6 up The VHF magazine

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50db UNDER THE NOISE a break-through

The Flying Noise-Lock .. K2TKN

Also in this issue:

F[illegible] Jim Kyle K5JKX

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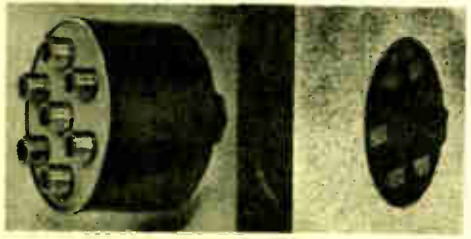

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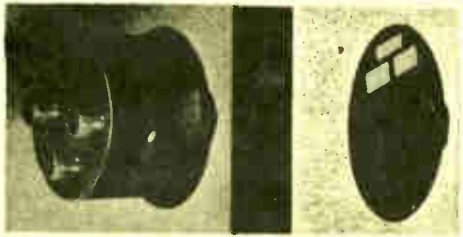

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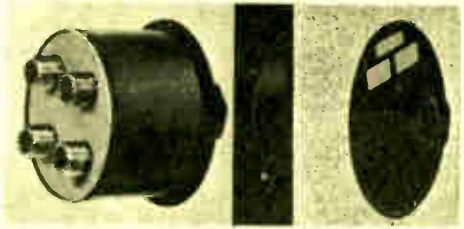

COAXIAL TRANSFER SWITCH — Model 336

Waters Manufacturing, Inc., Wayland, Massachusetts

. . . de K5JKX

ABOUT DERNED LITTLE . . .

Ever find yourself called upon to speak in public and discover you just didn't have anything to say right then?

You who have been watching me get my foot in my typewriter for lo these many months may not believe it, but that's the spot I'm in this month. An editorial to write, and nothing to say.

The K3IOP case is proceeding, and at the moment there's not much we can do about it except wait. Similarly, the one out in Santa Barbara is grinding through the "mills of the gods" and about all we do is wait (although for that one, we can send along a buck or two—it goes to the Santa Barbara Amateur Radio Defense Fund, P. O. Box 273, Santa Barbara, Calif., Zip 93102, and will be used to finance the upcoming court battle).

Lids we still have with us, but probably we always will. Those who disbelieve my pessimism can refer to the writings of The Old Man in ancient QST's. The only difference, then and now, is that the lids he was blasting are among today's honored and revered old-timers!

So in the absence of any real soapbox to clamber up on this month, and with no really hot gripe to sound off about, maybe I ought to take some space to tell you a little more about 6Up and its staff.

Of course most of you know that printing and the financial end of the magazine is taken care of by Wayne up at 73ville (if you can't find that in your atlas, look for Peterborough, N.H.). Down here, the editor, typesetter, illustrator, proofreader, and general flunky is yours truly ably assisted by some 12 purebred cats. Among our other interests we're nutty about felines, and "Cat City" is the result. Most of them are Persians, but there's a Burmese, an Abyssinian, and a Russian Blue around too. As this is being written, the room which serves as the 6Up office is also being used as an isolation ward (we're having a fungus, which is no fun for a longhaired cat) and five of the felines are curled around the copy.

Besides the cats, there are a couple of dogs. One thinks she's a cat too, and the other just sort of tolerates the whole mess. Among human types (though some people claim this is stretching a point) there are ye ed, the better (by far) half, three male-variety offspring who keep the noise level at +180 dbkw most of the time, and any passing ham with enough courage to brave the menagerie.

To all of this confusion, add the special equipment needed to put together a magazine, plus one peripatetic ham station, a garage full of surplus and shop gear which somehow keeps ending up on the dining room table, and a den of Cub Scouts who invade regularly every Monday afternoon. Whoops, I forgot to list the hamster! Stir well. You begin to get a picture of life at 1236 NE 44.

Not that I'm complaining. It's fun, in its own special way. If it weren't for the necessity of earning a living for everybody (which is also done with the typing machine, as a glance at the pages of 73 will verify), it would be like a permanent vacation.

But again there are days (like this one) when all the cats are sick, the dogs are feeling puny too, the people have the flu, and in general the confusion reaches its peak. On days like this, one wonders.

Usually, though, when this begins to happen, the phone will ring. It turns out to be a 6Up reader, passing through our fair city, who'd like to stop by and visit. This brightens everything up again, even if the mag does get out a day or so late.

Ooops, pardon me. The phone's ringing. I think it may be another passer-by who wants to visit.

What do you think? —K5JKX

Improving the FCV-2

All kinds of 2-meter converters are in use these days. But not too long ago, the International Crystal model FCV-2 was one of the hottest converters available for people who didn't want to go to the expense of a 417A or 416B. They're still in production, and thousands of them must be out and around.

A few months ago, I needed to get on 2 meters in a hurry. The transmitter was easy, with the constructional assistance of W5PPE, but the receiver posed a bit of a problem. Time was too short to do what I would have liked (build a really hot job) so I poked through the collection of older gear, and came up with a bare FCV-2, minus tubes and crystal.

A little more digging brought the rock to light. But try as I might, I couldn't find a 6BK7 in the shack. Newer and hotter tubes, yes, but the old cascode buddy, no.

About this time, a light dawned. A hot converter would be better than one which wasn't so sensitive. And if I could find a quick and easy way to soup up the old board, it might be of some help to other guys with the same type of converter.

A search of available tubes revealed a couple of 6DJ8 dual-triodes. This little bomb, with a transconductance of 12,500 micromhos under normal operating conditions, is nearly twice as sensitive as the 6BK7. While it takes less plate voltage, it has twice the gain and much less noise.

What's more, the pin connections are the same. It didn't take much thinking to decide that this tube just might be the answer to the problem.

A double-check with the tube books let me know that it had a chance of working. While the 6DJ8 requires a bit more bias, it also draws a bit more plate current, so the same cathode resistor works fine. The only questions left were (1) would the 6U8 oscillator still function at reduced plate voltage, and (2) would the neutralizing coil need modification?

Tubes were plugged in and connection made to a 90-volt power supply. The oscillator took off nicely, with only a bit of retuning necessary. Unfortunately, the front end oscillated a bit too. The neutralizing coil did need modification.

However, replacing the original coil with a new one, wound of 4 turns of No. 18 on a 1/4-inch drill bit as a form, did the trick. A little stretching and squeezing of the coil brought the regeneration and noise under complete control.

It would be nice to be able to say that the modified FCV-2 outperforms a Nuvistor or a 416B, but unfortunately it's not quite true. It is in the same league as the 6CW4, though. So far I have been able to hear all signals heard by Nuvistor-equipped stations here, when others using unmodified cascode-type units haven't been. Total cost is the price of the tube (not much) and the time requirement is only that needed to replace the neutralizing coil and hook to a low-output power supply.

While I haven't tried it, there's no reason to believe this won't work with just about any cascode-type converter using a 6BK7, 6BQ7, 6BZ7, 6BC8, etc. The same trick should work on Six; neutralization shouldn't be needed. —K5JKX

BETTER THAN EVER FOR '64!

Clegg's GREAT NEW

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HERE'S THE ULTIMATE RECEIVER FOR THE SERIOUS VHF OPERATOR WHO WANTS TOP PERFORMANCE ON AM, CW, OR SSB

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Converter input provides for 220 - 432 mc and up, as well as for excellent general coverage of the lower frequency bands using Clegg's new ALLBANDER converter speaker combination (described to the right).

Space will not permit a complete description of this fine new receiver, but we'd like to suggest that you see one at your dealers or write to the factory for complete data

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Flying Noise Lock

Strong noises—weak signals or the flying noise-lock system—

Bill Ashby K2TKN
Box 97—Sunset Lake
Pluckemin, N. J.

Like the weather, every one cusses noise but few attempt to do much about it, except trying to learn to squint their ears, which isn't easy.

Noise comes in various forms and intensities and it is pretty hard to find any two of the hundreds of noise definitions in print that describe the same thing.

For our purposes, let's say noise is detectable energy that never happens twice in the same place or the same way.

This lets out ignition noise, power line leaks, rotating or vibrating contact arcing; i.e.: repetitious pulse trains of wide bandwidth; for modern circuitry—noise blankers—rhododendron swamp hole punchers, etc., have pretty well settled their hash.

We are talking about electron motion noise. That non-coherent crud that is generated in infinite amounts throughout the whole galactic universe; measurable amounts when current is passed thru a hot resistor; and microwatts of which, in the input stage of any receiver, keeps us from hearing weak signals. "Johnson noise" as it is usually termed, is smooth and evenly distributed, but totally non-coherent. If a channel of 10 kc width centered at 450 kc was mixed with a channel of 10 kc bandwidth of the same shape factor but centered at 460 kc in a linear mixer the noise in each channel would neither add nor subtract, you would just get noise. The instantaneous peak value depending on the value in either channel at that instant and the gain or loss in the linear mixer.

This is an extremely controversial subject and the above definition treads on some highly educated toes, but remember nothing was mentioned about averages, non-linear detection, pre- or post-detection integration or attempting to measure finite values of noise power. All of these complicate the above picture to the nth degree and has been known to drive long friends at each other's throats with bare knuckles, knashing teeth and bloodshot eye.

Since we aren't going to discuss any of these, let alone try to use them in practical circuits, we will let the communication theory hounds worry these points into obscurity.

If you were to look at the output of one of the forementioned *if* channels with a wide-band, ultra-fast rise and fall-time scope operating well below the overload point, you would describe the pattern as very fine, continuously changing grass growing equal distances up and down. Widening the pass-band of the *if* channel would make the grass finer in changing detail and severely narrowing it would give a coarse, ever changing structure. At any instant in time it can have any amplitude, frequency or phase and it may or may not be the same at any other instant—in other words, complete non-coherence. It is extremely doubtful that noise in this state can be modulated or detected without serious changes in its basic structure.

Mixtures of very weak signal and lots of this type of noise are extremely difficult to picture. It is not really known if the noise rides on top of the signal or vice versa or whether they just intermingle. We do know that any attempt to measure or detect any part of this mixture with a non-linear or averaging circuit of any kind wipes out the smaller variations and squelches out the weak signal. By weak signal, we mean one whose peak value is 20 to 30 db under the peak values of the associated Johnson noise in the circuit. By using all linear circuits in your rcvr (product detector-BFO, etc.) CW signals that are 30 db below the peak value of the noise can be heard and with long practice slow CW can be read by a very expert ear when approximately 20 db below the noise peaks. It is doubtful that unknown signals of these intensities can be located or acquired by tuning this type receiver unless they peak up occasionally to much higher levels.

The commercials and military people have a number of systems that can pass useful information over circuits where the received signal is this far down in the noise. The majority of these are closed loop systems of little value to independent amateur operation. In these, some definite form of information is included in the transmitted signal and the receiver does not actually detect but correlates to locate this pattern of information out of the morass of noise. Another way to describe this —a key shaped block will only pass thru a key shaped hole—the round, square, oblong and triangular ones are ignored. If the receiver knows exactly the frequency—in fact, the exact received phase of the desired signal, then digging 30 db inside the peaks of noise is no problem.

What then, could two independent amateurs, half way around the world from each other, do to realize some measure of improvement in very weak signal in the presence of strong

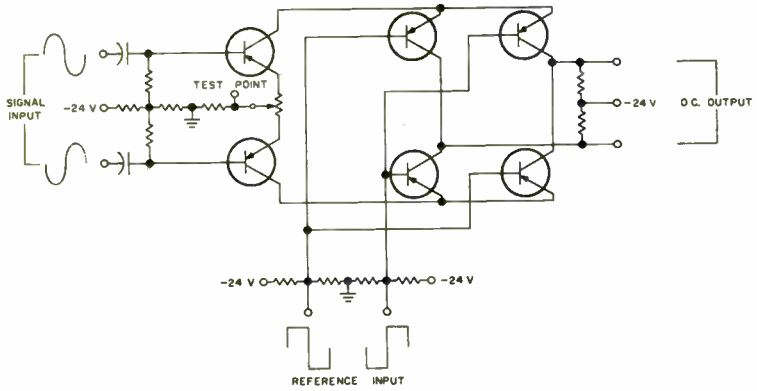


FIGURE 1

noise reception? This might be on 20 meters when the band is dead or on 432 mc using the moon as a reflector, but we must have a channel that is free of QRM. We want to get below that weak signal threshold that is so apparent in every receiver when a weak signal fades abruptly into the Johnson noise of its front end.

Many schemes have been tried by various amateurs—use of WWV as the phase lock identification; Dicke Astronomy setups with high speed switching between antenna and controlled noise source with synchronous detection, to achieve a hair-trigger balance that nulls out all receiver noise; and the only one that has given any concrete results—fantastic stabilization of the transmitted frequency to the extent that phase coherence between it and a stable BFO could be integrated inside a human head. A number of simple and very complex open loop phase-lock systems have been attempted (AFC of the L.O. or BFO to stay in phase stable relationship to received signal) but all seem to require very strong signal peaks to lock up so aren't much good, or noise peaks kick them off the desired signal, which is disastrous.

Flying Noise-Lock System

In experimenting with many variations of a number of the above systems, it became obvious all depended on a phase detector that really was just that. It had to be linear to both signal and noise and to give output that was a true measure of phase between a known and an unknown and to reject by at least 30 db any improperly phased inputs and particularly suppress input amplitude variations for these would be primarily noise. Since inventing such a circuit could be hard work I spent some time in research (lifted the circuit from a piece of equipment designed for another purpose). This is a double-balanced modulator that really is almost idiot-proof (Figure 1).

The diagonally opposed transistors are switched on and off by the square wave reference frequency. When they are switched on they are amplifying in a linear manner during that half cycle. In this way when the incoming signal is exactly in phase with the reference, the two transistors connected to one collector load resistor draw increased current and the other two less so there is a several volt dc difference between the collector ends of the balanced collector load resistors. 180° phase difference reverses this dc difference, and random phase gives zero dc output.

Random phase relative to the references or amplitude variations at either input such as noise result in some noise output but this will be attenuated by at least 30 db if the circuit is not overloaded.

Since the phase of a desired weak signal is not known, we are going to look for it. The very weak noise output from the balanced modulator caused by random phase and noise peaks is amplified in a linear dc amplifier and applied as AFC control to the base of a

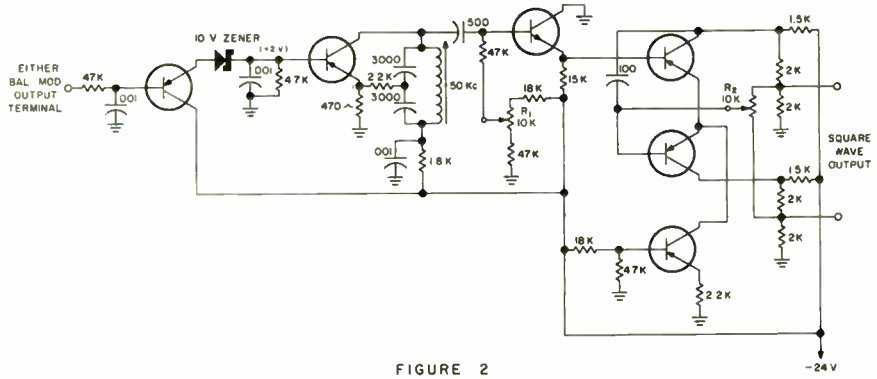


FIGURE 2

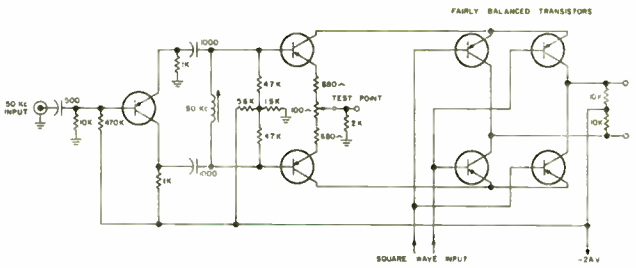


FIGURE 3

transistor whose collector-emitter circuit form a reference oscillator. The output of this is fed to a Schmitt trigger to form the symmetrical square wave required by the balanced modulator. Just enough filtering time constant is used to keep the AFC circuit from oscillating, but yet allow a wide band of positive and negative noise pulses to sweep the reference oscillator back and forth at random noise rates (Figure 2).

The result is very complex but can be simply described by the apparent action. It appears to lock up on every random noise pulse that gets thru the balanced modulator. If this pulse is moving in frequency—so does the reference oscillator—locked on. During this instant there is dc output from the balanced modulator for the oscillator is either exactly in phase or out with the noise pulse and this establishes the flying lock. But a noise pulse doesn't last—it moves clear off frequency or dies in amplitude and at its AFC minimum threshold the circuit jumps to the next best noise pulse available. This may result in the oscillator locking up in the same phase or opposite resulting in dc output from the balanced modulator of opposite polarity. Because noise is completely random the output circuit flops back and forth in polarity and amplitude of dc in a totally random manner for there are are just as many flings as there are flangs even during a few miliseconds (Figure 3).

