an elaborate alarm system installed. (See 73 Magazine, May 1973, page 19).

After some investigation of scanning receiver circuits of various brands, it was noted that the same characteristics were always present: with few exceptions all units were eight channel; all had flashing lights or LED's for channel indicators. all used a logical "0" or "Low" to turn the individual indicators on; and all had an easy-to-remote volume and squelch circuit. Further investigations revealed two unused panels in the car ideally suited for the mounting of the controls: one for the non-existent AM radio and another for an optional air conditioning vent.

Other ideas included the utilization of small blank spaces on the dashboard or the glove compartment door. Permanent holes were required, however, and inasmuch as this would lower the future resale value of the car, these ideas were not used. Finally it was decided to fabricate a panel to fit in the air conditioning cutouts on the dashboard.

It was desired to keep both the size of the panel and the number of conductors in the cable as small as possible. Remote control of volume, squelch and off-on power was desired and some sort of indicators were needed to show the channel being received but blanked while the receiver was scanning.

LED 7 segment readout devices were chosen since they draw little current, have infinite life and take up little room. The MAN 1 was used with an SN 7447 IC decoder driven from a diode encoder connected to the scanner outputs. Blanking was accomplished while the unit was scanning to prevent the readout from flashing the numbers 1–8 (See Fig. 1).

Circuit

Power is obtained from a surplus 5V regulator to avoid loading down the voltage regulators in the receiver and to make this

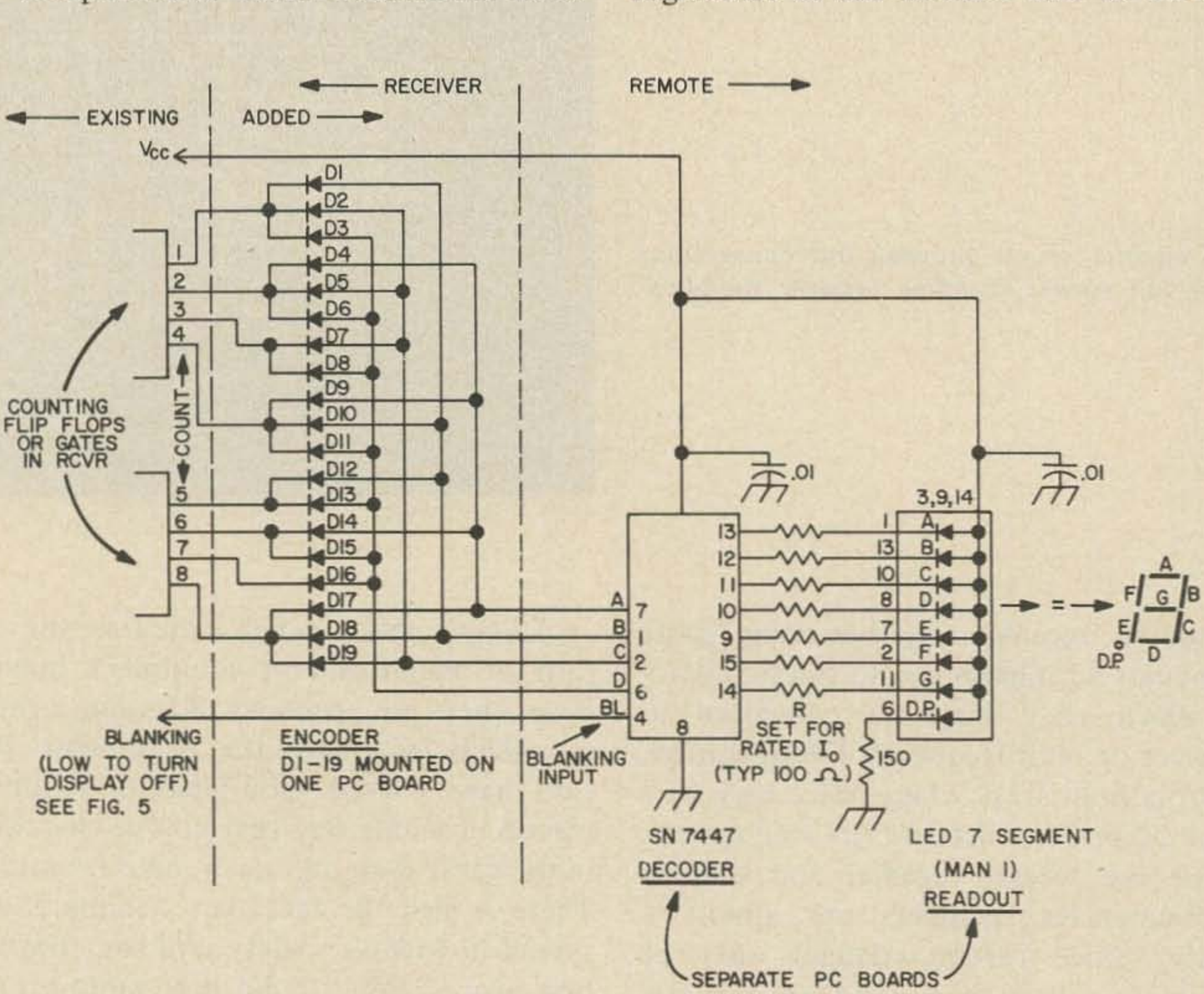


Fig. 1. Display hookup and circuit diagram.

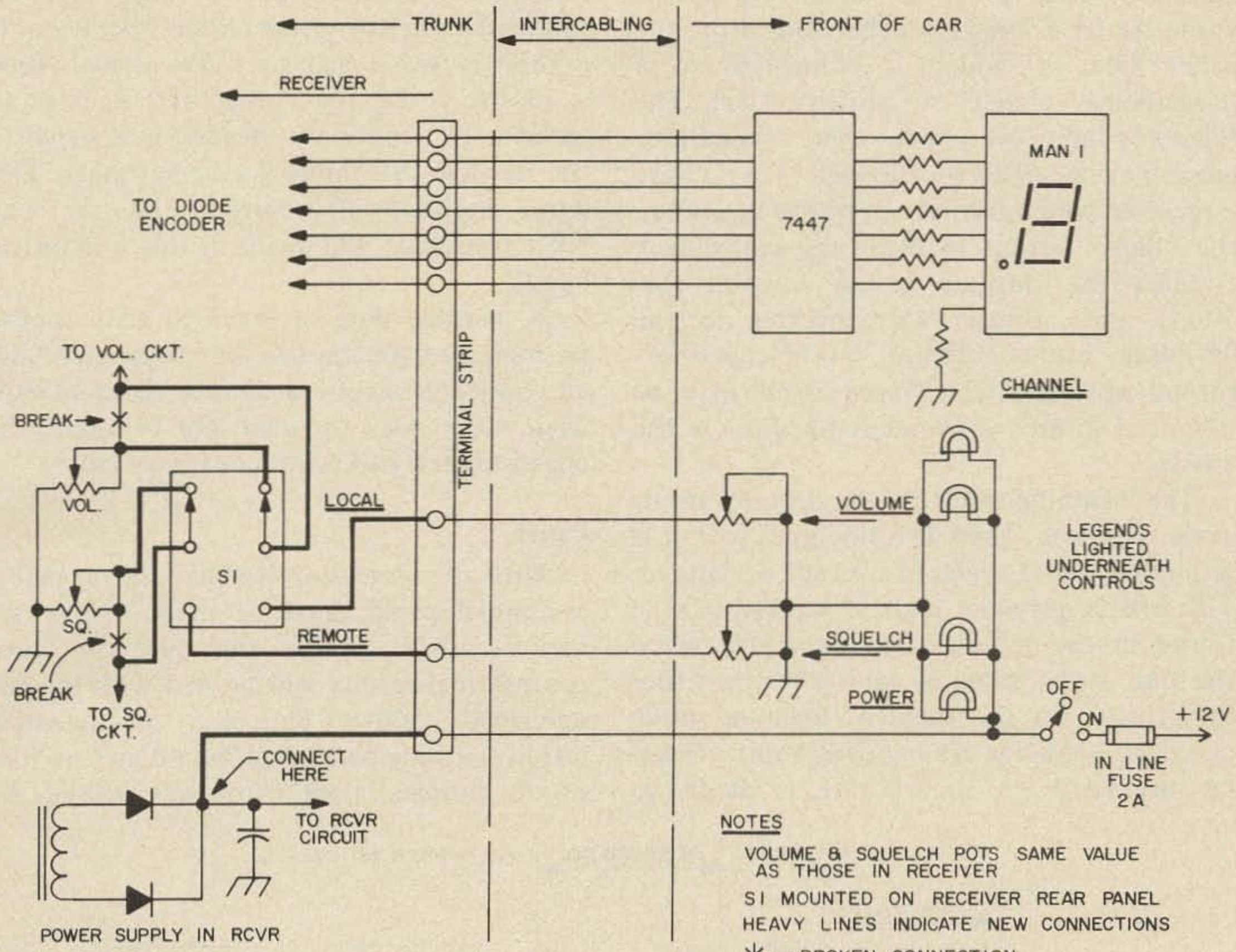


Fig. 2. Rear mount intercabling diagram for scanning receiver with dc type controls.

circuit more universally adaptable to any receiver. It is connected at the output of the filter in the power supply and mounted nearby.

A switch is incorporated for local-remote operation so that at any time the unit may be removed and used in the home or sold with no reduction in resale value. Basically, this switch removes any loading down of the circuit that would be caused by the remote controls. Wiring to and from this switch should be shielded to prevent hum pickup if the unit is operated from house current.

Basically, there are two different types of volume and squelch controls in various brands of receivers. The first of these we shall call the "dc type" (Fig. 2) where a transistor is used to gradually "turn off" the audio input to the af amplifier for control of volume, and a transistorized squelch amplifier is used to ground or unground the same line. Only two cable wires are needed to remote these functions, as seen in the diagram. This circuit is employed, for example, in the Electra BCIII receiver.

The second type is the "ac coupled" method where a more conventional L pad type of control is used (Fig. 3). Here, four cable wires are needed for remote application. The Realistic PRO 8A is an example.

In the latter cases, it may be more desirable to disconnect the internal speaker and, routing the hot lead to the front of the car, use a pad arrangement to attenuate the audio fed to the speaker (Fig. 4a). If much miniaturization is desired, this method will not be feasible because of the large physical size of the pot needed to handle two or three watts of power.

The encoding board inputs are connected directly to the output of the IC logic in the receiver. It is assumed here that when channel 1, for example, in your receiver is scanned, the output from the scanning cir-

cuit is logical 0 or ground. The circuit connects to a lamp or other indicator, the other side of which is connected to a permanently "high" or positive level. The indicator lights every time there is a path to ground as switched by the logic. If you have a receiver which uses the opposite logic (i.e., the "high" output turns on the indicators), connect the outputs to an inverter (SN 7404) and connect the inverter to the decoding inputs (diodes D1-19 must go turned around). The board itself may be mounted in any convenient location in the chassis.

The blanking input to the decoder needs some mention. When this line goes low or is grounded, the 7 segment readout is blanked. This line is normally high. If a point can be found in the receiver that goes high when the unit stops scanning and is low at other times, (i.e., in the squelch, logic or clock circuits), hook the lead to this point. It may be necessary to incorporate a diode to prevent the normal logically "high" level on this lead from disrupting circuit operation. If a point is found that goes low when a signal is received, use the circuit of Fig. 5 as an inverter to supply the needed low signal to the decoder BL input during scanning. This latter method will usually be the case. Any NPN transistor will work in this noncritical circuit.

A suitable plug or terminal strip should be mounted on the rear of the receiver and all connections routed to this. Keep a list of what wire goes to what pin or mark the chassis directly to avoid confusion later.

Panel

With all connections to the receiver made, a control panel must be made. There are various ways to do this but the most professional results will be had with the one described below. Basically, an unostentatious looking panel that would give no hint of the goodies in the trunk was desired. An

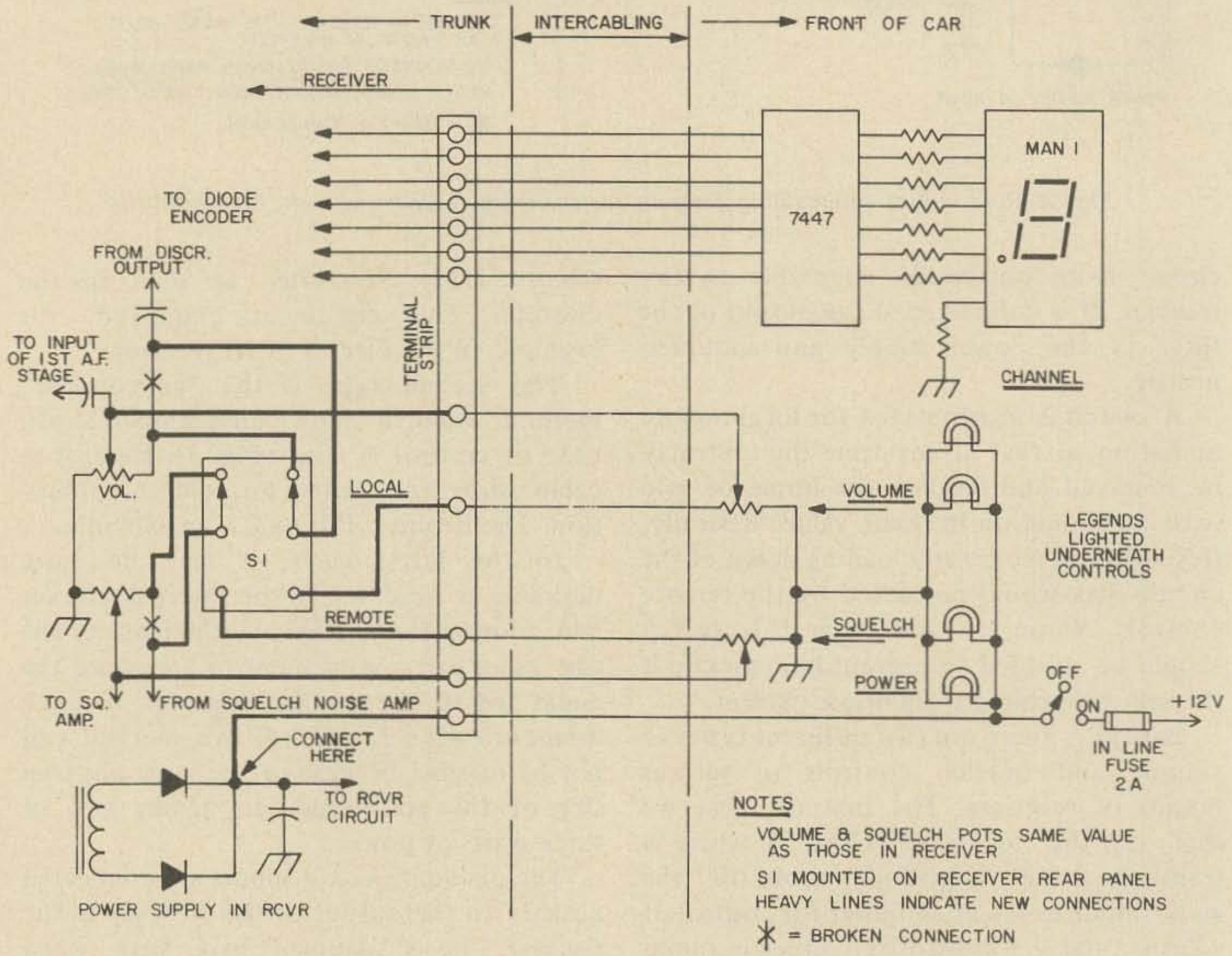


Fig. 3. Rear mount intercabling diagram for scanning receiver with ac type controls.

unmarked almost featureless panel was necessary. However, some method of identifying the different controls was needed when the unit was turned on.

Since dashboards are made from plastic these days, plastic seemed the material with which to work. A neater installation could be made, especially where there was any possibility of "drilling" a square hole, which, inevitably, comes out crooked. With a translucent panel many holes and markings would not be needed. The cutout for the optional air conditioning vents was measured and a piece of slightly oversized plastic cut to fit.

It was found that gray smoked plexiglass gives a block opaque look with no illumination behind it. When a LED or pilot lamp placed behind such material is turned on, the light is transmitted through the plastic with ease. Therefore, if a mask were made to block all but a certain shape of light, words and symbols could be formed by means of a single bulb.

Thus, a clear photo mask was laid out to the exact size of the panel. With various drafting aids such as Kepro or Bishop stick-ons, a black square was placed at the location of each readout and dry transfer

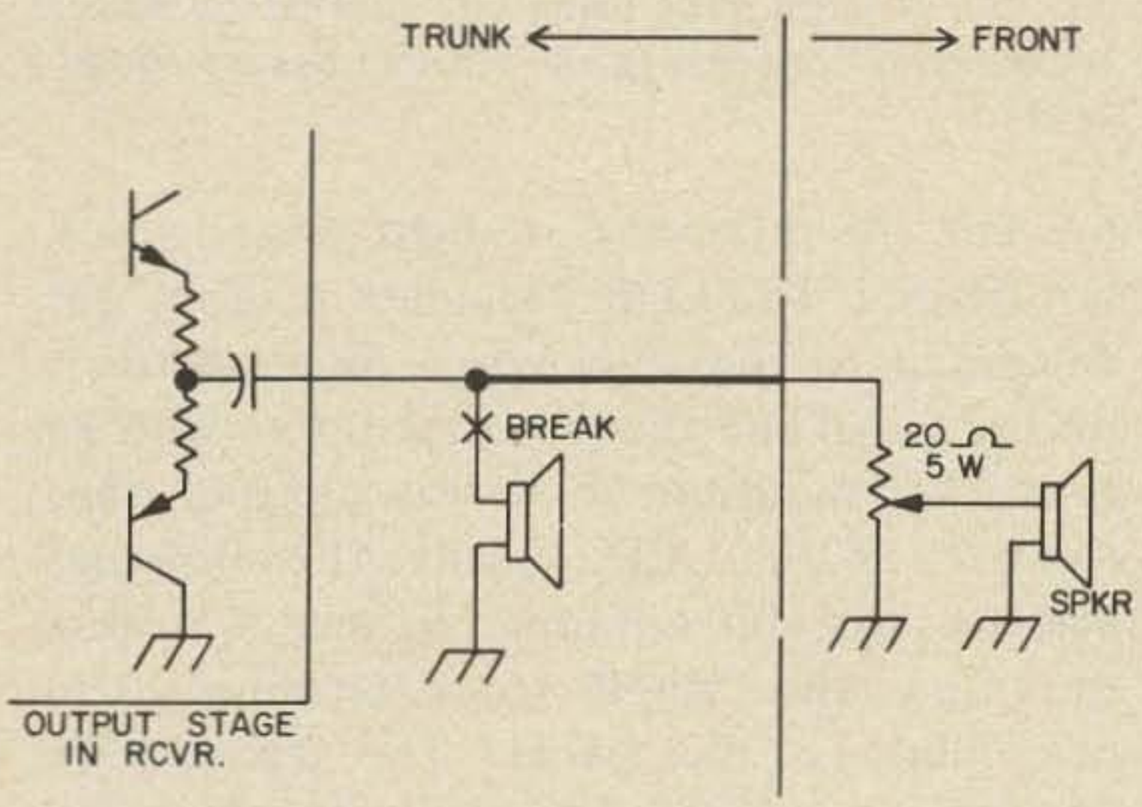


Fig. 4a. Speaker connections (optional).

lettering was placed below each control location and the readout square to indicate their respective function. This master layout was then taken to a photographer friend who reversed it full size (1:1) so that the lettering and readout space were now clear and the rest was opaque black. The material also had a sticky front with which it was

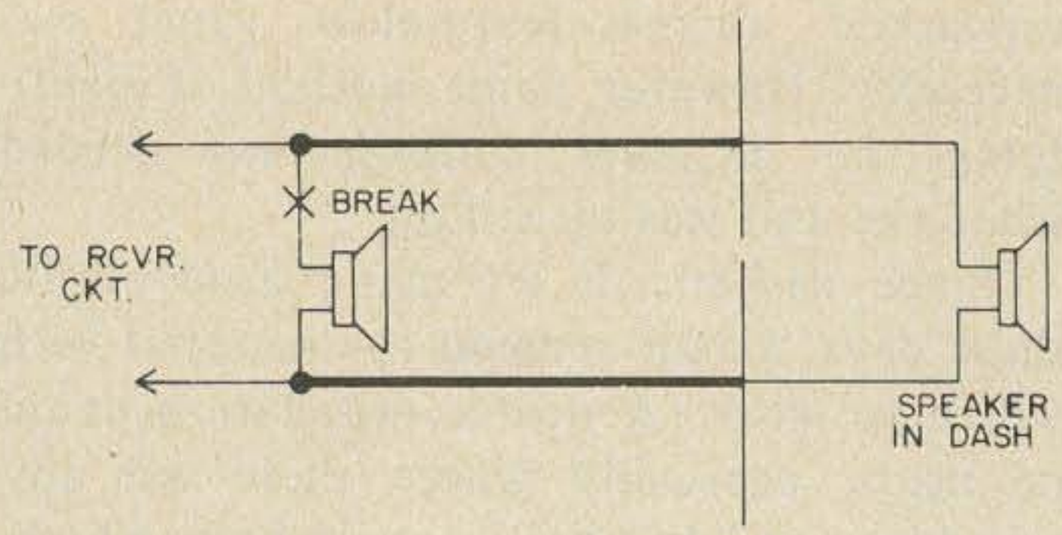


Fig. 4b. Speaker connections if no external jack available control of volume from Fig. 2 or 3.

attached to the rear of the plastic panel. Holes for the volume, squelch, and off-on switch were drilled and subminiature lights with pigtails (the type used for multiplex lights in Japanese stereo receivers) were cemented over or near each word. A cardboard shield was glued over each of them to

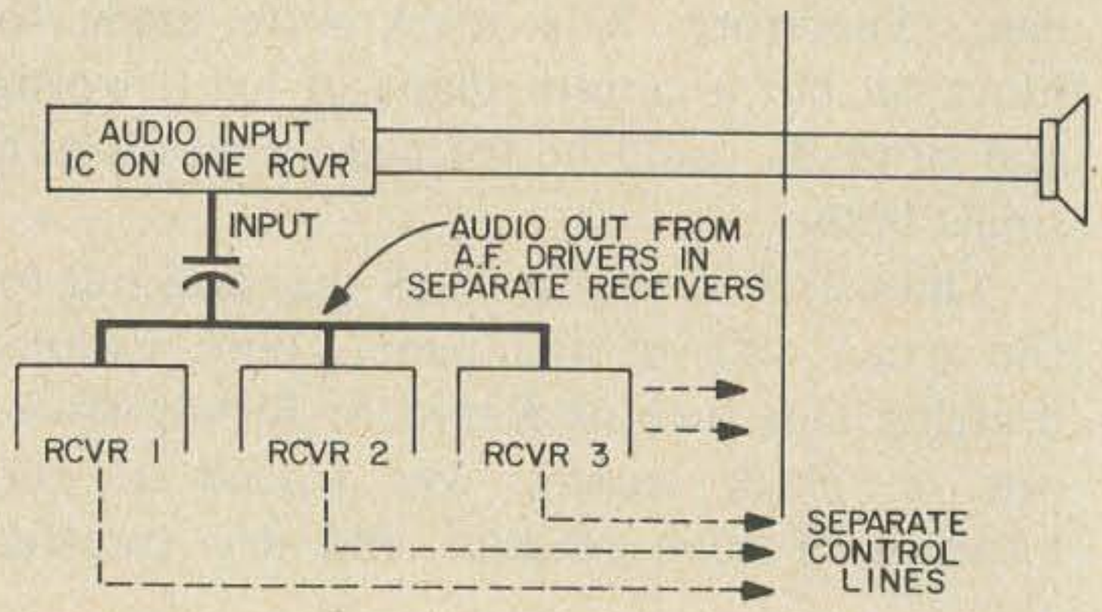


Fig. 4c. A method of using one speaker on several receivers to conserve space. Heavy lines are added wires.

prevent the reflection of light where it was not desired. The LED 7 segment readout was cemented to the clear space reserved for it on the panel and the indicator board with an IC socket mounted to it was plugged onto the back of the LED. Finally, the miniature surplus pots and subminiature switches were mounted and wired to a terminal strip cemented to the panel. The decoder pc board was cemented next to the terminal strip and wired to it and the LED indicator board.

The cable harness was run in the car wells and since a barrier type terminal strip was used on the receiver, the individual wires of the cable were attached to it. The other end was connected to the terminal strip and various connections at the panel. With a final check on loose ends and shorts power was applied, and presto – a professional looking

job. The panel remains dark, and looks uncluttered with only four knobs and two switches showing until the switches are turned on. Then the control functions flash into life below each knob and the panel

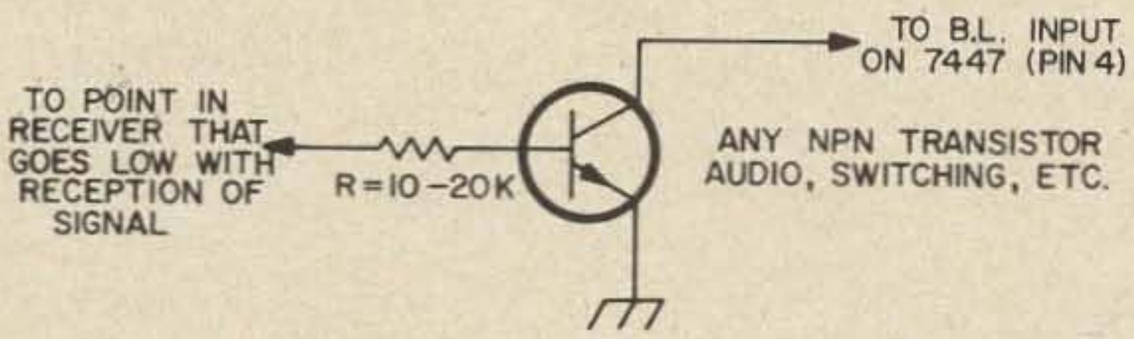


Fig. 5. Schematic of inverter to blank readout when receive is scanning. Use when no "Hi" or Logical 1 outputs are present (see text).

resembles a professionally made control center. The readout remains blank with only a dot showing until a signal is received, then a number appears in the space above the word "channel" indicating which frequency is being heard.

Comments

This is a simple, easy-to-use method that takes up a minimum of dashboard space. For those with a penchant for thoroughness and a larger amount of space, the seven segment readout may be dropped and a film made with the frequencies or names of whatever you listen to lettered on it, such as NYC PD, .94, .31–.91 RPT, etc. The scanner lights may be connected directly to bulbs behind these words and the resulting readout will show exactly what you are tuned to.

Speaker connections may be made as shown for each individual unit or, if the design of the car permits, the internal speaker from the receiver may be used and allowed to blare forth from its recessed location in the trunk.

Alternatively, the audio from all of the receivers may be fed (depending on the design of the units) into one receiver amplifying stage and one front speaker used. For transceiver connections, an additional switch to stop the logic clock in the receiver is mounted on the panel and microphone wires in the cable are soldered to a connector mounted on any available space on the panel or dashboard. When a signal is heard, the switch is depressed to stop the receiver from scanning until the QSO is completed.

. . .WA4SAM

A CBer's GLOSSARY OF AMATEUR TERMINOLOGY

Andrew M. Cohn K4ADL
4823 West Braddock Road
Alexandria VA 22311

I wish to state at the outset that in addition to my sixteen years as a licensed amateur I have also retained authorization to communicate via the Citizens Radio Service.

During the past several years in the latter category, I must frankly admit acquaintance with many fine, honest, public-service-minded citizens band operators. I have also come upon a helluva load of dum-dums. It is to this group I address the ensuing glossary, with a view toward a general uplifting of technical prowess for this unfortunate element in our vital world of communications.

As there is an occasional need for continuity in our CBer's Glossary of Amateur Terminology, we hereby suspend the customary alphabetical order of things.

ARRL: Association for Rescue and Resuscitation of Llamas. (Clearly a useful organization)

Antenna: An insect who refuses to sing bass.

CW: Continuous Wave; as in . . . a continuous wave of malicious interference.

Frequency: How often a given act occurs;

for example, the *frequency* of on-the-air profanity.

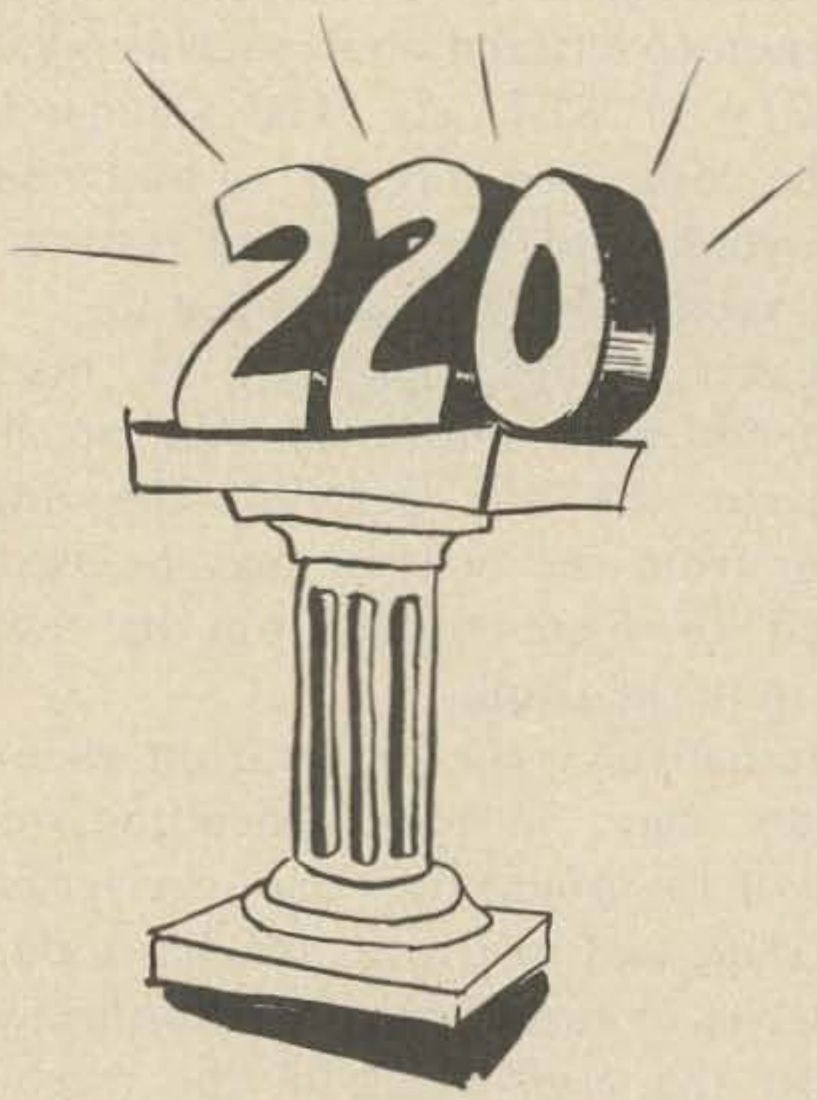
Frequency Counter: A device – usually containing insufficient digits – for measuring the activities described above.

Deviation: An act in opposition with acceptable norms; e.g., the use of code names instead of call signs.

Discriminator: One who establishes communication with regard to race, color or creed.

Resistance: An unwillingness to comply; for example, with Part 95 regulations.

220 MHz: As in biblical times, "The Promised Band."



Prog Line: An unlikely story about progs. For example, "Warts come from touching progs."

Digital Logic: A particular method of making a point, or rendering a greeting to a CB'er.

Bug: A defect; e.g., a transmitter capable of only 5 watts input.

Joule: Opposite of Bug. Any 11 meter transmitter capable of more than 5 watts input. In common usage: "Mercy! This rig's a real joule."

Wheatstone Bridge: Connects Bronx with Queens.

Clapp Circuit: The area of 42nd Street between 6th and 10th Avenues and all of Brooklyn.

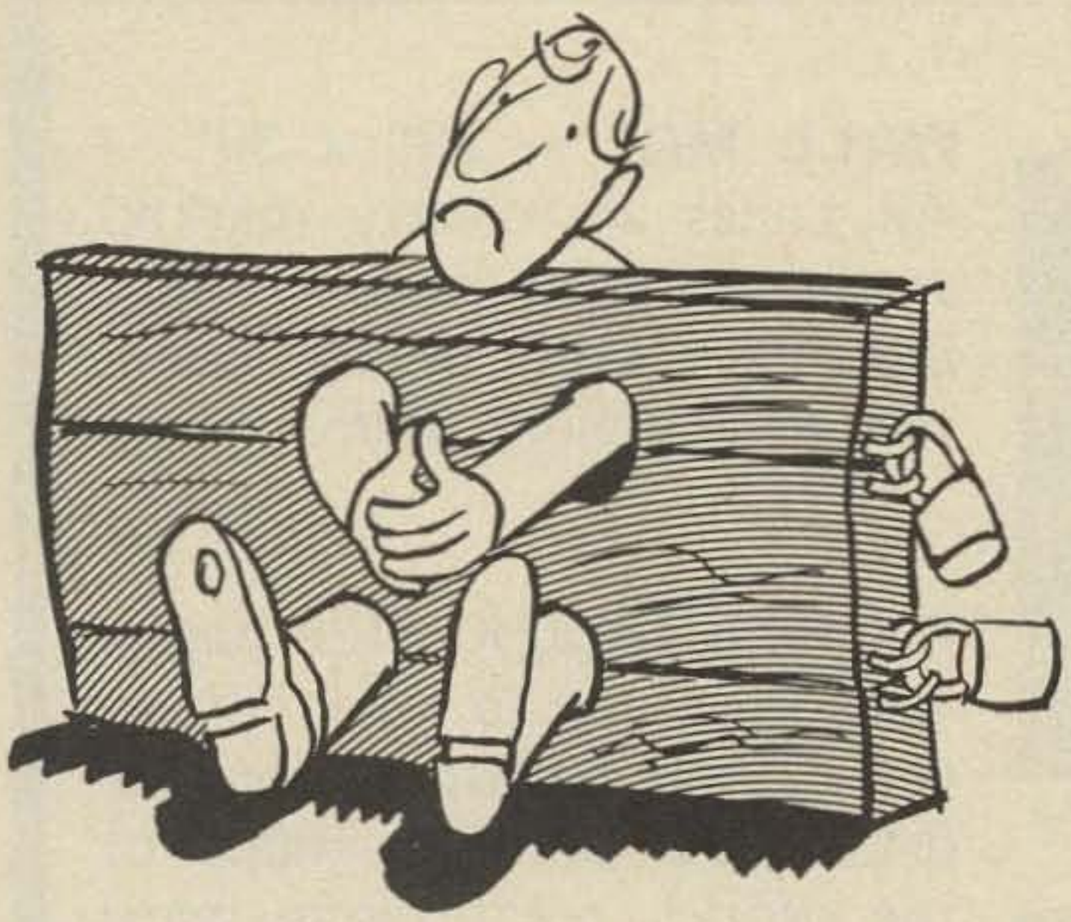
Half Wave: A greeting for someone you don't really like.

Squelch Tail: To make a long story short.

Autopatch: The process of repairing a vehicle.

Touch Pad: An apartment for encounter groups.

Repeater: A CB operator with more than one citation.



Linear Amplifier: A device "not intended for use on the 11 meter band."

PEP: "Promote Excessive Power." Motto of CB dealers stocking 11 meter linears.

Heterodying: The act of having dinner with a member of the opposite sex.

Hertz: An rf burn, or an FCC fine.

Zero Beat: A police officer suspended from duty.

Ohm's Law: Simply stated . . . "If you see a truck with revolving dome, you'd best pretend you're not at ohm.

Capture Effect: See Ohm's Law; the result of being found at ohm.

Split Channel: Something you should do when the FCC truck is spotted.

Kilowatt: The appropriate action to be

taken when running 6 watts on 11 meters while being followed by a strange truck with government tags.

Oven: When the heat's on, a good place to hide the linear.

Collinear: The result of placing the amplifier in the refrigerator rather than in the oven.

Skip: To avoid, or pass over. In common usage: "Mercy! This guy's calling from Texas! Let's not *skip* this one!"

73 Magazines: The approximate amount of

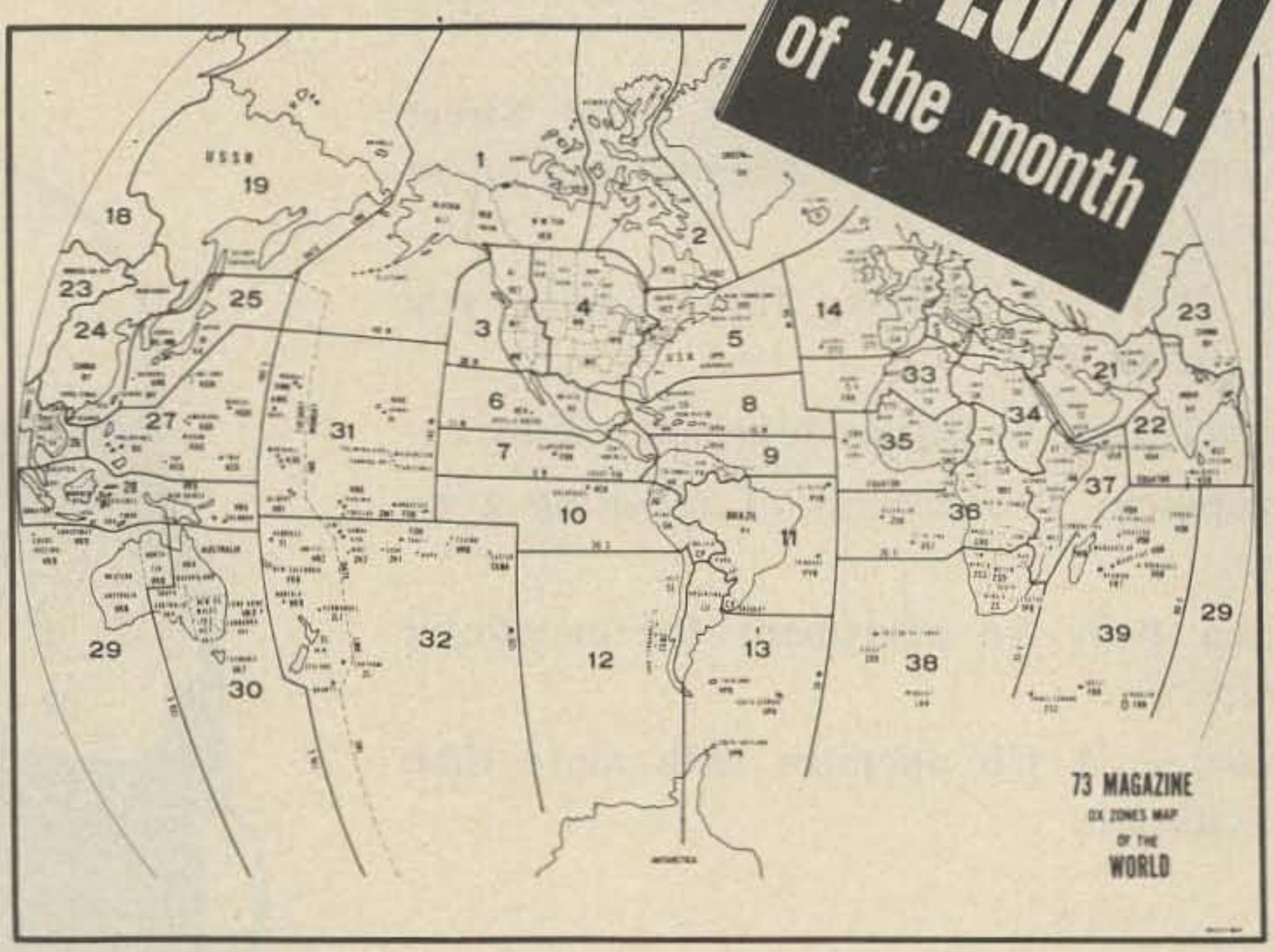
ammunition needed to control one square block of 11 meter deviates.

. . .K4ADL

DX OFFER

73 magazine SPECIAL of the month

Both map and book



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A TUNING HINT FOR RCA FM EQUIPMENT

Contrary to usual industry practice, RCA has designed its line of FM communications equipment to cover a broad frequency range. Normal practice in the two-way radio industry is to manufacture each radio to cover a narrow segment of frequencies within the general limits of the particular frequency band.

An example of this practice is seen in Motorola equipment which nominally covers the 30 to 50 MHz band. Motorola has split this band into three, (and sometimes four) segments; designated H (40 to 50 MHz), M (30 to 40 MHz) and L (25 to 30 MHz). Each segment requires a different tuned circuit. Therefore, unless the ham is lucky he must change coils and capacitors in order to convert the gear for use on the amateur band. This is an expensive and time consuming process.

RCA has eliminated this problem. Each rf coil has a tap to change the value according to a tuning table which is provided for each segment of the entire frequency range.

The table shown is reproduced from the manual covering an RCA transmitter used

TUNING CHART

OPER. FREQ MC	OSC. SCREEN JUMPERS See Note 10	271, 272 273 & 274 JUMPERS	2L7, 2L8 & 2L9 ACTIVE TURNS	SHUNT CAP.	FIN. PL. PADDER 2C54	APPROX. ACTIVE TURNS 2L12	2L13
25	1 to 2	1 to 3, 2 to 4	"	on	on	13 7/8	8 7/8
26			"			12 7/8	8 7/8
27			"			11 7/8	7 7/8
28			"			10 7/8	7 7/8
29	1 to 2	1 to 3, 2 to 4	"		on	9 7/8	7 7/8
30	t to 2, 3 to 4	1 to 3	8		off	13 7/8	7 7/8
31			8			12 7/8	7 1/8
32			8			11 7/8	7 1/8
33			8			11 1/8	6 7/8
34			8			10 7/8	6 7/8
35			8			9 7/8	6 7/8
36	1 to 2, 3 to 4	1 to 3	8	on		9 1/8	6 1/8
37	1 to 3	1 to 2, 3 to 4	"	off		8 7/8	5 7/8
38			"			8 7/8	5 1/8
39			"			7 7/8	5 1/8
40			"			7 7/8	5 1/8
41			"			7 1/8	5 1/8
42			"			6 7/8	4 7/8
43			"			6 7/8	4 7/8
44	1 to 3	1 to 2, 3 to 4	"			6 7/8	4 7/8
45	1 to 3, 2 to 4	1 to 2	8			6 1/8	4 7/8
46			8			6 1/8	4 7/8
47			8			5 7/8	4 1/8
48			8			5 1/8	3 7/8
49			8			4 7/8	3 7/8
50			8			4 7/8	3 7/8
51			8			4 7/8	3 7/8
52			8			4 1/8	3 7/8
53			8			4 1/8	3 1/8
54	1 to 3, 2 to 4	1 to 2	8	off	off	3 7/8	2 7/8

for operation in the 25 to 54 MHz range. To change the operating frequency from 33.05 MHz to 52.525 MHz, you would change jumpers according to the table, plug in your crystal and tune the transmitter in the normal manner. When a capacitor connection is to be changed, notes provided by RCA in each manual tell exactly where each component is stored when not in use.

There are two advantages for the ham with this system: First, you need not know the original operating frequency of the gear you are buying. Change jumpers and you are in business. Second, there are no expensive coils to buy, which means that you can shift all the way from six meters down to ten meters for only the cost of crystals. The RCA high-band (148–172 MHz) equipment has the same design advantages as the low-band equipment.

I hope that knowledge of this system will help you to better evaluate the goodies that show up at hamfests and surplus dealers. Manuals could probably be borrowed from the local two-way shop.

...WA9FGP

Paul H. Wiese WA8YDC
3450 Monticello Blvd.
Cleveland Heights OH 44121

ROCK SOLID SUBAUDIBLE TONE GENERATOR

With more and more repeater systems going up each day, the need for some type of tone access has become apparent. Some of these systems are utilizing the commercially proven low frequency subaduible continuous tone generator access system. Commercially, these tones are generated by a vibrating mechanical reed in both the sending and receiving units. Most of the amateurs now using subaudible (Private Line, Channel Guard, etc.) are using older surplus tube-type reed electronics. Most of these surplus reed units are bulky and at times hard to come by on the right frequency in certain areas. Even repeaters with tone burst access will be adding subaudible to reduce the beep-beeping (the roadrunner syndrome) of tone burst for their local operators which desire to add the more pleasant sounding access of a subaudible tone.

This unit is a small, crystal-controlled, digital IC subaudible tone encoder. This unit can operate anywhere between 9 to 15 volts dc and is extremely stable in frequency over the entire voltage range and normal temperature range. The desired output frequency is readily obtainable by ordering the right frequency crystal from one of several manufacturers.

Circuit Description

The 65–240 kHz crystal is oscillated by the 2 transistor modified multi-vibrator circuit Q1, Q2. The output of this high

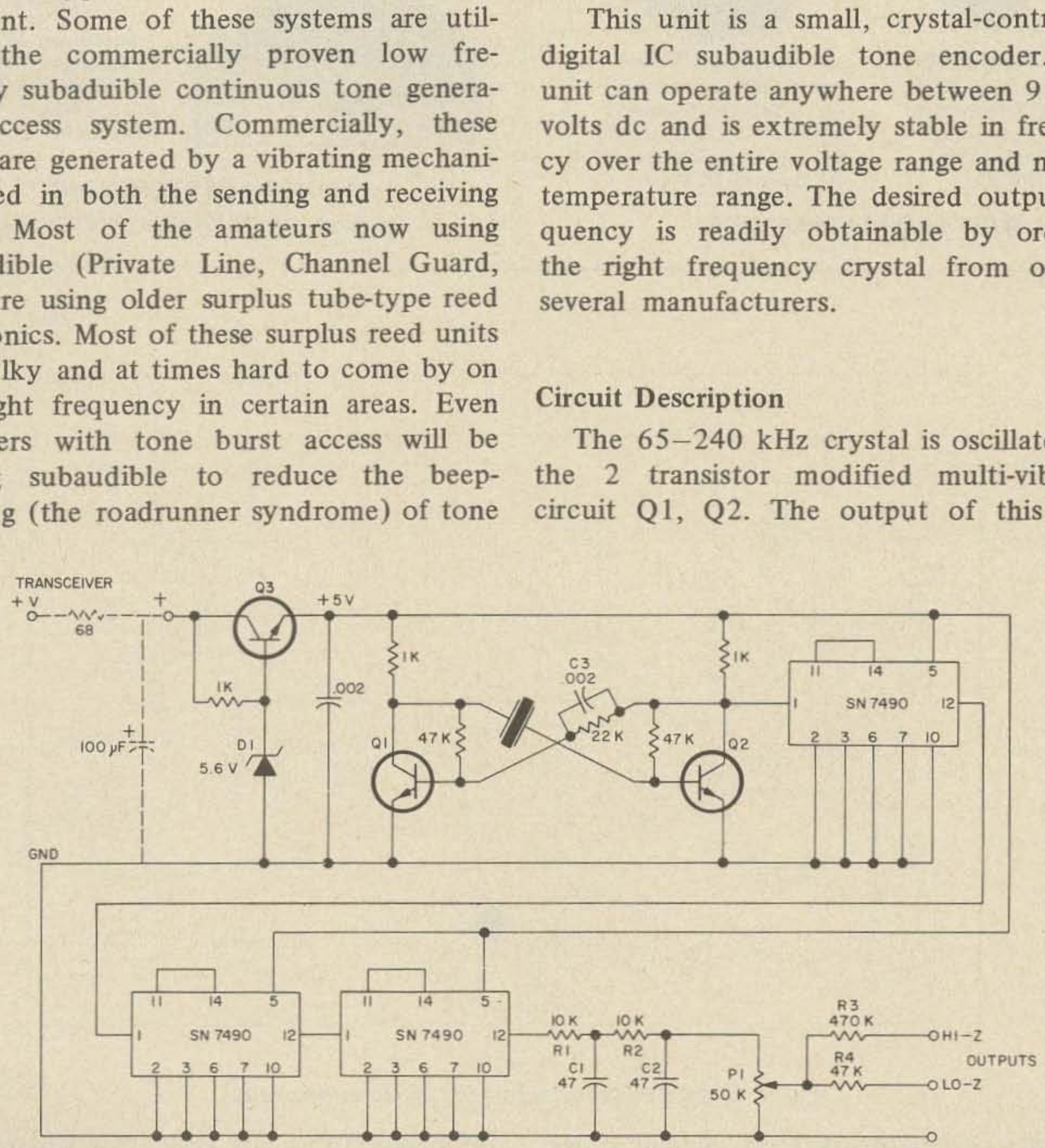

Fig. 1. Schematic of the sub-audible tone generator. Q1,2-MPS6513; Q3-2N1613

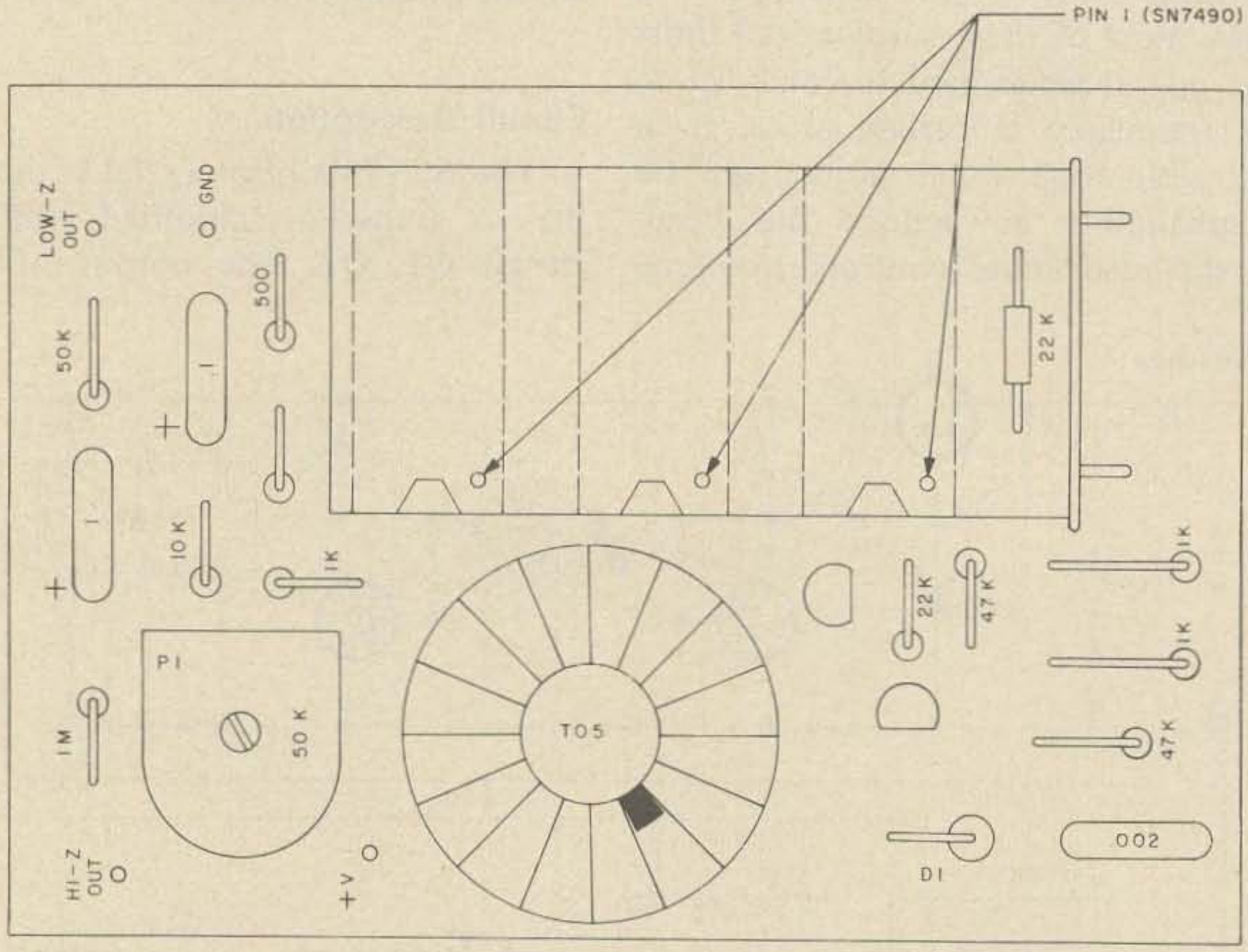

Fig. 2. Suggested parts layout for the tone generator.

frequency oscillator is then divided down to the 100 Hz range by the 3 SN7490 decade counters. The last counter output is the square wave of the desired subaudible frequency (65–240 Hz). This square wave is then filtered by the 2 stage RC filter network comprised of R1, R2, C1, C2. The output amplitude is then adjusted by the

50 K-ohm potentiometer. High impedance microphone circuits should be connected to the 1 megohm resistor R3 or for low impedance microphone inputs should be connected to the 50 Kohm resistor R4. Transistor Q3 and zendr diode CR1 regulate the supply voltage to the tone generator. The raw power supply can be from either a 9V transistor radio battery or connected to the +12–15 volt transceiver supply. In some instances, the tone generator will load the transceiver supply with the switching current ripple (i.e., when the output voltage pot is turned to zero, the audio harmonics can still be heard on the transmitted signal). If this occurs, then the generator supply should be isolated with the 68Ω, 100 μF RC filter.

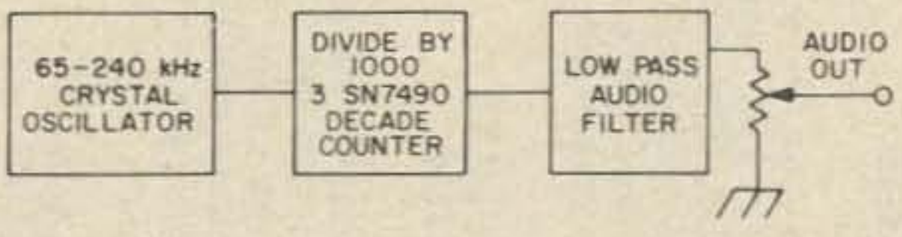

Fig. 3. Block diagram of the unit.

Test and Connection

To test the unit, connect the plus voltage lead to 9–15 volts and the ground wire to the return supply. Attach an earphone to the low impedance output and ground. When potentiometer P1 is maximum, the tone should easily be heard in the earphone. Once this tone is detected, you can assume that its frequency is the crystal frequency divided by 1000. To connect the unit to the transceiver, just run the audio output to the microphone input of the rig. The potentiometer P1 should be set at the minimum level to operate the repeater system reliably.

The encoder board can be mounted inside most transceivers. If desired, or necessity demands, the board can be placed inside a plastic box (a discarded or XYL borrowed dressmaker pin box is excellent). The boxed unit can then be "stuck" to the side of the rig with double-sided sticky foam tape.

. . .WA8YDC

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SEND ME: _____ PRICE:

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Scandal in the Wind

The premier issue of the 73 HOTLINE, which will be published every other Friday, is scheduled for April 5th. This newsletter will cover all the up-to-the-minute happenings in amateur radio . . . FCC news . . . new petitions filed . . . new actions . . . DXpeditions . . . new products . . . propagation flashes . . Hotline Classified ads . . . job opportunities in the ham field . . . hamfest and convention news . . . contest news . . . all those things hams want right now and not the usual two months late magazine schedule. The 73 HOTLINE will be chock full of last minute news since it will be in the mail just a few hours after deadline closing.

HOTLINE will be mailed to all subscribers (at $8 per year) by first class mail, marked Rush – Time Value. Our tests have shown that this class of mail seldom arrives later than airmail and often even sooner! HOTLINE will not be a simple typewritten sheet, as some newsletters are, but will be similar to the format of newspapers, with many times the information you might get elsewhere. Use the handy order form below and start getting the news you need to know while it's still news.

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FCC RULES AND REGULATIONS, PART 97 (IX)

Continuing from February, here is the last installment of the FCC Rules and Regulations pertaining to the Amateur Radio Service.

Subpart F—Radio Amateur Civil Emergency Service (RACES)

Subpart G—Operation of Amateur Radio Stations in the United States by Aliens

Subpart H—Operation of Amateur Radio Stations in the United States by Permanent Resident Aliens.

APPENDICES

AUTHORITY: §§ 97.1 to 97.409 issued under 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064–1068, 1081–1105, as amended; 47 U.S.C. Sub-chap. I, III–VI.

§ 97.221 Permissible communications.

Stations in this service are authorized to transmit only the following types of civil defense communications:

(a) Communications for training purposes consisting of necessary drills and tests to insure establishment and maintenance of orderly and efficient operation of the radio amateur civil emergency networks and such other radio stations and networks as may be associated therewith for the conduct of civil defense communications, including communications directly concerned with the conduct of practice alerts, practice blackouts, practice mobilization, and other comparable situations as may be ordered or initiated by competent civil defense authority or by the United States governmental or military authority charged with the defense of the area concerned. All messages which are transmitted in connection with such drills, exercises and tests shall be clearly identified as such by use of any one of the words "Drill" or "Exercise" or "Test" in the body of such messages.

(b) Communications when there is an impending or actual condition jeopardizing the public safety or affecting the national defense or security:

(1) Communications directly concerning the activation of the radio amateur civil emergency station networks or such other radio stations and networks as may be associated with the networks for the conduct of civil defense communications.

(2) Communications directly concerning the conduct of service by the radio amateur civil emergency networks and such other radio stations and networks as may be associated therewith.

(3) Communications directly concerning safety of life, preservation of property, maintenance of law and order, alleviation of human suffering and need, and combating of armed attack or sabotage.

(4) Communications directly concerning the accumulation and dissemination of public information or instructions to the civilian population essential to the activities of the civil defense organization or that of other authorized governmental or relief agencies.

(5) Communications directly concerning the transaction of business essential to public welfare.

§ 97.223 Use of codes and ciphers.

Any station in this service is authorized to transmit messages in codes and ciphers and to utilize any method of secret or coded authentication of its transmissions when such method of concealing the contents of messages or such authentication procedure is prescribed by the competent civil defense authority of the area served by the station and is approved by the cognizant federal civil defense authorities.

§ 97.225 Priority of communications.

The order of priority of communications by stations in this service, when there is an impending or actual condition jeopardizing the public safety or affecting the defense or security of an area, shall be determined by the cognizant civil defense authority of the area concerned or his authorized representative.

§ 97.227 Operating procedure.

The operating procedure, and the method of circuit control by the control station of each network, shall be determined by the responsible civil defense authority of the area concerned and shall, in general, conform as nearly as possible to the operating procedure normally followed in other services in the expeditions handling of message traffic by the method of transmission in use.

Subpart G—Operation of Amateur Radio Stations in the United States by Aliens

§ 97.301 Basis, purpose, and scope.

(a) The rules in this subpart are based on, and are applicable solely to, alien amateur operations pursuant to section 303(l)(2) and 310(a) of the Communications Act of 1934, as amended. (See Public Law 88–313, 78 Stat. 202.)

(b) The purpose of this subpart is to implement Public Law 88–313 by prescribing the rules under which an alien, who holds an amateur operator and station license issued by his government (hereafter referred to as an alien amateur), may operate an amateur radio station in the United States, in its possessions, and in the Commonwealth of Puerto Rico (hereafter referred to only as the United States).

§ 97.303 Permit required.

(a) Before he may operate an amateur radio station in the United States, under the provisions of sections 303(l)(2) and 310(a) of the Communications Act of 1934, as amended, an alien amateur licensee must obtain a permit for such operation from the Federal Communications Commission. A permit for such operation shall be issued only to an alien holding a valid amateur operator and station authorization from his government, and only when there is in effect a bilateral agreement between the United States and that government for such operation on a reciprocal basis by United States amateur radio operators.

§ 97.305 Application for permit.

(a) Application for a permit shall be made on FCC Form 610–A. Form 610–A may be obtained from the Commission's Washington, D.C., office, from any of the Commission's field offices and, in some instances, from United States missions abroad.