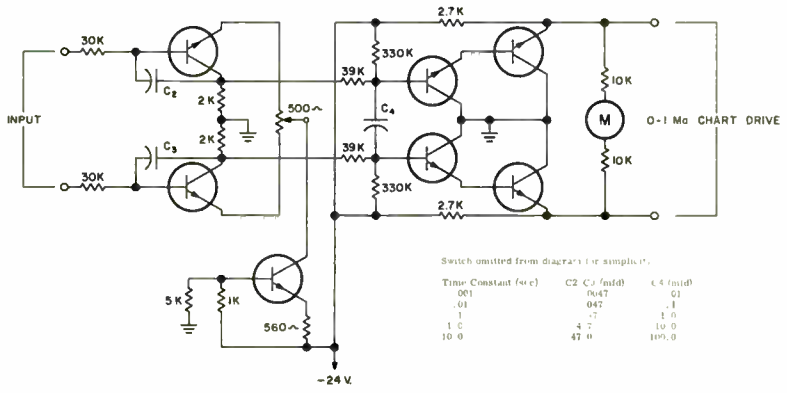
By means of a cathode or emitter follower, a volt or so of linear *if* signal is stolen from the last *if* in the station receiver. The BFO and all non-linear detectors must be decoupled or disabled.

This linear *if* output is fed to a split phase inverter to feed the double balanced modulator, rather than use a center tapped *if* transformer that could restrict or modify the frequency response at this point. The balanced driver transistors match the input impedance of the emitters of the balanced modulator. The total gain of these stages is not enough to produce non-coherent noise at the output without *if* input so that the reference oscillator rests on its natural frequency which should be approximately centered in the *if* passband of the receiver.

Under normal operating conditions, observation should be made occasionally with a high gain scope between the input Test Point and ground. Any evidence of signal at this point indicates severe overload of the balanced modulator and *if*-rf gain in the receiver should be reduced.

Tune the receiver across a fairly weak signal. The reference oscillator will lock up as soon as the signal is in the pass band of the *if* and balanced modulator. Several volts of dc difference in potential between the balanced modulator collector load output terminals will be in evidence. Upon tuning the signal thru the center of the *if* passband this dc output will flop to the opposite polarity as the reference oscillator locks in the opposite phase. This will hold till the signal is tuned out of the *if* passband and the reference oscillator AFC lets go and the oscillator heads for center, then random noise in the AFC loop starts the whole system searching at the noise rate again; it is looking for signal!

With very weak signals the operation of the flying noise lock system is slightly different. It will be necessary to add a high-gain, variable



Switch omitted from diagram for simplicity.

Time Constant (sec)	C2 C3 (mfd)	C4 (mfd)
.001	.0047	.01
.01	.047	.1
.1	.47	1.0
1.0	4.7	10.0
10.0	47.0	100.0

FIGURE 4

time-constant dc amplifier for the resultant dc shifts from weak signals may be 30 to 50 db below the peak swings from noise (Figure 4).

As outlined before, during no signal condition, the dc output from the balanced modulator flops back and forth at a random rate. By introducing longer time constants in the indicator amplifier, we can reduce the amplitude of these swings caused by short pulses of noise without interfering with the circuits' ability to indicate dc shifts that are caused by signals of longer duration than the time constant used.

Really weak signals will not indicate a locked up oscillator AFC but the indicator circuit will register more swings or "hits" toward one polarity than the other. Tuning across a very weak signal slowly will show increased hits toward first one side than toward the other as the signal modifies the phase on either side of the *if* passband.

This flying noise lock system tends to integrate hits when signal is present even in extremely small amounts. Use of some time constant in the indicator amplifier slows down the irregular swings of the output due to noise, but doesn't interefere with the output swinging over and staying there when signal is present then going back to the irregular swings centered around zero during no signal (Figure 5).

This Schmitt trigger circuit can be used across the recorded output of the indicator amplifier. This circuit keys the relay from the differential output and this keys an audio oscillator so slow CW can be read by ear. With very weak signal there will be errors in keying caused by noise pulses but the over-all result is far better than attempting to directly read a signal buried this far in the noise. For really solid results under very weak signal conditions a pen recorder allows reliable integration of signal hits actually thru the valleys of the noise pulses.

Without signal, there should be approximately 1 volt, peak to peak, of undistorted noise (measured with a wide-band scope) at the base of the reference oscillator. Attempts to increase this time-constant, or AFC filtering, will make this system a normal phase-lock affair, with attendant poor performance in acquiring weak signals. At the same time, any non-linearity in any part of the system. Particularly before the balanced modulator will wipe out weak signals.

This system digs out the information that a signal is there—now we must teach ourselves how to use the result to efficiently communicate. There are several approaches being looked into, probably one of the best is toward the use of a digital sampling integrator circuit following the balanced modulator. Allen, K2UYH is working in this area with excellent promise.

The Flying Noise Lock system is completely and dynamically unstable during no signal conditions. But if anything shows up in the *if* passband that even is slightly coherent or that happens twice in the same way, the system locks up and narrows down. Under minimum detectable signal conditions, noise peaks kick it off but it goes right back to the signal. Without signal, tune the BFO across the noise *if*

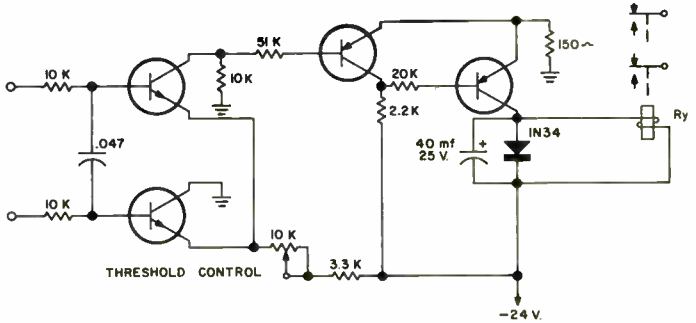


FIGURE 5

on a standard receiver—this crud is just the type of information the Flying Noise Lock system lives on. Use of phase modification information from a really good double-balanced phase detection circuit is something radically new, so don't knock it until you have tried it.

It is not possible, at this time, to plug in numbers proving just how sensitive this Flying Noise Lock system is. I do know that it will reliably indicate signals that are buried further in the Johnson noise than anything ever seen at this QTH. The system completely ignores all types of pulse type noise just as though it wasn't there, as long as they do not saturate the *rf-if* section of the receiver. It would appear this is the best presently known means of invading the never-never land of better than −200 dbm in minimum detectable signal sensitivity. Just trying to calibrate signal and noise generators at these levels is quite a job. On the air testing is slow for at −200 dbm there is no such thing as a dead band—just a morass of birdies and harmonics that are below the thresholds of any other receiver. We have succeeded in getting a firm grip on this tiger's tail—a little taming and we will be cranking 30 to 50 db improvements into communication range equations. A quick look at any of these and it is apparent why the last five years and the next is well worth any possible effort—get in and get your feet wet!

. . . K2TKN

Open Bands

50 MEGACYCLES had little to offer during February, with only a single band opening—and a weak one at that—reported.

But there was some news of an operating nature from around the country, so here it is.

Through the Mid-South VHF Association's "VHF Club News" (Memphis, Tennessee, and vicinity) we learn about a couple of instances of genuine public service on the part of VHF operators.

One involved WA4FGB, who happened upon an auto-motor scooter accident just after it occurred. He summoned aid via his 6-meter mobile and WA4IRY.

The other was by WA4PWV and W4OQG who were riding together when they discovered an auto accident in which one person was injured. While one of them summoned police and an ambulance, via K4FJT, the other administered first aid to the victim.

Such action as this is what we need all over the country, all the time, to keep our public-spiritedness up. End of editorial comment.

Ray, WAØDZI, advises that he plans to operate a 5-watt printed-circuit rig from Iowa, portable-Ø, this summer.

Most of our regular reporters sent in "negative reports" this month. W6IEY, out in the San Diego area, says Six was dead around there. WA4GDC, Kris, in Sebring, Fla., tells us his antennas are down and he would have heard nothing no matter what happened (hope they're back by now, OM). WA4IRX, Al, in Memphis, lists only two events. He heard unidentified carriers to the southeast at 0130 February 5, and again to the northeast at 1216 February 6 (all times, as always, in GMT).

WA5FYF, in Dallas, reports he heard W5YF and W5GMZ/4 in QSO at 0340 on February 15, using SSB, while Al added that he worked K4ZWB at the "very tail end of a small tropo" opening at 0058 of the same day. And that's all the activity for 50 Mc in February, it says here.

One more item before moving up the spectrum: John Anderson, KØBKL, 504 South Sixth Street, Burlington, Iowa, is looking for 6-meter skeds. John runs a low-power station (5 watts) but has made it out 100 miles on groundwave and wants to try skedding. Drop him a line if you are interested.

144 MEGACYCLES had a little more to offer. In the public service area, the ORC Newsletter from WA9FMQ reports a civil-defense net on Two in Outagamie County, Wisconsin. At their recent initial exercise, 15 ops took part and contact with all points in the county was reported. Sparkplug of the effort is W9FBC.

Via WA2YRF, W2EQV tells us there're some 30 to 40 fellows on 2-meter WBFM in the Albany-Schenectady area of New York State. At least one repeater station—at Pattersonville—is in use. This receives at 146.46 Mc and retransmits at 146.94. Other relays are planned.

K5TQP, out in Albuquerque, has more to report on the running tests he and W5LTR are running with K7NII in Scottsdale on 144.090 Mc. TQP reports at least partial copy from NII almost every night with good copy at times. W5LTR has begun a similar test series with W5PSY in El Paso, while TQP is available for skeds to the east or northeast on Saturday evenings. Drop a line to Fred Fish, Radio Communication Engineering, 1003 Shirley Street, N. E., Albuquerque, if you're interested.

WB2CCO, our reporter in Plattsburgh, N.Y., says nothing new has happened up his way this month but he hopes March will be better.

K9WZB, Garry Fisher, 217 W. Ben St., New Carlisle, Indiana, says he too is on the lookout for some skeds to most any place. He uses 145.007 Mc, CW or fone,

and currently is running a sked with K8-VMA, Franklin, Ohio, nightly at 0300. Anybody needing Indiana can drop Garry a card at the above address.

Now to the action. Fortunately, it was a bit better for Two than for Six. By days, in GMT as always, here it is:

FEBRUARY 3: K9WZB worked WA9-DOT, 200 miles away, at 0506, followed by W9YOI, 120 miles, at 0525. K8ZES reports "slightly better than average" conditions to the northwest of his Galion, Ohio, location.

FEBRUARY 4: K9WZB again, starting with W9FZD, in Wisconsin 180 miles away at 0357. Next Garry worked K9WZV in Illinois, 140 miles, at 0412, followed by WA8DWG, 200 miles away in Ohio at 0430, WA4ELH, 300 miles distant in Kentucky at 0435, then K9HMB, 125 miles, 0545, and W9YOI again at 0547.

FEBRUARY 5: K8ZES, Sid, characterized this night as "excellent" and listed these conquests to prove it: WA9IJA, 250 miles away, at 0358; K9CIF, 220 miles, 0417; K9WZB, 190 miles, 0436; WA8EPL, 180 miles (with a Pawnee) at 0507; and WA9HPE, 115 miles distant but using only a Twoer, at 0528. K9WZB listed WA9JBK, 195 miles distant, for 0244 (JBK using a Twoer, sigs S-7); W8JXM, 200 miles, 0305; K9WST, Indianapolis, 150 miles, 0333; K9WSV, also Indianapolis, 0346: W8KAY, Akron, at 0350 over 295-mile range; K9KNW, 210 miles, 0410; K8ZES as above with the added note that Sid's signal was S9+20; W8MVE, 230 miles, 0504; WA8GKK, 200 miles, 0531; K8HNI, 195 miles, 0539; and K8YWF, 200 miles, 1730.

FEBRUARY 6: Conditions still fair in Indiana, as K9WZB worked K9EVA, Chicago, at 0212; W8WY, 135 miles away, at 0242; K8TLT, 140 miles, 0320; and WA8GKU, 200 miles, at 0336.

FEBRUARY 7: K9WZB worked W8SDJ in Cincinnati, 260 miles away, at 0230; signals were S4.

FEBRUARY 8: Again K9WZB, working K8RZB, 210 miles, at 0319.

FEBRUARY 12: K8ZES reports conditions slightly better than average from his location; K9WZB worked W9YOI at 0340 (120 miles) and W8WY at 0420.

FEBRUARY 13: K8KEQ/3 and WA2-DRK's regular schedule, every weekday at 1215 on 145.477, had its first decent signal of the month. Signals were S4.

FEBRUARY 17: K9WZB worked K9EEK at 0120 and W8WY at 0405, both slightly over 120-mile range.

FEBRUARY 18: K9WZB and K8RZB made it over 210 miles at 0420.

FEBRUARY 28: Last report of the month from K8KEQ/3; the WA2DRK sked again had S4 signals.

432 MEGACYCLES was looking up during February. Not a lot of contacts reported, but much in the line of plans, announcements, and a few suggestions.

W9JFP is still having trouble getting on the band, but expects to be on by the time you read this. Look for Vic on 432.010.

K8ZES is on, and has received signal reports from K8PYQ and WA8DON.

The Naval Avionics Facility Amateur Radio Club, at Indianapolis, is planning a long-needed project for 432. W9ZRX tells us the group (all of who are active on the band with ATV now, and getting a range of about 50 miles) intends to build a rotating beacon similar to that used by the M-O Valve Company in England for several years. It will be a full kw, with large antennas, and they feel it should reach Chicago, St. Louis, Louisville, Cincinnati, and Dayton with ease. They want suggestions as to the specific frequency they should put it on, to be of maximum use to everybody.

From the other end of the country, the Grizzly Peak VHF Amateur Radio Club tells us they have a group of WBFM enthusiasts on 420 now, and some hope of establishing a mobile repeater station. They have a suggestion: since WBFM on 420 is just getting a start, they would like to see a national frequency set up (such as 52.525 on Six and 146.94 on Two). Their suggestion for this channel is 449.500 Mc, and they list several

(Turn to page 12)

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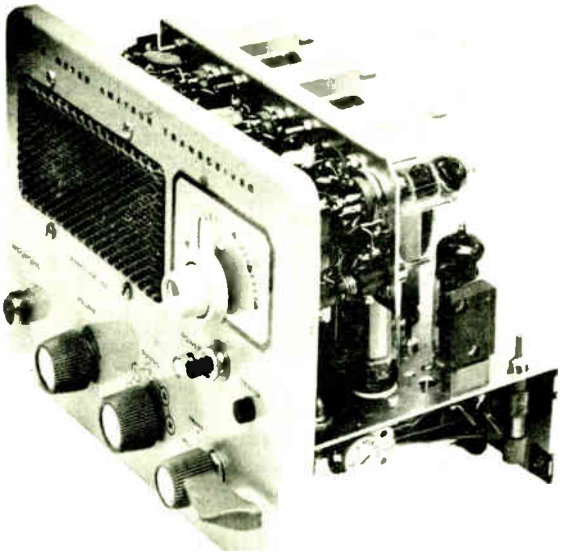

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Open Bands

reasons for their choice. Not the least is that all gear they have tried so far will operate here without modification; in addition, it's far enough from the AM-CW frequency of 432.000 to eliminate all possibility of interference, and is on an even multiple of 500 kc for ease in zeroing to a frequency standard.

They solicit comments from any other UHF FM addicts around the country; you can write Alan Christian, WA6YOB, at 3138 Groom Drive, Richmond, Calif., or to this column.

Farther south in 6-land, W6IEY advises that several guys are on in the San Diego area and are using 449.125 for their FM work. Dick also adds that the southern section of the Mars R&D net on 432 has been granted independent status, with W6BLK as net control station.

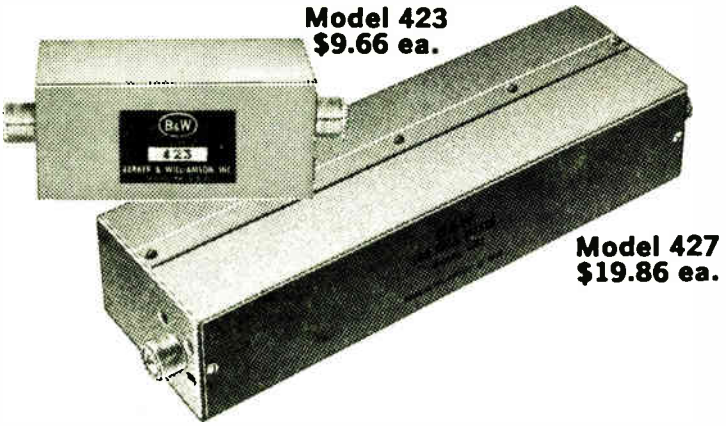
You may be wondering what happened to the "Reporting Honor Roll". As more technical articles keep coming in, we find ourselves running short of space each month—and as a result this feature ends up in the "inventory" basket more often than not. We are keeping it current, though, and will publish it when possible. Have you sent in a report for this column lately?