(b) The application form shall be completed in full in English and signed by the applicant. A photocopy of the applicant's amateur operator and station license issued by his government shall be filed with the application. The Commission may require the applicant to furnish additional information. The application must be filed by mail or in person with the Federal Communications Commission, Washington, D.C., 20554, U.S.A. To allow sufficient time for processing, the application should be filed at least 60 days before the date on which the applicant desires to commence operation.

§ 97.307 Issuance of permit.

(a) The Commission may issue a permit to an alien amateur under such terms and conditions as it deems appropriate. If a change in the terms of a permit is desired, an application for modification of the permit is required. If operation beyond the expiration date of a permit is desired, an application for renewal of the permit is required. In any case in which the permittee has, in accordance with the provisions of this subpart, made a timely and sufficient application for renewal of an unexpired permit, such permit shall not expire until the application has been finally determined. Application for modification or for renewal of a permit shall be filed on FCC Form 610–A.

(b) The Commission, in its discretion, may deny any application for a permit under this subpart. If an application is denied, the applicant will be notified by letter. The applicant may, within 90 days of the mailing of such letter, request the Commission to reconsider its action.

(c) Normally, a permit will be issued to expire 1 year after issuance but in no event after the expiration of the license issued to the alien amateur by his government.

[*§ 97.307(a) amended eff. 12-15-72; VI(72)-1*]

§ 97.309 Modification, suspension, or cancellation of permit.

At any time the Commission may, in its discretion, modify, suspend, or cancel any permit issued under this subpart. In this event, the permittee will be notified of the Commission's action by letter mailed to his mailing address in the United States and the permittee shall comply immediately. A permittee may, within 90 days of the mailing of such letter, request the Commission to reconsider its action. The filing of a request for reconsideration shall not stay the effectiveness of that action, but the Commission may stay its action on its own motion.

§ 97.311 Operating conditions.

(a) The alien amateur may not under any circumstances begin operation until he has received a permit issued by the Commission.

(b) Operation of an amateur station by an alien amateur under a permit issued by the Commission must comply with all of the following:

(1) The terms of the bilateral agreement between the alien amateur's government and the government of the United States;

(2) The provisions of this subpart and of Subparts A through E of this part;

(3) The operating terms and conditions of the license issued to the alien amateur by his government; and

(4) Any further conditions specified on the permit issued by the Commission.

(c) An alien amateur may operate on dates, at locations, or via an itinerary, significantly different from that specified in the application for his permit only under the condition that he has given advance notice of the particulars of such operation to the Commission in accordance with the requirements of § 97.95(a).

§ 97.313 Station identification.

(a) The alien amateur shall identify his station as follows:

(1) Radio telegraph operation: The amateur shall transmit the call sign issued to him by the licensing country followed by a slant (/) sign and the United States amateur call sign prefix letter(s) and number appropriate to the location of his station.

(2) Radiotelephone operation: The amateur shall transmit the call sign issued to him by the licensing country followed by the words "fixed", "portable" or "mobile", as appropriate, and the United States amateur call sign prefix letter(s) and number appropriate to the location of his station. The identification shall be made in the English language.

(b) At least once during each contact with another amateur station, the alien amateur shall indicate, in English, the geographical location of his station as nearly as possible by city and State, commonwealth, or possession.

Subpart H—Operation of Amateur Radio Stations in the United States by Permanent Resident Aliens

[*Subpart H (§§ 97.401-97.409) added new eff. 8-8-72; VI(72)-1*]

§ 97.401 Basis, purpose and scope.

(a) The rules in this subpart are based on and are applicable solely to those provisions of section 303(1)(3) and 310(a) of the Communications Act of 1934, as amended (see Public Law 92–81, 85 Stat. and 78 Stat. 202) whereby certain aliens admitted to the United States for permanent residence should be eligible to operate amateur radio stations and to hold licenses for their stations.

(b) The purpose of this subpart is to implement Public Law 92–81 by prescribing the rules under which an alien, who is a permanent resident of the United States and has filed a declaration of intention with a State or Federal court may operate an amateur radio station in the United States.

§ 97.403 License required.

(a) Before an alien, under Public Law 92–81, may operate an amateur radio station in the United States under the provisions of sections 303(1)(3) and 301(a) of the Communications Act of 1934, as amended, he must obtain a license for such operation from the Federal Communications Commission. A license for such operation shall be issued only to an alien admitted to the United States for permanent residence who has filed under section 334(f) of the Immigration and Nationality Act (8 U.S.C. 1445(f) a declaration of intention to become a citizen of the United States and has successfully completed an examination pursuant to § 97.29.

§ 97.405 Application for license.

(a) Application for license shall be made on FCC Forms 610 and 610–C. Both forms may be obtained from the Commission's Washington, D.C., office or any of the Commission's field offices.

(b) The application forms shall be completed in full in English and signed by the applicant. The Commission may require the applicant to file additional information. Both applications must be filed in accordance with the instructions contained in §§ 97.11 and 97.41.

§ 97.407 Issuance, modification, or cancellation of license.

(a) The Commission may issue a license under such conditions, restrictions, and terms as it deems appropriate.

(b) At any time the Commission may, in its discretion, modify or cancel any license issued under this subpart. In this event, the licensee will be notified of the Commission's action by letter.

§ 97.409 Operating conditions.

(a) The alien applicant may not under any circumstances begin operation until he has received a license issued by the Commission.

(b) Except as stated in any condition the operational rules and procedure contained in Subparts A through E of this part shall be applicable.

(c) When the licensee under this subpart becomes a citizen of the United States it will not be necessary for him to notify the Commission of this fact until such time as the licensee desires to renew or modify his license. At the time the licensee becomes a citizen of the United States all procedural rights shall attach

to his license and the Communications Act and Administrative Procedure Act shall be applicable regarding any request or application for, or modification, suspension, or cancellation of, any such license.

APPENDICES

APPENDIX 1

EXAMINATION POINTS

Examinations for amateur radio operator licenses are conducted at the Commission's office in Washington, D.C., and at each field office of the Commission on the days designated by the Engineer in Charge of the office. Specific dates should be obtained from the Engineer in Charge of the nearest field office of the Commission.

Examinations are also given frequently, by appointment, at the Commission's offices at the following points:

Anchorage, Alaska.
Beaumont, Tex.
Mobile, Ala.
San Diego, Calif.
Savannah, Ga.
Tampa, Fla.

Examinations are also given at greater intervals at the places named below, which are visited for that purpose by Commission examiners from the field offices for such locations. For current schedules, exact time, place, and other details, inquiry should be addressed to the office conducting examinations at the chosen point.

QUARTERLY POINTS

Albany, N.Y.
Birmingham, Ala.
Charleston, W. Va.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.
Corpus Christi, Tex.
Davenport, Iowa.
Des Moines, Iowa.
Fort Wayne, Ind.
Fresno, Calif.
Grand Rapids, Mich.
Indianapolis, Ind.
Knoxville, Tenn.
Little Rock, Ark.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Nashville, Tenn.
Oklahoma City, Okla.
Omaha, Nebr.
Phoenix, Ariz.
Pittsburgh, Pa.
St. Louis, Mo.
Salt Lake City, Utah.
San Antonio, Tex.
Sioux Falls, S. Dak
Syracuse, N.Y.
Tulsa, Okla.
Williamsport, Pa.
Winston-Salem, N.C.

SEMIANNUAL

Albuquerque, N. Mex.
Boise, Idaho.
El Paso, Tex.
Fairbanks, Alaska.
Hartford, Conn.
Helena, Mont.
Jackson, Miss.
Jacksonville, Fla.
Juneau, Alaska.
Ketchikan, Alaska.
Las Vegas, Nev.
Lubbock, Tex.
Portland, Maine.
Salem, Va.
Spokane, Wash.
Tucson, Ariz.
Wichita, Kans.
Wilmington, N.C.

ANNUAL

Bakersfield, Calif.
Bangor, Maine.
Billings, Mont.
Hilo, Hawaii.
Jamestown, N. Dak.
Klamath Falls, Oreg.
Lihue, Hawaii.
Marquette, Mich.
Rapid City, S. Dak.
Wailuku, Hawaii.

Arrangements have also been made, including cooperation of other Federal agencies, for General Class examinations in outlying areas as follows:

Guam: District Communications Officer, United States naval station.

Hawaii: At not exceeding one point on any island, by the Engineer in Charge (Honolulu).

[*Appendix 1, Helena, Mont., added to Semiannual Examination Points; Great Falls and Helena, Mont., deleted from Annual Examination Points eff. 2-21-73; VI(72)-2*]

APPENDIX 2

Extracts From Radio Regulations Annexed to the International Telecommunication Convention (Geneva, 1959)

ARTICLE 41—AMATEUR STATIONS

Section 1. Radiocommunications between amateur stations of different countries [1] shall be forbidden if the administration of one of the countries concerned has notified that it objects to such radiocommunications.

SEC. 2. (1) When transmissions between amateur stations of different countries are permitted, they shall be made in plain language and shall be limited to messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified. It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties.

(2) The preceding provisions may be modified by special arrangements between the administrations of the countries concerned.

SEC. 3. (1) Any person operating the apparatus of an amateur station shall have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. Administrations concern[illegible] may, however, waive this requirement in the case of stations making use exclusively of frequencies above 144 MHz.

(2) Administrations shall take such measures as they judge necessary to verify the technical qualifications of any person operating the apparatus of an amateur station.

SEC. 4. The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which these stations are to work.

SEC. 5. (1) All the general rules of the Convention and of these Regulations shall apply to amateur stations. In particular, the emitted frequency shall be as stable and as free from spurious emissions as the state of technical development for such stations permits.

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[1] As may appear in public notices issued by the Commission.

(2) During the course of their transmissions, amateur stations shall transmit their call sign at short intervals.

RESOLUTION NO. 10

Relating to the use of the bands 7000 to 7100 kHz and 7100 to 7300 kHz by the Amateur Service and the Broadcasting Service.

The Administrative Radio Conference, Geneva, 1959,

Considering—

(a) That the sharing of frequency bands by amateur, fixed, and broadcasting services is undesirable and should be avoided;

(b) That it is desirable to have worldwide exclusive allocations for these services in Band 7;

(c) That the band 7000 to 7100 kHz is allocated on a worldwide basis exclusively to the amateur service;

(d) That the band 7100 to 7300 kHz is allocated in Regions 1 and 3 to the broadcasting service and in Region 2 to the amateur service;

resolves,

that the broadcasting service should be prohibited from the band 7000 to 7100 kHz and that broadcasting stations operating on frequencies in this band should cease such operation;

and noting,

the provisions of No. 117 of the Radio Regulations;

further resolves,

that interregional amateur contacts should be only in the band 7000 to 7100 kHz and that the administrations should make every effort to ensure that the broadcasting service in the band 7100 to 7300 kHz, in Regions 1 and 3, does not cause interference to the amateur service in Region 2; such being consistent with the provisions of No. 117 of the Radio Regulations.

APPENDIX 4

Convention Between the United States of America and Canada, Relating to the Operation by Citizens of Either Country of Certain Radio Equipment or Stations in the Other Country

(Effective May 15, 1952)

ARTICLE III

It is agreed that persons holding appropriate amateur licenses issued by either country may operate their amateur stations in the territory of the other country under the following conditions:

(a) Each visiting amateur may be required to register and receive a permit before operating any amateur station licensed by his government.

(b) The visiting amateur will identify his station by:

(1) *Radiotelegraph operation.* The amateur call sign issued to him by the licensing country followed by a slant (/) sign and the amateur call sign prefix and call area number of the country he is visiting.

(2) *Radiotelephone operation.* The amateur call sign in English issued to him by the licensing country followed by the words, "fixed," "portable" or "mobile," as appropriate, and the amateur call sign prefix and call area number of the country he is visiting.

(c) Each amateur station shall indicate at least once during each contact with another station its geographical location as nearly as possible by city and state or city and province.

(d) In other respects the amateur station shall be operated in accordance with the laws and regulations of the country in which the station is temporarily located.

APPENDIX 5

DETERMINATION OF ANTENNA HEIGHT ABOVE AVERAGE TERRAIN

The effective height of the transmitting antenna shall be the height of the antenna's center of radiation above "average terrain." For this purpose "effective height" shall be established as follows:

(a) On a U.S. Geological Survey Map having a scale of 1:250,000, lay out eight evenly spaced radials, extending from the transmitter site to a distance of 10 miles and beginning at (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° T.) If preferred, maps of greater scale may be used.

(b) By reference to the map contour lines, establish the ground elevation above mean sea level (AMSL) at 2, 4, 6, 8, and 10 miles from the antenna structure along each radial. If no elevation figure or contour line exists for any particular point, the nearest contour line elevation shall be employed.

(c) Calculate the arithmetic average of these 40 points of elevation (5 points of each of 8 radials).

(d) The height above average terrain of the antenna is thus the height AMSL of the antenna's center of radiation, minus the height of average terrain as calculated above.

NOTE 1: Where the transmitter is located near a large body of water, certain points of established elevation may fall over water. Where it is expected that service would be provided to land areas beyond the body of water, the points at water level in that direction should be included in the calculation of average elevation. Where it is expected that service would not be provided to land areas beyond the body of water, the points at water level should not be included in the average.

NOTE 2: In instances in which this procedure might provide unreasonable figures due to the unusual nature of the local terrain, applicant may provide additional data at his own discretion, and such data may be considered if deemed significant.

APPENDIX 3

CLASSIFICATION OF EMISSIONS

For convenient reference the tabulation below is extracted from the classification of typical emissions in Part 2 of the Commission's Rules and Regulations and in the Radio Regulations, Geneva, 1959, and it includes only those general classifications which appear most applicable to the Amateur Radio Service.

Type of modulation	Type of transmission	Symbol
Amplitude	With no modulation	A0
	Telegraph without the use of modulating audio frequency (by on-off keying).	A1
	Telegraphy by the on-off keying of an amplitude modulating audio frequency or audio frequencies or by the on-off keying of the modulated emission (special case: an unkeyed emission amplitude modulated).	A2
	Telephony	A3[1]
	Facsimile	A4
	Television	A5
Frequency (or phase).	Telegraphy by frequency shift keying without the use of a modulating audio frequency.	F1
	Telegraphy by the on-off keying of a frequency modulating audio frequency or by the on-off keying of frequency modulated emission (special case: an unkeyed emission frequency modulated).	F2
	Telephony	F3
	Facsimile	F4
	Television	F5
Pulse		P

[1] (In Part 97) unless specified otherwise, A3 includes single and double sideband with full, reduced, or suppressed carrier.

THE END

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690 Chipwood
Orange, CA 92667

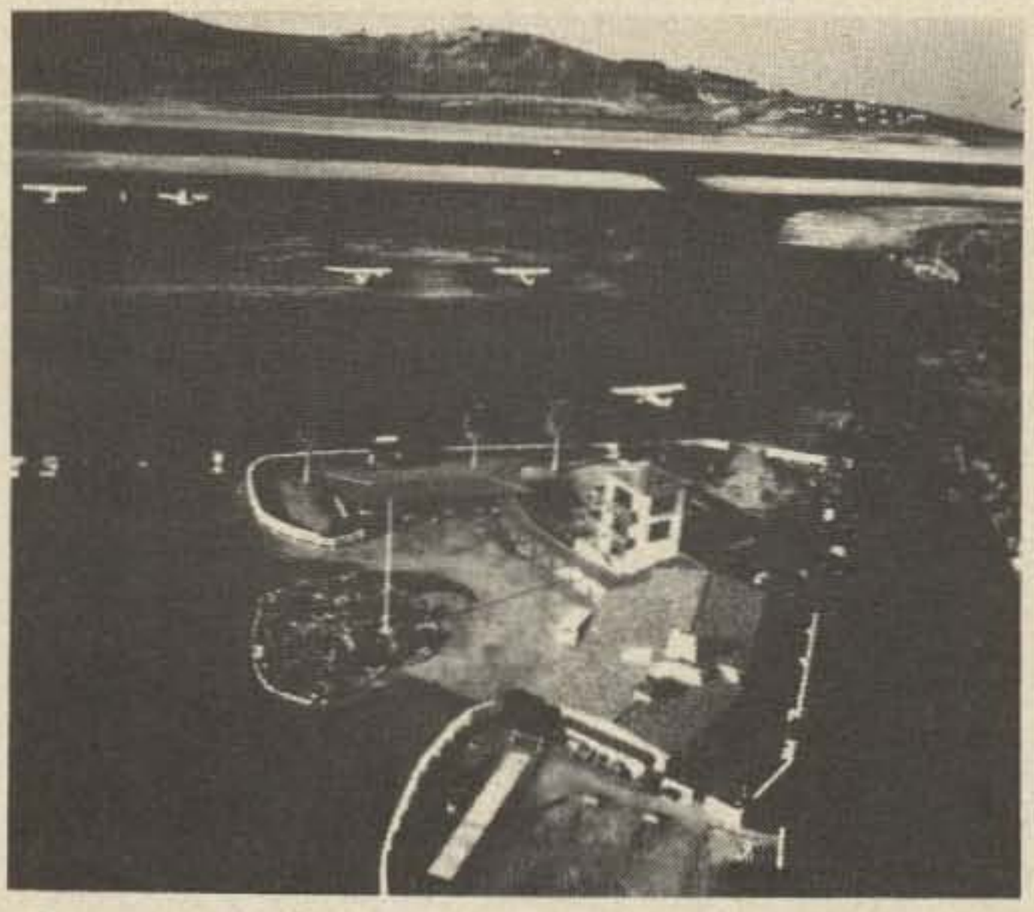
FIRST U.S. LICENSED REMOTE-CONTROLLED REPEATER

On 27 April, 1973, the country's first licensed remotely controlled repeater came on the air with a 10-watt voice from Catalina Island, and more than 200 Southern California and Mexican amateurs tried out its 13,000 square mile coverage.

Located on an island, the new WR6 AAA repeater had several obstacles to overcome before it was ready for service. First, the island of Catalina is privately owned by the Wrigley (chewing gum) family, which meant designing an installation under some conditional constraints of the lease. Then, there is the problem of transportation. Everything going to or from the island must be transported either by boat or by aircraft. In fact, it was this aspect of private flying that actually sparked the creation of the "AAA" repeater.

Catalina Island is not heavily populated; only about 1500 full-time residents share the 18-mile-long by 7-mile-wide island with some wild goats, numerous wild boar, and a herd of buffalo. The island is located 26 miles off the Southern California Coast, giving it a view of the mainland north to Santa Barbara, south to San Diego and Mexico, and inland to the San Bernardino Mountains.

The island itself is mountainous, with the terrain covered by thick chaparral growth and some scrub oak. Private pilots are keenly aware of the topographic elevation of the island's "airport in the sky." Catalina Airport is 1,560 feet above sea level. There is a unique thrill finding yourself at 2,000 feet altitude over the water when you have left the runway just seconds before. It is this unusual airport location that brought private pilots to the service of amateur radio.



Catalina Island's "Airport in the Sky"

The idea of a repeater on Catalina started more than two years ago when Dave Corsiglia WA6TWF, working as a flight instructor, would occasionally visit the airport in the sky with student pilots. On several of these trips, he found that he was able to work San Diego as well as the greater Los Angeles area with a 2-watt hand-held from the base of the control tower. He decided to pursue the idea of an airport-located repeater, and obtained a lease from the Catalina Island Company with the help of Ms. Debby Klapper, a student pilot and friend of the airport manager.

Next came the task of gathering financial support. Several clubs in the Los Angeles area were contacted, but all were skeptical. One club's "engineer" even said that he knew it would never work because he had tried to install a repeater for the Government in the 1950's and had failed because of the local temperature inversion. Strangely enough, instead of a hindrance, this weather phenomenon of the temperature inversion layer has so far seemed to be a great help to propagation.

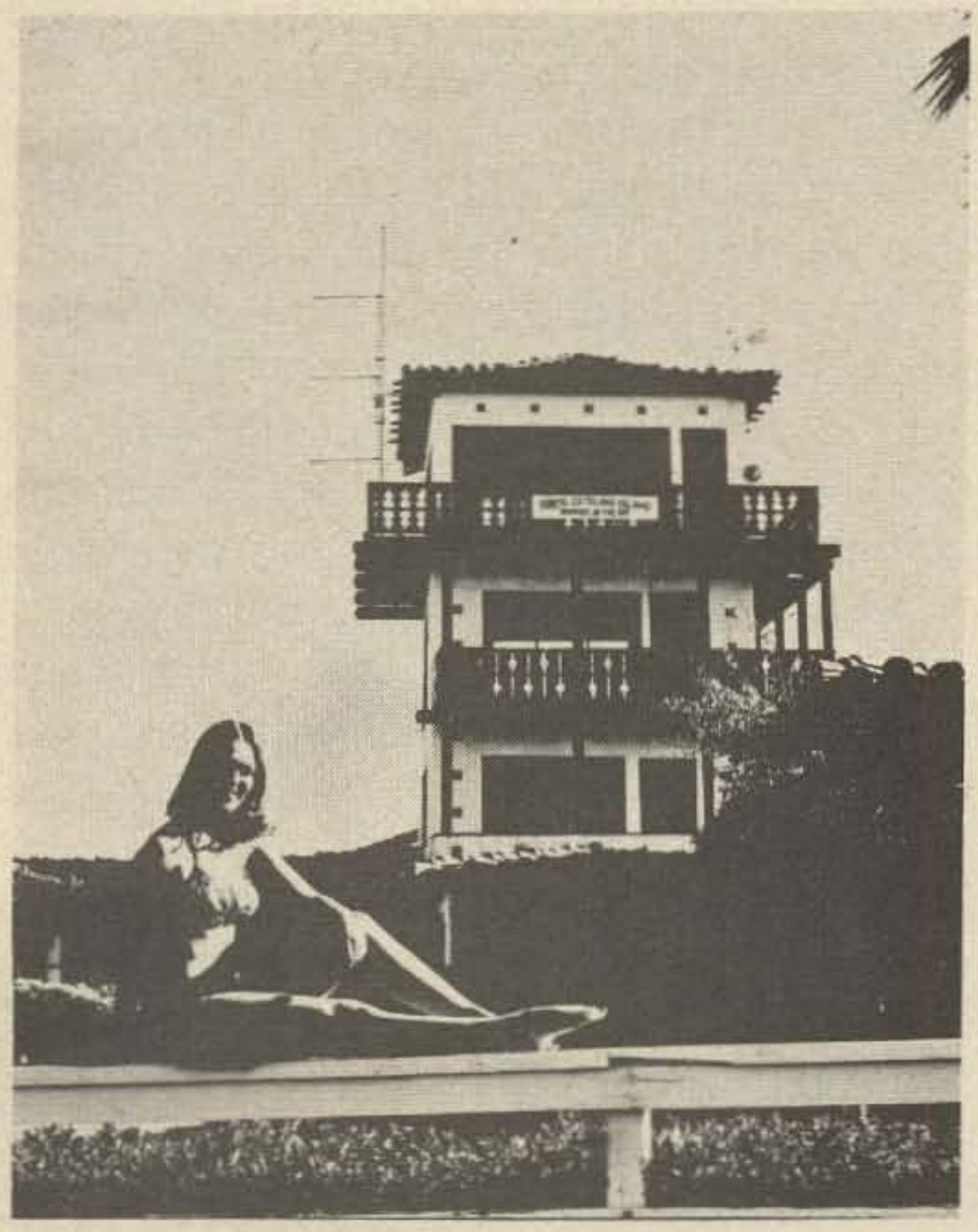
Undaunted by the skeptics, Dave continued his efforts and formed the Catalina

Catalina Island Repeater Club with equipment by Henry Radio.

Island Repeater Club. However, they were still unable to raise sufficient financial support until Sam Niles W6CXW, volunteered to talk to his employer, Ted Henry of Henry Radio. Ted agreed to sponsor the repeater.

The next step was to apply for the repeater station license and to design the system. I had some limited experience with FCC applications, so this is where I got into the program. Being a private pilot too, this also added to the transportation availability out to the island. Working together with Sam Ferraro W3VGU, of the FCC's Washington Office, we were able to obtain our station license, complete to the gain antenna and the radio remote control. Special thanks to Sam for his patience in this aspect.

The design of the system required careful consideration for reliability; an island 26 miles off the coast is not exactly handy for service calls. For this reason, plus the history of successful operation of the Standard repeater, WR6AAC WA6ZZE, an all solid-state design was selected. The system would consist of a Standard Radio model RPT-1, several Tempo Commercial Line transceivers for control, a TPL 80-watt power amplifier with a fan (installed later), a Cushcraft colinear antenna, and a Phelps-Dodge 506-509 duplexer. The control tone circuitry was custom designed. After final assembly and test, the repeater and duplexer were fine-tuned by Roland Souci WA6EGZ, who designed the repeater for Standard.



Catalina Airport Control Tower.

After a week of checkout operation from Orange, California, the 4-foot pack plus accessories was ready to move out to the island to the top of the Catalina Airport control tower. Dave Corsiglia WA6TWF, Bob Swenson W6HIL, Rick Moore WB6FXF, Sam Niles W6CXW, and I loaded up two aircraft on the morning of 27 April and waited for the fog to clear at Catalina. At about 10:30, the island cleared just long enough for us to land, and then it closed in again.

Paul White WA6NUA, Assistant Manager of the Airport, was on hand to help us haul the equipment to the top of the tower by way of a rope line over the side. Then we connected the power. This was when we discovered another constraint – a minor clause in the lease agreement which said that the total antenna height should not exceed five feet because it would conflict with the aesthetics of the building. It should be pointed out here that the Catalina Airport is indeed a beautiful piece of architecture in the traditional Southern California old-Spanish-mansion style, which blends nicely with its environment. A not-beautiful antenna would certainly disrupt the aesthetics.

The remote control link antenna posed no problem. This 11-element beam antenna was installed inside the building, on the ceiling. The main antenna, however, would be another design challenge.

Our return trip was a real lesson in instrument flying and zero-zero takeoff. With the white line on the runway barely visible, we pushed our way through the fog and within 30 seconds were over the water, back in the sunshine. . .but still worrying about how to design an aesthetically pleasing antenna that would still perform well when mounted to the side of the control tower.

George Campbell W6FXZ, an antenna engineer and a new 2m FM enthusiast, was contacted and he agreed to take on the antenna design task. His first design consisted of two 2-element, end-fire, colinear arrays, fed 90° to provide a cardioid pattern. This antenna was installed and produced satifactory results.

George soon discovered that this first design did not cover San Diego as well as he had hoped, so he designed and built a

second antenna for the repeater system. As shown in the photographs, the antenna is about 13 feet long overall, consisting of two 3-element, colinear arrays spaced at 135°, and driven 45° out of phase to produce a modified cardioid pattern shaped (appropriately for Southern California) much like the ears on a Mickey Mouse hat.

The second array design proved to work much better. The antenna develops 7.5 dB gain ±45° off center and approximately 5.5 dB at center. Total 3 dB beamwidth is 180°. The dipoles used to construct the antenna were taken from the original Cushcraft hardware.

With satisfactory operation of the antenna established, a TPL power amplifier was installed to bring the ERP up to the allowed 100 watts. Operation of the system has been outstanding; only one service call has been required in eight months of operation. Planned later additions to the repeater system include a battery backup for emergency operation.

Remote control and monitoring of the repeater is accomplished from five control points in the Orange County, California area on a shared-time basis. Each day is broken into four time segments. Bill Davis WB6YHP, handles service from 6AM until noon, when Rick Moore WB6FXF, covers until 6PM, then Bob Swenson W6HIL, operates until midnight, when my call letters K6BIG, are behind the control until 6AM. Dave Corsiglia WA6TWF, acts as backup in the event of equipment failure or operator commitments.

Operation of the WR6AAA repeater system has proven to be a real help to Southern California amateur operators. More than 600 different calls have been logged to date and the repeater's record of continually improved performance attests to its fine operation.

We wish to thank everyone who has graciously supplied their time to the "AAA" project, particularly the people involved with the antenna installation, and to Jerry Vanderville (the new Catalina Airport Manager) for his patience and understanding, and especially to Henry Radio for their support of the program.

K6BIG

1974 Repeater Atlas of The World

ALABAMA

WA4AHX	Albertville		6.34-6.94
			6.20-6.76
WR4ACB	Birmingham		6.16-6.76
			6.13-6.76
WR4ADD	Birmingham		6.34-6.94
WR4ACK	Decatur		6.40-7.00
W4ZBA	Demopolis	W1.8	6.34-6.94
		W1.8	52.760-52.525
			449.00-444.00
K4HAB	Dothan	W1.8	6.34-6.94
WR4ADJ	Florence		6.01-6.61
K4IQU	Huntsville		6.34-6.94
K4SPP	Huntsville		6.46-7.54
WA4UAG	Huntsville		5.992-7.120
W4QEE	Mobile		6.22-6.82
WB4QEV	Mobile		6.34-6.94
W4MWF	Montgomery		6.16-6.76
WB4QGL	Montgomery		6.34-6.94
WB4QFR	Phenix City	T1.8	6.28-6.88

ALASKA

	Anchorage		6.34-6.94
KL7GNG	Fairbanks		6.34-6.94
KL7USA	Fairbanks		6.28-6.88
	Nome		6.34-6.94

ARIZONA

WA7HUH	Globe		CLOSED
WA7KUM	Globe		CLOSED
K7EIK	Kingman	T1.8	6.16-6.76
			6.34-6.94
W7DAY	Phoenix		52.576-52.525
WR7ABQ	Phoenix		6.16-6.76
			6.34-6.94
WR7ABR	Phoenix		6.04-6.64
WR7ABS	Phoenix		449.30-445.30
WR7ABT	Phoenix		6.22-6.82
W7AJU	Prescott		CLOSED
WA7KYT	Sierra Vista		CLOSED
WA7KZW	Tucson		6.16-6.76
WR7ABH	Tucson		6.28-6.88

ARKANSAS

WA5YUR	Asadown		6.22-6.82
WA5SNO	Fayetteville		6.16-6.76
			52.550-53.020
WB5FKF	Forrest		6.16-6.76
WA5YUT	Ft. Smith		6.34-6.94
WA5BRT	Hot Springs		6.28-6.88
W5RHL	Jonesboro		6.34-6.94
W5DI	Little Rock		6.34-6.94
W5TEF	Springdale		6.10-6.70

CALIFORNIA

W6CX	Alamo		7.80-7.06
WR6ACB	Anaheim		6.19-6.79
K6KDU	Auburn		CLOSED
WA6ZSR	Bakersfield		6.07-6.67
WR6ACT	Barstow (Edwards AFB)	T1.8	6.16-6.76
WR6ACG	Bishop		6.34-6.94
W6IWY	Canoga Park		7.66-7.06
W6TI	Castro Valley		7.96-7.18
			7.00-7.34
WR6AAA	Catalina Island		7.69-7.09
WR6ADD	El Segundo (RACES)		7.72-7.12
WB6DGJ	Eureka		6.34-6.94
			6.94-7.48
WA6ICB	Eureka		52.760-52.525
W6JPU	Fresno		6.12-7.71
			6.85-7.71
			51.725-51.125
			448.00-449.93
WR6ACU	Fresno		6.34-6.94
K6QEH	Fullerton	T2.1	6.28-6.88
WA6IRY	Garden Grove		7.60-7.00
WA6UGS	Grass Valley		6.34-6.94
WB6QEO	Grizzly Peak	T1.95	7.00-6.34
WA6PPS	Hollywood Hills		7.90-7.30
WR6ABB	Hollywood Hills		6.01-6.61
WA6TWF	Huntington		7.69-7.09
WA6FLL	Johnstone Peak (FAX)		7.99-7.39
WR6ACD	Johnstone Peak		6.22-6.82
			222.38-223.98
WA6ZOF	Kentfield		CLOSED
WB6SZO	Long Beach		6.37-6.97
W6DOO	Los Altos		6.85-7.71
WB6VQD	Los Altos		6.31-6.91
K6CPT	Los Angeles		7.87-7.27
W6GY	Los Angeles		7.63-7.03
WA6LNU	Los Angeles (AM)		222.20-223.00
K6MYK	Los Angeles		7.84-7.24
WA6NTW	Los Angeles		222.34-223.94
K6ROC	Los Angeles		CLOSED
WA6TOD	Los Angeles		7.435-6.40
			7.405-
WA6VFO	Los Angeles		7.78-7.18
WR6AAE	Los Angeles		6.22-6.82
WR6ABA	Los Angeles		7.81-7.21
WR6ABB	Los Angeles		6.01-6.61
WR6ABC			CLOSED
WR6ABI	Los Angeles		7.60-7.00
WR6ABJ	Los Angeles		6.07-6.67
			223.26-224.86
WR6ABT	Los Angeles (West)		6.19-6.79
WR6ABV	Los Angeles		7.78-7.18
WR6ABU	Los Angeles		7.66-7.06
WR6ABW	Los Angeles		7.60-7.00
WR6ACA	Los Angeles (RTTY)		6.10-6.70
WR6ACD	Los Angeles		6.22-6.82
WR6ACJ	Los Angeles		6.25-6.85
WR6ACE	McKittrick		6.31-6.91
WB6EMJ	Merced		6.06-6.76
WA6ZQD	Monterey		6.37-6.97
WR6ADH	Monterey Park	T1.8	7.87-7.27
WR6ABQ	Mt. Disappointment		7.87-7.27
WR6ABN	Mt. Lee		7.84-7.24
W6NWG	Mt. Palomar		6.13-6.73
WR6ACY	Mt. Palomar		7.99-7.39
W6AEX	Mt. Vaca		CLOSED
WB6WYI	Mt. Vaca		51.600-51.000
WR6AAD	Mt. Wilson		7.96-7.36
WA6IRY	Mt. Wilson		7.60-7.00
WR6ABE	Mt. Wilson		7.425-6.40
WR6ABF	Mt. Wilson		7.435-6.40
W6FHF	Norwalk		CLOSED
WA6ZNL	Norwalk		CLOSED
WB6ZRR	Novato		6.40-5.47
WB6NDJ	Oakland		6.28-6.88
			51.700-51.075
			50.400-51.070
K6SWS	Oakland	T1.8	6.34-6.94
WR6ABM	Oakland		6.22-6.82
			449.5-444.5
K6YUY	Oroville		6.34-6.94
WB6GUA	Palmdale		6.34-6.94
WR6ADA	Palm Springs		6.34-6.94
WA6TSM	Palo Alto		6.13-6.73
WA6YCZ	Palo Alto		6.85-7.71
W6RBW	Palos Verdes		7.66-7.06
WB6SLC	Palos Verdes		6.16-6.76
WB6ZON	Palos Verdes		CLOSED
WR6AAC/6	Palos Verdes		6.37-6.97
WR6ABO	Palos Verdes		6.34-6.94
W6ECE	Paradise		7.00-6.49
WB6SXC	Petaluma		5.98-6.90
			448.60-443.60
W6AOE	Pine Cove		7.75-7.15
K6QFO	Pise Hill		6.25-6.85
WB6RSK	Pomona Valley		6.13-6.73
K6MIA	Redding		5.22-7.20
W6GDD	Rio Linda		6.34-6.94
WA6UGY	Rio Linda		6.49-7.00
K6ZCE	Riverside		6.16-6.76
WA6ZYM	Riverside		6.28-6.88
WA6ZZR	Riverside		6.16-6.76
WA6ZSM	Running Springs		6.31-6.91
WA6AJU	Sacramento		6.43-7.66
WA6JCW	Sacramento		CLOSED
WA6RYO	Sacramento		6.34-6.94
			449.10-444.10
WA6UGR	Sacramento		CLOSED
WB6ZOI	Sacramento		6.16-6.76
K4TXK/6	Sacramento		52.760-52.525
			52.880-52.525
WR6ACA	Saddle Peak (RTTY)		6.10-6.70
W6AGU	Salinas		6.60-7.60
WA6ALV	San Bernadino		6.25-6.85
			223.26-224.86
WA6ZYN	San Bernadino		6.28-6.88
WA6BTH	San Bruno		51.900-51.350
WA6KS8	San Diego		7.93-7.33
WR6ACF	San Diego		6.04-6.64
W6IN	San Fernando		6.13-6.73
W6WX	San Francisco		7.96-7.18
WA6ILA	San Joaquin		6.37-6.97
WR6ABD	San Jose		6.04-6.64
WB6TSO	San Luis Obispo		6.22-6.82
K6GWE	San Rafael		6.10-6.70
			448.25-443.25
WA6UGM	San Rafael		CLOSED
K6YDQ/K6UGP	Santa Ana		7.96-7.36
WB6IYW	Santa Barbara		6.31-6.91
WB6RYX	Santa Barbara (RACES)		7.325-7.00
WB6IAG	Santa Clara	T2.55	6.34-6.94
WB6LJR	Santa Clara		CLOSED
WB6OQS	Santa Clara		6.16-6.76
			449.60-444.60
WA6FLH	Santa Monica		6.07-6.67
WR6ACK	Santa Monica		7.93-7.33
WB6ZRQ	Sierra Peak		CLOSED
K6ZXZ	Simi		6.22-6.82
WR6ACV	Stocton		6.28-6.88
WA6SIN	Sulfur Mountain	T1.95	6.28-6.88
W6ZGC	Table Mountain	T2.1	6.16-6.76
W6QFK	Temple City		7.72-7.12
WA6TIC	Van Nuys		6.10-6.70
WB6IWF	Ventura	T1.95	6.25-6.85
WB6SLC	Wilmington		6.16-6.76
WR6ABX	Woodland		6.37-6.97
W6ZGC	Wrightwood	T2.1	6.16-6.76

COLORADO

WØIA	Boulder	T1.8	6.16-6.76
			444.55-449.55
WAØFTM	Broomfield		6.01-6.61
			444.40-449.40
WBØERV	Buckhorn		6.25-6.85
WØJGL	Castle Rock		6.07-6.67
			443.50-448.70
WAØBAG	Colorado Springs		6.16-6.76
WAØVTT	Colorado Springs		6.16-6.76
WAØVTV	Colorado Springs		6.37-6.97
WAØNVU	Denver		CLOSED
KØOVQ	Denver		6.82-7.30
WAØVVC	Denver		444.35-449.35
WØWYX	Denver		6.16-6.76
			6.34-6.94
			53.500-53.525
			445.45-449.45
WRØABF	Denver (Squaw Mountain)		6.34-6.94
WRØABG	Denver		444.45-449.49
WRØACL	Denver		6.28-6.88
WRØACM	Denver		6.04-6.64
			444.60-449.60
WAØKXD	Fremont		6.22-6.82
WØPRZ	Grand Junction		5.32-6.94
WAØVVX	Loveland		6.25-6.85
WAØSNO	Pueblo		6.28-6.88
			6.34-6.94
	Pueblo		6.19-6.79
WAØZCI	San Luis		6.16-6.76

CONNECTICUT

WR1ABM	Avon		6.28-6.88
WR1ABE	Bridgeport		6.295-6.895
WR1AAD	Canton		7.96-7.36
WA1KGB	Farmington		6.37-6.97
W1EOR	Glastonbury		5.47-7.09
WA1KHA	Hartford		6.04-6.64
WR1ACD	Monroe		6.235-6.835
WA1PXN	Naugabuck		7.78-7.18
WR1ABT	New Haven		6.01-6.61
WR1ABD	New London		6.07-6.67
W1WHZ	Norwalk		7.99-7.39
WR1AAF	Oxford		7.49-6.49
W1CDO	Ridgefield		441.85-446.85
WA1PXO	Roxbury		7.72-7.12
WR1ABA	Simsbury		6.22-6.82
WR1ABR	Stamford		6.055-6.655
WA1KGY	Torrington		6.25-6.85
WA1KGQ	Vernon		6.19-6.79
			52.760-52.525
			443.30-448.30
			221.38-224.38

DELAWARE

WA3KWE	Delmar		6.22-6.82
WA3FRH	Wilmington		6.13-6.73

FLORIDA

WR4ACV	Boca Raton		6.22-6.82
WR4ADC	Daytona Beach		6.34-6.94
W4AB	Ft. Lauderdale		6.22-6.82
WB4EQU	Ft. Walton Beach	W1.8	29.440-29.640
WB4KLT	Ft. Walton Beach	T1.8	6.19-6.79
WR4AAF	Jacksonville		6.16-6.76
			52.760-52.640
WB4KNQ	Merritt Island		6.28-6.88
WB4HAA	Miami		6.16-6.76
WB4JJO	Ocala		6.01-6.61
WB4GLK	Okeechobee		6.34-6.94
WB4QEL	Orlando		6.16-6.76
			6.34-6.76
WR4AER	Orlando		7.12-7.72
			444.50-449.50
WB4QFY	Palm Beach		6.22-6.82
WB4QER	Panama City	W2.0	6.34-6.76
WR4ACZ	Pensacola		6.16-6.76
W4AFS	Pompano Beach		6.04-7.03
WB4IES	St. Petersburg		CLOSED
	Tallahassee		6.34-6.76
WB4HAE	Tampa		6.34-6.76
WB4QEN	Tampa		441.10-449.10
			444.10-449.10
			449.10-448.10

GEORGIA

WR4ADM	Albany		6.22-6.82
	Athens		6.13-6.73
W4BOC	Atlanta	T1.8	6.16-6.76
			6.34-6.76
WB4NST	Atlanta		CLOSED
WB4QGF	Atlanta		444.50-449.50
WB4WST	Atlanta		6.34-6.76
WR4AAE	Atlanta		6.22-6.82
WR4ABC	Atlanta		6.37-6.97
WR4ABN	Atlanta		7.63-7.03
WB4KLM	Augusta		6.34-6.94
	Dallas		6.25-6.85
WR4ACX	Eatonton		6.10-6.70
WB4CNC	Griffin		6.31-6.91
WR4ABD	Mableton		6.13-6.73
K4SEX	Newnan		6.19-6.79
WR4ADH	Rome	W2.1	6.34-6.94
W4RRW	Smyrna		6.28-6.88

HAWAII

KH6EQN	Hilo		6.22-6.82
KH6EQF	Honolulu		6.28-6.88
			52.525-53.520
			449.15-444.15
KH6EQR	Lualualei		6.16-6.94
KH6EQK	Mt. Holeakala		6.34-6.94
KH6EQL	Waialva		6.16-6.76
KH6FOX	Waikiki		6.16-6.76
KH6NLH	Waipahu		6.16-6.76

IDAHO

WR7ABA	Boise		6.28-6.88
K7ZZL	Deer Point		6.34-6.94
WR7ABX	Moscow Mountain		6.22-6.82

ILLINOIS

W9WWD	Alton		6.04-6.48
WA9EAW	Aurora		CLOSED
WA9WVA	Batavia		CLOSED
WA9GCK	Bloomington		6.22-6.82
WR9ABU	Carbondale		6.13-6.73
WB9AEK	Chicago		6.01-6.61
			445.35-449.35
			445.40-449.45
WA9DZO	Chicago PL		6.10-6.85
WA9EAP	Chicago		7.45-7.75
W9NGI	Chicago		7.45-7.75
WR9AAF	Chicago		6.34-6.94
WR9ABB	Chicago		448.60-443.60
			223.34-224.94
WR9ABY	Chicago		6.16-6.76
			448.75-443.75
W9MJL	Danville		6.28-6.88
WA9WJG	Danville		6.04-6.64
K9HGX	Decatur	T2.2	6.34-6.94
WA9TEC	Decatur	W2.2	6.34-449.60
WR9ABQ	Elgin		6.19-6.79
WB6ADW	Genoa		6.13-6.76
W98YZ	Genoa	T1.65	6.16-6.76
		T1.65	6.34-6.94
WB9HWS	Hinsdale	T2.5	6.22-6.70
WR9AAA	Joliet		6.28-6.987
WR9AAD	Murphysboro		6.25-6.85
WB9AEU	Oak Lawn		442.30-447.30
WR9ACK	Oak Lawn		6.28-6.88
WB9AEF	Peoria		6.14-6.76
WA9EAM	Petersburg		6.34-6.94
WB9ADI	Quincy		6.34-6.94
K9CLW	Rockford		6.22-7.30
WB9EEH	Rockford		6.00-6.88
W9FBS	Rockford		6.22-7.30
W9DGV	Rock Island	T1.8	6.34-6.76
WR9ABX	Rock Island		6.34-6.94
W9AIU	St. Louis		6.16-6.76
WB9IEZ	Skokie PL		CLOSED
W9YIY	Troy		6.16-6.76
WA9WVB	Urbana	T1.8	6.34-6.76
WA9LIV	Waukeegan	T1.95	5.95-6.55
WR9ABH	Western Springs		6.07-6.67
			223.30-224.90
K9CLW	Winnebago		CLOSED

INDIANA

WR9ALI	Anderson		6.22-6.82
			6.34-6.76
K9KTH	Bloomington		6.22-6.82
WR9ABR	Columbus		6.19-6.79
WR9ABI	Elkhart		6.04-6.64
WA9ZFM	Evansville	W	52.920-52.575
WB9FHD	Freemont		52.640-52.525
WA9EAU	Ft. Wayne		6.16-6.76
WR9AAC	Ft. Wayne		6.34-6.94
WR9ABN	Ft. Wayne		6.28-6.88
WR9ACJ	Ft. Wayne		
WB9RAI	Indianapolis		6.16-6.76
WR9ABA	Indianapolis		6.10-6.70
WR9ABP	Indianapolis		6.16-6.76
WR9ABW	Kokomo		6.31-6.91
W9EJV	Lafayette		6.16-6.76
K9JSI	La Porte		6.22-6.82
W9CSF	Michigan County	T1.8	6.37-6.97
WR9ABO	Pittsburg		6.13-6.73
WR9ACG	Plymouth		6.07-6.67
WB9ADO	Schereville		6.31-6.91
W9EHZ	Schereville		6.34-6.91
W9EQD	Terre Haute		52.920-52.525
WA9UHY	Wabash		7.63-7.03
WR9ABL	Warsaw		6.25-6.85

IOWA

WR0ACR	Ayrshire		6.22-6.82
WA0VVA	Cedar Rapids	T2.0	6.16-6.76
WA0ABY	Clarinda		6.37-6.97
WA0VVD	Council Bluffs		6.22-6.82
WR0ABS	Davenport		6.22-6.82
K0IXR	Des Moines	W	6.34-6.94
WR0ABD	Dubuque		6.34-6.94
WR0ACU	Iowa City		6.28-6.88
WA0BBQ	Ottumwa		6.34-6.94
WA0VVQ	Ottumwa		6.04-6.64
WA0SNS	Waterloo		6.34-6.94

KANSAS

WA0ABU	Kansas City		6.22-6.82
WA0AMR	Kansas City		6.34-6.94
			52.700-52.525
K0OKI	Kansas City		52.800-52.525
WR0ACH	Lawrence		6.16-6.76
WA0VWN	Lawrence		6.28-6.88
WR0ABV	Lenera		52.880-52.525
WR0ABW	Merriam		448.10-449.10
WA0VVW	Pittsburg		6.34-6.94
WR0ABO	Pittsburg		6.13-6.73
WA0VWR	Plainsville		6.28-6.88
WA0CJQ	Salina		6.34-6.94
WR0ACG	Topeka		6.34-6.94
WR0ABB	Wichita		6.22-6.82
WR0ABK	Wichita		6.34-6.94
WR0ABZ	Winfield		6.16-6.76

KENTUCKY

WR4ACQ	Ashland		6.34-6.94
W4YWH	Covington		6.13-6.73
			6.19-6.79
WB4VQF	Lexington		6.34-6.76
WR4ACR	Lexington		6.16-6.76
W4MOP	Louisville		6.34-6.94
WB4RYX	Louisville		6.28-6.88
WR4ABO	Murray		6.34-6.94
WR4ACO	Owensboro		6.34-6.94

LOUISIANA

WA5MZZ	Alexandria		6.34-6.94
WA5ZHD	Baton Rouge		6.34-6.94
W5WN	Lake Charles		6.34-6.94
WB5CDP	Monroe		52.827-52.525
W5MLE	Morgan City		6.34-6.94
WB5AEG	New Orleans		444.20-449.20
W5UK	New Orleans	T1.8	6.34-6.94
K5JRV	Shreveport		6.22-6.82
W5ZS	Shreveport		6.31-6.91

MAINE

WR1ACI	Bangor		6.34-6.94
WA1KGZ	Buckfield		6.28-6.88
WA1KGP	Sanford		6.13-6.73

MARYLAND

W3EHT	Baltimore		6.19-6.79
K3MDX	Baltimore		6.91-7.33
			6.91-7.22
WR3ABQ	Baltimore		6.07-6.67
WR3ABC	Cheverly		6.01-6.61
W3IJF	Frederick		6.13-6.73
WA3EWJ	Gaithersburg		6.04-6.64
WR3ABB	Greenbelt		6.28-6.88
WA3DZD	Harmans		6.16-6.76
WR3ABO	Harmans PL		443.95-448.95
WA3PPN	Havre de Grace		6.25-6.85
WA3CJD	Hyattsville		52.760-52.525
WA3ENJ	Montgomery		443.00-442.45
K3SVA	Salisbury		6.22-6.82
WA3PJQ	Severn		6.46-7.06
W3JCN	Silver Spring		448.00-449.00
W3ZM	Silver Spring		6.25-6.85
W3FT	Wheaton		6.07-6.67
			448.30-449.30
			223.30-224.30

MASSACHUSETTS

WA1HDS	Agawam		6.40-7.00
WR1ACB	Bellingham		7.66-7.06
WR1ABP	Billerica		7.72-7.12
WR1AAI	Boston		6.07-6.67
W1UQ	Brookline		6.39-6.99
WA1OXW	Fall River		6.43-7.42
WR1ABI	Fall River		6.19-6.79
			52.010-52.700
WR1ABB	Framingham		7.75-7.15
WR1ABX	Holyoke (Mt. Tom)		6.34-6.94
			52.780-52.525
WR1AAA	Malden		6.31-6.91
WR1ACO	Malden		6.19-6.79
W1QFD	Marlboro		7.87-7.03
WR1AAH	Marlboro		6.01-6.61
WR1ABY	Maynard		7.84-7.24
DL2AA/WR1	Medway		7.81-7.21
K1FFK	Mt. Greylock		6.31-6.91
			52.780-52.525
WA1KHC	Mt. Lincoln		6.13-6.73
WR1ACH	Newton		7.96-7.36
WA1KFZ	No. Adams		6.43-7.42
WR1AAC	Salem		6.28-6.88
WA1MHN	Somerville		6.145-7.45
W1ACM	Stoughton		6.775-6.175
WR1ABN	Walpole		7.69-7.09
WR1ABV	Waltham		6.04-6.64
WR1ABG	Webster		6.28-6.88
W1MTV	Westfield		6.10-6.70
WR1ABJ	Weston		6.22-6.82
WR1ABO	Worcester		6.37-6.97

MICHIGAN

WB8CSC	Ann Arbor		6.37-6.97
WB8CRH	Bangor		52.640-52.525
WB8CSA	Benton Harbor	T2.4	6.34-6.94
W8MAI	Benton Harbor		6.22-6.82
WA8BDD	Clarkston		6.25-6.85
WB8CRK	Detroit		449.00-444.00
WB8CQS	Detroit PL		6.16-6.76
WR8ACF	Detroit PL		6.04-6.64
WB8CRW	East Tawas		6.34-6.94
W8IIE	Grand Rapids	T2.15 or PL 100	6.16-6.76
WA8PUD	Grand Rapids	T2.4	6.34-6.94
WB8CSU	Jackson		6.13-6.73
WR8ABZ	Jackson		6.28-6.88
WB8CQM	Lansing		6.34-6.94
WB8CRQ	Manistee		6.16-6.79
WR8AAA	Milford		6.19-6.79
			7.79-6.79
	Monroe		6.13-6.73
K8WNJ	Muskegon	T2.25	6.22-6.82
WR8ABI	Oshtemo		6.19-6.79
WB8CRN	Trenton		443.70-432.90
K8TJP	Trenton		433.70-432.90
			437.90-432.90
K8WKE	Utica		6.28-6.91
WB8HEE	Whitmore Lake		6.13-6.73

MINNESOTA

K2OPT/0	Albert Lea		6.34-6.94
W0GUP	Duluth		6.34-6.94
K0RTU	Elk River		6.37-6.97
WA0SSN	Faribault		6.16-6.76
WA0JCX	Minneapolis-St. Paul		6.28-6.88
K0LAV	Minneapolis-St. Paul		6.25-6.85
WA0NPZ	Minneapolis-St. Paul		6.94-6.46
K0PML	Minneapolis-St. Paul	T1.8	6.16-6.76
W0PZT	Minneapolis-St. Paul		6.22-6.82
WA0ODF	Rochester		6.34-6.94
K0PMU	St. Paul	T1.8	6.16-6.76
W0UGR	Waseca	T1.65	6.34-6.94
			6.94-6.46
W0WUG	Wilmar		6.34-6.94

MISSISSIPPI

K5TYP	Biloxi	T2	6.34-6.94
WA5RMS	Gautier	T2.4	6.34-6.94
WR5ABT	Jackson		6.28-6.88
WR5ACC	Jackson		6.16-6.76

MISSOURI

WR0ABP	Barry		CLOSED
WR0ABC	Bonne Terre		6.28-6.88
WA0VWP	Columbia		6.16-6.76
WA0ZIK	Eldon		6.28-6.88
WR0ACT	Independence		7.69-7.09
WA0AMR	Kansas City		6.16-6.76
K0FRA	Kansas City		52.700-52.525
K0OKI	Kansas City		448.10-449.10
WA0TEG	Kansas City		52.880-52.525
WA0VVB	Kansas City		6.34-6.94
WR0ABP	Kansas City		CLOSED