What's New?

Propagation Products Co., P. O. Box 242, Jacksonville, Fla., 32201, has new listings of military tech manuals for sale. They have the books on the ARC-27, the APX-6, and most all the new surplus.

For a copy of the listings, drop them a postcard.

Radio Ham Shack, 1187 Flatbush Ave., Brooklyn, N. Y., 11226, tells us they have some 2-meter railroad transmitters now on 150-170 Mc which run about 90 watts to 6146's; conversion to Two is a breeze according to WA2INM and takes only about half an hour. Price is $24.95 plus shipping. Drop Larry a line for more details.



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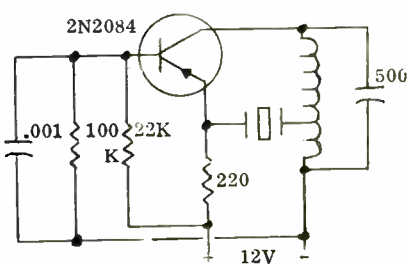
Transistor Oscillator Uses Surplus Rocks

Because early transistors were limited to audio and low radio frequencies, little attention has been paid to them by many VHF/UHF experimenters.

But today, UHF transistors are readily available at prices under $2. And since the transistor is the coming thing, many of us are discovering that they're fun as well as efficient.

Lately, several transistorized VHF circuits have been published. Here's another one. This is an overtone oscillator which uses ordinary surplus rocks in the 8-Mc range and gives output about 24-25 Mc; power level is low but is ample to drive another transistor as buffer to reach about 50 mw output.

The striking thing about this circuit is its simplicity. Three resistors, two capacitors, a coil, a crystal, and the transistor comprise the whole thing.



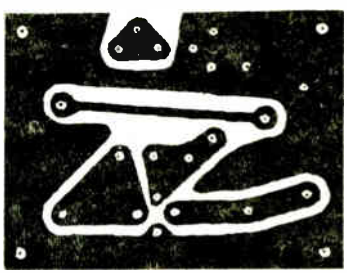
Schematic Diagram

The transistor used is the Amperex 2N2084 "Universal RF Transistor", a PNP unit capable of handling 10 mA at 40 volts. In this circuit, it draws 3 mA at 12 volts.

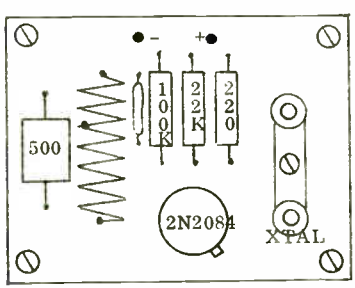
If a capacitor is substituted for the crystal, the circuit is an ordinary Hartley oscillator. The tank circuit tunes to 25 Mc, with a 100-pf mica capacitor and a coil consisting of 11 turns of No. 18 E wire wound on a 5/16" diameter drill and tapped 4 turns from one end.

With the crystal in the circuit, the path for feedback is blocked except at series resonance of the crystal; the resonances occur at the fundamental and at each odd harmonic. However, only the third-harmonic resonance can get any energy through the tank, so the only oscillation will be at 3 times crystal frequency.

A full-sized circuit-board pattern is provided for your convenience if you want to put this on a board. The original was built on a small piece of Vectorbord, pattern G, with identical parts arrangement as shown in the printed-board view here.

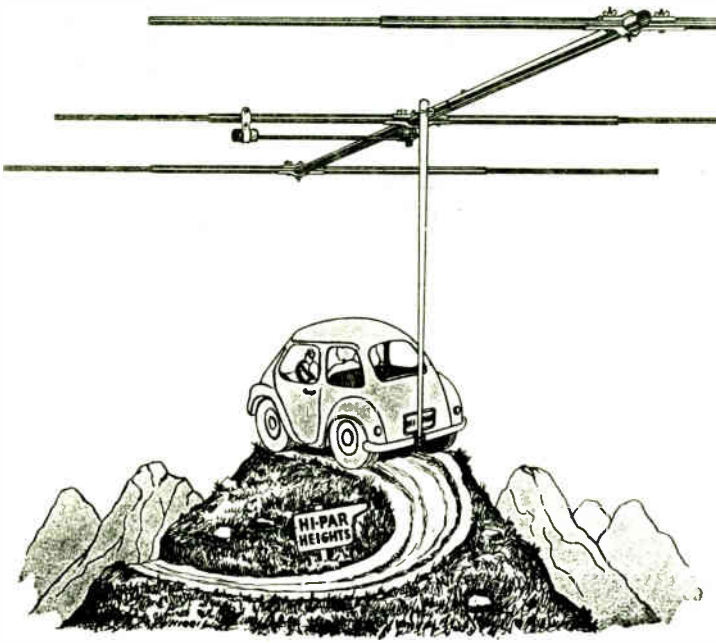


Circuit Side of Board



Component Side of Board

Uses for the gadget are limited only by your imagination. It can be put into any converter to replace the existing oscillator, for instance, or might even do a nice job of modifying a Sixer to take 8-Mc rocks (feed the 25-Mc output into the existing xtal socket). We're working on a fully-transistorized 6-Meter mobile rig, here, and it's the first step!



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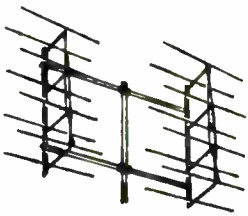

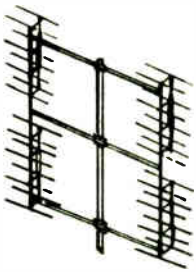

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The T-Hunt Tweeter

by Emory Hiebert, WA6HGE
and Ted Heil, WA6EOY

Transmitter hunts are getting more and more popular and T-Hunt addicts will tell you that it's quite a chore to watch the S-meter and the road at the same time. To get around that problem the circuit shown here was adapted from a blind operator's tuning circuit.

Here's how it works: A simple transistorized audio oscillator is connected to the S-meter and as the meter registers higher voltages for signal strength increases, the oscillator pitch changes. The greater the signal strength, the higher the audio pitch in the sensing unit. This little accessory makes it possible to steer the car or rotate a loop without having to squint at the meter.

CONSTRUCTION

Once we decided on the layout of the circuit, it was decided that to get small and neat units we would etch the circuits and then add the components in the usual way. The "chassis" of the oscillators are 1-3/8 by 2-1/4 inch boards. We used fibreglas board material and the small pieces were cut from a larger one with a nibbling tool, which made the job fast and neat. The etched-circuit material was part of an E-Z Etch kit which came from World Radio Labs. Since the small boards don't need as much etchant, we pro-rated the etch crystals and used about one ounce of chemical and 4 ounces of hot water for each board.

After the boards were etched, we used a No. 51 drill to make holes for the various parts leads and a larger drill for the mounting tabs of the audio output transformer. Battery connectors were made by sweating the gripper contacts from exhausted batteries to large "pads" which were etched on the copper boards. The grippers are easily removed from old batteries by drilling out the press-fit flanges within each connector. The schematic shows a switch, but in practice we turn the units on and off by removing the "006" 9-volt transistor battery.

About the transistors: This circuit requires one each NPN and PNP, and type isn't critical. Q1 can be a 2N229, 2N233 or 2N170; Q2 can be a CK722, 2N107 or 2N408.

OPERATION

When the signal strength is low, the oscillator has a low-frequency buzz. As signal strength increases, the buzz turns into a tone and then into a squeal. Current drain is 1 to 2 mA with weak signals and rises to about 4-1/2 mA on strong signals.

The etched circuit could be arranged so it would mount directly on the connection studs of the S-meter. We have found that the "Tweeter" loads the meter a little and makes it somewhat "scotch". This means that if the Tweeter is to be permanently attached to the meter that a disconnect switch should be included in the circuit, or that the meter calibration be rechecked to allow for the load.

Since everyone will have different ideas about parts layout, we show only the schematic of the T-Hunt Tweeter; board layout is up to you.

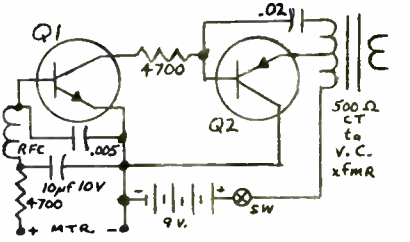

Diagram of Tweeter Wiring

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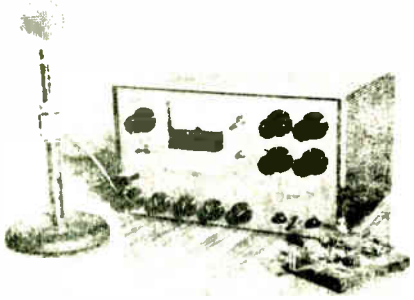

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HOW TO DX

Do you dream enviously when reading the reports, here and elsewhere, from VHF DXers? Is the wall of your shack somewhat lacking in exotic QSLs?

It doesn't have to be this way. You, too, can work DX if you want to. Interested in finding out how?

"Sure," you may say. "Anybody can work DX if they can buy fancy enough equipment. But a Twoer is just about the limit for my pocketbook!"

While it's true that money helps, with the resulting ability to finance huge antenna farms, far-out low-noise receivers, and maximum-power transmitters, it's also true that you can work much more DX than you imagine with nothing more than the simplest transceivers.

The secret is in knowing just when and where to look for the DX, and in knowing how to snag it once you find it. Most DX operators learn these secrets through long and patient effort. In this article, we'll try to let you in on them.

But before we get into this phase of the DX art, let's take a short look at equipment which might be considered desirable. Even if you can't afford to make any changes in your gear now, you can use this as a guide when the day comes that you do want to move up.

Keep in mind that DXing, like almost any other art, is subject to many conflicting opinions. So while we may seem to be dogmatic about a few things, you're quite likely to run into good operators and successful DXers who contradict our recommendations. Listen to them all, and then make up your own mind about what's best for you. But this, at least, will provide you a starting place.

With that understanding, let's get into equipment. We feel that the receiver is the most important single component of a DXer's station. No matter how powerful the transmitter nor how huge the antenna, if the receiver won't do the job then all the rest is wasted. After all, if you can't hear them you can't work them.

So when you're improving your gear, then the logical place to start is with the receiver. The $500 variety is nice, but a bit rich for the blood of most of us. And in many cases, less expensive ones may do a better job.

The most important single characteristic of the receiver, for VHF DXing, is its selectivity. Narrow bandpass is one of the musts. It doesn't have to be of the type needed for SSB; a good crystal filter such as that found on the older Hammarlund or Hallicrafters rigs is far better for many VHF purposes.

If you can't afford a crystal-filter rig, even of the older sort, next best would be a Q-multiplier. Lacking this, install a Selectoject circuit (see ARRL handbook for details of this). But no matter how you do it, be sure you can get the bandwidth down to around 5 kc for phone and to 500 cps or less for CW. The simple matter of bandwidth in the receiver, by itself, can easily make a difference of 10 db or more in the signal-to-noise ratio of the incoming signal, and in DXing, this 10 db can increase your range by at least 40 percent.

In any event, the wide-band surplus rigs with 2-Mc or so bandpass in the IF strip are definitely out. They may work nicely for local nets, but they're a washout for serious DXing.

A suitable receiver needn't set you back a fortune. Alan Margot, W6FZA, in the January, 1962, issue of QST, describes his version of a VHF receiver, and this one shouldn't cost over $20 or so. An old car radio from a junkyard can be fitted with an AC supply and some converters, and this route shouldn't cost over $10.

Stability in tuning is the second important thing in a VHF receiver, but most receivers can be made to fill the bill in this department by using a low-frequency band such as the broadcast band.

Sensitivity is relatively unimportant in the receiver itself, because a crystal-controlled converter will be used out in front and the converter will establish the sensitivity of the system. You can buy the converter or build it; we publish plans from time to time, and so do the other ham magazines such as 73.

In the converter, low noise and adequate gain are the key points. Most converters using Nuvistors are adequate on all counts. They should be considered the minimum, but once you hit this level in the receiver the next outlay should be on the antenna instead. Additional receiver improvement can wait until antenna and transmitter come up to the same level.

In the antenna department, one rule is supreme: the higher, the better. An old rule of thumb, which has been somewhat neglected of late but still holds true, is that every time you double the height of your antenna, your signal at the other end goes up 6 db. If both you and the other guy double heights, signals rise by 12 db. Again, this can increase your range about 50 percent!

Other factors also enter the picture, though, so some confusion exists. The bigger (physically) your antenna, the more signal you'll pull in. Antennas such as the Twin Five or the 16-element colinear give good power gain, and one of these mounted low can easily outperform a dipole or ground-plane on a 100-foot pole. But the big antenna on the high pole will outperform either, and is to be preferred.

With the high poles, you must use low-loss feedline. You really should in any case. Coax losses can easily wipe out the difference between a Twoer and a 20-watt transmitter; why pay for power that does nothing but heat up a feedline?

The lowest loss feedline you can get, and still be practical, is homebuilt open wire feeders. Below 225 Mc, losses in commercial open-wire TV lead wire are comparable. Next best is twinlead, even if its impedance does change when rains come. The tubular type of twinlead has less reaction to rain than the flat, by the way. Coax should be used only when you can't escape it, such as in the final short run from the end of the open-wire into the shack, or around the rotor at the top of the pole. Match it to the wire with a balun or an antenna tuner; the balun is usually simpler.

Now to the transmitter; the one you have now will do provided you are able to key it for CW. It's surprising how far even a Twoer will reach when tied to a good high antenna and used with a good receiver! Ye editor has worked 120 miles with one, in a mobile, and our DX reports regularly list 200-mile work by Twoer users.

Of course, the more power the better, and at least one expert has gone on record with a statement that 100 watts is a minimum for serious DXing. A full gallon is, of course, even better—but like a parametric amplifier, can wait until all the rest of the system is up to similar levels of excellence.

That's enough about equipment for now. Let's find out about operating technique.

The first thing you must know, in looking for VHF DX, is when and where to look. This particular trick varies from band to band.

On Six, the most common type of DX is "skip", or sporadic-E. When this is in, nothing special in the way of gear or operating savvy is needed. However, nobody has yet found a way to predict it. The best way to find skip is to keep your receiver on, around the clock.

A skip-finding technique used by several operators involves a TV set and a beam-type antenna for it. The set is tuned to a channel between 2 and 5 which is not in local use; 2 is preferable and 3 is next best.

When skip opens up, TV signals from the skip area will come in. The extra power used by TV stations balances out the frequency differences, and Six usually opens up only a few minutes after TV skip appears. You can determine direction of the skip by turning the TV beam.

Another trick sometimes used is to monitor CB. With the aid of a CB call-area map, you can identify any skip as it appears. When 27-Mc skip distance

gets down around 600 miles or so, try 50 Mc and see what happens.

For Two, most DX is tropospheric in nature. This means that it depends on weather, and your best aid in predicting this kind of opening is the weather map frequently shown on TV.

The thing to look for is a sharp "front" passing through or near your location. If the front is stationary, so much the better. The DX will lie along the front in both directions, usually.

TV can also be used to detect tropo openings when they occur. For this, channels 6, 7, and 8 are your best bets. Look for reasonably weak and snowy signals from stations some 200 miles away. In the case of a really hot tropo opening, you may find "windshield wipers" or bars as two or more DX signals battle each other in your receiver.

Higher bands are similar to Two; when Two is open, it pays to check 220 and up. Most often, signals get weaker as the frequency goes higher, but sometimes an opening will be good on 220 and non-existent on Two.

Once you've found an opening, what do you do then? One thing not to do is open up calling "CQ DX". This brands you as a beginner. The first step is some very careful listening. Tune carefully, near the spot on which you intend to transmit, and see who's on. Then when a QSO in that region ends, open up and call the fellow you were hearing. Chances are he will come right back; if not, forget him and try another one.

On Two and above, it helps to do the tuning with the BFO on and selectivity set for its sharpest position. This way you can find many signals you would never find any other way. To work these, CW is necessary—but in VHF DXing, CW is necessary anyway. You don't have to be fast (5 WPM is plenty most of the time) but the approximately 20 db extra punch it gives you frequently makes all the difference.

When transmitting, keep everything as short as possible. It's not a ragchew; the opening may close at any instant. A number of brief transmissions lets you know when that happens; a monologue may all go into a dead band.

In an opening, if you get no answer after calling someone, listen around a bit before calling again. Quite probably, somebody will be calling you.

But don't listen all the time, either. If we all listen, nobody can tell the opening is there. Make frequent, but brief, calls until you get your QSOs.

Band openings don't provide all the DX. One of the more interesting ways of doing it is the DX Sked.