WA8CJW	St. Louis		6.34-6.94	WA2UWK	Jamestown		6.28-6.88	WR8ABT	Cheviot		6.07-6.67
K8RWU	St. Louis		52.050-51.250	WR2ABW	Larchmont		6.31-6.91	WR8ABO	Chillicothe		6.25-6.85
WR8ABH	St. Louis		6.28-6.88	K2UHD	Long Island		7.12-7.69	WB8CQS	Cincinnati		6.16-6.76
WR8ABI	Savannah		6.25-6.85	W2WJS	Long Island		441.65-446.65	WB8NON	Cincinnati		6.115-6.70
			6.10-6.85	WR2ACB	Long Island		6.16-6.76	W8QID	Cincinnati	T1.9	52.920-53.050
WA8VVV	Springfield		6.31-6.91	WB2AEB	Mahopac		CLOSED	K8SCH	Cincinnati		6.07-6.67
				WA2ZDX	Manhattan		7.84-7.24	WR8ABP	Cincinnati		6.28-6.88
MONTANA				WA2ZWN	Manhattan		7.15-7.75		Cincinnati		7.78-7.18
W7YB	Bozeman		6.34-6.94	WR2AAA	Manhattan		6.13-6.73		Cincinnati		7.99-7.39
WA7KZF	Butte-Anaconda		6.34-6.94	WR2AAC	Manhattan		7.84-7.24	W8BCRV	Cleveland		6.28-6.88
			448.15-449.15	WR2ACD	Manhattan		6.40-7.00				6.40-6.88
WA7QAA	Great Falls		6.34-6.94	WR2ACV	Manhattan		7.43-6.43	W8TTO	Cleveland		6.22-6.82
	Sweetgrass		6.34-6.94	WA2BXX	Millbrook		7.09-7.69	WR8ABC	Cleveland		6.16-6.76
							7.73-6.73	WR8ABD	Cleveland		6.34-6.94
NEBRASKA				W2CVI	Mt. Beacon		441.15-446.10		Cleveland		6.25-6.85
WR8ACD	Beaver Crossing		6.16-6.76	WA2UYP	Mt. Beacon		441.15-446.15	W8AIC	Columbus		6.16-6.76
WR8ABA	Bellevue		6.04-7.30	WR2ABB	Mt. Beacon		6.37-6.97				6.34-6.76
WA8MFC	Lincoln		6.16-6.76	WA2NVT	Plattsburgh		6.22-6.82	W8WTB	Columbus		6.16-6.76
K8YRL	Lincoln		6.34-6.94	WR2ABE	Port Chester		6.34-6.94		Columbus		6.31-6.91
WR8ABQ	Omaha		6.34-6.94	WA2UWQ	Rochester		6.28-6.88		Columbus		7.55-7.06
				WR2ABF	Rochester		6.19-6.79		Columbus		7.81-7.21
NEVADA				WR2ACJ	Rochester		6.28-6.88	WB8CQK	Dayton		6.04-6.64
W7AKE	Las Vegas		7.18-7.84	W2IBW	Rockland Co.		CLOSED				6.16-6.76
WA7HXO	Las Vegas		6.34-6.94	WR2ACC	Rockville Centre		6.07-6.67	WR8ABF	Dayton		6.34-6.94
			6.40-6.94	WR2ABO	Rome		6.28-6.88		Dayton		6.22-6.82
WA7LAH	Reno		6.34-6.94	WR2ABV	Schenectady		6.46-6.94	WR8ABK	Delaware		6.37-6.97
WA7NHV	Reno		6.34-6.94	WB2GDF	Staten Island		449.25-444.25	K8ZES	Galion		6.25-6.85
			7.00-6.94	WA2YYQ	Staten Island		6.28-6.88	WA8WMH	Hamilton		6.37-6.97
K7UGT	Reno		6.94-7.48	WA2YZZ	Staten Island		449.25-444.25	WR8ABH	Hudson		6.01-6.61
K7VJZ	Reno		6.94-6.525	WR2ABK	Staten Island		7.915-7.315	W8HH	Marietta		6.28-6.88
				WR2ACB	Stonybrook L. I.		6.16-6.76	K8PWL	Miamisburg		6.22-6.88
NEW HAMPSHIRE				WA2IWZ	Syracuse		6.04-6.64	WR8ABE	Miamisburg		6.22-6.82
WR1ABU	Concord		6.34-6.94	WA2UWF	Syracuse		6.22-6.82	WB8ATD	Monroe		6.01-6.61
WR1ABQ	Derry		6.25-6.85	WA2ZYZ	Syracuse		6.31-6.91	WR8ABA	Mt. Vernon		6.19-6.79
WR1ACN	Londonderry		7.66-7.06	WR2ABG	Syracuse		6.46-7.06		Newark		6.28-6.88
WA1KFV	Manchester		5.885-7.33	WR2ABD	Tompkins Co.		6.37-6.97	WR8ABJ	Newcomerstown		6.13-6.73
WR1ABF	Salem PL		6.37-6.97		(near Ithaca)			K8JHG	Ottawa	W1.8	6.28-6.88
WR1ACL	Salem		7.765-7.165	WR2ABZ	Troy		6.22-6.82				52.760-52.525
				WR2ACL	Troy		7.69-7.09				53.360-53.540
NEW JERSEY				K2GVI	Utica-Rome		6.34-6.94				52.760-53.540
WR2ABJ	Cedar Grove		7.18-7.78				444.20-449.20	WR8ABG	Springfield		6.13-6.73
K2TYV/2	Denville		6.385-6.395	WR2ADA	Utica		6.16-6.76	K8ZPR	Steubenville		6.34-6.76
K2ODP	Fords		447.40-449.40	WR2ACI	Valhalla		7.66-7.06	K8ALB	Toledo		6.01-6.61
WA2UWO	Fords PL		6.22-6.82	K2LJC	Woodmere		6.04-6.64	WB8CQO	Toledo		6.20-6.80
WA2UWC	Greenbrook		6.34-6.94	WB2SEQ/2	Yonkers		221.74-224.74				6.34-6.94
W2QW	Martinsville		6.025-6.625	WR2AAB	Yonkers		6.31-6.91		Toledo		6.19-6.79
WR2ACQ	Northfield		6.16-6.76						Troy		6.46-6.88
	(near Atlantic City)			NORTH CAROLINA				WB8CRU	Tuscarawas		6.34-6.76
WR2ABN	Oakland		6.10-6.70	WA4NUO	Asheville		6.22-6.82	W8IOO	Youngstown		6.31-6.76
WA2UWR	Paramus PL		6.19-6.79	WR4ABQ	Aurora		6.34-6.94				6.34-6.76
K2GE	Sayreville		6.16-6.76	WR4ADS	Beulaville		6.34-6.94	WR8ACL	Youngstown		6.31-6.91
WB2ZWQ	South Jersey		6.22-6.82	WA4FYS	Burlington		52.760-52.525				
WR2ABR	Toms River		6.31-6.91		Burlington		6.19-6.79	OKLAHOMA			
K2GCL	Waldwick PL		6.25-6.85	WB4QFZ	Chapel Hill		6.22-6.82	WA5YUF	Ardmore		6.34-6.94
WA2PRO	W. Orange		443.25-448.25	K4RSH	Chapel Hill		6.22-6.82				6.46-6.94
WR2ABM	Woodbridge		6.22-6.82	WR4ABK	Charlotte		6.46-7.06	WA5LDJ	Bartlesville		6.34-6.94
				WR4ABT	Charlotte		6.28-6.88		Cherokee		6.94-5.96
NEW MEXICO				WR4AEI	Charlotte		CLOSED	WA5MQA	Chickasha		6.34-6.94
K5CQH	Albuquerque		6.34-6.94	WR4AEU	Charlotte	T1.8	6.34-6.94				6.37-6.97
WA5OIP	Albuquerque		6.25-6.85	WB4QFT	Durham		6.22-6.82	WA5YUH	Durant		6.34-6.94
WA5QLZ	Albuquerque		6.28-6.88				444.25-449.10	WR5ABW	Enid		6.34-6.94
WA5QXB	Albuquerque		6.40-7.00	K4RUQ	Durham	W	6.34-6.94	K5CFM	Oklahoma City		6.22-6.82
WA5YUG	Albuquerque		53.725-52.525	WR4ADN	Elizabeth City		6.28-6.88	WA5YTI	Oklahoma City		6.34-6.94
WA5KUI	Alamagordo		6.34-6.94	WR4ADK	Fayetteville		6.31-6.91	WA5ZZA	Oklahoma City		6.16-6.76
WR5ABG	Las Cruces		6.16-6.76				50.480-53.450		Ponca City		6.34-6.94
W5PDO	Los Alamos		6.34-6.94	WB4KIB	Gastonia		6.37-6.97	WA5LVT	Tulsa		6.34-6.94
WA5JDZ	Mt. Taylor		6.34-6.94	W4NBR	Goldsboro/Kinston		6.16-6.76				6.28-6.88
WA5YTG	Portales		6.34-6.94	WR4ABL	Greensboro		6.16-6.76				52.680-52.525
WA5DMQ	Roswell	T2.4	6.34-6.94	WR4ABP	Grifton		6.16-6.76	WA5SJE	Tulsa		6.22-6.82
K5SFB	Sandia Crest		448.60-443.60	WR4ABY	Hendersonville		6.04-6.64				
WA5VKY	Sandia Crest		6.46-7.06	WR4ADT	High Point		6.40-7.00	OREGON			
WA5YTK	Sierra Blanca		5.50-6.50		High Point		6.19-6.79	W7DBS	Eugene	T1.8	6.34-6.94
				W4WID	Lenoir		52.760-52.525	K7KGV	Grants Pass		6.34-6.94
NEW YORK				WR4ACM	Lenoir		6.25-6.85		King Mountain		6.34-6.94
WR2ABQ	Babylon L. I.	TT	7.63-7.03	WR4ABX	Lexington		6.31-6.91		La Grand		6.24-6.76
W2ARI	Bath		6.34-6.94	WB4NXE	McCain		52.780-52.525	W7FIO	Lookout Mountain		6.34-6.94
WR2ABB	Beacon		6.37-6.97	WR4ACJ	Mt. Airy		6.37-6.97				52.920-53.460
WR2ABP	Bedford		7.705-7.105	WR4AEV	Mt. Pisgah		6.16-6.76		Mary's Peak	T2.25	6.34-6.94
WA2PDJ	Bellmore		6.25-6.85				222.34-223.94	W7OFY	Medford		6.34-6.94
WR2ABS	Binghampton		6.22-6.82	WR4AFB	Munfreesboro		6.31-6.91	W7DXX	Mt. Scott		6.34-6.94
WA2CKW	Birch Hill		5.20-7.12	WA4EHL	Raleigh		52.780-52.525		Newport		6.76-6.94
K2LDT	Boston		6.31-6.91	K4ITL	Raleigh		6.28-6.88		Pendleton		6.34-6.76
WR2ACV	Brooklyn		7.43-6.43	WR4ACF	Raleigh		6.04-6.64	K7DVK	Portland		447.17-449.17
WR2ABU	Buffalo		6.31-6.91	WR4ADE	Reidsville		6.25-6.85	W7VS	Portland		6.34-6.96
WA2UYO	Cherry Creek		6.31-6.91	WB4PPS	Roaring Gap		6.22-6.82	WR7ABE	Portland		444.17-449.17
WR2ACA	Cherry Creek		6.40-7.00	WR4AAA	Salisbury		6.13-6.73	WR7ABJ	Westport		6.16-6.76
WA2ZWM	Cobleskill		6.01-6.61	WR4AEF	Seven Springs		6.25-6.85				
W2SS	Dunkirk		6.25-6.85	WR4ABF	Shelby		6.28-6.88	PENNSYLVANIA			
WA2UVX	Dutchess Co.		7.09-7.69		Spindale		6.07-6.67	W3OI	Allentown		6.34-6.94
WR2ABL	Elmira		6.10-6.70	W4DCD	Wilkesboro (No.)		52.780-52.525	K3ZFD	Bensalem		6.37-6.97
WA2UYI	Farmingdale L. I.		441.75-446.75	WA4ZAT	Wilmington		6.22-6.82	WA3IGS	Berwyn		6.28-6.76
W2AWX	Fishkill		441.10-449.10	WR4ACA	Winston-Salem		6.04-6.64				52.800-52.720
W2AWG	Flushing L. I.		443.75-448.75					W3VV	Bradford		6.25-6.85
WR2ACQ	Flushing L. I.		6.16-6.76	(No repeaters currently listed in North Dakota.)							6.34-6.94
	Flushing L. I.		7.09-6.69					WR3ABZ	Center Point		7.66-7.06
WR2ACF	Fredonia		7.07-7.67					WR3ACD	Churchville		222.98-224.58
WR2ACM	Fredonia		6.25-6.85	OHIO				K3ZTP	Coatsville		6.22-6.82
WR2ACK	Gloversville		6.16-6.76		Akron		6.04-6.64	K3DSM	Devon		446.00-440.00
K2KDA	Hempstead		441.70-446.70	K8HRS	Ashtabula		6.16-6.76	WA3KXD	Erie		6.19-6.94
WR2ACE	Hicksville L. I.		7.735-7.135	K8TQK	Athens		6.34-6.94				6.34-6.94
WA2UZE	Huntington L. I.		7.93-7.33		Cambridge		6.25-6.85	WR3ABY	Erie	W1.477	6.22-6.82
WR2ABT	Huntington L. I.		7.93-7.33	WA8VWH	Canfield		6.28-6.88				

WR3ACA	Erie		6.34-6.94
			6.19-6.94
WA3KXG	Etters		6.16-6.76
WR3AAA	Freedom		6.28-6.88
WA3KXE	Harrisburg		446.00-440.00
			444.95-449.95
WA3KFX	Hollis		6.01-6.61
K3GKB	Honeybrook		6.13-6.73
W3OK	Lehigh Valley		6.10-6.70
WR3ABN	Meadville		6.34-6.94
WA3RFL	Mt. Holly Springs		6.28-6.88
WR3ACE	New Holland		6.01-6.61
			223.34-224.94
K3AWZ	Philadelphia		6.28-6.88
WA3BKO	Philadelphia		6.13-6.73
			6.16-6.76
			6.19-6.79
			6.25-6.85
			6.28-6.88
			6.31-6.91
			6.34-6.94
			6.37-6.97
			6.40-6.97
WA3KUR	Philadelphia		6.31-6.91
			52.720-52.640
			448.80-443.80
WA3KVR	Philadelphia		52.720-443.80
WA3KWI	Philadelphia		6.37-6.97
WA3KWL	Philadelphia		449.00-444.00
W3QV	Philadelphia		29.640-29.493
W3SK	Philadelphia		6.37-6.97
WR3ACH	Pittsburgh		6.22-6.82
WA4BJS	Pittsburgh		6.16-6.76
WA3BNO	Pittsburgh		6.37-6.97
WA3QCE	Pittsburgh		6.28-6.88
W3BN	Reading		52.575-52.680
W3CCH	Reading		52.575-52.640
WR3ABD	Richboro		6.19-6.79
	Scranton		6.34-6.94
WA3IPP	Sellersville		6.28-6.76
			446.50-449.50
WA3KUW	State College		6.34-6.76
WR3ABH	Valley Forge		222.34-223.94
WR3ABI	Valley Forge		6.34-6.94
WA3MOP	Warminster		448.55-443.55
K3PSP	Washington		6.19-6.79

RHODE ISLAND

WR1AAG	Cranston		6.10-6.70
WR1ACG	Johnston		222.38-223.98
WR1ACE	Lincoln		6.16-6.76
WA1OMS			

SOUTH CAROLINA

WR4ABB	Augusta (No.)		6.13-6.73
WR4ADG	Caesar's Head		6.01-6.61
WA4MPC	Columbia		6.28-6.88
WR4ABA	Columbia		6.28-6.88
WR4ACD	Columbia	T1.8	6.34-6.94
			52.760-52.525
WB4QGK	Charleston	T1.4	6.34-6.94
	Florence		6.37-6.97
WB4PUP	Greenville		6.34-6.94
WR4ABG	Greenville	T2.4	6.34-6.94
WA4SSJ	Greenville		52.760-52.525
WR4ABM	Lancaster		6.10-6.70
	Pickens		6.40-7.00
	Rock Hill		6.25-6.85

SOUTH DAKOTA

W8OGS	Aberdeen		6.34-6.94
W8BXO	Brookings	W1.8	6.34-6.94
K8RTD	Pierre		6.34-6.94
WA8CPX	Rapid City		6.34-6.95
WA8VWH	Rapid City		6.34-6.94
WR8ABX	Sioux Falls	T1.8	6.34-6.94
WR8ACK	Sioux Falls		6.16-6.76

TENNESSEE

WR4ADA	Chattanooga		6.19-6.79
WB4QEY	Gallatin	T	6.04-6.64
			6.04-7.18
WR4ADO	Kingsport		6.16-6.76
W4SKH	Knoxville		6.28-6.88
W4TEA	Knoxville		6.16-6.76
WR4ADF	Knoxville		6.34-6.94
			52.760-52.525
			449.30-444.30
K4RSV	Lenoir City		6.16-6.76
WR4ACI	Manchester		6.10-6.70
K4BN	Memphis		6.34-6.94
W4BS	Memphis		6.16-6.76
			6.22-6.76
			444.00-449.00
WA4HBY	Memphis		6.18-6.82
WA4BXI	Nashville	T2.805	6.04-6.64
	(remote)		
WB4EKI	Nashville PL		6.40-7.00
W4RFR	Nashville		6.34-6.94
WA4TOA	Nashville		6.04-6.64
WA4YND	Nashville		6.70-7.70
WR4ABV	Nashville PL		6.25-6.85
			5.75-449.65
WR4ACS	Nashville PL		6.16-6.76
WR4ACT	Nashville		52.920-52.525
WR4ACU	Nashville		443.45-448.45
WR4ACY	Nashville	T2.805	6.28-6.88
W4IWV	Shelbyville		6.34-6.94
K4EGC	Tullahoma		6.10-6.70
	Walland		6.34-6.94
W4WLH	Winchester		6.22-6.82

TEXAS

	Abilene		6.34-6.94
	Alice		444.10-449.10
WA5GRC	Amarillo		6.34-6.94
			444.50-449.50
WA5YTO	Austin		6.34-6.94
WA5YZD	Austin		449.10-444.10
W5AW	Big Spring		6.22-6.82
WR5ABM	Brownfield		6.22-6.82
WA5YTJ	Corpus Christi		6.34-6.94
WA5HNW	Dallas-Ft. Worth		53.550-52.750
WA5VKW	Dallas		6.28-6.88
WR5ABA	Dallas		6.01-6.61
WR5ABD	Dallas		6.22-6.82
W5HHS	Denton		6.25-6.85
K5WPH	El Paso		6.28-6.88
WA5MWI	Ft. Smith		6.34-6.94
K5DSV	Ft. Worth		53.325-53.725
WA5KTO	Ft. Worth		6.16-6.76
WA5YTM	Ft. Worth		6.34-6.94
	Ft. Worth		53.050-53.150
WA5QTZ	Houston		6.22-6.82
WR5AAA	Houston		6.28-6.88
WR5ABP	Houston		6.01-6.61
WR5ABQ	Houston		444.20-449.20
WA5YTY	Killeen		6.34-6.94
WB5EMR	Levelland		6.28-6.88
WA5YUP	Longview		6.28-6.88
WB5BRY	Lubbock		6.34-6.94
WR5ACF	Lufkin		6.34-6.94
W5YNI	Mainview		6.22-6.82
WR5ABN	Midland		6.16-6.76
	Mt. Franklin		6.28-6.88
WA5SNJ	Pasadena		6.34-6.94
W5YNL	Plainview		6.22-6.82
			6.22-6.94
WA5YUS	Port Arthur		6.34-6.94
WA5YUB	Richmond		6.16-6.76
W5UFO	San Angelo		6.34-6.94
WA5UNH	San Antonio		52.880-52.525
WA5VKZ	San Antonio		6.34-6.94
WR5ABZ	San Antonio		7.30-7.18
WR5ABB	Sequin		6.34-6.94
WA5LDL	Tyler		6.34-6.94
WR5ABC	Victoria		6.16-6.76

UTAH

WR7AAA	Cedar City		6.34-6.94
WA7AKI	Salt Lake City		6.34-6.94
			444.90-449.90

VERMONT

WR1ACA	Mt. Ascutney		6.16-6.76
W1ABI	Mt. Killington		6.28-6.88
			441.20-446.20
W1KOO	Mt. Mansfield		6.34-6.94
			444.40-449.40

VIRGINIA

WB4QFP	Arlington		6.31-6.91
WB4URR	Blue Mountain		6.37-6.97
WB4KNX	Charlottesville		6.28-6.88
K4OQS	Chesapeake		6.22-6.76
WB4QEP	Danville		6.28-6.88
	Danville		6.10-6.70
WR4ADY	Forrest		6.34-6.94
WB4KNU	Hampton		6.34-6.94
WR4ACN	Hampton		6.19-6.79
WR4ABU	Lexington		6.01-6.61
W4GCE	Lynchburg		6.22-7.42
WB4HCX	Lynchburg		6.34-6.94
WR4AEN	Lynchburg		6.16-6.76
WB4KNN	Newport News		6.34-6.94
K4OQB	Norfolk		6.22-6.76
WA4ZAU	Norfolk		6.19-6.79
W4DXC	Richmond		52.720-52.640
W4NJE	Richmond		6.22-7.42
WB4QEO	Richmond	W1.4	6.34-6.94
WR4ACW	Richmond		6.28-6.88
WR4ADI	Richmond	T1.336	6.34-6.94
WB4QET	Roanoke		6.34-6.94
WB4QFS	Roanoke		6.38-6.98
	Roanoke		6.28-6.88
WB4QFF	Tyson's Corner		6.31-6.91
WA4NQT	Virginia Beach		6.37-6.97

WASHINGTON

WA7KZG	Bawfaw Mountain	T1.95	6.34-6.94
WR7ACB	Chehalis	T1.95	6.34-6.94
	Ephrata		6.34-6.94
WR7ACR	Everett		6.31-6.91
W7DAQ	Longview		53.290-6.76
WR7ACF	Mica Peak		6.28-6.88
			449.85-444.85
	Moses Lake		6.34-6.94
K7QKL	Mt. Rainier		6.34-6.94
WR7ACE	Mt. Spokane		6.34-6.94
K7IUT	Olympic		52.525-53.290
W7FHZ	Puget Sound		CLOSED
K7PBU	Puget Sound		449.85-444.85
W7DXX	Rattlesnake Mountain		6.34-6.94
WR7ABC	Renton		6.22-6.82
K7TGH	Richland		52.525-53.290
W7DBF	Seattle		CLOSED
K7GMR	Seattle		52.525-53.290
W7PUG	Seattle		CLOSED
WR7ACJ	Seattle		6.37-6.97
K7LBV	Spokane		52.525-53.290
K7PYC	Tumwater		52.525-53.290
WA7AJF	Vancouver		53.290-53.460
	Wenatchee		53.290-53.460
WR7ABZ	Yakima		6.34-6.94

WEST VIRGINIA

WR8ACD	Charleston		6.28-6.88
WR8ABB	Fairmont		6.28-6.88
WB8ARY	Huntington		6.34-6.76
K8SXO	Huntington		6.34-6.76
WA8ART	New Martinsville		6.34-6.94
WR8ACJ	Parkersburg		6.37-6.96
K8ZPR	Weirton		6.34-6.76
WBJDJ	Wheeling		6.34-6.76

WISCONSIN

WA9ZEF	Appleton		6.28-6.88
WR9ABE	Baraboo		6.28-6.88
WR9AAE	Cedarburg	T2.25	6.37-6.97
W9AYR	Green Bay		6.28-6.88
WR9ABV	Lake Geneva		6.37-6.97
WA9WVE	Madison	T2	6.46-6.88
WR9ABT	Madison	T2.1	6.16-6.76
WB9AES	Maukesha PL		6.22-6.82
WB9ADK	Milwaukee		6.16-6.76
WB9ADX	Milwaukee		6.31-6.91
W9WK	Milwaukee		6.07-6.67
WR9ABF	Milwaukee		7.99-7.39
			52.800-52.525
			449.50-444.50
			1250.0-1220.0
WR9ABS	Milwaukee		6.25-6.85
	Milwaukee		448.75-443.75
K9YFF	Racine		52.600-52.525
W9AIQ	Sturgeon Bay		6.16-6.76
WA9LIV	Waukegan		5.95-5.55

WYOMING

K7KMT	Casper		6.34-6.94
WA7KZC	Cheyenne		6.16-6.76
			444.30-449.30
WA7EGK	Laramie		6.34-6.94
			6.76-6.94
W7RPV	Thermopolis		6.16-6.76

CANADA

ALBERTA

VE6QE	Alberta		6.46-7.00
VE6AUY	Calgary		6.46-7.00
VE6WO	Edmonton		6.46-7.33
VE6WQ	Edmonton		6.46-7.00
VE6OL	Grand Prarier		6.46-7.00
VE6CAM	Lethbridge		6.28-6.88
	Lethbridge		6.34-6.94

BRITISH COLUMBIA

VE7ELK	Chilliwick		6.46-7.00
	Kamloops		6.34-6.94
VE7CAP	Kimberly		6.34-6.94
VE7BTU	Nelson		6.46-7.33
	Penticton		6.34-6.94
VE7AFG	Prince George		6.58-7.33
VE7CAQ	Trail		6.34-6.94
VE7RPT	Vancouver		6.34-6.94
VE7VAN	Vancouver		7.72-7.12
	Vancouver		6.40-7.06
VE7BEL	Victoria		6.22-7.54

MANITOBA

VE4BDN	Brandon		6.46-6.94
VE4XK	Winnipeg		6.46-6.94

NEW BRUNSWICK

VE1GT	Fredricton		6.34-6.94
VE1PD	Fredricton		6.16-6.76
			(AM) 7.80-4.225

VE1RPT	Moncton		6.28-6.88
		TT	62.8-52.525
		TT	52.525-7.52
VE1KI	St. John		6.22-6.82
NEWFOUNDLAND			
VO1KI	Cornerbrook		6.46-6.94
VC1AV	Grand Falls		6.46-6.94
VO1GT	St. Johns		6.46-6.94
NOVA SCOTIA			
VE1ATN	Charlottetown		6.10-51.515
	(Prince Edward Island)		52.525-7.00
VE1HI	Charlottetown		6.34-6.94
	(Prince Edward Island)		
VE1HR	Fraser's Mountain		6.16-6.76
	(New Glasgow)		
VE1ARC	Halifax		6.34-6.94
VE1AEH	Mt. Blomidon		6.58-7.18
VE1JD	Sydney		6.46-6.94
VE1XK	Truro		6.46-6.94
			6.46-7.06
ONTARIO			
VE3KBR	Belleville		6.46-6.94
VE3MRT	Bracebridge		6.28-6.88
VE3TCR	Brantford		6.55-7.15
VE3KCR	Chatham		6.34-6.94
			7.46-7.06
VE3GOD	Goderich		6.46-5.-6
			6.43-5.03
VE3LCR	Grimsby		6.49-7.09
VE3DRW	Hamilton		6.16-6.79
VE3BSQ	Kingston		6.46-6.94
VE3KER	Kingston		6.34-7.06
VE3KSR	Kitchener		6.34-6.94
			6.37-6.97
VE3LAC	London		6.46-7.06
VE3NFM	North Bay		6.34-6.94
VE3OSH	Oshawa		6.40-7.12
VE3PBO	Peterborough		6.34-6.94
VE3BER	Port Colborne		449.40-449.70
	(FAX-RTTY)		
VE3WCR	Port Colborne		6.43-7.30
VE3STP	Renfrew		6.34-7.06
VE3NRS	St. Catherines		7.07-7.67
VE3SAR	Sarnia		6.34-6.94
VE3SSM	Sault Ste. Marie		6.34-6.94
VE3SRS	Sudbury		6.46-6.94
VE3TIS	Timmins		6.34-6.94
VE3CDX	Toronto		7.93-7.33
VE3MOT	Toronto		6.58-7.18
VE3RPT	Toronto		6.46-6.94
			6.46-7.06
VE3SIX	Toronto		52.760-52.525
VE3SSS	Toronto		6.64-7.30
VE3TTY	Toronto		6.10-6.70
	(RTTY only)		
VE3HY	Waterloo		6.10-6.70
VE3III	Windsor		6.40-7.06
VE3WIN	Windsor		6.40-7.00
QUEBEC			
VE2SP	Chicoutimi		6.46-6.94
VE2CSL	Matane		6.46-6.94
VE2ASU	Mont Buckland		6.70-7.60
VE2SP	Mont Jim Gray		6.46-6.94
VE2CAT	Montreal		6.18-6.94
VE2CLA	Montreal		6.10-6.70
VE2PY	Montreal		6.28-6.88
VE2RM	Mont Rigaud		6.40-7.18
VE2XW	Mont St. Bruno		6.70-7.60
VE2TA	Mt. Orford		6.52-7.50
VE2OM	Quebec		6.34-6.94
VE2VD	Quebec		6.16-6.76
VE2NY	Riviere-du-Loup		6.46-6.94
VE2ZO	Shawbridge		6.46-7.06
VE2SS	Sherbrooke		6.46-6.94
VE2AT	Trois Rivieres		6.46-6.94
SASKATCHEWAN			
VE5FN	Lloydminister		6.46-6.94
VE5SS	Regina		6.46-7.33
VE5SK	Saskatoon		6.46-6.94
YUKON			
(no repeaters currently listed in the Yukon Territory.)			
AUSTRIA			
OE5XGL	Altmuenter		4.15-5.75
	Graz		4.20-5.80
	Igmunden		4.15-5.75
OE7XTI	Innsbruck		4.15-5.75
	Klangenfurt		4.20-5.80
	Kufstein		4.20-5.80
OE5XLL	Linz		4.25-5.85
	Mattighofen		4.30-5.70
OE5XUL	St. Johann		4.15-5.75
	St. Poelten		4.20-5.80
OE2XSL	Salzburg/Gaisburg		
	Schladming		4.35-5.65
	Wien-Stadt		4.15-5.75
BERMUDA			
VP9BA			4.34-4.94
CZECHOSLOVAKIA			
OK0B	Cerna Studnice		5.225-5.825
OK0A	Prague		5.10-5.70
DENMARK			
OZ3REN	Aalborg		5.05-5.65
OZ3REC	Aarhaus		5.35-5.85
OZ3REQ	Aarhaus		435.15-433.65
OZ3REO	Bornholm		5.05-5.65
OZ3REB	Copenhagen		5.15-5.75
	Copenhagen	T1.4 and T2.2	5.35-5.85
OZ3REK	Esbjerg		5.05-5.65
OZ8JS	Hadersley		5.35-5.85
OZ3REE	Herning		5.25-5.85
OZ3RET	Hjørring		5.25-5.85
OZ3REI	Knivsbjerg		4.15-5.75
OZ3REA	Lyngby		5.35-5.85
OZ3RED	Lysnet		5.15-5.75
OZ3REF	Odense		5.25-5.85
OZ3REJ	Ringsted		5.05-5.625
ENGLAND			
GB3PI	Cambridge	T1.7	5.15-5.75
GB3BC	Pontypool		5.15-5.75
GERMANY			
DB0WA	Aachen		4.20-5.80
DB0XA	Altenwalde		4.30-5.70
DB0ZA	Aschberg		4.25-5.85
	(Rendsburg)		
DB0UA	Augsburg		4.20-5.80
DB0YB	Bad Hersfeld		4.20-5.80
DB0VB	Bad Koenig		4.175-5.775
DB0XB	Baiderstrasse/Ostsee		4.20-5.80
DB0UB	Bamberg		4.20-5.80
	(Zusaetzlich 18)		
	Bamberg		431.30-438.90
DB0UG	Bentheim-Lingen		4.20-5.80
DB0XD	Bergheim		4.25-5.85
WB0WF	Berlin		4.15-5.75
	(Funkturm)		
DB0YL	Berlin-Neukdelln		4.225-5.825
DB0SP	Berlin-Sp		5.15-5.60
DB0XN	Bredstedt		4.175-5.775
DB0WU	Bremen		4.25-5.85
DB0WC	Bremerhaven		4.20-5.80
DB0XY	Bucksberg/Harz		4.30-5.70
DB0YC	Cham		4.15-5.75
DB0UC	Coburg		4.15-5.75
DB0US	Damme/Vechta		431.35-438.95
DB0ZB	Dchsenkopf		4.25-5.85
DB0WN	Dchsenwang		4.225-5.825
DB0XD	Deggendorf		4.20-5.80
DB0WD	Deister		4.20-5.80
DB0WT	Detmold		4.25-5.85
DB0UM	Doerenberg/Osnabrueck		431.20-438.80
DB0ZR	Dortmund-Schwerte		4.20-5.80
DB0ZV	Dortmund-Schwerte		431.15-438.75
DB0XR	Dreilaendereck		4.20-5.80
	(Loerrach)		
DB0ZD	Duerenberg/Dsnabrueck		4.15-5.75
DB0UD	Duisburg		431.10-438.70
DB0WW	Duisburg		4.15-5.75
DB0XC	Elm		4.76-5.90
DB0XX	Elm		431.20-438.80
DB0VV	Erbeskopf		431.25-438.50
DB0WE	Essen		4.225-5.825
DB0VS	Feldberg/Schwarzw		431.30-438.90
DB0DX	Feldberg/TS		5.05-5.65
DB0UF	Feldberg/TS		4.15-5.75
DB0VE	Feldburg/TS		431.15-438.75
DB0YF	Feldburg/TS		4.10-5.90
	(RTTY)		
DB0VF	Frankfurt-Stadt		4.225-5.825
DB0XF	Freising		4.175-5.775
DB0UE	Fulda		4.175-5.775
DB0WG	Goeppingen		4.175-5.775
DB0ZZ	Grab		4.20-5.80
DB0WM	Muenster-Westf.		5.05-5.65
DB0VR	Nordhelle-Sauerland		5.075-5.675
DB0UL	Nortorf		431.40-439.00
DB0ZN	Nuernberg-Moritzberg		4.15-5.75
DB0UN	Nuernberg-Schmausenbuck		4.225-5.825
DB0VN	Nuernberg-Schmausenbuck		431.05-438.65
	Ochsenkopf		431.20-438.80
DB0UD	Oldenburg		4.15-5.75
	Oldenburg		431.05-438.65
DB0UP	Pforzheim		4.225-5.825
DB0VP	Pirmasens		4.225-5.825
	Pirmasens		431.45-439.05
DB0YS	Siegen		4.20-5.80
DB0WR	Stuttgart		4.15-5.75
	Stuttgart		431.40-439.00
DB0WX	Triberg		4.20-5.80
DB0UT	Trier		5.175-5.775
DB0ZW	Weiden		4.20-5.80
DB0UJ	Wetzlar-Giessen		431.05-438.65
DB0WB	Winterberg		4.25-5.85
DB0WZ	Wuerzburg		4.25-5.85
DB0ZS	Zugspitze		431.25-438.85
DB0ZU	Zugspitze		4.275-5.725
DB0XG	Greding		4.20-5.80
DB0VG	Guch-Kleve		431.25-438.85
DB0WS	Guslar-Steinberg		4.25-5.85
	Guslar-Steinberg		431.30-438.90
DB0UH	Hagen-Westf.		4.175-5.775
DB0UR	Haltern		431.30-438.90
DB0XH	Hamburg		4.15-5.75
DB0YR	Hamburg		4.10-5.90
	(RTTY)		
DB0VH	Hannover		431.40-439.00
DB0WH	Hannover		4.15-5.75
DB0ZH	Heidelberg		4.25-5.85
DB0YH	Hoechenschwand-Schwarzw		5.075-5.675
DB0WV	Hoechsten-Oberschwaben		4.25-5.85
DB0XM	Hoher Meissner		4.225-5.825
DB0YK	Homburg-Kaiserslautern		4.20-5.80
DB0XE	Kaddel		4.15-5.75
DB0ZF	Kaiser-Freiburg		4.15-5.75
DB0XK	Kalmit		4.30-5.70
DB0UK	Karlsruhe		4.175-5.775
DB0UQ	Knuell		431.40-439.00
DB0XU	Knuell		4.25-5.85
DB0ZK	Koblenz		4.20-5.80
DB0VK	Koeln-Stadt		4.175-5.775
	(Zusaetzlich)		
DB0WK	Konstanz		4.15-5.75
DB0WL	Lahr		4.25-5.85
DB0WD	Leer-Ostfriesland		4.20-5.80
DB0YN	Lindau-Northeim-Hann		4.20-5.80
DB0YY	Ludwigsburg		4.30-5.70
DB0XL	Luebeck		431.30-438.90
DB0ZL	Leuchow-Elbe		4.20-5.80
DB0UI	Marburg		431.35-438.95
	Mayen		431.30-438.90
DB0UU	Melibokus-Darmstadt		431.20-438.80
DB0VD	Melibokus-Darmstadt		4.20-5.80
DB0XS	Merzig-Saar		4.25-5.85
	Merzig-Saar		431.10-438.70
DB0ZY	Mintraching-Muenchen		
DB0ZM	Muenchen-Stadt		4.15-5.75
ISRAEL			
	Haifa		5.175-5.775
JORDAN			
JY73	Amman		6.34-6.94
NETHERLANDS			
PA0ALK	Alkmaar		5.20-5.80
PANAMA			
HP1PC	Panama		6.34-6.94
SWEDEN			
	Bollnas		5.05-5.65
	Boras		5.20-5.80
	Falun		5.20-5.80
	Gallivare		5.05-5.65
	Goteborg		5.05-5.65
	Helsingborg		5.05-5.65
	Huskvarna		5.15-5.75
	Kalmar		5.20-5.80
	Karskrona		5.15-5.75
	Kiruna		5.20-5.80
	Malmo		5.175-5.775
	Mellerud		5.10-5.70
	Nassjo		5.05-5.65
	Rommeleasen	T2.172	4.90-5.80
	(So. Sweden)		
SK0DZ	Stockholm	T2.172	4.90-5.80
	Stockholm		5.05-5.65
	Stockholm		5.125-5.725
	Stockholm		5.20-5.80
	Sundsvall		5.20-5.80
	Umea		5.20-5.80
	Uppsala		5.15-5.75
	Ystad		5.20-5.80
SWITZERLAND			
	Appenzell	T1.595	431.20-438.80
HB9B	Basle	T1.435	431.05-438.65
	Berne		5.05-5.65
	Fribourg	T1.29	432.05-438.92
HB9AA	Lucerne-Pilatus	T1.595	431.05-438.65
	Lucerne	T1.595	431.05-438.92
	Lucerne	T1.16	431.20-438.80
HB9H	Lugano		5.15-5.75
HB9FG	Neuchatel	T1.16	431.05-438.65
HB9CC	St. Gall-Santis	T1.595	431.20-438.80
HB9BA	Solothurn	T1.16	431.20-438.80
HB9Z	Zurich	T1.16	431.05-438.65