In this, you set up a regular schedule with someone else who's normally out of range for you, or at the extreme limit of your normal range. Each of you knows the other's frequency to a gnat's eyelash and the exact time at which the other is to transmit. In this manner, if any bit of signal gets through it can be found.

A special form of DX Sked is that used in meteor showers. This form of DXing involves bouncing the VHF signal off of the ionized trail left behind as a meteor vaporizes, and is exotic indeed. Many articles have been written on meteor shower work alone, and all we can do here is mention it. If you're interested in more, we'll see whose arm we can twist for details.

Similar to meteor work is Aurora, but here skeds are less essential. Work is more like in an opening, except that the signals will be almost unbelieveably bad. At best, they sound something like a buzz saw going through a pine knot. Often all you hear of CW is a hiss, rather than a true note. The tipoff on this comes from WWV; if they're sending "N" on the hour and half-hour, no aurora. If anything else, keep your eyes open. Telephone men have an advantage here; the companies monitor "earth voltage" which is an indication of aurora conditions.

Which brings us to the end of the space available this month. We won't pretend that you're now an expert DX operator, but we do hope that we have showed you how simple it can be—and helped you over some of the rough spots most of us must learn the hard way. If you want more of this data, let us know. —Staff

50-Mc Cavity

by Darryl Phillips, WØDJG
500 S. 12th Street
Marion, Iowa

This unit is a Six-Meter re-entrant cavity filter, very useful for TVI, which I've been using for several years. Several friends have built them too, with excellent results.

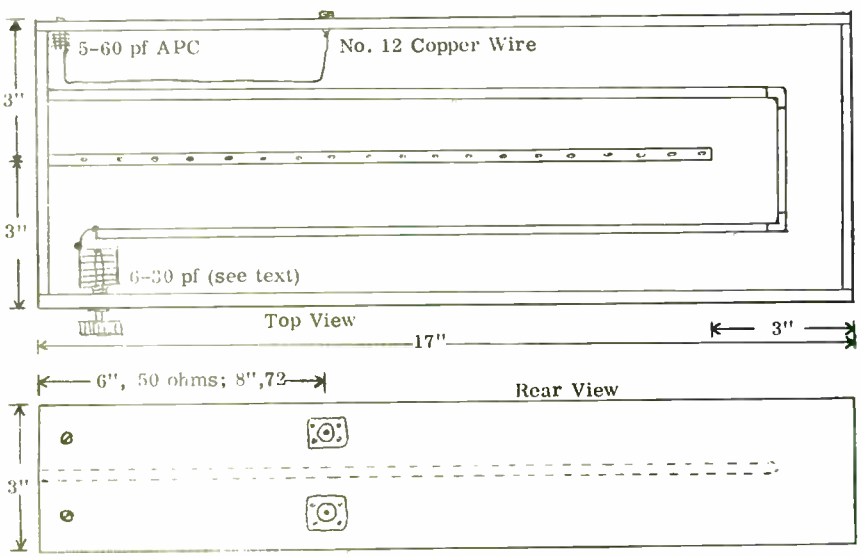
Besides the filtering action, this is an excellent way of matching 50 ohms to 72 ohms or vice versa.

The case is a standard 3 x 6 x 17-inch chassis; it rack-mounts nicely. Use 1/2 inch ID rigid copper tubing for the center conductor and sweat all fittings. Sizes of the capacitors are nominal, but use a high-voltage type (double-spaced) in the 6-30 pf spot.

The grounded end of the tubing must be a good connection from copper to chassis because RF current at this point is very high. The shield down the middle and on the top can be either aluminum or copper but must be secured with lots of tight screws.

Back-panel details are evident from the sketch; the No. 12 wire should be close to the tubing but not touching. Impedance looking in or out is determined by distance from the coax connector to the end of the filter. Six inches gives 50 ohms, eight inches gives 72. One connector may be placed for 50 and the other for 72 if you're using it as a matcher.

The main disadvantage of a unit of this type is that it must be retuned whenever you change frequency. That's why C1 is brought out to the front panel. However no harmonics, birdies, or other crud will get through—and the retuning is a small price to pay for this. The back-panel capacitors are set once, with an SWR meter, and can then be forgotten.



Construction Details of 50-Mc Coaxial Cavity Filter

Black Box Quiz

One of the favorite concepts of today's electronic engineers is the "black box". This, in case you haven't met one lately, is an opaque box with a specified number of terminals, and the user has no idea at all what's inside it. He can measure the resistance, inductance, and capacitance between any terminals he likes, and he can also put voltages in at some terminals and get voltages out at others. By measuring these voltages and the currents associated with them, and from the R, L, and C measurements, the user is then able to figure out what's inside.

Personally, we think it's more likely most people would just get a can-opener and take a look—but the "black box" is a fine way to find out what goes on inside some new gadget, without being scared away by the gadget itself.

For instance, take a black box with a pair of terminals, A and B. An ohmmeter shows infinite resistance between A and B, yet when the black box is placed in series with an ordinary 200-watt light bulb on the 115 VAC house line, the bulb lights as usual. What's in the box?

It could be either of two things. A big capacitor (100 mf or more) would do it, but more likely is an inductor and capacitor in series, forming a series-resonant circuit at 60 cps. For the resonant frequency, this is almost a short; for DC as used in the ohmmeter, it's open.

Want to try your skill on a few more of the black-box puzzlers? These range from as simple as the one above, to a few which may give fits to the experts. Answers are on page 24.

1) Our first box has four terminals, A, B, C, and C. When 115 VAC is applied to A and B, 150 VDC appears at C and D. Ohmmeter shows open circuit from A to B, and from C to D. What's inside?

2) Box No. 2 also has four terminals. These are I, II, III, and IV. Resistance measurements between the terminals, two at a time, show 75 ohms between all pairs except I and II, and III and IV. These pairs read 100 ohms. When 100 VDC is applied between I and II, an ammeter shows 1 amp flowing in, for 100 watts power input. Yet no voltage or current appears between III and IV. Why?

3) This four-terminal box is a little bit more complicated. Resistances are an open circuit from A to B and from C to D, and short-circuit from A to C and B to D. But when AC is applied to A and B, the output voltage across C and D is just half the input voltage, while when DC is applied, output is equal to input. Hint: five components are inside this box.

4) Let's try a five-terminal black box this time. With one lead of the ohmmeter on terminal A, we read 1 ohm at B, 2 ohms at C, 4 ohms at D, and 7 ohms at E. Moving the fixed lead to terminal B, we read 1 ohm at A, 3 ohms at C, 5 ohms at D, and 8 ohms at E. From C, we read 2 ohms at A, 3 ohms at B, 6 at D, and 9 at E. Reading from D, we get 4 ohms at A, 5 ohms at B, 6 ohms at C, and 11 ohms at E. Finally, from E, we find 7 ohms at A, 8 at B, 9 at C, and 11 at D. What's inside and how is it hooked up?

5) Final black-box problem this time involves just three terminals. The ohmmeter shows negligible resistance between A and B, and slightly higher for B to C. The A-to-C reading is the same as from B to C. When 12 VDC is applied between A and B, no output is obtained between B and C. When the 12 VDC is removed, however, an impulse with a peak value of approximately 12,000 volts appears between B and C. What's on the inside?

Answers

Here are the answers to the Black Box Quiz:

No. 1 contains an ordinary half-wave power supply.

No. 2 is a Wheatstone bridge with 100-ohm resistors in each leg. Terminals I and II are one pair of "opposite" terminals, while III and IV are the other pair. Since all legs are equal, III-to-IV can produce no output regardless of input; the DC power input is dissipated in the four resistance arms.

No. 3 includes an LC series-resonant circuit in series with an AC relay, all connected from terminal A to B. B and D are strapped internally. The relay's contacts are SPDT, with the arm connected to terminal C. The normally closed contact is connected to A, while the normally-open contact is connected through a large resistor to D. An equal value resistor is connected from A to C

but is normally shorted by the relay contact. With DC input, the relay cannot operate, and output is connected directly to input. With AC, the relay pulls in and the two resistors form a voltage divider, halving the output.

No. 4 contains four resistors, with values of 1, 2, 4, and 7 ohms. All four are joined at one end, and the four free ends go to terminals B, C, D, and E (the common connection is terminal A). The measurement from terminal A identifies which connects where; the rest are only for confusion. This circuit provides a handy decade box with only four resistors, by the way.

No. 5 is possibly the simplest of the lot since the box contains only an auto ignition coil, with primary connected from A to B and secondary from B to C.

vote!

The votes received by presstime in the survey asked last month are proving to be most interesting. Some of the early ones are reflected in the choice of articles this month. To help still more, why don't you take a minute to rate the articles in this issue as you see them? Believe us, it helps at this end. Just rate them 1-to 12, with 1 best and 12 the one you like least. Airmail to K5JKX.

____ Noise Scan (K2TKN)
____ 6-Meter Coaxial Filter
____ How to DX
____ Transistor Oscillator
____ T-Hunt Tweeter
____ Black Box Quiz
____ Balun Table
____ Announcements
____ Editorial
____ Open Bands
____ VHF Wallpaper
____ WBFM Column

Hamfest Plans

Hamfest time approaches; out in Fresno, Calif., they're going to hold their 22nd annual one on May 16. Big program is planned; nice prizes. Drop a line to W6TO, P.O. Box 783, Fresno, for more poop if you're interested.

Another hamfest, this one with special VHF emphasis, is that at Amarillo, May 2 and 3. By name it's the "Fourth Annual Golden Spread Hamfest" and the location will be Amarillo's National Guard Armory. Sponsors are the Panhandle VHF Pioneers and the Panhandle Amateur Radio Club. Get in touch with Anna Smith, WA5DVA, 3604 N. E. 15th Street, Amarillo, Texas, 79107, for the rest of the details.

Help Wanted

A lot of VHF/UHF construction projects call for 10-mil Teflon, which frequently turns out to be as rare as the proverbial hen's tooth.

Greg Wagner, K3UQD/K3FWM, says he's located a source for the stuff. Just one hitch. He has to buy 30 square feet of it, and the price is $20. Greg says he doesn't need this much and is looking now for more people who want Teflon.

He figures five guys, with $4 each, can get six square feet of the stuff apiece. This ought to be more than enough for all construction efforts for a long time. Greg himself is one, and he has one other fellow lined up—but there's still room for three more.

If you're interested, drop Greg a note. His address is 1055 Firwood Drive, in Pittsburgh, Pa. By the way, he adds he has "dozens" of good 416B's, should any be needed anywhere.

WBFM

Column conductor:
Fred E. Haneline, W9UDD
4811 Forest Avenue
Fort Wayne, Indiana

Of the many letters we have received since the WBFM column started, one from Hubert Testroet, KØHOS, brings up a question which seems to puzzle many hams just making the acquaintance of WBFM gear. Though we answered him briefly last month, the mail indicates a more detailed answer will help many of you.

Hubert asks, "We have some RCA receivers that use one crystal at 8678 kc to convert twice to receive 52.525. How?"

Most of the older sets that are available to hams for six and two WBFM used a single crystal. And all but a very few are double conversion. One works just as well as two, and of course saves money.

The puzzler in those old RCA's, and the thing that those unfamiliar with these crystal-multiplier strings usually fail to consider, is that the crystal doesn't multiply the same number of times you divide to find its frequency. The formula for those RCA's looks like this:

Crystal frequency equals the carrier, minus the second IF, divided by 6. Or, as it's usually seen: $F_O = (F_C - IF_2)/6$. Let's plug in the numbers: 52.525 - 457 is 52.068, divided by 6 is 8678.

But, in the set, the crystal multiplies by only 5. Five times 8678 gives 43.39, which when mixed with 52.525 gives us a 9.135-Mc high IF. Now this, mixed with the crystal fundamental of 8678, gives a 457-kc second IF.

The grid of the oscillator, which is oscillating at the crystal fundamental, goes to the second mixer, while the plate circuit, tuned to the fifth harmonic, goes to the first mixer.

If you reverse the process and start up the scale to put the numbers all back together, 457 plus the crystal of 8678 is 9.135. Add this to 5x crystal, and we're back to 52.525.

The old Motorola 150-Mc "coffin" sets did about the same except for another multiplication due to higher frequency. The early-model "Standard" sets (those without the "A" following the number on the IF cans) used $F_O = (F_C - 3.8)/16$, so for 146.94 we have 146.94 - 3.8 = 143.14, which divided by 16 is 8946.25 kc.

Later models look the same but have an "A" following the number on the IF cans. These use 1.7-Mc second IF's and high-side injection, so their formula is: $F_O = (F_C + 1.7)/17$. The "Dispatcher" units made by Motorola for several years used this same frequency setup. This comes out (146.94 + 1.7)/17 = 8743.53, which times 16 from 146.94 gives us 7044 for the high IF.

Since the high IF is different for each frequency in this converting scheme, multi-frequency receivers are limited in separation by the high-IF bandwidth. In two-crystal sets both IF's stay the same and the frequency separation is limited only by the front-end bandwidth.

In moving some of these older sets from the 30-40 Mc frequencies to 52.525, it is sometimes difficult to get enough mixer injection out of the older type RF pentodes used in the crystal-multiplier. The easiest way to solve this and to use cheap crystals is to replace the 7C7, 6J7, or 6V6 with a more up-to-date twin triode like a 6J6 or 12AT7. By adding one small coil to make the first half of the tube a Dollar oscillator tripling from an 8-Mc rock, and doubling in the second section using the present coil pruned to the 50-Mc injection frequency, enough injection will be had to make many of the oldtimers sit up and take nourishment.

That's this month's lesson. When we find room, we'll get a bibliography of pertinent articles and available books together. We have many letters from all of you; have patience, all will be answered. Many request schematics, some of which are not available. But most are, and we'll send you one if we have it.

—73, Fritz

Baluns

While it's not especially difficult to figure out the proper length for a half wave balun, if the velocity factor of the line to be used in its construction is known, the time taken to do this can't be spent on other projects.

So we've worked out balun lengths in inches for all types of line and all our popular bands, and the result appears in tabular form below.

FREQ stands for frequency in megacycles. Spc means "free-space" and is the length of a half wave in free space, in inches. O.W. is for "open wire" and is the length of a half wave on any type of open-wire line. Twin means twinlead and refers to the common 300-ohm type which has a velocity factor of .89. Foam is foam-filled coax, such as Belden type 8214 and similar low-loss varieties. Finally, RG Coax refers to the common type of coax such as RG-8 or RG-11.

Lengths are all in inches, to the nearest tenth of an inch. For frequencies between those listed in the table, you simply interpolate.

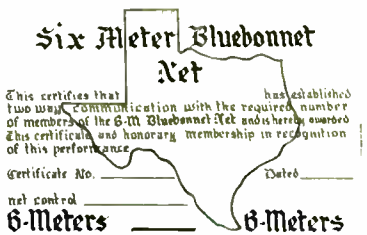
FREQ	Spc	O.W.	Twin	Foam	RG Coax
50	118	115	105	100	79
51	116	114	103	98	77
52	113	111	101	96	75
53	111	108	99	94	74
54	109	106	97	92	72
144	41	40.3	36.5	34.8	27.5
145	40.8	40	36.3	34.5	27.3
146	40.5	39.8	36	34.3	27
147	40.3	39.5	35.8	34	26.8
148	40	39.3	35.5	33.8	26.5
220	26.9	26.2	24	22.9	17.9
221	26.8	25	23.9	22.8	17.8
222	26.6	25.8	23.7	22.6	17.7
223	26.5	25.7	23.5	22.5	17.6
224	26.4	25.6	23.4	22.4	17.5
225	26.3	25.5	23.3	22.3	17.4
420	14	13.7	12.4	11.9	9.3
432	13.6	13.3	12	11.5	9
450	13.1	12.8	11.6	11.1	8.7

VHF Wallpaper

by Ron Toller, WA4FVD
Marathon Shores, Fla.

Here we are with our first bi-monthly column for 6Up, for the purpose of promoting VHF certificate-hunting. This being our first column, we will present one certificate and then scan through our own personal collection. From there, it's up to you. We would appreciate it if you would send samples, rosters, and details of all awards available to VHFers anywhere in the world. The address is Ron Toller, WA4FVD, Box 2466, Marathon Shores, Florida, Zip 33052.

First off, we have the "Six Meter Bluebonnet Net Certificate" from the Texas coast. Requirements are to work six members of the net on 6 Meters, with at least three of them being more than 50 miles from your QTH. The net meets Mondays, 7:30 p.m. CST (0130 Tuesday GMT), on 50.3 Mc. Awards custodian is Leroy Boudreau, W5TXG, 314 Rossiter, Corpus Christi, Texas. Application consists of log data, and there's no fee.



Now to the WA4FVD collection: One of the nice certificates hanging on the wall here is the "Cottonpicker Certificate" of the Mid-South VHF Club, Memphis, Tennessee. Sam Hicks, WA4ISC, is the custodian, and as I understand it Sam also prints the certificates and does a very fine job, too. The certificate is on parchment paper. This is another of the awards issued free of charge; requirements are to work five members of the club. Most VHFers in Memphis and in Shelby County are members and they're more than willing to help you earn the certificate.

Another popular certificate is "The Carnation Award" issued by CHC-VHF Chapter 14, Ohio. George, W8FKU, is president and custodian. This certificate is available with endorsements. George has full details; we may have before long.

Newly formed is the Florida CHC-VHF Chapter 25. Kay, K4TBG, is president and is doing a fine job. This chapter is sponsor of the "Orange Award" and you can get the poop on it from Kay at P. O. Box 528, Lake Worth, Florida.

Being an ex-Buckeye I can't leave this one out, especially in the first column. "The Buckeye Rag-Chewers Net Award" is issued by the organization of the same name, and Larry, K8QLT, is custodian. The group actually issues two awards; the net award above is given for contacts with five members of the club, and "The Buckeye Rag-Chewers VHF CC Award" for contacts with 100 Ohio amateurs on VHF. Larry has full details, and let me note right here that if you are new to certificate hunting, when writing for details be sure to include a stamped, addressed envelope. It not only assures you of an answer, but a prompt one at that.

The QRP Amateur Radio Club sponsors "The QRP-VHF-10 Award" for working ten members of The QRP ARC with five being worked on skip. Bill Thompson is custodian and the charge is 50¢. For details drop Bill a line at K5MCV, Box 425, Scooba, Mississippi.

Let's not leave out "The SMART CLUB" which is a vertical award. Rae Duncan, K9TNR, is custodian. This one hangs long-ways on the wall, so if you have a bare spot (long) that needs covered up, this fits the bill. This certificate is on a gold background. Requirements are to contact five members of the club on 6 Meters.

Two other popular certificates are "The Junkhunters Award" and "The Moonwatcher Award". Requirements for both of

these have recently changed and I don't have the new details. Help wanted! Send it in if you want it in print.

This doesn't complete the list by any means, but it will do for a start. In future columns we hope to highlight other awards and certificates, including "The Royal Order of Hoot-Owls". Certificate hunting has become one of hamdom's fastest-growing activities lately, and we hope to help VHFers find out about all certificates available to them. To do it, we need information, samples to print, etc., so drop a line. Or in other words, "CQ Certificate Committee . . ."

—Ron, WA4FVD

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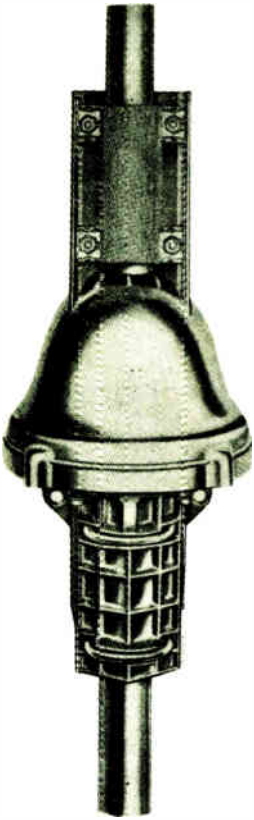

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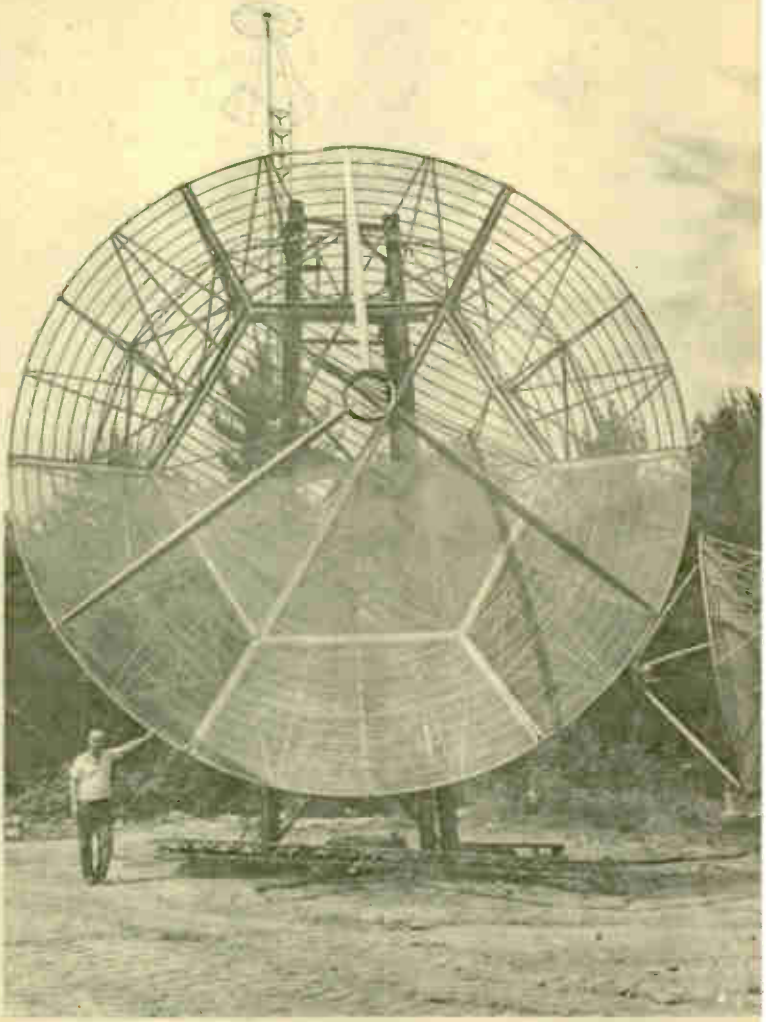

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...m Kyle K5JKX

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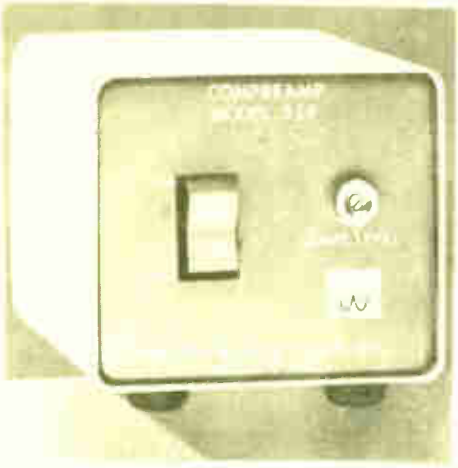
Waters "Compreamp"tm

AUDIO PREAMPLIFIER/LIMITER-MODEL 359



The Waters Compreamp increases the effective speech power output of a transmitter up to four times. It is a self-contained, battery powered, two stage transistorized audio amplifier/limiter designed to be used with all types of radio transmitters.

The Compreamp is connected between the station microphone (50,000 ohm dynamic or high impedance ceramic) and the transmitter microphone input connector. No wiring changes are required in the transmitter. Provision is made for switching the Compreamp in and out of the circuit, and for adjustment of the Compression Level. The Compreamp may also be used with tape recorders and public address system amplifiers to increase effective speech power and dynamic range.

Specifications	
Input Impedance	100 K ohms (nominal)
Input Level	.005 to .020 volts
Gain (voltage)	10 db (minimum)
Output Level	.060 volts
Output Impedance	50 K ohms (nominal)
Power Source	9 volt Burgess 2U6 or equivalent
Size	2 3/4 " high, 3" wide, 4 1/2" long
Price	$27.95, less battery

Compratch?

The NEW Waters Universal Hybrid Coupler (Model 3002) not only acts as a coupler between the phone and your transmitter and receiver (SSB too), but also has a built in compressor amplifier in the microphone circuit which can be adjusted from 0-12 db by a front panel control. This coupler can be used with a tape recorder if you aren't interested in phone patches. It can also be used with a tape recorder if you are interested in phone patching. Very versatile. $69.95. Retrokit: Modifies Model 3001 to 3002: $19.95.

Send for spec sheets on these and our many other products.

WATERS MFG. INC.

Wayland Massachusetts

. . . de K5JKX

ABOUT PUBLIC SERVICE, ETC. . .

Currently there's a great furor going on in the ranks of ham radio about something called "incentive licensing." Without going into either the pros or the cons of the proposal, which doesn't have any immediate effect on our VHF regions, we can say that the proponents of this idea claim it is necessary in order to preserve the good name of amateur radio, while those who are against it claim that it will wreak great hardship on the majority of amateurs.

Gentle readers, I propose that it—and anything else government regulations can provide—doesn't make one whit of difference so far as preserving the good name of amateur radio is concerned! I think only we amateurs can do that.

I am not alone in my position. No less a figure than Ivan H. Loucks, W3GD, boss man of the amateur service at the FCC, has now come out and declared in public what I have been saying in private for more than a year.

Here's the gist of it:

The reason for existence of the amateur radio service, just like any other radio service, is to serve the "public interest, convenience, and necessity." This is as it should be; spectrum space is far too valuable a natural resource to waste on any operation which doesn't serve the public in some way.

And while many people, especially of late, seem to believe that the primary manner in which amateur radio serves the public is by advancement of the state of the radio art, this just ain't so.

FCC regulations spell out five ways in which the amateur service meets the public-need requirements. In order, they are (1) by providing voluntary non-commercial communications service, (2) by advancing the radio art, (3) by self-improvement of the amateur in "both the communication and technical" phases of radio, (4) by expansion of a trained pool of "operators, technicians, and electronics experts", and (5) by enhancement of international good will.

Kindly note that not only is communication the first of the five, but that in both item 3 and item 4 the communication has precedence over the technical phases.

Still think that the amateur service exists primarily for us technical types?

Loucks, speaking at a meeting of the Quarter Century Wireless Association, went on to accuse the amateur service in general of neglecting its important public-service communication duty. (His remarks were reprinted in the December issue of QST.)

I can attest to that. In Oklahoma City live several hundred hams. Last time I was around when a real public emergency came up, four of them responded to the call. In Los Angeles, I found the situation even worse.

And most heretical of all, Loucks said that the vacancy left in the public-service by abdication of us amateurs was now being rapidly filled by that despised and misguided soul, the denizen of 11 meters, The Citizens Bander!

I can attest to that too. When those four hams responded, they found more than 100 CB mobiles taking part. And one of the four later raised indignant objections when the local press praised "amateur radio operators" for their participation. "They weren't amateurs," he declared. "They were CBers!"

The danger is real and present; any time the Chief of the Amateur and Citizens Radio Division of the FCC goes out of his way to point out that hams have abdicated their most important responsibility and that CBers have taken it up, we can expect to see some sweeping changes in the

(go directly to page 23)

How Good MUST Your Station Be?

How good should your VHF station be? If you've been around the very highs for any time at all you know that this question has as many answers as there are hams, and if you've been around for long you probably have your own opinions.

However, unless you're a most unusual VHFer you haven't really sat down for the prime purpose of figuring it all out on a cold scientific basis.

For one thing, the information needed to calculate station performance hasn't been generally available. Even the bit which was available required complicated mathematics for the most part.

But if you're interested in knowing just how good your station must be to work the stations you want to work, read on. We've dug out all the data you need, and when it's all put together some of these old wives' tales that have plagued VHF ops for years die a sudden death.

One of the generally accepted ideas in VHF work for several decades has been that a receiver front-end should be just as sensitive as you could get it. Noise performance has been the big thing; the old-fashioned "DC-band" idea of straight voltage gain has been secondary.

So it may be hard to accept the idea of being able to work over a 110-mile range on 144 Mc with 20 watts and a 6-db noise figure in the converter, on phone. But if you've done this, as many midwestern hams have, it won't be so surprising.

And in this particular case, a front end giving you 2-db noise figure wouldn't do anything but improve signal-to-noise by 4 db, a barely perceptible improvement.

Don't get the wrong idea; noise figures and good receivers are still important. So is plenty of power. But you can get surprising DX with low power and poor receivers. A lot of the difference lies in your choice of operating frequency.

Before digging any more deeply into the more controversial aspects of these performance-measuring techniques and graphs, let's look at the big picture for a few minutes.

It takes only a few minutes of listening on any band for the weak ones to prove that the limiting factor on how weak any signal can be and still be copied is noise.

On lower bands, the limiting noise is contributed by the atmosphere and nothing can be done about it except to increase transmitter power. That's why there are so many 50-KW broadcast stations.

In the VHF region, atmospheric noise takes a nosedive and the noise generated in the receiver front end starts taking over. This is why we have believed for so many years that the lowest-noise front end we could get was the best.

When we get up to the place where none of the noise comes from atmospherics, and the largest part comes from the front end of the receiver, then we can calculate all the factors involved and come up with a fairly reliable "range" figure.

The equation used to do this is usually known as the "radar range equation" for its first and primary use was in radar. Complete descriptions of the radar range equation and its use have been published widely, and at least one entire booklet is built around it.

There's just one thing wrong with using this radar equation for VHF ham work. It omits several very important factors which do not affect radar, but play a big role in ham communication.

The largest of these factors is that of "cosmic noise", which comes to us from outer space and is appreciable only in the 30-300 Mc region. Another is the effects of atmospheric noise remaining on 50 Mc.

Radio astronomers have measured the

cosmic noise throughout the frequency spectrum, and their findings have been published. One such publication was in QST, in mid-1961. Unfortunately, the radio astronomers use power levels in watts to express their results, and most of us hams use decibels; that's the only reason we can offer for the two-and-a-half-year neglect of this information!

Once cosmic noise is converted to a decibel-comparison figure, allowing it to be compared readily to the familiar path-loss figures, some startling facts appear.

One is that those people who have long maintained that good noise figure isn't needed at 50 Mc have some basis for the belief; cosmic noise level at the antenna (at 50 Mc) becomes equal to the received signal level at an exceptionally short path length, compared to what you would expect from the classical radar equation, and so the difference between a 0-db noise figure and a 10-db noise figure is only a matter of about 30 miles in range. After all, when the signal at the antenna is no stronger than the noise, no front end built is going to do much for you.

All this notwithstanding, a few avid DX hounds have found that paramps and the like are not wasted (for them) on 50 Mc. These folk are playing in the big league, and the 2 db or so of improvement they obtain can make the difference between a 0-db S/N ratio and a -2 db figure. To help still more, they use big antennas and big transmitters. But for average all-around use, worry about receiver front-end noise on 50 Mc is wasted.

Not so at higher frequencies. At 144 Mc and above, cosmic noise is 10 db or more below that at 50 Mc, which extends range appreciably and makes the receiver noise figure important.

Still, don't stay away from 432 just because you don't have a paramp. Even with a 9-db converter (Nuvistors reach this noise figure readily at 432) you can reach out as far as you can on 144 Mc. The only thing restricting 432 operation is a severe lack of on-the-air stations!

By now you may be interested in getting at the charts to do some calculation for yourself. Here's how they work:

All calculations are in dbw, which is the abbreviation for "decibels referred to 1 watt". If you're not used to decibels and how they work, see the ARRL handbook. If you are, you'll recognize that 25 watts of RF up the coax is some

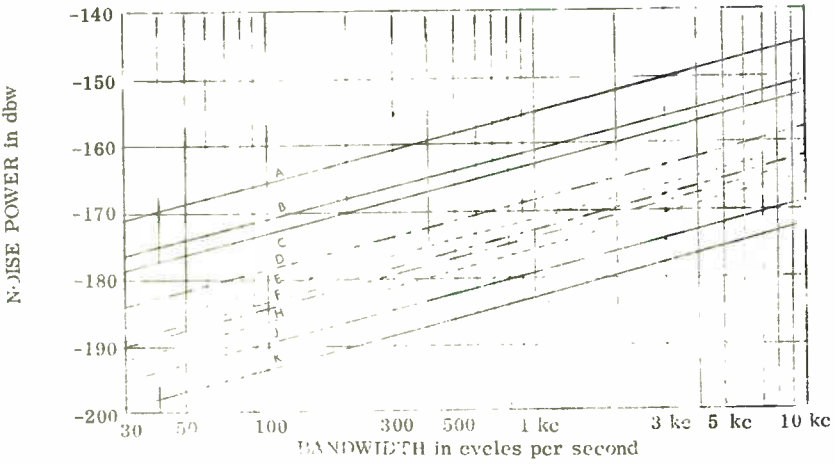


FIGURE 1. Antenna Noise Power at Receiver; lines A, B, and C are for 50 Mc, D, F, and G (dashed) for 144 Mc, E, H, and J (dotted) for 220 Mc, and J and K for 432. Averages on each band are B, F, H, and K. See text for other lines.

14 db greater than 1 watt, so it would be "14 dbw". Similarly, 250 watts is 24 dbw. The maximum transmitter power you're likely to have, legally, is about 28-1/2 dbw (700 watts).

To start, figure (or estimate) the power output of your transmitter in dbw. Add to this the gain of your antenna in db, and subtract your feedline loss in db. You now know your effective radiated power in dbw.