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LETTERS

VOX POOP

I would like to see more articles on RTTY construction and use. . . WN3UTQ. *(So would we. . .wayne).* You should start a series for the beginners and show how to build a complete station from transmitter to transmatch. . .Mike Reid. *(Any budding authors out there to tackle this? . . .wayne).* Circuits column should be expanded; would also like to see "idea articles on UHF and SHF experimental gear; and please consider more construction articles on SSTV and RTTY system. . .WB4NLM. *(Good idea. . .wayne).* I would like to see more 2m solid state FM receiver projects, more 2m FM transmitter and amplifier projects (solid state). 73 is a fine magazine with many fine technically oriented projects. Unlike QST or CQ, 73 is consistent with the needs of the builder, so keep up the good work. . .WB6ICR. *(Right on. . . wayne).* More specialized columns needed such as Novice, QRP. More general interest articles such as the one on Europe's repeaters and hamming in Jordan. Stay away from useless gimmick and gadget articles. . . WN9JOU. More Novice news, and how about some simple transmitters and VFO's, antennas, etc. Maybe a Novice column?. . .WN7WPH. *(We're game. . .any takers??. . .wayne).* 73 is great, groovy, grand, FB and OK. . . DA1SM. Your issues carry more VHF information than I care to read about. Let's get hams building more things. . .K6SLM/5. *(We print what is sent in. . .wayne).* Thanks for the material to bombard my representatives in Washington. . .W2RRJ. I would like to see some QRP projects. . .WN9JYU/4. One thing I like about 73 is the lack of contest results and junk like that. I want repeater control systems and construction articles. . .VE1NU. More Oscar operating info for us beginners please. . .WA7QED. Would like more articles on modules. You have a great magazine. . .WA9SYK. *(OK all you module lovers, start writing for Lorain WA9SYK and other module fans. . . wayne).* The variation in articles from issue to issue is very good. I'm very pleased with your format, keep up the good work. . .Reynolds ME. Just right on general interest articles, but let's have humor articles every other month. . .WA7ADD. Whatever happened to tubes? A lot of us still use them and like them better than solid state, also they are much easier to get. . . WA8HGS. You are #1. . .WA9NQW. I wish you would stop "wasting" a whole issue on 2m FM. The HF bands are still alive, and how about some SSTV?. . .WA2DRL. The New Products review of the MITS 150 was very good and I hope to buy one soon. Also appreciate ads from Circuit Specialists, Meshna, Selectronics and Amateur Wholesale. . .Gerttula OR. Where in hell is the subscription blank?. . .W2ZTT. *(We didn't have room for it. . .wayne).* Keep the girlie pix off the cover. Don't agree with most of your editorial opinions, but every activity needs "radicals" to keep the rest of us honest!. . .WAØUVX.

Female adornment on the covers? By all means yes!. . .R. Harper. Construction projects are excellent. I am working on some and learning a great deal more about electronics. FCC regs are an excellent addition to 73 and invaluable. . .WN6SUW. *(Radical? I'm a hidebound conservative, it's only by comparison with ARRL that I appear a radical. . .wayne).* Would like to see some solid state construction articles on microwave, especially at 2300 MHz. . .Niggemann FL. *(Good idea. If anyone is doing some please note and start writing. . .wayne).* How about some simple 2m portable projects? How about something on towers, antennas, etc. (homebrew). . .WN4CJP. *(Love to, but need more and more articles on some. . . wayne).* Great idea printing frequency allocations in each issue – real handy. How about charts and tables that can be cut out and put on the wall? Keep up the editorials Wayne, it's the best part of the magazinee. . .WBØFZL.

(Any chart and table writers out there?. . .wayne). I like digital devices and you seem to do a good job in this field. . .WA7GRI. More logic articles. . .WB4NXW. You need more projects for the beginner in radio. . . WN6UKK. *(I agree. . .wayne).* How about an article on high speed digital TV? And more experimental stuff. . . W. R. Stephen. *(Any volunteers?. . . wayne).* I appreciate the reader service section and the large amount of consumer information. . .WA9TBW. Like to see more articles like Jordan. Best I've ever read in any ham magazine. Also, every DXer should read the QSL manager by W4NJF. . .K6OPG. Need some articles on 6m FM transistor projects. Great magazine. . . WA4CKO. I would like to see complete networks for FM and TV across the U.S. through the repeater system. More circuits and theory for both of these expanding fields. . .K8VSI. More of your excellent FM articles. . . WB8IMC. How about some tech data on RF power VHF transistors?. . . WB5HHZ. Would like to see more product reviews. . .WA7KKP. Touchtone accessories for repeaters would be nice. . .WB6SFL. How about a surplus conversion column?. . . WBØCUN. 450 MHz FM news and construction articles. . .WB9DGT. More articles on exotic aspects such as moonbounce, super contesting, etc. . .WB8JAJ. More attention to HF, which still has the majority of hams. . .W8ZZZ. More ATV. . . WØYRE. More on SSTV and digital. . .WB8KPS. More HF and less 2m FM. . .R. N. Wert.

GET THE DRIFT?

Does anyone know if the SP-600JX-17 Hammarlund receiver has a very severe drift problem *by design?* This problem in my receiver is only present between 14.220 and 14.350 MHz. Many hours of trouble-shooting have failed to find the cause. Also, before I spend more hours again, do all of the s-meters read downward on modulation?

Ken Branning K9RSF
3419 Senate Ave.,
Ft. Wayne IN 46806

MAYBE THIS TIME

Please send me your 14 WPM code cassette in exchange for my $3.95 check.

I have been trying since 1970 to pass the 13 WPM test, and just this week failed it again. At $9 a test, $10 for gas, $20 per night in Detroit, I figure I've spent almost $200 so far and have not been on the air since my WN8HAK expired in June of '72.

When you get to be 40, have two teenagers running around with 140dB rock on, and then with going to school myself to get my Engineering Masters during this period, for some reason the code won't sink in.

At least I'll finish my Masters with a 3.98 point average thru all this, have been promoted (?) to a job that gets me out of town one night a week and managed to get an FCC 2nd Class Commercial Ticket.

Now, once more for that ham ticket, if the fuel shortage doesn't stop me. . . . .!

Donald Upp Ex-WN8HAK
Trotwood OH 45426

NEVER TOO LATE

Being a Novice (albeit 55 years old) who has recently found time to start, I was interested in finding a magazine which would help me move towards the General Ticket. So far, with 3 copies of 73, I find 99% of the articles "way" beyond me.

Is it possible that some small portion of each issue could be used to help inform us Novice types?

W. J. Elperin WNØLDN
Kirkwood MO

We are currently looking for a Novice Editor for the Newspages. Any takers? If more Novice articles are sent in we will accept more and publish more. We can't publish them if we don't have them. . .ed.

MORE SCANDAL?

I enjoyed reading about the 'Non Ham SCM Election.' There has been a similar happening here in Montana. First of all out here in the "Great Conditional Frontier" one can obtain a Conditional license by several under the table techniques. Recently the FCC was pressured into re-examining some of the Conditionals here in Montana. After many letters to the FCC in regard to this illegal licensing of Conditionals, we got tired of the same old answer "still under investigation." Finally we sat down and contacted one of our Senators. He stated he would look into the matter. Within the week we received a notice from the FCC that a number of Conditionals would be recalled for examination.

One of the persons recalled by the FCC was a past SCM, W7SFK. W7SFK contacted the FCC and stated he was unable to appear for examination due to extreme illness. After getting this information back from our Senator we obtained a letter from W7SFK's employer, the county sheriff. The sheriff stated, "No, he has been in real good health and has been doing a good job as a deputy sheriff." After getting this information it was once again filed with our Senator who dropped the entire matter back into the lap of the FCC. Shortly after, W7SFK's license was cancelled.

The FCC received all kinds of excuses from the ones they recalled; some had been ill, some had taken the wrong medication and couldn't appear, and one claimed that he was financially unable to appear. This last person at the time was vacationing in Arizona. It is time the amateurs put a little force on the FCC through their Senators and Representatives and get some action where it is needed.

If the FCC got rid of all of the unqualified mail order hams, there would be no need for incentive licensing programs. The FCC reports that less than 7% of all mail order licensees are qualified. I personally feel it is time to get rid of all the illegal hams. Hopefully the FCC will continue to recall these amateurs.

If the FCC started by recalling all the hams listed in the Montana column of QST there might be a lack of League Officials left in Montana. Out of this column only about seven hams are ever mentioned. These, of course, are the clique that operated with our Conditional class SCM.

Let's all get together and force out these unqualified so called hams!

Name Withheld

INFORMATION PLEASE?

Can anyone advise me as to whom to contact about participating in the OOT (fifty year) Amateur Radio Club?

Eric G. Hook
Monitor Liquid Level Indicators
Westford Massachusetts
01886
617-692-8335

AMEN

Amen to your article in the February 1974 issue of 73. The article I have in mind deals with the IRS and their unlimited power. Please keep this type of article coming!

I am a chemical engineer and as such purchased an HP-35 calculator for my work. The cost of this unit was $303. I asked the IRS if I could deduct this cost since this unit was necessary in my work. Their answer was yes if you depreciate the cost over 10 years! *CAN YOU BELIEVE THAT!?* I then asked the same question to another IRS agent who told me to depreciate the unit over 5 years. A third IRS agent said to take the whole amount!!!!!! Who do you believe?

I have had friends who have been under an audit by three agents at different times covering the same return and have been given three different judgements!!! *CAN YOU BELIEVE THAT!?* Needless to say, something must be done to correct this situation. What can the "little guy" do?

Name Withheld

We believe it. . .ed.

NON-INTEREST

I am really not interested in your problems with the IRS. I subscribe to your magazine to read about amateur radio.

E. F. Munsell K6CL
Los Angeles CA 90066

So you lose a page. . .ed.

COMMENDATION

I would like to commend you on the excellent magazine. I always enjoy reading 73. I'm 100% in favor of your series of editorials re the "Jolly Roger" branch of the government. I am able to see reasonable taxation for the support of the government (etc.), but when it comes to having to tolerate Cossack tactics, I must object. You have my total sympathy re your relationship with the "International Renegade Society." They should definitely have their wings clipped. I would welcome a series of articles on other forms of governmental snoops and henchmen with perhaps, listings of their confidential telecommunication frequencies. With domestic political discrepancies such as the "Watergate," the citizens do not feel especially close to the action. But when the Cossacks drag you down into their local pit for fun sessions with the thumbscrew playthings, or even worse, if tribute is demanded from the wallet, one feels as if he is in the middle of the "Battle of Tannenburg!"

You have compared the IRS to the good old Gestapo, but there is another equally accurate comparison, that being the "Inquisition." It seems that the IRS retains a modified version of the old practice of burning dissidents at the stake.

Changing to another topic. I appreciate the inclusion of ciphers in past editions, and look forward to seeing them in the future. Please do not publish my name as I do not wish to have the Cossacks effect a pogrom upon me. The forced labor camps are very cold this time of year (Newspeak translation from 1984 ("joycamps").

Name Withheld

TIY XLB RTOW RGWAW XETORA PYUXJKT QGWB TIY YAW L RTOWQEURWE LBS IDDAWR IBW KWRRWE. AXEWQ UEA. . .wayne.

IRS SERVICE?

I have been reading with much interest your editorials concerning the operation and policies of the IRS. This comes at the end of my first year of being "self-employed," and discovering that there is more to income tax than a W-2 and a standard deduction.

While my business may not yet be as large as 73, I find that we are all faced with the same governmental institution looking for our money. In an effort to understand how it works, one needs information about the "Service(?)." I am in support of your efforts, and apparent courage to find out more about this rather large, powerful, profitmaking organization.

Name Withheld

anywhere make sure that they have some technical advice. . .or let me know and I'll parlay it into a free trip to California and make sure they don't screw up like that again. We need all the good PR we can get. . . and there are a thousand interesting stories that could use ham radio. . . maybe a hundred?

The firms who bankrolled this attrocity were Jello, Pabst, Janitor in a Drum, Pam and Holiday Inns. Let's let them all off easy by organizing an avoidance of these products for only one year. No more Jello. No more Pabst (I guarantee not to drink Pabst ever again). No more Drummed Janitor. No Pam (I use bacon grease anyway). And to hell with Holiday Inns. . .unless they advertise in 73.

And may the great sacred eagle of the United States deposit vast quantities of quano on Sy Salkowitz for writing this lame-brained episode.

CB RADIO MADE TRUCK STRIKE POSSIBLE

Just two years ago such a strike would have been impossible. The recent massive use of CB to foil the police radar speed traps by truckers gave them the communications which made the strike work.

Articles have appeared in the newspapers all around the country on the use of CB radios by truckers to warn each other of police traps (smokey-the-bear is the code). CB radios have been selling like pep pills at truck stops and, since there is virtually no way for anyone to prove anything, few have bothered to pay the $20 for the CB license. Why should they? Once they get the CB ticket they come under the rule of the FCC. . .if they don't get the license it is up to the FBI. . . and the FBI record for tracking down illegal mobile radios is zilch.

About the only serious problem the truckers have been having is with high powered skip stations jamming them out for local communications. If the FCC goes ahead with the 224 MHz CB band this should solve that nicely and open a relatively interference-free band for organizing illegal activities. It will also be a God-send for crooks, who have been struggling to use 11m, but have had problems with skip interference.

CLEANING UP CB

If we are to donate a segment of our 220 MHz band to our good buddies who are now using our old 11 meter band, perhaps we should help them a bit by giving them a hand with the enforcement of their rules. There is no reason why a few bad eggs should spoil things for everyone, right?

A letter from W50JZ explains the details. It seems that there are two parts of the Communications Act that are being fractured by these over enthusiastic pals of ours. Those who have gone to the expense of buying a valid CB license ($20) and proceed to run more than five watts, put up two big antennas, not give their call signs, talk base to base, use foul language, coordinate illegal activities and other such rather popular CB goings on, are in violation of Section 301 and the FCC is the enforcer of the rules.

The FCC is badly understaffed, so they can use all the help you can give them. They'll want to know the name, address, call sign (FCC issued), dates and times of violations and the nature of the violations, how the party was identified, and any other pertinent facts. This information should be sent to the Chief, Safety and Special Radio Services Bureau, 2025 M Street NW, Washington DC 20554, Attention Legal, Advisory and Enforcement Division, Room 5202.

CB'ers who do not have FCC licenses are in violation of Section 501 of the Communications Act and the responsibility for them lies with the Department of Justice. . .that's the FBI. You'll find your local FBI office listed in the phone book. They will want to know the name and address of the violator, when he was on the air, and tape recordings or whatever else might be available. They will also want identification from you.

So there is one answer to Fat Albert down the block — call the FBI!

MORE TECHS BUSTED

The FCC vendetta against Techs and Conditionals continues briskly, with many losing their licenses.

One Tech recently wrote that when he appeared for the FCC exam, per their request, they said that all they had was the 13 wpm tape and told him to pick out five characters from it. He protested that he couldn't copy more than 5 wpm, but they went ahead with the 13 per tape, which threw him into a panic. . .and he got no copy. Then, after he was thoroughly rattled, they found their 5 wpm tape and ran that for him. . .and flunked him.

It's tough enough when everything goes right to pass the code test. True, our Tech reader would have done far better to bone up on his code via the 73 6-wpm practice cassette. . .there's no way they could have thrown him then. If you think you may be called up for retesting you could do worse than get one of these tapes. Better get it now while there is time to practice than suddenly get the word from The Man that Exam time is Here!

MORE LOSSES COMING

One of the more cryptic comments dropped by the FCC was that the CB grab for 220 MHz and the emergency medical try for 450 MHz were only starters, that we would be seeing several more even more serious pushes to get our ham bands. Remembering the recent utter loss of virtually all our satellite bands, a loss which will come to haunt us in years to come, one wonders at the situation. We lost the satellite bands because we did not prepare adequately for the ITU conference. They did not have to be lost and ther loss could have been prevented.

Yes, I know these are things that most amateurs don't want to read about, don't want to think about, and don't want to do anything about. I can see the situation, and I don't know what to do about it. I know of no way to get the League to do these things and I don't see anyone else around to do them.

OTHER RULE CHANGES?

The repeater rules a la Docket 18803 are not the only bones of contention between amateurs and the FCC. There are not a few amateurs who are seriously concerned over the new third party regulations, which are over restrictive and tend to inhibit the public services that amateurs can provide. Where such restrictions serve a useful purpose, there would be little objection — but this doesn't seem to be the case. Perhaps it will be possible to reopen consideration of this situation and work toward an amendment of the third party regulations.

What other rules fit into this category of being over-restrictive to no good end?

HATE WAYNE GREEN CRUISE PLANS

Plans are in the works for a giant free cruise to the Bermuda Triangle for registered haters of Wayne Green. If you or a friend think you qualify for this select group all you have to do is write ten reasons why you hate Green and send them to 73 Magazine, Hate Contest Department, Peterborough NH 03458, and wait for the decision of the impartial judge. All entries become the property of 73 Magazine.

CANADIAN OPERATION

Why leave amateur radio behind when you go to visit Canada? Getting a license to operate there is a snap. Send a letter for an application to the Department of Communication, 55 St. Clair Avenue East, Toronto 290, Ontario, Canada. Don't forget to give you name, call, address, and class of license. You'll get your forms pronto.

INSTANT SLOW SCAN PROGRAMS

The Slow Scanner has a problem with flexibility. Programs can be made up ahead by means of tape, but once made it is difficult to ever change them. Some amateurs do their programming "live" by panning their camera to a menu board, then to themselves for a frame or two then to some photographs, then a magic marker sign. . .etc. This keeps a person hopping, and it gets old quickly.

On the left is the SBE Slow Scan unit, complete with tape recorder. . .in the middle is the Signal One. . .the Robot Slow Scan monitor on the right, and the Venus Slow Scan monitor is on top of the Robot. The result is that incoming pictures can be viewed on all three monitors for comparison.

The SBE unit camera is used with the slide projector and the Robot camera is used for menu board work and live shots of the harried operator. The Venus camera has not arrived as yet.

One way to get programs together is via 35mm slides and a projector. While color slides do work passably, better results are obtained with black and white positive slides. These can be made with ordinary black and white film and an inexpensive reversal kit which changes the resulting negative into a positive. The slides are then mounted normally.

The slide projector is then focused on a rear projection screen and the Slow Scan camera merely takes the picture of the screen. I use a small 90° mirror with a ground glass screen built in, made by Hudson Photographic Industries and available from several mail order houses.

The projector is at the left. . .the right angle rear projection screen is in the middle and the camera is at the right. This is right beside the operating position so the camera can be swung around for live shots if desired.

By keeping the projector remote control at hand I can show each slide as many times as band conditions dictate. Where I have a closed circuit contact I show each one once. . .on DX I may give them three or four chances at it. And it is simple to update programs just by rearranging the slides.

This system has proven to be first rate. It is vastly superior to my first scheme of taking the slow scan camera around and taping pictures here and there. The 35mm camera is so much more portable and flexible than the Slow Scan camera and monitor.

BEWARE!!

All of the rip-offs in amateur radio are not in the ads in the other ham magazines – some may arrive by mail. One forwarded by K20AW is a recent effort to part you from your cash by one A. Vance Williams, Inc., of North Carolina. Williams says in his letter that he is running a very successful business – half a million bux last year – and has some common stock for sale at $1 per share. The letter mentions radio amateurs and apparently is being sent to hams.

Since such stock has to be registered with the SEC, and there are all sorts of legal problems in selling it over state boundaries, I didn't even have to note the lack of anything but a rubber stamp letterhead and several misspelled words to develop suspicions. The Phone Company in Jacksonville said they had no record of a Williams Inc., or even a Williams at the address given. I forwarded the stuff to the Fraud Division of the Post Office.

Reminds me of a gimmick a few years back where amateurs would get a letter on a clipping service letterhead (appropriately named, I thought) saying that they had a clipping on hand from a national publication mentioning the amateur and that it would be forwarded for a small service fee. And what did they get for their buck? Their name and address clipped out of the Callbook Magazine!

OCEANUS CALLS

Ship registry forms are now available for registering any craft with Oceanus. Your Oceanus amateur radio call may then be used aboard that craft outside of the three mile limits of any land. Any ship may be registered under the Oceanus flag, from a row boat to an ocean liner to an airplane, and this registration does not supercede any previous registration, nor does it call for the display of the Oceanus flag.

Oceanus call letters are being issued by the Chancellor of Communications of Oceanus, 73 Magazine Street, Peterborough NH 03458. They are being issued in order starting with O1AA. A copy of your valid amateur radio license together with a statement that you wish Oceanus citizenship and that it is not to supercede your previous citizenship and a $5 fee made out to Oceanus will bring you your amateur license, your Oceanus call letters, your Oceanus passport, and a registration form for a ship to fly the Oceanus flag.

OCEANUS CALLS

O1AB	Robert K. Vonier	W6ISV
O1AC	Joseph Sauerzapf	K8HNL
O1AD	Charles E. Deckard	WN4FAR
O1AE	Michael J. Eisenstot	WA8ARZ
O1AF	Barbara B. Thompson	KH6ICQ
O1AG	Noel J. Thompson	KH6FOX
O1AH	Carl P. Van Court	K1RCD
O1AJ	Stan Dunn	WA3PHQ
O1AK	Raymond T. McKeever	W1WJR
O1AL	Elaine P. McKeever	WA1LUT
O1AM	Steve Radgowski	WN2RMO
O1AN	William C. Spenn	WA5QVD
O1AO	David F. Reed	WB5GDL
O1AT	Jimmy Powell	K5UHM

HOTLINE NEWS NEEDED

The 73 HOTLINE will publish the last minute news of hamfests, conventions, and other ham events. . .if you send them in. Please let us know your plans for speakers, exhibitors, and other important aspects of your events. The HOTLINE will get this news to the readers within a few days. . .as a matter of fact, the HOTLINE will be in the mail within a few hours of the last minute items being received. Deadline for news is the Wednesday before publication and the HOTLINE will come out every other Friday starting April 5.

Any events of note should be sent in, preferably with photographs. . . emergenciess handled. . .repeater updates. . .FCC petitions entered. . .DXpeditions mounted. . .etc.

CARNETS

While many amateurs have had no problem carting their rigs from country to country, what with a minimum of customs inspection being the norm for most countries, the peace of mind of knowing that even if you should be inspected you would get through quickly and without cost is worth the effort in getting a carnet.

A carnet will cut the red tape when you want to take along any radio or other professional equipment when visiting other countries. The carnet system is used by salesmen and engineers for taking samples and other gear from country to country.

The carnet is issued by the International Chamber of Commerce and can be gotten by mail. The average cost of a carnet for ham gear would be about $60. Full information is available from the ICC, 1212 Avenue of the Americas NYC 10036.

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 . . .

DAYTON HAMVENTION expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P.O. Box 44, Dayton, Ohio 45401.

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, Kenwood, Tempo, Genave, Swan, Clegg, Ten-Tec, Standard, Midland, 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.

CURTIS ELECTRODEVICES and Madison Electronics present the finest in CW devices: EK420A CMOS Deluxe Keyer, $139.95; KM420 CW Message Memory, $299.95; KB4200 Keyboard Morse Generator, $499.95; Write literature. Brown and Vibroplex paddles. All prices F.O.B. Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

YAESU FT101. Excellent condition, with manual and Yaesu desk mike, $475. Will ship or deliver. K. J. Clatanoff WAØYCC/1, 88 Farm Lane, Portsmouth, NH 03801. 603-436-6675.

ROCK RIVER RADIO CLUB of Dixon IL announces their 8th annual Hamfest on April 28, at the Lee County 4-H Fairgrounds, one mile east of the junction of US 30 and IL 52, in Amboy IL. Tickets $1.50 in advance, $2 at the gate. Talk-in on .94.

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	$ 110
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
Midland 220 MHz xcvr – brand new – ($220)	$ 180
Clegg 21 220 MHz xcvr – new – ($300)	$ 235
Regency 16ch scanner TME-H-LMU ($300) – new –	$ 245
Waller 60A p.s. brand new ($125)	$ 99
SBE Scanvision, complete, like new ($900)	$ 600
Robot Monitor – new – ($296)	$ 240
Robot camera – with micro-focus gear – ($330)	$ 250
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
Genave GTX-200 – used ($270)	$ 180
Icom IC-30 6m xcvr – brand new ($400)	$ 299
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
Clegg 6.5A power supply ($80) – brand new	$ 60
Vanguard 2m preamplifier – used – ($25)	$ 15
Vanguard conv 223.34 MHz – brand new – =407 ($55)	$ 45
Tempo CL-220 xcvr – new – ($329)	$ 220
Tempo FMH charger – ACH – brand new – ($30)	$ 20
Caringella Rx – WWV – 5-10-15 MHz – tested ($75)	$ 45
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 cassette recorder – excellent – ($60)	$ 35
Hitachi stereo cassette recorder – exc – ($120)	$ 75
Hitachi AM-FM-cassette recorder – exc – ($90)	$ 50
Regency HR-2 xcvr - used	$ 145
Turner mike – noise can NC350DM – brand new	
Vanguard preamp 201 – 52.525 MHz ($25) – new	$ 18
Vanguard preamp 202 – 450 MHz ($29) – new	$ 23
Vanguard conv 144-146/14-15 MHz =407 – new – ($50)	$ 40
Vanguard conv 144-146/28-30 MHz =407 ($50) new	$ 40
Vanguard conv =407 146.94/10.7 MHz new ($50)	$ 40
Antenna Spec rubber ducky antennas HM-4 2m	$ 4
KLM 2m amp PA-270B – brand new ($150)	$ 125
SWR meter – exc ($25) KW	$ 12
Test Labs – 10 in 1 – SE-400 ($25) as is	$ 10
Control Signal ID unit – brand new ($50)	$ 35
Concord stereo recorder-changer – 12 cassettes ($240) brand new	$ 135
VTR Monitor – exc – Hitachi ($225)	$ 125
Video tape – new – per roll ½"	$ 10
Radio Shack Code cassette – new ($6)	$ 4

All prices fob: UPS collect.

73 Magazine – Peterborough NH 03458

THE TRI-STATE ARS WILL hold their annual hamfest on May 18, 1974, at the 4-H fairgrounds, U.S. 41, three miles north of town. Overnight camping, auction, flea market, door prizes and ladies bingo. For information or advance registration contact: Steve WB9MDB, 5805 Berry Lane, Evansville IN 47710.

GE POCKETMATES See Oct. 73 issue. Physically complete, less batteries, not checked out. Some with 2 frequencies, some with tone transmit: Supplied with schematics and cassette tape on servicing unit. Shipped postpaid and insured, $70 each. F.J. Pritchett, 130 North Oxalis Drive, Orlando FL 32807. 305-275-1144.

SELL VHF GIR: For list send SASE to Ewell D. Pendergrass WA5AER/5, Rt. 1, Box 250F, Apt. 4, Fort Smith AK 72901.

HAMFEST! Indiana's friendliest and largest Spring Hamfest. Wabash County ARC's 6th Annual Hamfest, May 19, 1974, 4-H Fairgrounds, rain or shine. Admission still only $1 for advanced tickets ($1.50 at gate). Large flea market, technical sessions, bingo for XYL's, free overnight camping, plenty of parking. Bonus for car-pools (4 or more adults per car). For more information or advanced tickets write: Jerry Clevenger WA9ZHU, Route 4, Wabash IN 46992.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates – July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs – Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL President, Vice-presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For Info, Contact: ARRL Convention, 303 Tenafly Road, Englewood, N.J. 07631.

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 F.O.B. Houston. Free flyer. Madison Electronics, 1508 McKinney, Houston TX 77002. 713-224-2668; Nite 713-497-5683.