Using Figure 1, determine the effective antenna noise at the receiving location. Note that effective noise power is affected by both the band in use, by the bandwidth of the receiver, and by cosmic-noise conditions. The uppermost line for each band is for worst-noise conditions while the lower line is for least noise. The middle line is the average level. On 432, no least-noise condition has been measured; additionally, the worst-noise condition for this band is the same as the least-noise condition for 220.

An important point is that total receiver bandwidth, rather than merely the bandwidth occupied by the transmission, must be used with Figure 1.

Knowing the effective antenna noise, go to Figure 2. Choose an antenna signal-to-noise ratio which allows some margin for your converter noise figure, your feedline losses, and the S/N which you find to be marginal copy. If the converter noise figure is not over 5 db and feed losses don't exceed 2 db, you should be safe with the 10-db antenna S/N line (the 0-db line simply marks the absolute limits of operation). Enter from the left with your effective antenna noise in dbw, and drop down to the bottom scale when you reach the line corresponding to your chosen antenna S/N ratio. The result is the sum of your allowable path loss and your effective radiated power.

Subtracting the ERP calculated as the first step of this procedure leaves only the path loss; for this we go to Figure 3.

Enter Figure 3 from the left with the path loss we just determined, and move to the right until the line corresponding to the band you're using is met. Then

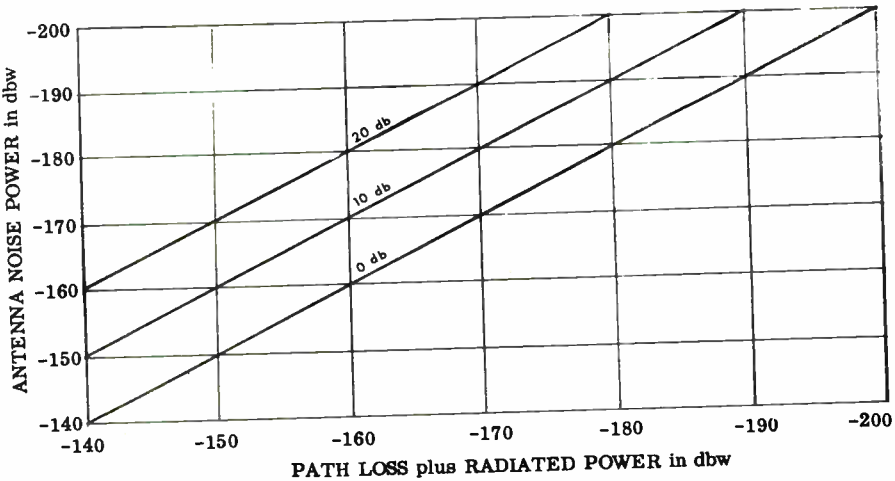


FIGURE 2. Graph for Determining Allowable Path Loss plus Radiated Power

drop to the bottom scale, and the result is your 50-percent-reliability range.

With the factors you have plugged into the charts, and assuming an identically equipped station at the other end, you should be able to talk with him exactly half of the time.

If you want to raise this figure to 90%, just add 8 db more gain in the system. Or figure the range, from Figure 3, for 8 db less path loss.

You may have noticed that we left the gain of the receiving antenna completely out of the picture. That's because it has the same gain for cosmic noise as for a signal, so it can't do a thing to help your antenna S/N ratio. And thus another old idea bites the dust; an antenna does not buy gain in both directions so far as the signal-to-noise ratio is concerned, when the limiting factor is cosmic noise.

Both for practice in handling the charts, and to see how they correlate with actual conditions, let's work out some range figures for some "typical" VHF stations and also for some "state-of-the-art" rigs for the four lower VHF/UHF bands.

We'll define the "typical" station as a 20-watt RF output transmitter, on all of the bands, while the "state-of-the-art" installation will be a full gallon on each band. On 50 Mc, "typical" antenna will have 9 db gain and feedline loss will be 2 db; "big" antenna will have 15 db gain and feedline loss is 1 db. For higher bands, combined antenna gain and feedline loss is as follows:

144 Mc	typical, 13 db	big, 17 db
220 Mc	typical, 12 db	big, 19 db
432 Mc	typical, 15 db	big, 21 db

Let's look at the typical 50-Mc station in detail, working through the charts and figures step by step, then summarize the ranges for the other seven cases:

We start with 20 watts RF power output, which is 13 dbw. Adding 9 db for antenna gain brings us to 22 dbw, and subtracting 2 db for feedline loss gives us an ERP of 20 dbw. Since we're going to be thinking of loss figures as well as gain and loss can be considered "negative gain", let's start right here writing the sign as well as the number: ERP = +20 dbw.

For phone operation we need a 3-kc bandwidth while for CW we can get by with only 100 cps. Let's go to Figure 1 and see what the corresponding antenna noise powers come out at. For phone, with worst-case cosmic noise, the 50-Mc noise power is -158 dbw (best-case noise power is -151 dbw. while for CW, noise drops to -166 dbw in the worst case and to -173 dbw for the best situation.

Now to Figure 2; let's use the 10-db line

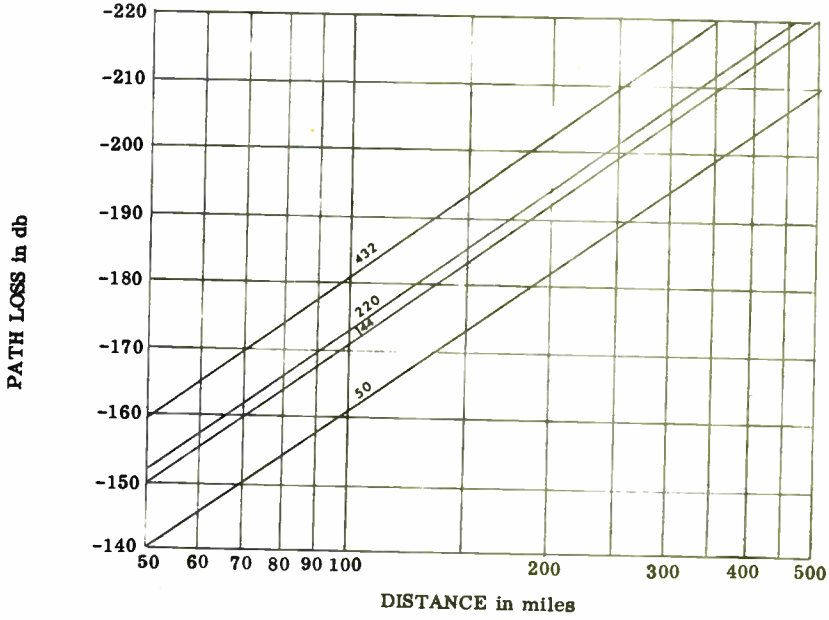


FIGURE 3. Path Loss versus Distance for VHF/UHF Bands

and see what happens. For phone and the worst case, our allowable path loss is -148 db. For CW and the best case, we can have a loss of -163 db. To these path loss figures we must add (really we subtract algebraically) our ERP of +20 dbw; the result is a total allowable "path loss" of -168 db on phone and -183 db on CW.

Moving on to Figure 3, we find that at 50 Mc a range of 160 miles gives us path loss of -168 db, while for a path loss of -183 db we extend range on out to about

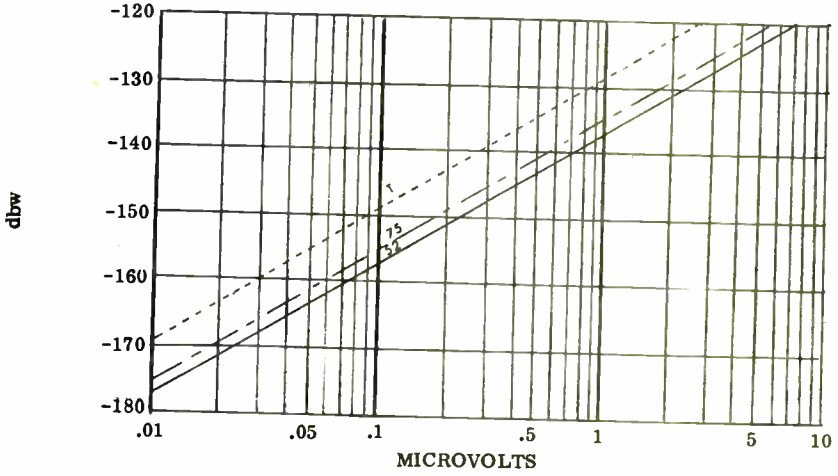


FIGURE 4. Conversion from Microvolts across 300-ohm, 75-ohm, and 52-ohm lines to dbw. T is for 300-ohm line.

210 miles. This means that our "typical" station has a range of about 160 miles on phone and 210 miles on CW.

The "big" station, on the other hand, has an ERP of some +42 dbw (you figure it out). Since we're still on 50 Mc, the antenna-noise-power figures remain the same at -158 dbw and -173 dbw. Let's stay with 10-db signal/noise ratio at the receiver, so we hold -148 and -163 db figures at this point as well.

But when we plug in our +42 dbw ERP, the total allowable path loss figures jump to -190 and -205, respectively. From Figure 3, the corresponding ranges in miles are 260 and 430. Quite a difference to be sure, but quite an investment as well.

On 144 Mc, we find that a "typical" station has a phone range of 165 miles and a CW range of 255 miles (a little better than its 50-Mc counterpart) while the "big" rig can work out 240 miles on phone and 480 miles on CW.

220 Mc comes out a little better than does 144, though the difference is small. The "typical" installation can work out 165 miles on phone or 270 on CW, while the "big" one gets 260 miles on phone and the CW range runs off the chart at a shade better than 500 miles.

On 432 Mc, we changed from the 10-db S/N ratio to 20-db to allow for poorer converters in the "typical" stations but remained with the 10-db figure on the "big" rig. We find a phone range for the "typical" installation of 105 miles (it goes out to nearly 150 miles with 10-db S/N) and a CW range of 255 miles. With the "big" rig, phone operation can be had up to 265 miles away and the CW figure ran off the chart; it's estimated at 600 miles.

On 432, however, these figures may be a bit misleading. That 600-mile range figure means only that range is limited to 600 miles by cosmic noise. Converter noise problems are more likely to be the limiting factor here although several db are included to allow for converter noise. The received signal at 600 miles is only some 0.007 micro-microvolts (!) so that the converter would have to be very good indeed. Figure 4 is a dbw-to-microvolt conversion chart to help sidestep this problem should it arise elsewhere.

Please note that this procedure applies only to tropo-scatter or "extended ground wave" operation, which is available for use 24 hours a day every day of the year. The ranges determined through this procedure will naturally be extended when the band opens through either tropo duct action or (on 50 Mc at least) by E-skip. Additionally, the path loss figures given by Figure 3 are statistical averages for 50 percent reliability. The path loss will be 6 db less 10% of the time, and 8 db less 1% of the time. It will be less than 8 db greater 90% of the time, and less than 18 db more 99% of the time.

These charts and the calculation techniques described here, while more complete than previous descriptions, cannot cover the subject totally. For one thing, a few of the factors involved in radio wave propagation are still unknown. If you want to read still more about it, see the list of references below. But take care that you don't become confused by some of the older ideas included in the list. Checking the publication date will help you decide which of two conflicting theories is more likely to be right.

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Kandoian, A. G. (chief, editorial board),

(try page 23 next)

Improving the CENTIMEG

432 Mc Converter

by Gianni Lovisolo, I1LOV
Malnate, Varese, Italy

After having used the Centimeg 432-Mc converter for three years with good results, I felt the need for a more sensitive and less noisy front end for this band.

Rather than build a new one, I decided to modify the Centimeg for three very good reasons: very little mechanical work, the possibility of using the existing crystal-controlled harmonic oscillator, and the three silver-plated tuned circuits. So the following modification was attempted, and gave good results:

1) Substitution of the two 6AM4 RF amplifiers with two EC88 (editor's note: EIA number is 6DL4) Amperex frame grid tubes.

2) Use of a 1N21 crystal mixer instead of the noisy 6BK7 triode mixer.

3) Modification of the RF tuned circuits using inductive coupling rather than capacitive coupling.

4) Use of a 12AT7 double triode as grounded-grid IF amplifier and cathode follower output stage.

To give a noise figure for the modified converter would be ridiculous on my part, since I do not have the equipment to measure it accurately at this frequency, but now I receive and read signals (with the same 64-element collinear antenna and the same GPR 90) which I did not dream to receive before. With the 1N21 mixer well adjusted, there is a barely audible increase in noise when the converter is connected to the receiver and even this noise is quieted by weak signals.

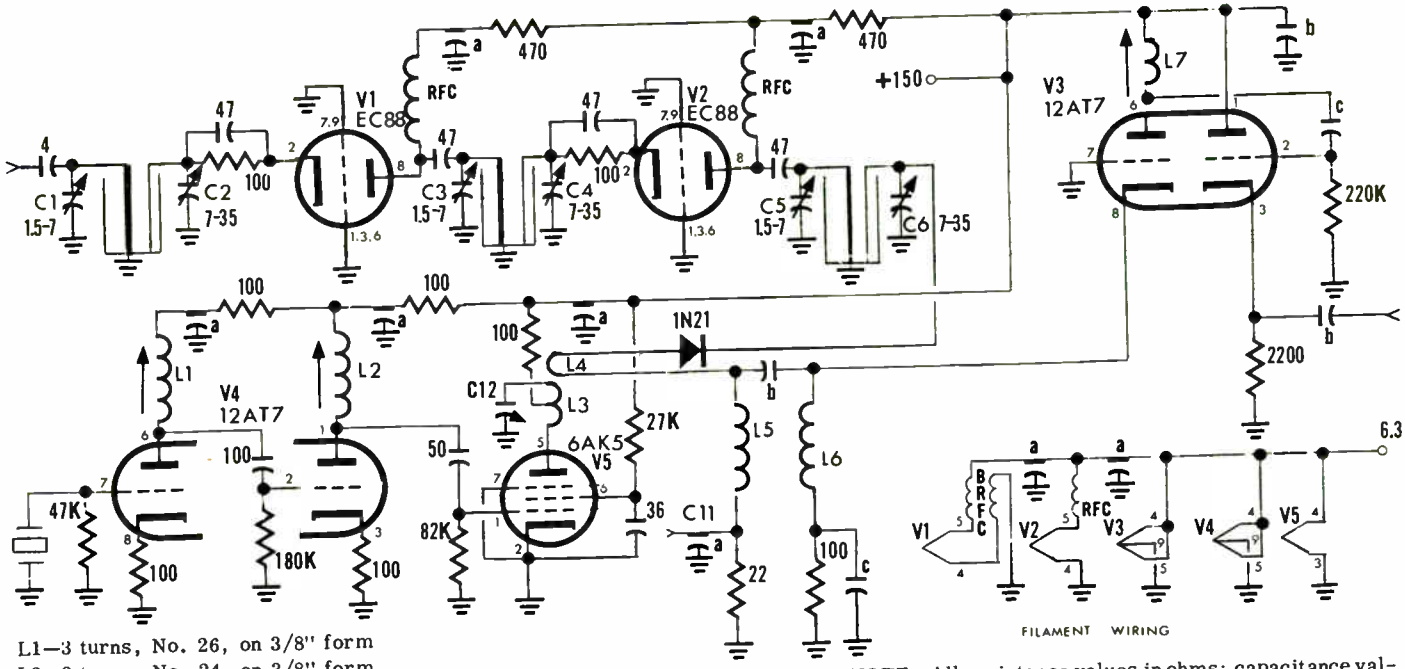
RF AMPLIFIER MODIFICATIONS

To change the 6AM4's with the EC88's, strip all of the RF section, unsolder all connections to the two tube sockets, and remove the copper shield between the RF section and the harmonic oscillator compartment, the 5-30 pf coupling trimmers, and the three coaxial tuned circuits.

While the partition is off, unsolder all connections from the 6BK7 socket. Remove these three tube sockets and discard them. Now install two 9-pin ceramic or teflon insulated tube sockets in place of the old ones. They must be positioned as shown in Photo 1; to do this, two new holes must be drilled for each socket. Install a new 9-pin socket in place of the old 6BK7 socket, positioned as shown in Photo 3, with pin 9 facing the RF partition. Now place the partition back and solder it to the center pins of V1 and V2 (see schematic diagram). Solder pins 1, 3, 6, 7, and 9 to the center pins or to the partition.

To modify the three tuned circuits Z1, Z2, and Z3, drill a 1/8-inch hole through the top as shown in detail A and Photo 2; the center of this hole must be 1/4 inch from the outer rim of the circuits. Cut a length of 1/8-inch diameter copper wire (better if silver plated), let it thru the hole, and solder. Be careful, since too much heat could unsolder the top of the circuit or otherwise spoil the internal silver plating. This wire, once soldered, must run parallel to the inner conductor and be of the same length; this is now the coupling link out of the coaxial line.