GENERAL ELECTRIC: 80W TPL, 2m, 2 frequency, with 94, manual, accs., $175. Motorola mocom 30 450 MHz with PL, $100. TU532A base mic mint, $20. Heath HW32 20m SSB transceiver $75. HO-10 monitor scope, $30. Misc. Motorola and GE control heads and cables. D. Benischek, 4185 Arch Drive, # 317, Studio City, CA 91406.

FANTASTIC VALUES: Regency HR2-MS like new $190, Regency HR-6 good condition $150, Lafayette HA-750 good condition $60, Collins R-390A bad 2 kHz filter $390, R-391 very good $500, Galaxy V Mk2, DCPS $250, Polycomm PC-6 very good $80. George Misic, 37370 Windy Hill Drive, Solon OH 44139. 216-831-4152.

HT-220's – 2 frequency 2 watt slimline carrier squelch; $350 – 6 frequency 2 watt "E" model omni with "PL" ; $600 – both units with Nicad battery and heliflex antenna. Tom Williams WB4NXQ, 204 Foxboro Drive, Madison TN 37115.

BUY-SELL-TRADE. Write for monthly mailer. Give name, address, call letters. Complete stock of major brands, new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc., SSB & FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. 913-381-5901

YAESU FTDX560 transceiver w/mike, speaker, cw filter. 2 years old w/manual. Flawlessly immaculate, $687 new — asking $437. Jeff Goodman WA1QLK, 15 Greenough Street, Brookline MA 02146. 617-734-0661.

MOTOROLA PORTABLES — Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal Services, 6663 Industrial Loop, Greendale WI 53129.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader", Sycamore, IL 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

FOR SALE: Heath RX-1 receiver/speaker — $100; Heath HG-10B VFO — $35; Heath HD-10 keyer — $20. Walter Briggs WA2MQF, 25 Jill Terrace, Succasunna, NJ 07876.

R-390A — MINT — Like new with SPARES and manual, $450 (R-390A, excellent condition, checked perfect, $350 w/TM). Products, P. O. Box 36, Sweet Valley PA 18656.

MOULTRIE AMATEUR RADIO KLUB, 13th Annual Hamfest, Wyman Park, Sullivan IL, April 28, 1974. Indoor — Outdoor market. Ticket donation $1 in advance — $1.50 at the door. For information write: M.A.R.K. Inc., P. O. Box 327, Mattoon IL 61938.

PRINTED CIRCUIT TECHNIQUES FOR THE HOBBYIST. Ferric chloride "suspension etching," cutting epoxy glass, screen printing, etc . . .BOOKLET $2. TRUMBULL' 833 Balra Dr., El Cerrito CA 94530.

WANTED HIGH VOLTAGE transformer for Collins KNS-1. Jule Gordon W8HBQ, Box G, Moundsville WV 26041.

FOR SALE TX-62 and 621 VFO, NC-300 (rack mount) 2 meter conv, speaker and relay, $225. New 4H4-c tubes, $5 each. K1ZKR, 203-935-5762.

3-400Z LINEAR w/power supply, similar description September 1969,73, $150. Pictures available for SASE. 4-400A, 5vct, 30A filament transformer, $30. Shipping charges extra. Want cabinet similar DX100, Apachie, Mohawk. Bill Taylor, P.O. Box 485, Bettsville OH 44815.

ROCHESTER NY — The largest Hamfest in the northeast on May 17 and 18. Get your name on the mailing list. Write: WNY Hamfest, Box 1388, Rochester, NY 14603.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding. Literature. Estes Engineering, 543-A West 184th St., Gardena CA 90248.

SWAN 240 with dc power supply and TCU power supply, vertical 10-80 antenna, complete station $275. W5PBO, 405-634-2513.

FOR SALE: 432 HANDIE TALKIE SR-C 432 2 watt 6 channel with case $270. 2m Handie Talkie SR-C 145B 2 watt 5 channel with case all new $230.. Joe Gibson, P. O. Box 442, Wallingford CN 06492.

RTTY PICTURE PERF TAPES error-free, 11/16 inch CHAD type, hundreds available. 10¢ stamp for catalog. Joe Dickens, 601 South Dodson Avenue, Urbana IL 61801.

HOMEBREWERS: Stamp brings list of high quality electronic components. All at very low prices, and all POSTPAID. CPO Surplus, Box 189, Braintree MA 02184.

FRIEDEN FLEXOWRITERS — one for $45, one for $75. Oscilloscope — $75. Much other equipment for sale or trade. SASE for list. Jim Einolf, 1218 W. Ionia, Lansing MI 48915.

ANTIQUE RADIO BUFFS. Do you need a schematic for your radio? For information send SASE showing make and model number. Joseph C. Crockett K3KUL, 762 S. Gulph Road, King of Prussia PA 19406.

NEW $220. never assembled fiberglass 3 element quad 10-15-20. Pick up, will not ship, $140. A. S. Coverdale K2TSB, 39 Vivian Court, Lakewood NJ 08701 201-892-7075.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls), $15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona, Las Cruces, New Mexico 88001.

WANTED 51S1, serial above #500, excellent condition with manual, boxed, delivered to airline. State serial and condition. Arthur S. Cohen, Risco No. 437, Mexico 20., D.F. Mexico XE1LL.

TRADE Gonsett 2m sidewinder with ac supply, in perfect condition, for a miniature tv set, same condition. Bob Montgomery WA9CDG, 1345 Stanley Street, Stevens Point WI.

WANT — data and parts for "ACME" facsimile machine Model FNP-IS. Edward L. Radtke WA4BQE, 1602 Woodluck Avenue, Louisville KY 40205.

HT-37, SSB. CW. AM. Excellent condition, new finals — $150. Trade for Drake 2B. Jim Gysan W1VYB, 617-922-3850.

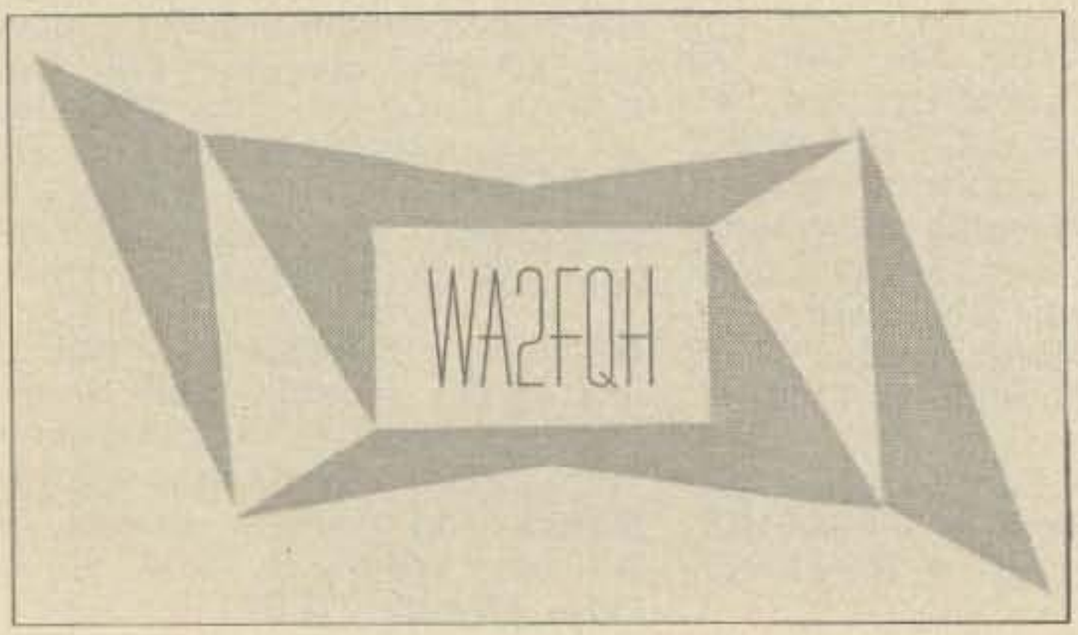
SWAN 500CX with 117-xc power supply, $535. Includes shipping. KL7HOQ, Box 6, Talkeetna, AK 99676.

TECH MANUALS — $6.50 each: R-220/URR, R-274/FRR, R-390/URR, URM-25D, URM-32, TT-63A/FGC, CV-591A/URR, TS-382D/U, TV-2/U, BC-779B, TS-497B/URR, TS-413A/U, SP-600JX, TS-34A/AP. W3IHD, 7218 Roanne Drive, Washington DC 20021.

HEATHKIT SB-100 TRANSCEIVER. HP-23 ac power supply and SB-600 speaker. All with manuals and in perfect physical and operating condition, $300. Will ship or deliver. Willard Revaz W1MBX, 21 Nancy Mae Avenue, Prospect CN 06712. 203-758-5858.

DIGITAL/ANALOG PLANS for home and lab!!! Scope Multiplexor, Instrumentation Amplifier, Solderless Prototyping, etc. For free catalog write MP Plublishing, Box 378-H, Belmont MA 02178.

QSL CONTEST



This month's QSL Contest Winner is Lawrence E. Skibicki WA2FQH, of Hollis, New York. His card, called "Homage To An Angle," shows the intrinsially simply beauty of the triangle, thought by many who judge such things to be the most beautiful angle in the world. Though not perfect in degree, you must admit that it does have something.

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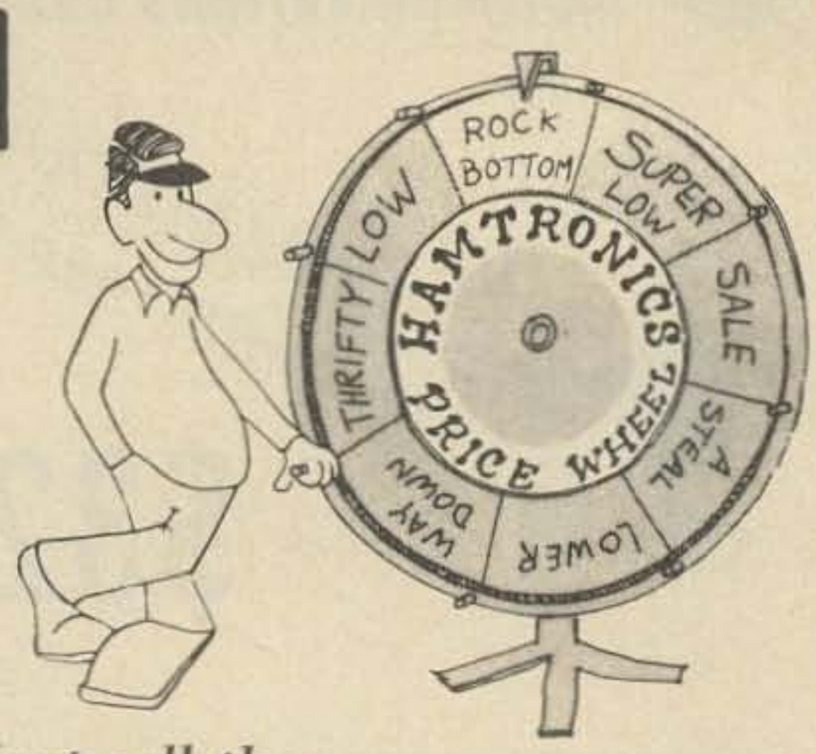

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7408	.30	7454	.25	74151	1.10
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MV1 amber		.50	
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JUNCTION FETs, TO-18 case

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NJF10	2N4416, MPF102	3/$1.00
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All FETs come with data sheets.

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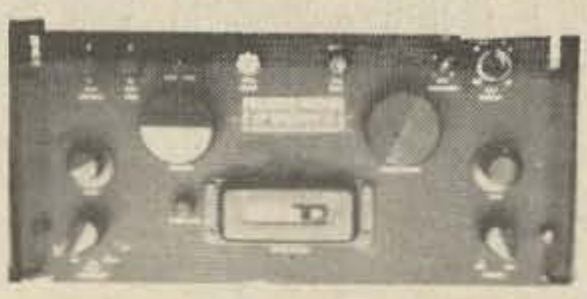

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2N236A	1.25	2N697	.35	2N1542A	2.40	2N3226	10.45
2N236B	1.40	2N706	.25	2N1543	2.90	2N3262	5.90
2N250A	1.30	2N918	.60	2N1544	1.35	2N3391	.29
2N251A	1.35	2N956	.45	2N1544A	1.40	2N3392	.23
2N255	.90	2N963	.55	2N1545	1.45	2N3393	.23
2N255A	.90	2N987	1.20	2N1545A	1.85	2N3394	.23
2N256	.80	2N1007	1.10	2N1546	1.95	2N3395	.28
2N256A	.90	2N1016E	36.00	2N1546A	2.30	2N3396	.23
2N257	1.20	2N1021	2.20	2N1547	2.25	2N3397	.22
2N268	2.50	2N1021A	2.25	2N1547A	2.75	2N3398	.22
2N268A	2.60	2N1022	2.65	2N1548	4.40	2N3441	1.95
2N277	1.90	2N1022A	2.70	2N1605	.52	2N3442	3.65
2N278	2.30	2N1044-2	3.00	2N1613	.80	2N3667	2.40
2N285A	2.40	2N1073	1.95	2N1639	.51	2N3703	.32
2N285B	2.45	2N1073A	2.90	2N1702	3.65	2N3707	.26
2N296	2.50	2N1073B	3.65	2N1703	3.90	2N3708	.26
2N297	1.15	2N1132	1.40	2N1770	2.25	2N3709	.27
2N297A	1.20	2N1136	1.75	2N1770A	2.45	2N3710	.29
2N301	1.05	2N1136A	2.35	2N1771	2.35	2N3713	1.60
2N301A	1.90	2N1136B	3.30	2N1771A	2.75	2N3714	1.65
2N307	.85	2N1137	2.10	2N1772	2.45	2N3715	1.70
2N307A	1.35	2N1137A	2.90	2N1772A	3.05	2N3716	2.25
2N316	1.05	2N1137B	4.20	2N1773	2.95	2N3721	.30
2N333A	.85	2N1159	1.90	2N1773A	4.05	2N3766	1.35
2N335	1.35	2N1160	2.22	2N1774	3.20	2N3767	1.50
2N350A	1.20	2N1168	1.05	2N1774A	4.95	2N3771	3.40
2N351A	1.35	2N1204	1.20	2N1775	4.90	2N3772	3.40
2N375	2.60	2N1227	1.15	2N1775A	5.80	2N3773	5.40
2N376A	1.30	2N1291	2.95	2N1776	5.50	2N3878	1.65
2N392	1.55	2N1293	4.95	2N1776A	6.50	2N3900	.28
2N396A	.50	2N1295	6.60	2N1777	6.70	2N3904	.35
2N399	1.80	2N1297	7.70	2N1777A	7.20	2N4037	.74
2N400	1.75	2N1301	1.75	2N1778	7.55	2N4041	9.00
2N401	1.20	2N1302	.29	2N1905	3.30	2N4111	4.40
2N404	.30	2N1303	.33	2N1906	5.20	2N4112	5.10
2N404A	.39	2N1304	.36	2N1971	2.30	2N4113	6.50
2N418	3.30	2N1305	.39	2N1980	3.30	2N4114	6.75
2N419	1.30	2N1306	.41	2N1981	4.05	2N4124	.23
2N420	1.60	2N1307	.43	2N1982	4.00	2N4234	1.32
2N420A	1.75	2N1308	.68	2N2061	.52	2N4235	1.54
2N441	1.60	2N1309	.72	2N2061A	.56	2N4314	.65
2N442	1.70	2N1358	2.85	2N2062	.56	2N4347	2.37
2N443	1.90	2N1359	1.55	2N2062A	.71	2N4348	3.30
2N456A	1.30	2N1360	1.80	2N2063	1.05	2N4910	1.05
2N456B	1.50	2N1361	1.90	2N2063A	1.09	2N4911	.88
2N457A	1.60	2N1362	2.65	2N2064	1.09	2N4912	1.05
2N457B	1.80	2N1363	2.85	2N2064A	1.12	2N4913	1.35
2N458A	2.10	2N1364	9.90	2N2065	1.21	2N4914	1.45
2N458B	2.25	2N1365	10.40	2N2065A	1.46	2N4915	1.55
2N459	3.05	2N1478	.80	2N2066	1.46	2N5061	.95
2N499A	2.95	2N1487	3.30	2N2066A	1.52	2N5067	1.10
2N508	.39	2N1488	3.60	2N2075	4.25	2N5068	1.30
2N554	.90	2N1489	5.40	2N2076	2.93	2N5069	1.65
2N555	.85	2N1490	6.00	2N2077	2.33	2N5598	4.50
2N561	2.60	2N1494	1.60	2N2078	2.10	2N5602	4.50
2N589	2.25	2N1495	2.40	2N2079	5.90	2N5604	5.60
2N597	1.00	2N1511	11.25	2N2080	4.15	2N5606	4.60
2N598	.97	2N1512	10.25	2N2081	2.55	2N5608	5.60
2N599	.80	2N1513	12.25	2N2082	1.95	2N5610	6.40
2N600	2.65	2N1514	14.75	2N2147	1.58	2N5612	7.50
2N618	2.75	2N1529	1.32	2N2148	1.18	2N5622	6.30
2N627	2.15	2N1529A	1.44	2N2305	4.90	2N5624	7.50
2N628	2.65	2N1530	1.45	2N2375	.68	2N5626	8.90
2N629	3.75	2N1530A	1.65	2N2490	1.93	2N5628	9.95
2N630	4.35	2N1531	2.10	2N2491	2.15	2N5632	3.65
2N637	1.80	2N1531A	2.30	2N2492	3.30	2N5633	4.05
2N637A	2.75	2N1532	2.85	2N2613	.56	2N5634	5.05
2N637B	3.85	2N1532A	3.05	2N2619	9.60		
2N638	1.87	2N1533	4.10				

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4. **Time Base Stability:** ± 10 ppm/10°C to 40°C ref temp of 25°C after 30 minutes 1 ppm/month
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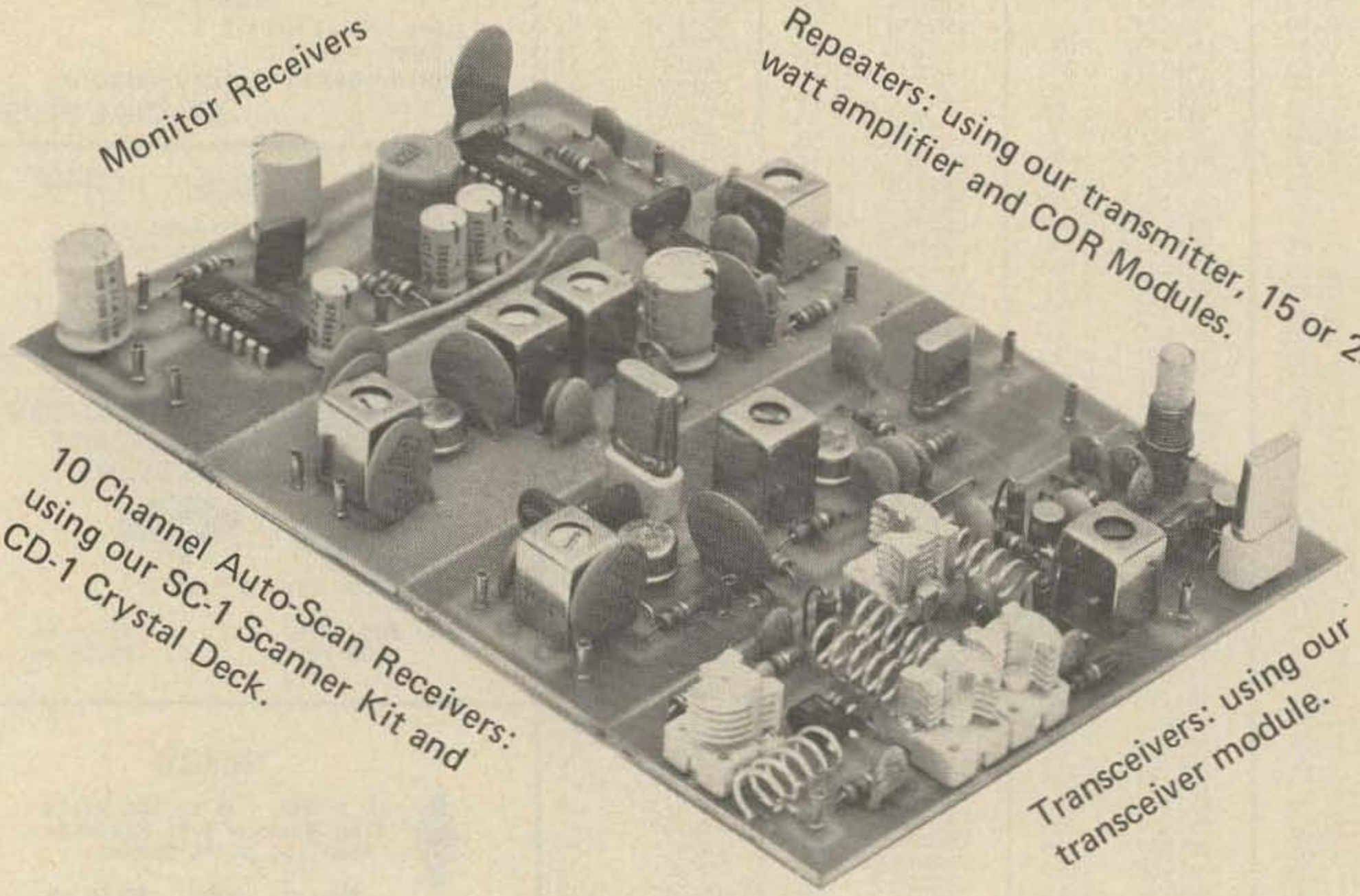

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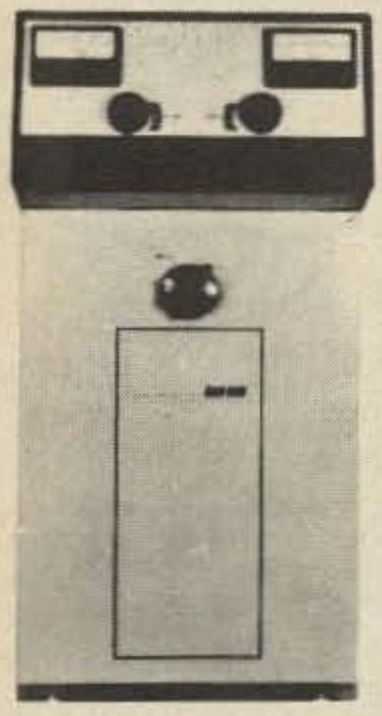

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11-48001	Pkg of 8 current limiting resistors for SLA-1	----	----	.36	.32	.28	.24	.20	16
21-10001	OPCOA SLA-11, 7-Segment, 40mA, left decimal	0.33"	Green	2.00	1.85	1.70	1.55	1.40	10
21-20001	OPCOA SLA-21, 7-Segment, 40mA, left Decimal	0.33"	Yellow	2.00	1.85	1.70	1.55	1.40	10
11-58001	Pkg. of 8 current limiting resistors for SLA-11 & -21	----	----	.36	.32	.28	.24	.20	16
24-00002	OPCOA SLA-2, ±1, 15mA	0.33"	Red	2.00	1.85	1.70	1.55	1.40	10
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24-10001	OPCOA SLA-12, ±1,40mA	0.33"	Green	2.00	1.85	1.70	1.55	1.40	10
24-20001	OPCOA SLA-22, ±1, 40mA	0.33"	Yellow	2.00	1.85	1.70	1.55	1.40	10
11-54002	Pkg. of 4 current limiting resistors for SLA-12 & -22	----	----	.20	.17	.14	.12	.10	16
23-00011	OPCOA SLA-1C, 7-Segment with Colon, 15mA	0.33"	Red	2.30	2.15	2.00	1.85	1.70	10
11-49011	Pkg. of 9 current limiting resistors for SLA-1C	----	----	.40	.36	.32	.28	.24	16
23-10011	OPCOA SLA-11C, 7-segment with Colon, 40mA	0.33"	Green	2.30	2.15	2.00	1.85	1.70	10
23-20011	OPCOA SLA-21C, 7-Segment with Colon, 40mA	0.33"	Yellow	2.30	2.15	2.00	1.85	1.70	10
11-59011	Pkg. of 9 current limiting resis. for SLA-11C & -21C	----	----	.40	.36	.32	.28	.24	16
21-00007	OPCOA SLA-7, 7-segment, 20mA, left decimal	0.33"	Red	1.50	1.40	1.30	1.20	1.10	10
11-48007	Pkg. of 8 current limiting resistors for SLA-7	----	----	.36	.32	.28	.24	.20	16
24-00009	OPCOA SLA-9, ±1, 20mA	0.33"	Red	1.50	1.40	1.30	1.20	1.10	10
11-44009	Pkg. of 4 current limiting resistors for SLA-9	----	----	.20	.17	.14	.12	.10	16
21-00008	OPCOA SLA-8, 7-segment, 20mA, left decimal	0.33"	Red	1.50	1.40	1.30	1.20	1.10	10
11-48007	Pkg. of 8 current limiting resistors for SLA-8	----	----	.36	.32	.28	.24	.20	16
24-00010	OPCOA SLA-10, ±1, 20mA	0.33"	Red	1.50	1.40	1.30	1.20	1.10	10
11-44009	Pkg. of 4 current limiting resistors for SLA-10	----	----	.20	.17	.14	.12	.10	16
21-10008	OPCOA SLA-18, 7-segment, 40mA, left decimal	0.33"	Green	1.50	1.40	1.30	1.20	1.10	10
11-58008	Pkg. of 8 current limiting resistors for SLA-18	----	----	.36	.32	.28	.24	.20	16
24-10010	OPCOA SLA-20, ±1, 40mA	0.33"	Green	1.50	1.40	1.30	1.20	1.10	10
11-54010	Pkg. of 4 current limiting resistors for SLA-20	----	----	.20	.17	.14	.12	.10	16
21-20008	OPCOA SLA-28, 7-segment, 40mA, left decimal	0.33"	Yellow	1.50	1.40	1.30	1.20	1.10	10
11-58008	Pkg. of 8 current limiting resistors for SLA-28	----	----	.36	.32	.28	.24	.20	16
24-20010	OPCOA SLA-30, ±1, 40mA	0.33"	Yellow	1.50	1.40	1.30	1.20	1.10	10
11-54010	Pkg. of 4 current limiting resistors for SLA-30	----	----	.20	.17	.14	.12	.10	16
21-00003	OPCOA SLA-3H, 7-segment, 30mA, right decimal	0.77"	Red	5.50	5.10	4.70	4.30	3.90	10
11-48003	Pkg. of 8 current limiting resistors for SLA-3H	----	----	.36	.32	.28	.24	.20	16
21-20003	OPCOA SLA-23H, 7-segment, 30mA, right decimal	0.77"	Yellow	5.50	5.10	4.70	4.30	3.90	10
11-58003	Pkg. of 8 current limiting resistors for SLA-23H	----	----	.36	.32	.28	.24	.20	16
24-00004	OPCOA SLA-4H, ±1, 30mA, right decimal	0.77"	Red	5.50	5.10.	4.70	4.30	3.90	10
11-45004	Pkg. of 5 current limiting resistors for SLA-4H	----	----	.24	.21	.18	.15	.12	16
24-20004	OPCOA SLA-24H, ±1, 30mA, right decimal	0.77"	Yellow	5.50	5.10	4.70	4.30	3.90	10
11-55004	Pkg. of 5 current limiting resistors for SLA-24H	----	----	.24	.21	.18	.15	.12	16
29-00125	OPCOA 9B125, 9-digit calculator display	0.125"	Red	10.00	9.25	8.50	7.75	7.00	10
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220 MHz	Double	35 dB	2.5 dB	$18.50	$24.50
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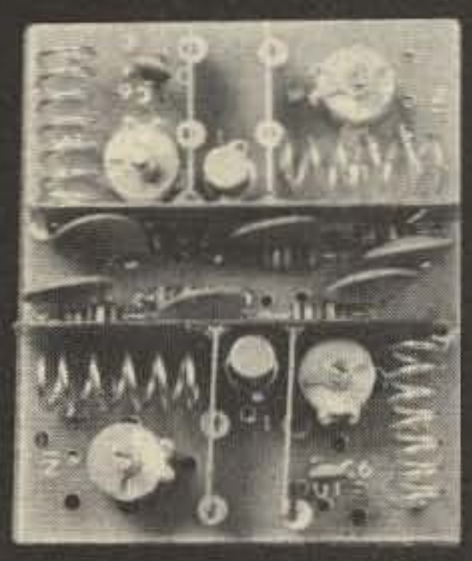

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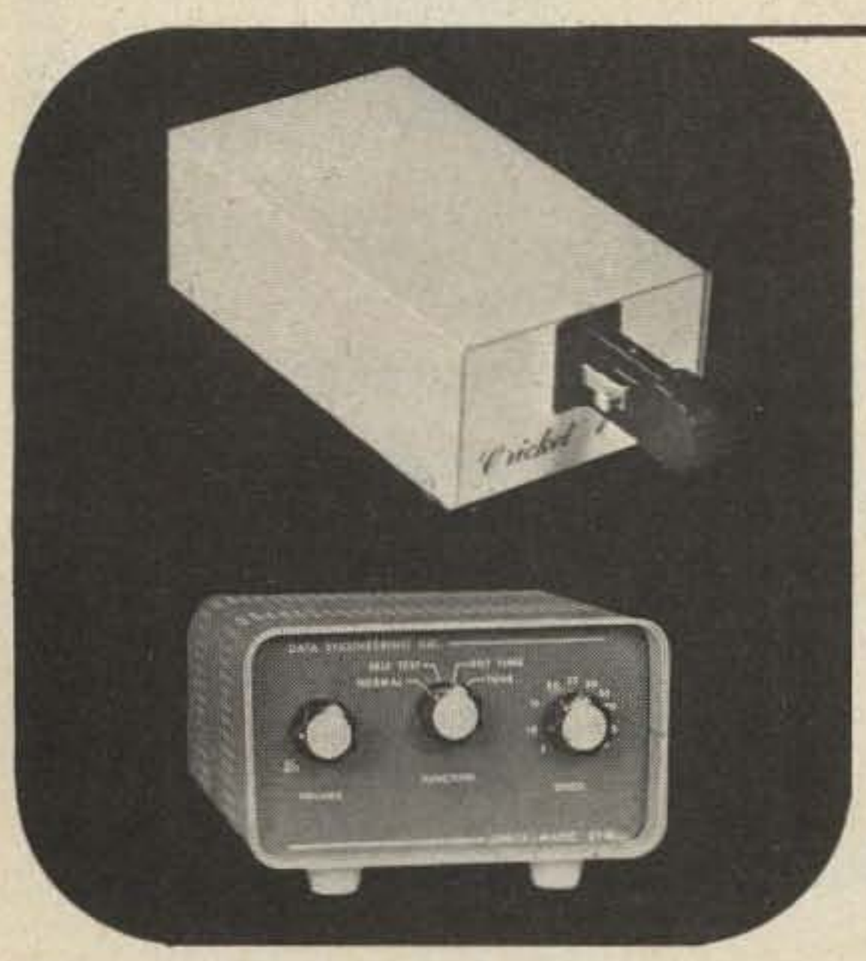

CRICKET 1

A popularly-priced IC keyer with more features for your dollar. Cricket I is small in size and designed for the beginner as well as the most advanced operator. It provides fatigue-free sending and its clean, crisp CW allows for easy copying at all speeds. Turned on its side, the Cricket can be used as a straight key for manual keying. Right or left hand operation. AC/DC.