Mount back the three tuned circuits and wire the RF section as shown in the diagram and the pictures. The center conductor of the tuned circuit always goes to the plate of the preceding tube, while the link goes to the cathode of the fol-



L1—3 turns, No. 26, on 3/8" form
L2—3 turns, No. 24, on 3/8" form
L3—2 turns, No. 18, air wound 1/2" dia., center-tapped
L4—1 turn, No. 16, 1/2" dia.
L5—20 turns, No. 26, 3/8" form, slug removed
L6—same as, and wound on top of, L5
L7—same as L5 but with slug retained in form
BRFC—Bifilar winding, 18 turns, No. 30, 1/8" dia.
RFC's—7 turns, No. 24, 1/8" dia.

NOTE—All resistance values in ohms; capacitance values in picofarads (micromicrofarads). Resistors are 1/2 watt. Capacitors marked "a" are .001-mf feedthrus; those marked "b" are .001-mf disc ceramics; and those marked "c" are .002-mf disc ceramics.

SCHEMATIC DIAGRAM of modified Centimeg converter. Oscillator-multipler is unchanged.

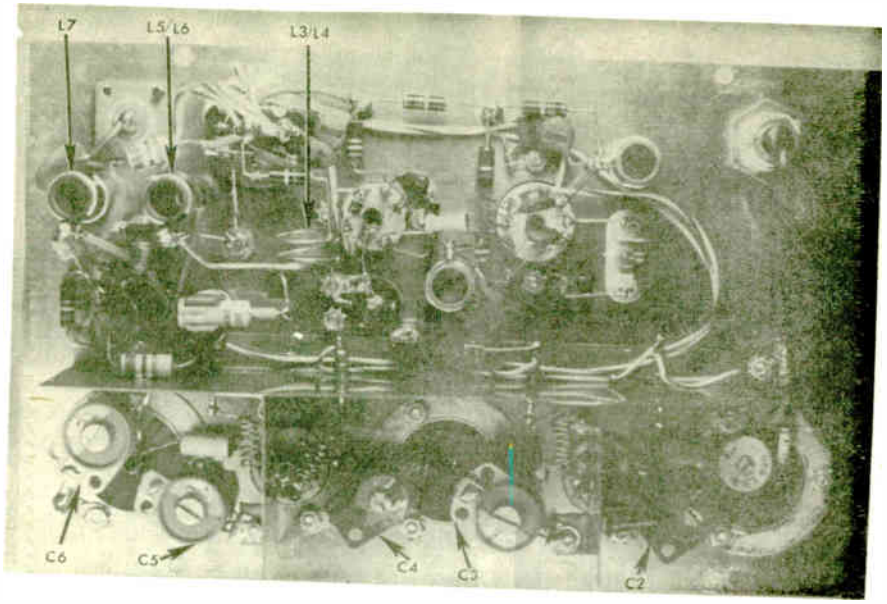


PHOTO 1. Underside of modified Centimeg converter showing changes. Input connector is at upper right, output at upper left.

PHOTO 2. Top view of mixer cavity shows position of hole for coupling link and of capacitor C11 (right of tube).

lowing tube. The ceramic trimmers are the most critical part of the circuit; they must be of good quality (piston trimmers would be better but require additional holes) and of the same maximum and minimum capacitance required, otherwise the tuned circuits will not resonate.

MIXER AND IF MODIFICATIONS

Remove and discard the link made with the short length of coax which coupled the harmonic output of the 6AK5 to the 6BK7. The crystal diode mixer is held in place by means of a fuse clip supported by a ceramic insulator 1/2 inch long. To mount the insulator, drill a hole as shown in Photo 3, near the plate feedthru capacitor of V2. On the fuse clip, which contacts the cathode of the 1N21, is soldered a piece of wire which goes through the existing hole in the partition to the link of tuned circuit Z3 (see Photo 4). The connection to the anode of the diode is made with a clip taken out of a dis-

(Next instalment, page 17)

OPEN BANDS

50 MEGACYCLES seemed to start fairly slowly, but then the band sort of exploded a third of the way through November and has been rather active for much of the time since. By days, with all times in GMT, it went like this:

November 2: WA4IRX, Memphis, heard WA4PNK in North Carolina briefly (2152).

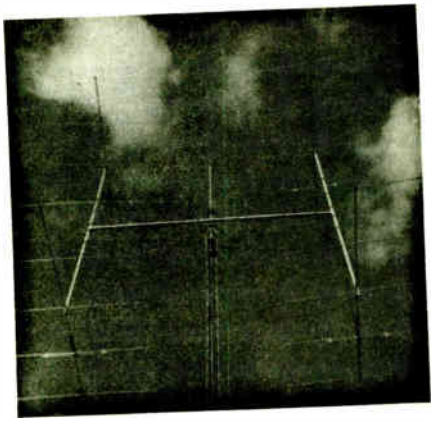
November 3: WA4IRX again, heard W3 and W8 signals poorly and briefly (1332).

November 11: WA9CWZ/Ø in Kansas City reports hearing other K.C. stations working Arizona about 0210. But the fun really started about 2330 and lasted into the next day. WA4GDC reports the band opened for him at 2330, and in the next few minutes he worked a pair of Maryland stations. By 2353 it had shifted to Indiana (from Kris' Sebring, Fla., QTH) and at 0013 Kris reported working Kansas City and hearing, at the same time, W1GKE working VP7CX. Four minutes later, WA4IRX found the band opening for him and Al worked 3 Jacksonville, Fla., stations in the following 22 minutes. At 0045 WA4GDC was still in there working Illinois as the opening (for him) moved south. By 0111 the target was Tennessee and at 0115 Kris worked K4HNH in Nashville. At 0158 new faces got into the act as WA9ETE/WA9KHZ, LaHarpe, Illinois, worked K5WWQ/5 followed by several more W5's, and at the same time double-hop made its entrance for the Florida crew. WA4GDC reports working, then, W5GDZ, Tulsa, Okla. Meanwhile, back in Memphis, WA4IRX was polishing off Miami stations from 0138 to 0225 when he found that the band was also open west and, at 0238, worked WA5ESQ in Amarillo. Six minutes earlier Kris was working Fort Worth from Florida. Things went out for WA4GDC at 0252; no other report of ending time.

November 13: Fairly quiet day at normal operating time, with only a report of Michigan being heard in Florida about 0215. But next evening, at 2300, fun rivaling that of the 11-12 began again. As before, it started in Sebring as WA4GDC worked N. J., N. Y., and Pennsylvania stations. In Memphis, it was weak; Al reported hearing Florida poorly between 0104 and 0239 (backscatter, perhaps?) with no signals above 50.55 Mc. But until 0226, the Florida boys had fun with Virginia, Ohio, Kentucky, Indiana, and Missouri coming in.

November 16: At 1335, WA4IRX heard an unidentified W4 on what appeared to be a meteor ping.

November 19: WA4IRX reports hearing W8AEF at 0254 but the band folded too fast for a contact. About 0300, says



BEHEMOTH OF A BEAM is this 20-element array at K4OCK, Miami, Fla. John advises it is 18 feet square (between booms); gain is about 19 to 20 db, sidelobes are 20 db down. Feeding it is a kilowatt; John also operates a gallon on 144 (both SSB) and 50 watts into a quad helix at 1220 Mc. Wow!

Cush Craft

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Rugged, lightweight, and real performers. Booms 1" diameter aluminum tubing, elements 3/16" dia. aluminum rod pre-assembled on booms. Transformer dipole for 300 ohm match. May be ordered for 200 ohm. Available on 2 meter beams only gamma match for direct 52 or 72 ohm feed.

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Model No. A144-11 ..... $12.75
2 Meter, 7 element, Boom 8',
Model No. A144-7 ..... 8.85
1¼ Meter, 11 element, Boom 8.5',
Model No. A220-11 ..... 9.95
¾ Meter, 11 element, Boom 5'
Model No. A430-11 ..... 7.75

DUAL STACKS

Utilize two of our standard VHF beams 3 db gain over single beam. Complete with two antennas, stacking bars, and all hardware. Feed line same as single beams.

	Net
2 Meter, 22 element Dual, Model No. A144-11 Dual	$29.00
2 Meter, 14 element Dual, Model No. A144-7 Dual	21.25
1¼ Meter, 22 element Dual, Model No. A220-11 Dual	22.90
¾ Meter, 22 element Dual, Model No. A430-11 Dual	18.50
Vertical Polarization kit for duals: Specify model no. of dual being used with the kit when ordering. Model No. VPK	7.50

QUADS

6 db gain over single beams. Complete package with four antennas, stacking frames, phasing bars, Q sections, and all hardware. Standard Quad 200 ohm (52 ohm thru balun), may be ordered for 300-72 ohm.

2 Meter, 44 element Quad,
Model No. A144-11 Quad $76.00
2 Meter, 28 element Quad,
Model No. A144-7 Quad 62.50
1¼ Meter, 44 element Quad,
Model No. A220-11 Quad 54.50
¾ Meter, 44 element Quad,
Model No. A430-11 Quad 43.00

VHF COLINEAR

Mechanically balanced, lightv
tenna systems, with extremely
major front lobe, low SWR,
coverage: Large capture area
radiation provide excellent rec
mitting characteristics.

16 ELEMENT ANTENNAS

2 Meter, 16 element Colinear,
Model No. CL-116 .....
1¼ Meter, 16 element Colinea
Model No. CL-216 .....
¾ Meter, 16 element Colinear,
Model No. CL-416 .....
Universal matching stub provid
ohm match to 300 ohm 16 el
Model No. CL-MS Freq .....

32 ELEMENT ARRAYS

Order two 16 element antennas,
ment stacking kit, complete wit
and matching stub. Antennas no
2 Meter, 32 element stacking kit
Model No. CK-132 .....
1¼ Meter, 32 element stacking
Model No. CK-232 .....
¾ Meter, 32 element stacking k
Model No. CK-432 .....

64 ELEMENT ARRAYS

Order four 16 element antennas
ment stacking kit, complete
hardware, and matching stub.
included.
2 Meter, 64 element stacking kit
Model No. CL-164 .....
1¼ Meter, 64 element stacking k
Model No. CL-264 .....
¾ Meter, 64 element stacking ki
Model No. CL-464 .....

6 METER BEAM

Rugged, Full size, wide spaced
Booms are 1¼" and 1½" diam
are ¾" heavy wall aluminum
match for direct 52 or 72 ohm
marked for quick assembly.
6 Meter, 3 element, Boom 6', M
6 Meter, 5 element, Boom 12', M
6 Meter, 6 element, Boom 20', M
6 Meter, 10 element, Boom 24',
Model No. A50-10 .....
6 Meter, Portable 48" x 4" folded
Model No. A50-3P .....
6 & 2 Meter, 10 element, Boom
Model No. A26-9 .....

BIG WHEELS & HALOS 360° Coverage

The amazing Big Wheel is a horizontally polarized, broadband, omnidirectional gain antenna. It provides direct 52 ohm coaxial feed.

Model No. ABW-144 Single 2 meter Big Wheel	$10.95
Model No. ABW-220 Single 1¼ meter Big Wheel	9.95
Model No. ABW-430 Single ¾ meter Big Wheel	8.95
2 Bay stacking Kits available	3.95
4 Bay stacking Kits available	11.75

MOBILE HALOS: Aluminum construction; machined hardware; Beddi Match for 52 or 72 ohm direct feed. 2 meter. Dual hals two bands one 52 ohm feed line.

Model AM-2M—2 meter, with mast	$8.70
Model AM-22—2 meter, stacked Complete	14.95
Model AM-6M—6 meter, with mast	12.50
Model AM-26—6 and 2 dual hals, with mast	17.45

NEW ZIPP

with wing nut construction

Combination ZIPPER with
No. A26-ZP .....

6 Meter 3 element ZIPPER

INAS FOR OUTSTANDING PERFORMANCE

RRAYS

ight VHF an-
gh power gain,
id broad band
id low angle of
ring and trans-

13.2 DB GAIN

.....$16.00
..... 12.85
..... 9.85
s 200-52, or 72
nent antennas,
..... 4.75

7 DB GAIN

ind one 32 ele-
all hardware,
included.

.....$32.50
lt,
..... 32.50
.....
..... 19.95

0 DB GAIN

ind one 64 ele-
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Antennas not

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..... 59.50
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..... 29.95

IS

ham beams.
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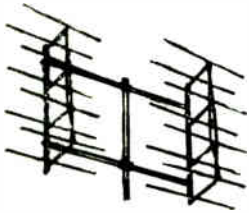
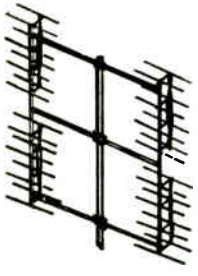
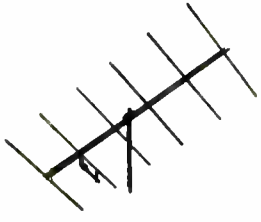
del No. A50-3..$13.95
del No. A50-5.. 19.50
del No. A50-6.. 32.50
..... 49.50
..... 10.95
2",
..... 27.50







TWIST Another CushCraft 1st!

For Tracking Oscar III

For satellite tracking, back scatter, or point to point communications. The Twist provides either vertical or horizontal and left or right circular polarization. Ideal as a combination point to point or base to vertical mobile antenna. Reddi Match driven elements for direct 52 ohm feed. Cut to frequency within 130 to 150 Mc. range.

Model No. A144-20T Single 20 element TWIST $24.95

Dual and Quad arrays available.

THESE LEADING DISTRIBUTORS CARRY CUSH CRAFT ANTENNAS

Arrow Electronics, Inc.
900 Broad Hollow Road
Farmingdale, L. I., N. Y.

Bell Electronic Supplies, Inc.
1835 West 9th Street
Chester, Pennsylvania

Electronic Wholesalers
938 Burke Street
Winston-Salem, North Carolina

Amateur Electronic Supply
6450 Milwaukee Avenue
Chicago, Illinois

Purchase Radio Supply
327 East Hoover Avenue
Ann Arbor, Michigan

Crescent Electronic Supply, Inc.
537 South Clairborne Avenue
New Orleans 12, Louisiana

Radio, Inc.
1000 South Main Street
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ER PORTABLE BEAMS

6 & 2 Meters

or sturdy swing out portability, and ZIP assembly.

elements on 2 meters, 3 elements on 6 meters Model
..... $15.95

Model No. A50-ZP $10.95

Cush Craft 621 HAYWARD ST. • MANCHESTER, N. H.

WA9ETE, a few W5's were heard in Illinois.

November 20: Two openings reported, both by WA4GDC. At 0143 Kris worked K3MPN in Pennsylvania, and at 1410 he nabbed WAØDLN, Missouri.

November 21: No E-skip but K3MZO reports good groundwave, working WA2-WLB, New Jersey, over an extended path.

November 27: Again from K3MZO, in Pennsylvania, report of a small opening to Florida. No time given.

November 28: WA4IRX reports numerous unidentified audio bursts between 1350 and 1427.

November 30: At 0049, WA4GDC worked WAØBPC, Missouri; at 0205, Kris hit W5EME, Fort Worth.

December 1: WA5FYF reports hearing K5DCP work VE4MA at 0215. From 0230 to 0330 WA9CWZ (at home in Illinois for visit) worked a pair of Denver stations, both with fading signals.

Other Data: John Liszczak, K9KGI, tells us of a SSB net which meets every Wednesday at 7 p.m. CST on 50.110; he is net control and alternate NCS is K9-KMK. Anyone in the Chicago area is welcome to check in, USB please.

Les Baker, WA9ETE/WA9KHZ, passes us data on three nets in his area. The Lee County Emergency Net meets Tuesdays, 6:30 p.m. CST, 50.460 Mc, with WØYWP as NCS. The Des Moines County Net meets Thursdays, 9 p.m. CST, 50.4 Mc, rotating NCS. And the McDonough Six Meter Emergency Net meets on Tuesdays, 9 p.m. CST, 50.350 Mc, under K9HLT.

144 MEGACYCLES, as could be expected, had the big play in November and early December as tropo conditions shaped up nicely over the entire nation. A few meteors here and there didn't hurt any either. By days, with times in GMT, here it is:

November 4: K9WZB, New Carlisle, Indiana, reports working W8EOJ at 0335 and K8VMA at 0140; both are in Ohio, and K8VMA is at a distance of 240 mi. This is a regular sked, 0335 daily except Wednesday and Saturday on 145.008 CW.

November 6: WB2CCO, Plattsburgh, N. Y., worked W1CMV portable in New Hampshire (low power) at 0240.

No ember 8: Good opening in northern midwest. WØRDL, Independence, Mo., worked WAØFDY in North St. Paul at 0237. Eight minutes later RDL hooked KØWLK, Glen Lake, Minn., and at 0337 he worked WØWKB in Iowa. Finally WØAWK near Minneapolis closed it out for RDL, who was using 20 watts RF to an 8-over-8 J-beam, and a 417A converter.