Shipping Weight 3 lbs. $49.95

SPACE-MATIC 21B

The SWITCHABLE Keyer — eight keyers in one! Selectable dot/dash memories, and character/word spacing. The perfectly-timed code sent by the SM-21B is as easy to copy as "Tape Code", and it gives the sender a distinguished "professional fist". When you buy the Space-Matic, you buy a "keyer for keeps". No need to trade next year for another keyer with additional features. They are all here today — in the SPACE-MATIC 21B!

Shipping Weight 4 lbs. $119.50

Clegg & HAMTRONICS

two great names important to you...

one has the other in stock, ready to ship.

FM

CLEGG 27-C???
Rumors are confirmed
at HAMTRONICS—

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Factory Warranty Station —
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Call and ask for our
Special Surprise Packages.

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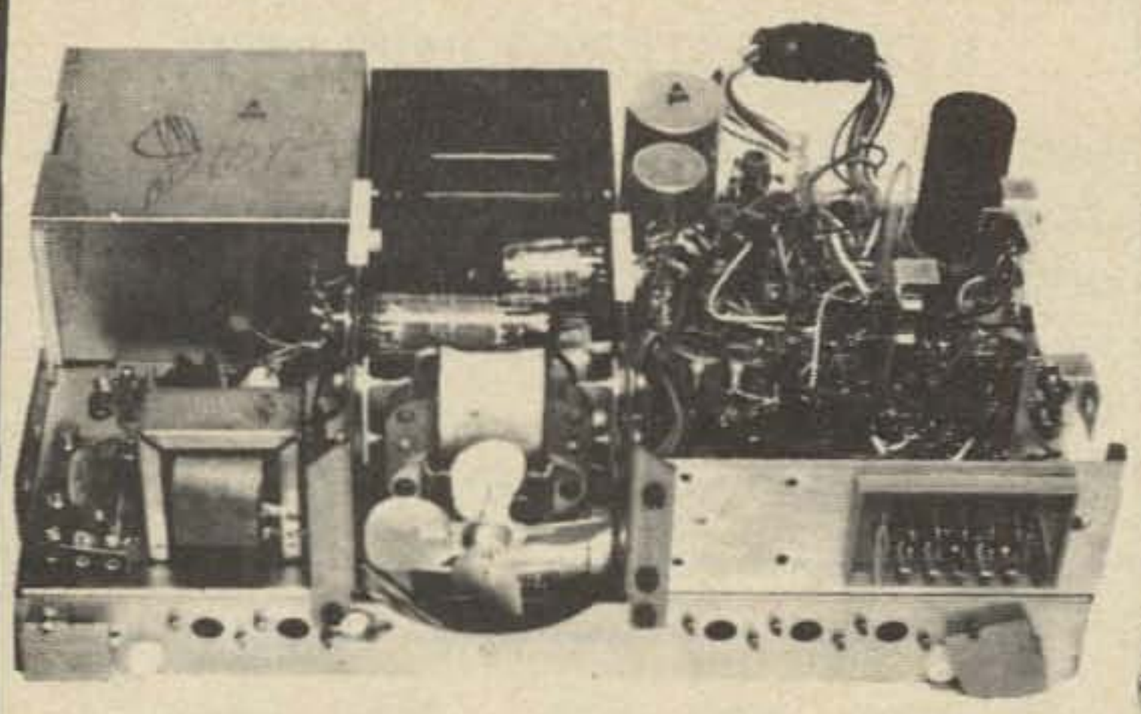
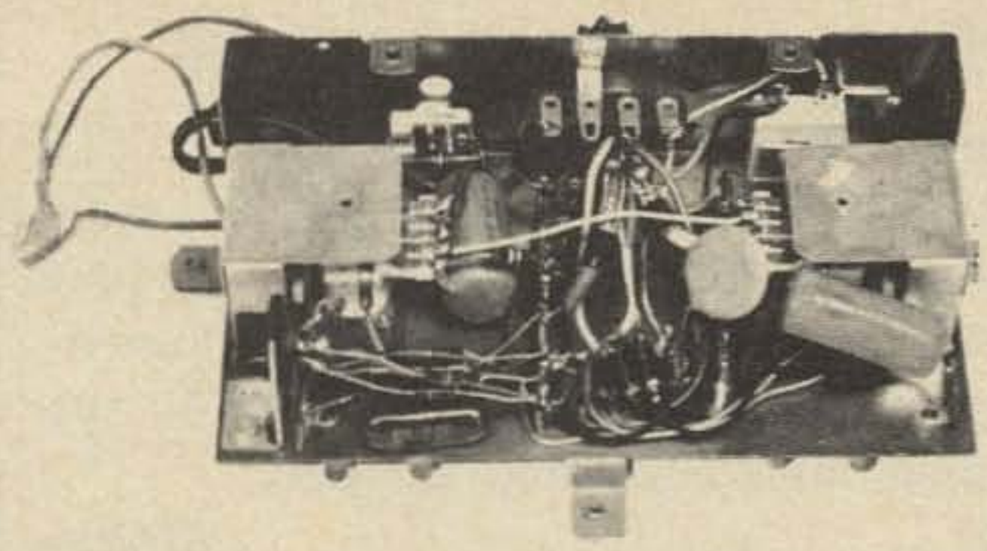




PAY TV ASSEMBLY $15.00

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**

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

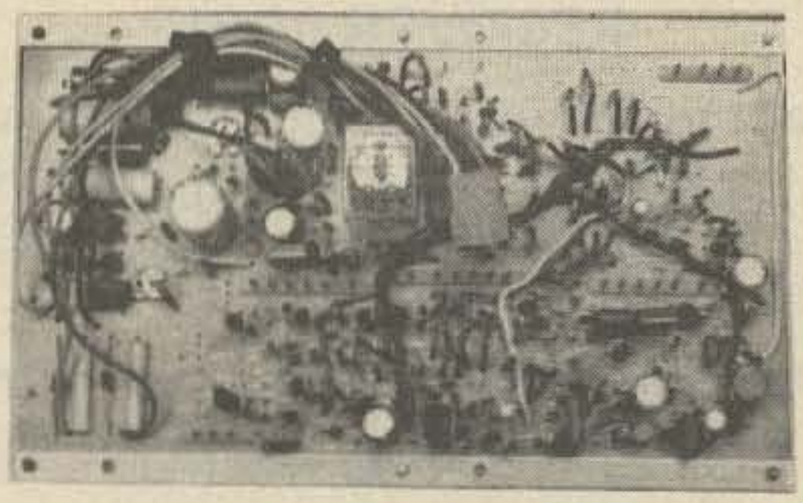
Brand new fully assembled, ready to install in your car to give 3rd dimension concert hall effect. Complete with instructions, rear seat speaker, grill, wires, plugs.

#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 $7.50



TV POWER SUPPLY & TRANSPORT CIRCUIT

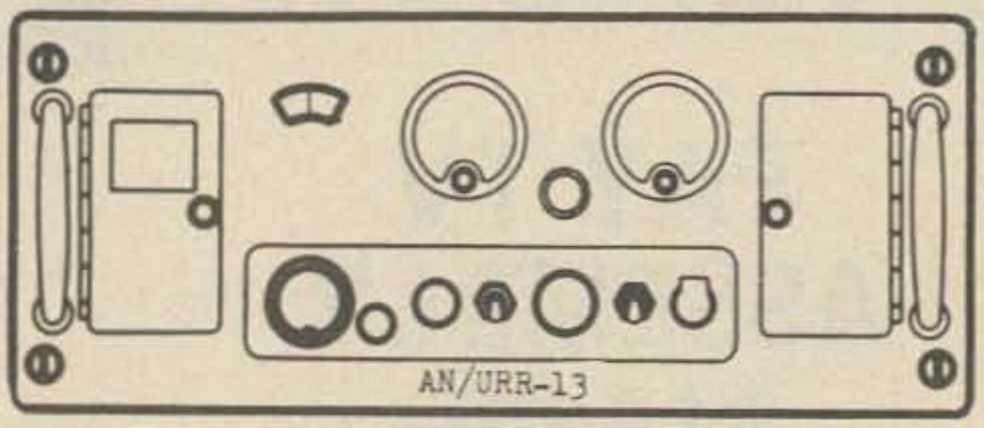
A complete assembled PC board, spares from a video tape machine. Many many fine components to be found. One section of the board used as a 12 volt and 24 volt regulated power supply. You add the transformer and output will be 24 volts transistor regulated as well as another output of 12 volts transistor 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



URR–13 RECEIVER

Listen in to jet planes, Air Force 1, U-2 spy planes, FBI, etc. They use the frequency covered by this receiver . . . 220 to 400 mc. Possibilities of covering the 220-450 mc band by re-tuning. Operates from regular 115 Volt 60 cycle, requires only antenna and speaker. Tuneable through the frequency, direct reading dial. Schematic and write up on this set furnished.

Visually OK condition . . . URR-13 - $50.00

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.

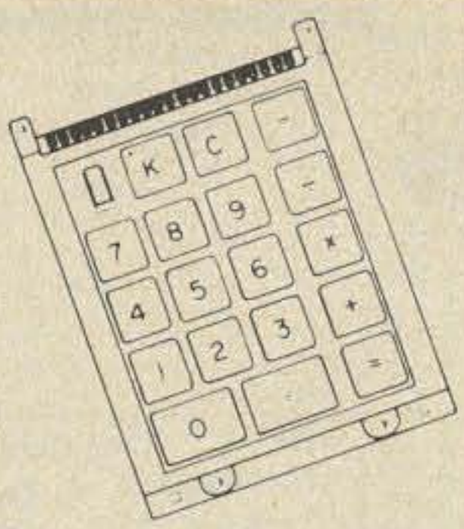
6 WATT $10.00
10 WATT $15.00

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**

Meshna *NEW 96 PAGE CATALOG NOW READY*



CALCULATOR KEYBOARDS

Brand new keyboards for hand held calculators. Two styles available. One for CAL TEX 5001–5002–5012 or MOSTEK 5010–5012. Another for use with GEN INSTR C500.

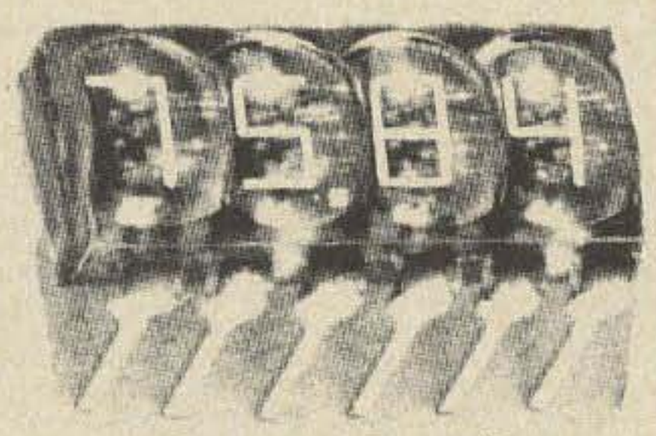
$8.00 each, 2/$15.00

CT 5005 CALCULATOR ON A 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 and bargain priced. With Specs.

$8.00 each, 2/$15.00

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 $8.00 per strip of 4 digits. Two strips (8 digits) $15.00. Another strip . . . this one a clock readout. The strip has 2 digits . . . space . . . 2 digits. Perfect for reading hours & minutes.

$8.00 per strip, 2/$15.00

CMOS 4814 HEX INVERTER

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

$1.00 each, 12/$10.00

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

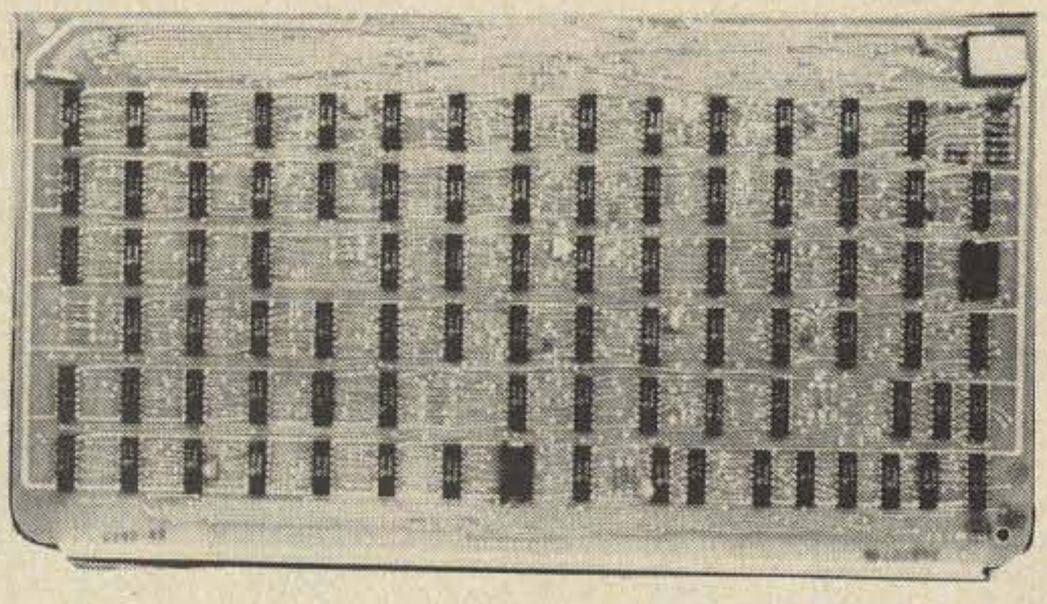
Rare item. See Pop. Elect. Mag. Oct. 1973 for uses. In 14 pin DIP package.

#8038C **$9.95 each, 2/$18.00**

ASCII KEYBOARDS W/ENCODER

New or like new. Extra function buttons. Open faced, no cabinet. Schematic provided. Price is postpaid world-wide.

$47.00



7400 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 also have these in ST 600 series DTL. So give your choice . . . 7400 series or ST 600 series. Mix-N-Match if you wish.

#SAN **$6.00 each, 6/$25.00**

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

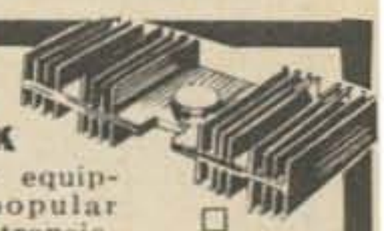
LIMITED OFFER!

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

	Type	Sale
☐	SN7400	$0.24
☐	SN7401	.24
☐	SN7402	.24
☐	SN7403	.24
☐	SN7404	.26
☐	SN7405	.26
☐	SN7406	.45
☐	SN7407	.49
☐	SN7408	.27
☐	SN7409	.28
☐	SN7410	.24
☐	SN7411	.31
☐	SN7413	.89
☐	SN7415	.49
☐	SN7416	.49
☐	SN7417	.49
☐	SN7420	.24
☐	SN7421	.55
☐	SN7422	.31
☐	SN7425	.50
☐	SN7426	.33
☐	SN7430	.24
☐	SN7432	.35
☐	SN7437	.49
☐	SN7438	.52
☐	SN7440	.24
☐	SN7441	1.19
☐	SN7442	1.12
☐	SN7443	1.12
☐	SN7444	1.25
☐	SN7445	1.19
☐	SN7446	1.29
☐	SN7447	1.29
☐	SN7448	1.35
☐	SN7450	.27
☐	SN7451	.31
☐	SN7453	.31
☐	SN7454	.43
☐	SN7455	.31
☐	SN7460	.27
☐	SN7461	.27
☐	SN7462	.35
☐	SN7464	.43
☐	SN7465	.43
☐	SN7470	.36
☐	SN7471	.55
☐	SN7472	.41
☐	SN7473	.49
☐	SN7474	.49
☐	SN7475	.85
☐	SN7476	.53
☐	SN7478	.85
☐	SN7480	.65
☐	SN7481	1.25
☐	SN7482	.99
☐	SN7483	1.15
☐	SN7485	1.15
☐	SN7486	.49
☐	SN7489	3.10
☐	SN7490	.85
☐	SN7491	1.35
☐	SN7492	.85
☐	SN7493	.85
☐	SN7494	1.05
☐	SN7495	1.00
☐	SN7496	1.00
☐	SN74106	.95
☐	SN74107	.51
☐	SN74108	.95
☐	SN74112	.95
☐	SN74113	.95
☐	SN74114	.95
☐	SN74121	.61
☐	SN74122	.69
☐	SN74123	1.05
☐	SN74125	1.45
☐	SN74126	1.45
☐	SN74139	1.25
☐	SN74140	2.50
☐	SN74145	1.19
☐	SN74148	4.50
☐	SN74150	1.19
☐	SN74151	1.00
☐	SN74152	4.95
☐	SN74153	1.39
☐	SN74154	1.69
☐	SN74155	1.29
☐	SN74156	1.45
☐	SN74157	1.45
☐	SN74158	1.45
☐	SN74160	1.85
☐	SN74161	1.59
☐	SN74163	1.75
☐	SN74164	2.10
☐	SN74165	2.10
☐	SN74166	1.85
☐	SN74173	1.85
☐	SN74174	2.20
☐	SN74175	2.60
☐	SN74176	1.85
☐	SN74177	1.85
☐	SN74179	1.85
☐	SN74180	1.10
☐	SN74181	4.10
☐	SN74182	1.05
☐	SN74185	2.50
☐	SN74192	1.55
☐	SN74193	1.50
☐	SN74194	1.55
☐	SN74195	1.10
☐	SN74196	1.25
☐	SN74197	1.10
☐	SN74198	2.35
☐	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

3 for $18. ☐ Only $6.95

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 . . 9.95 with 3-function memory.

KRONOS WITH "TIME BASE"*

Cabinet is 6" x 5½" x 6".

$47. Any Type Clock less time-base NEW FOR 1974!

* With TIME BASE $64.95

CHOOSE YOUR READOUT

	Type	LED	Charac.	Sale
☐	KR-101	MAN-3	.12	$47.
☐	KR-103	MAN-4	.19	47.
☐	KR-104	Nixie*	.45	47.
☐	KR-105	707†	.33	47.
☐	KR-106	704†	.33	47.
☐	KR-107	SLA-1†	.33	47.
☐	KR-108	Same as SLA-1 but GREEN, add $12.		

† "MAN" LED readouts are "all LEDs" but the Litronix 707 and Opcoa SLA-1, like the MAN-1, are of the reflective bar segment technique, the 704 is the reflective bar version of the MAN-4. *The Nixie tube is a 7-segment device as others.

- Now two clocks in one!
- For 12VDC* 110VAC!
- Now adaptable to boats, planes & cars too!
- One price for any LED!
- The only clock of its kind in USA today!
- 12 or 24-hr clock

Scientific Devices introduces the new any LED Kronos digital clock. That's right, you can choose the "ALL-LED" Man-1, Man-3, and Man-4, and the new reflective bar types with the larger digits, at only one price, $47. This is a Scientific Device first! We even hav the GREEN LED readouts at a slightly extra cost. We have more . . . for $19.95 we have available as an (*) extra option to Naval Observatory your clock, or making it an all-purpose all-duty unit. For indoor and outdoor activity. This **"TIME BASE"** is the simplest on the market today with the help of one of the largest time base manufacturers for the famous digital wrist watches. Therefore, current drain is negligible, not like other cumbersome types. It's easy to construct, easy to slip into the Kronos of your choice and connect with easy instructions. Its overall design is simple and easy to construct. The kit is complete with famous black-and-white TEN-TEC cabinet, plus all accessories with booklets. Features include 3 setting controls, 1-hour per second, 1-minute per second, and hold button. KR100 series is a Scientific Device exclusive!

CRYSTAL TIME BASE FOR ANY KRONOS*

☐ $19.95

Includes precision crystal, time-base IC, pc board & accessories with info.

*Not for KR-104

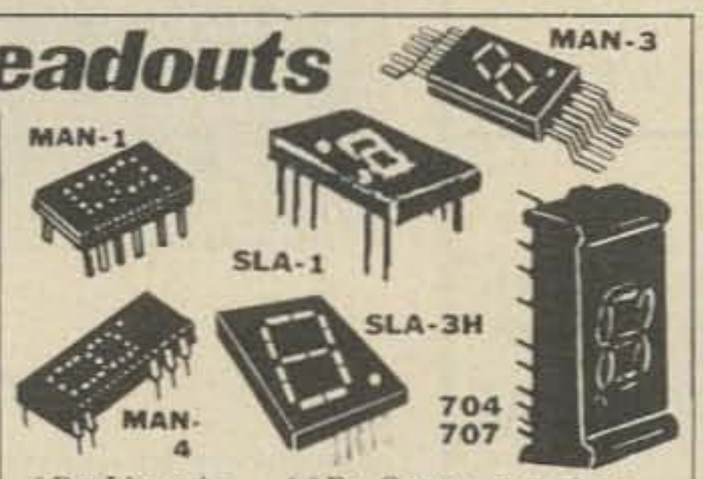
7-SEGMENT LED Readouts

(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	2.50	3 for $6.
SLA-3**	.70	5.95	3 for $15.
SLA-11**	.33†	4.95	3 for $12.



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

FIRST TIME!

WHY BUY MULTIDIGIT REJECTS!

9 DIGI-METER READOUT FOR PANEL INDICATION

☐ $14.95

Buy 3 take 10%

Imagine, nine 7-segment MAN 3's mounted in a red molded plastic 2½" x 1" x ½" meter like case. Properly multiplexed. For PC use. Unique panel-like construction lends itself to 1000's of DIGI-METER applications for hand-held, panel and table instruments. Instructions.

LED MITY DIGIT "DCM'S"

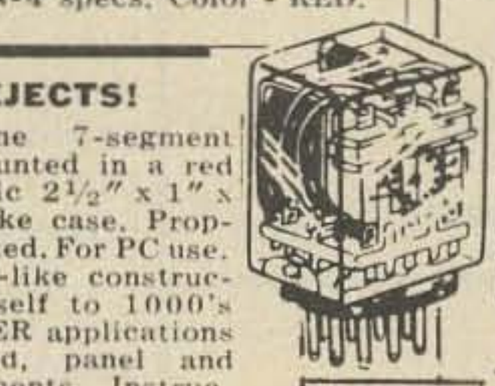
Buy 3 — Take 10%

Scientific Devices "Digital Counting Modules" outperform any other DCM on the market today. More features than ever before! Not gaseous, not incandescents, not nixie but the modern LED. Choose from such famous manufacturers as Monsanto's MAN-1, MAN-4, Litronics 707 and 704, Opcoa's SLA-1 (the last 4 having character heights of 0.33 at no extra charge). Each kit includes 3x2" p.c board with fingers for a FREE edge connector, side-mounting dip socket, LED readout of your choice, resistors, 3 IC's, and Molex connectors (this ELIMINATES SOLDERING YOUR IC's), and booklet. **INCLUDES P.C. EDGE CONNECTOR — FREE!**

Only $9.99

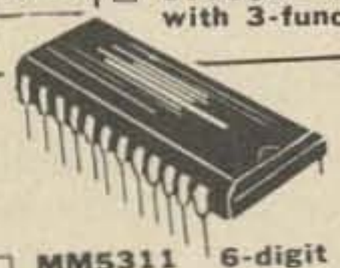
READOUT	Char.	Maker
☐ MAN-1	.27 h.	Monsanto
☐ MAN-4	.19 h.	Monsanto
☐ 707*	.33 h.	Litronics
☐ 704**	.33 h.	Litronics
☐ SLA-1*	.33 h.	Opcoa

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



CLOCK CHIPS ON A "DIP"

ANY CHIP $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

☐ 1-MM5316, DIGITAL ALARM CLOCK FACTORY FALLOUT — $1.49 EACH

LINEAR Op Amps

• FACTORY GUARANTEED • FACTORY TESTED • FACTORY MARKED

BUY ANY 3 — TAKE 10%

☐	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
☐	703C RF-IF, amp, 14 ckts (TO-5)	.69
☐	704 TV sound IF system	1.50
☐	709C Operational amp (A)	.33
☐	710C Differential amp (A)	.47
☐	711C Dual diff. comp (A)	.47
☐	723C Voltage regulator (A)	.75
☐	733 Diff. Video Amp	1.75
☐	741C Frequency compensator 709 (A)	.44
☐	741CV Freq. comp 709 (Mini DIP)	.49
☐	747C Dual 741C (A)	.89
☐	748C Freq. adj. 741C (A)	.69
☐	753 Gain Block	1.75
☐	739-739 Dual stereo preamp	1.98
☐	741-741 Dual 741C (TO-5)	.89
☐	PA265 5-Watt voltage regulator	1.50
☐	ULN2300M Op amp with SCR	1.50
☐	CA3065 Video Audio system	1.05
☐	75451 Dual peripheral driver	.44
☐	75453 Dual peripheral driver	.44
☐	75491 Quad seg driver for LED readouts	1.65
☐	75492 Hex driver w/col. out 250 ma. For LED readouts	1.85

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

Potter & Brumfield KAP RELAYS

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

CENTRAL UNITED STATES TO:

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

WESTERN UNITED STATES TO:

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

A = Next higher frequency may be useful also.
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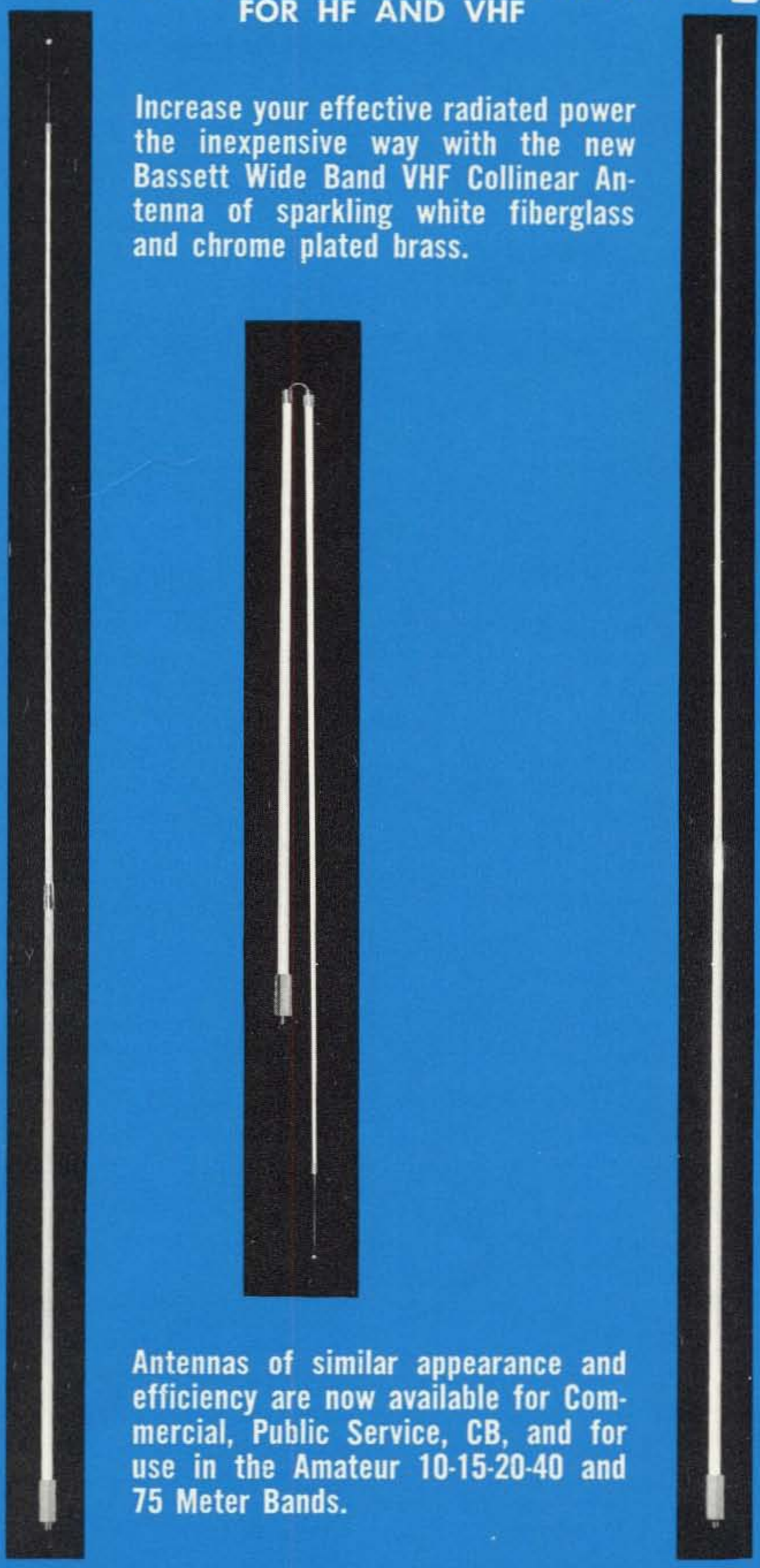

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