The same night, at 0400, K9WZB got through to WA9DOT, Grafton, Wisc.; at 0445 he hooked K8RZB, 215 miles away, on phone; and at 0535 using CW he snagged W8SDJ, Cincinnati, 260 miles.

November 12: WB2CCO worked VE2-BMC and VE2AVP, both operating less than 5 watts input in Montreal, and received both Q5 S9 from 0405 through 0515.

November 15: K9WZB's CW made it to Paradis—Art Paradis, W8KAY, that is—over a 285-mile range at 0515.

November 18: Meteors were here, and K8AXU (W. Va.) proved it at 1037 when he worked W4MNT in Florida on a 40-second burst. However, Al reports no luck on skeds with either W7JRG or WØ-EYE.

November 20: At 0317, WB2CCO found W2LVQ in the Bronx ready to talk over a 300-mile range and made the contact.

This isn't a complete list of all the contacts reported by the people quoted, but due to our oversize technical articles this month we've left out repetitive contacts and hit only the extreme highlights.

However, we didn't leave out 220, 432, and up for space reasons. We still don't get much input data on the upper bands.

Sid, K8ZES, put it nicely in his report (which lay misrouted in the postoffice too long to be newsy when the mailmen finally found it and sent it on): "I'm still amazed at the evidently poor reporting you get. I know many VHF boys get 6Up, but where are the reports? Many of them have plenty to report if they'd care to."

Have we heard from you lately? Special credit to consistent reporters appears in the box below—and extra plaudits go to WA4IRX and WA4GDC, neither of whom has missed a month since the second issue of the magazine (the first for which reports were asked). If you want to see YOUR call in the box, send reports for at least two months. When we haven't heard from you for four months, out it comes. Now let's hear from you!

REPORTING HONOR ROLL

Call	Reports
WA4GDC	5
WA4IRX	5
WB2CCO	3
K8ZES	3
W2NSD/1	2
K3GGZ	2
K4EBT	2
W5AJG	2
W6IEY	2
WA9CWZ	2
W9JFP	2
W9OKB	2
KØDEL	2
VE3LI	2

WANTED: SHORT STUFFIES

All of us now and then come up with an idea or two which can make operating easier for the other fellow if only we tell him about it.

That's the purpose of "Short Stuff". In this space, most anything goes. It can be a construction idea, an operating hint or even a tip on a new tube type. But it has to be sent in to appear here.

Unfortunately we can't even give free subscriptions in payment. We will send along an extra copy of the mag. But the main idea is to share those ideas with the rest of the gang, anyhow. We'll be looking for yours. —K5JKX

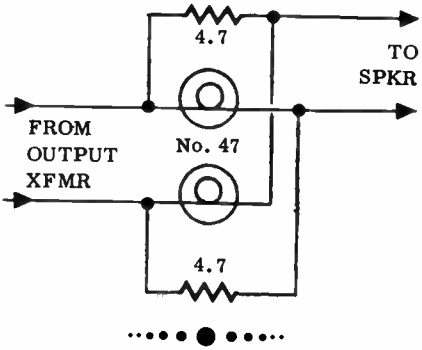
Short Stuff

SQUELCHING A TWOER

Here's a quick and simple squelch used originally with the Heath Twoer but it could be adapted to any rig.

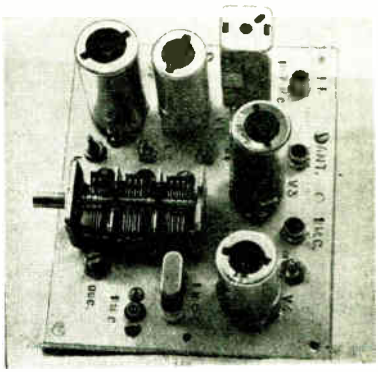
It works like this: With nothing but noise coming through, the bridge formed by the resistors and the pilot bulbs is almost balanced, so little sound gets thru to the speaker. When signal appears, it causes some current flow through the 2 bulbs, which changes their resistance.

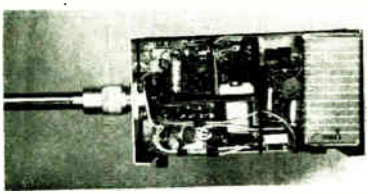
When the resistance changes, the unit is no longer balanced so more signal can get through; the more signal, the more current, and the greater the unbalance. Almost immediately you have full audio.

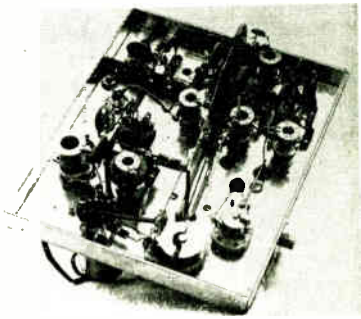


The most common variety of mica compression trimmer capacitors around is the line made by ARCO. These are marked with a model number which indicates the capacitance range. The following table translates these numbers into capacitance ranges, should you find some of these trimmers in your junkbox:

ARCO NO.	RANGE (in mmf)
460	1.5 to 15
461	2.7 to 30
462	5 to 80
463	9 to 180
464	25 to 280
465	50 to 380
466	80 to 480
467	110 to 580
468	140 to 680
469	170 to 780







6 METER KITS

FUN! That's the best way to describe this miniature 6 meter transceiver. For hilltopping, traveling or keeping in touch at hamfests, this little rig is unbeatable. It uses 5 transistors, including 2 in the transmitter, 1 in the receiver, and 2 in common audio section. The receiver is similar to a transistorized Sixer; the transmitter runs 50 mw input.
K3NHI Kit: $25.00

GOOD? No, not good, excellent! This little converter is tunable over the entire 6 meter band, giving a fixed output at 10.7 mc. The 6EW8 rf amplifier is really hot. Excellent 0.1uv sensitivity and 27 db gain give better performance than many more expensive converters. The if output can be tuned on any communications receiver or it can be fed into an FM receiver for direct copy of 52.525 FM.
W9DUT-2 Kit: $20.00

Are you junkboxless? Don't let that keep you from building your favorite projects from 73 Magazine; buy 73 Parts Kits. These handy kits provide all necessary parts at a price lower than your friendly supplier's. They have all connectors, tubes, transistors, sockets, chokes, resistors, etc. The only things you need are a chassis or cake pan, miscellaneous nuts and bolts, and a hot soldering iron. Complete instructions are found in the article pertaining to the enkitified piece of equipment. Order from 73 Magazine, Peterborough, New Hampshire.

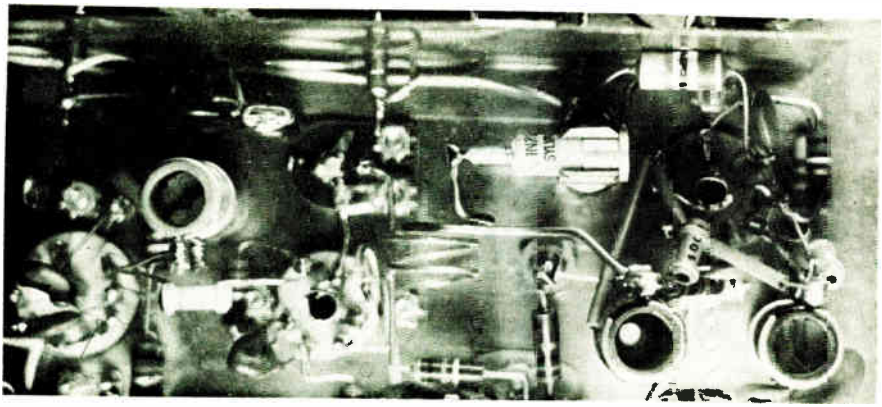


PHOTO 3. Detail view of crystal mixer wiring and L3-L4 coupling arrangement. IF amplifier is at left of photo; oscillator at far right.

carded octal tube socket. The one-turn link shown in Photo 3 is the coupling link L4 to take the harmonic conversion signal from L3. Position between L3 and L4 is critical for best work of the mixer and will be discussed later.

Looking at the converter from the harmonic-circuit side, remove the coil on the left (one of the two original output coils) and add a new layer of wire over the original one. This new winding (made with same wire size as the other and the same number of turns) is L6, while the original is L5 (see diagram). L5-L6 should resonate broadly on 30 Mc. Remove and discard the slug of this coil. The ground end of L5 goes to the feed-thru capacitor shown in Photo 2, for which a hole must be drilled. More on feed-thru C11 later.

(EDITOR'S NOTE: I1LOV did not discuss the IF amplifier circuit, since it is taken directly from page 39 of the September, 1959, QST. However, many of us may not have access to the original article, so a brief description of the 12AT7 stage follows:

(The first stage of this IF amplifier has an input impedance of about 400 ohms, which happens to be the optimum load for the 1N21 series of mixer crystals. L5 and L6 form a bifilar RF choke for the DC return of the crystal and the cathode of the IF amplifier. L7 is the plate load for the grounded-grid stage, and it will tune very sharply. The original article suggests that this coil must be retuned if

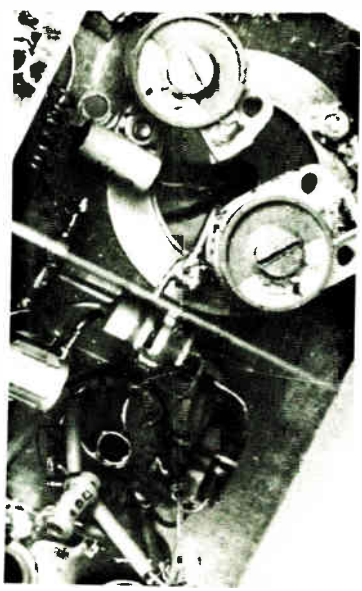


PHOTO 4. Bottom view of mixer cavity shows details of added coupling link and IF-amplifier socket wiring.

frequency is moved as much as a few hundred kilocycles. This is no handicap on 432, since most operation is in a 50- to 100-kc range centered on 432.000 Mc.)

ALIGNMENT AND OPERATION

Connect a 2-mA meter between feedthru C11 and ground, and tune L1, L2, and C12 for maximum reading of crystal current. With L4 well coupled to L3 you should get more than 1.5 mA which is much more than needed; average diodes require from 300 to 700 microamperes for best operation.

Next, connect the converter to a receiver, connect a voltmeter across the audio output, tune the receiver to 28 Mc, connect a modulated signal generator tuned to 432 Mc to the input of the converter, and tune C2 and C3 for maximum deflection. Tune C4 and C5 for maximum at 434 and C6 for maximum at 436. Tuning of L7 is for best signal-to-noise ratio; tuning of C1 for best noise figure with converter connected to the antenna terminals. If a signal generator is not at hand, the same procedure can be used with weak signals. (You can make your own weak signals with an 8-Mc oscillator and a diode multiplier—EDITOR.) The best alignment possible would be, of course, with oscilloscope and sweep generator. After these adjustments, tune a signal at 432 and tune C12 for best noise figure while observing the milliammeter connected to C11. Usually, even with C12 detuned, the output of the harmonic generator 6AK5 will be too high (e.g., too much crystal current for proper operation of the mixer). If this happens, decouple L4 from L3 until you find the proper crystal current consistent with good operation.

Once proper crystal current has been determined and set, you can replace the meter with a jumper. However, it's best practice to monitor crystal current at all times. —I1LOV

WANTED: More Technical Articles.

De-Noising the 6N2

by Jim Speck, W5PPE
1609 Glenbrook Terrace
Oklahoma City, Oklahoma

The line noise sure came up when a Johnson 6N2 transmitter was installed at W5PPE, or so I thought for a couple of hours. The S-meter, which usually sat at 1 or 2, was pushing 9—and no one was coming through.

After futilely pounding power p les, close checking eliminated everything but the new transmitter as the source. The noise was tunable with either plate or grid tanks of the 5894, and gave indications of being caused by an unstable bottle, so final neutralization was checked. No luck. Further checking showed the noise to be originating in the 6360 driver stage, but neutralization added to the stage had no effect on the noise.

Shortly before calling in a witch doctor, I happened to remember how a diode noise generator works—and sure enough, the 6N2 has one designed into it. When on standby, or on transmit with the factory recommended push-to-talk modification, 250 volts is supplied to both the plate and screen of the 6360. Since the stage is cathode biassed, it draws static plate current. This current generates diode noise just like a noise generator.

The final, meanwhile, has 600 volts on it but plate current is held down by the low screen voltage resulting from clamp tube action. Even so, the 5894 does do some amplification of the noise being put into its grid circuit. In my case, the noise was getting into the converter via the -30 db leakage through a TR relay.

Opening the cathode lead of the 6360 eliminated the trouble, and fortunately an easy fix was available to do just that on receive with no change in operation or tuneup, but definitely curing the noise. The key jack is in the 6360 cathode, and is a grounding type with a separate connection for the plug shell which is linked to ground at the jack (see Figure 1). All that is necessary is to break this link, and connect the plug-shell terminal to the antenna relay contact terminal (crystal socket) next to it which is grounded on transmit. (The other antenna-relay terminal remains connected to ground on the operate switch.

The antenna relay connection now does the grounding for all cathodes except the 5894, and no noise can be generated on standby. In addition to eliminating the noise, this modification reduces the standby power dissipated by the rig. If the transmitter has not been modified per Johnson for PTT, connect the key jack terminal directly to SW2-1 and bypass at the jack with a .005-mf disc ceramic.

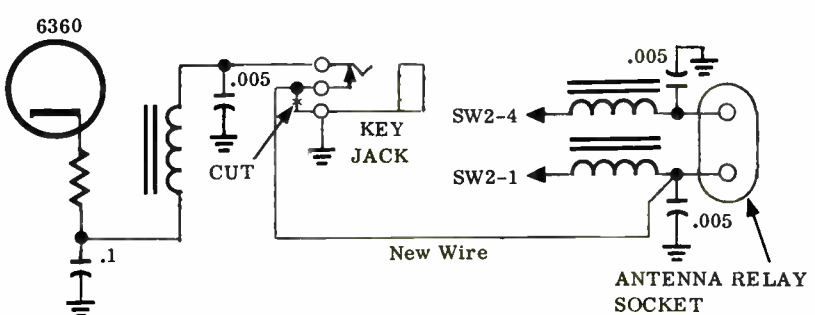
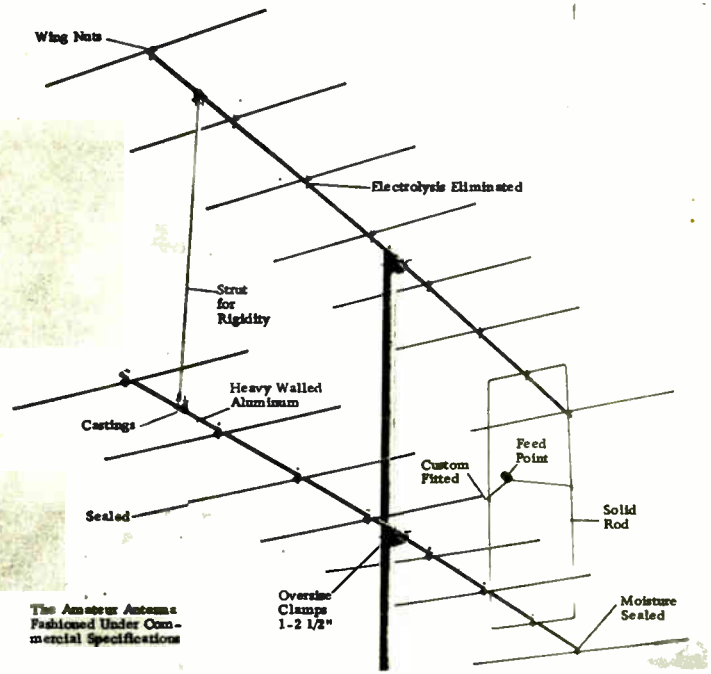


FIGURE 1. Changes in Johnson 6N2 Transmitter to Eliminate Noise

Only the "J" Beam Antenna can give you all these lifetime advantages!



1. ADD-A-UNIT MODULAR CONSTRUCTION

Exclusive "J" Beam design affards endless cambinatians. Starting with basic madel, yau simply add matched "J" Beam elements and units far any gain yau desire. Basic unit delivers powerful pin-point 11.0 db gain. Added elements pravide 2 ar 3 db plus gain. Additianal units can expand antenna ta 128 ar mare elements. Na ather antenna has this feature. The "J" Beam defies absolescence.

2. CONSTANT IMPEDANCE AND IMPROVED RECEPTION

Unique infirite impedance feed design reduces SWR's ta an absolute minimum. Lawer lasses result in increased signal strength. Stacked "J" Beam design gives greater receiving aperature, greatly reducing fade and flutter.

Ratings: 50MC-1KW, 144MC-1KW, 220MC-1KW, 420MC-1KW

3. BEAM COMPRESSION AND ELIMINATION OF SIDE LOBES

Exact phasing facuses farward signal inta ane narraw path. Perfect feeding symmetry campresses side labes inta farward signal. These features insure the delivery af full pawer.

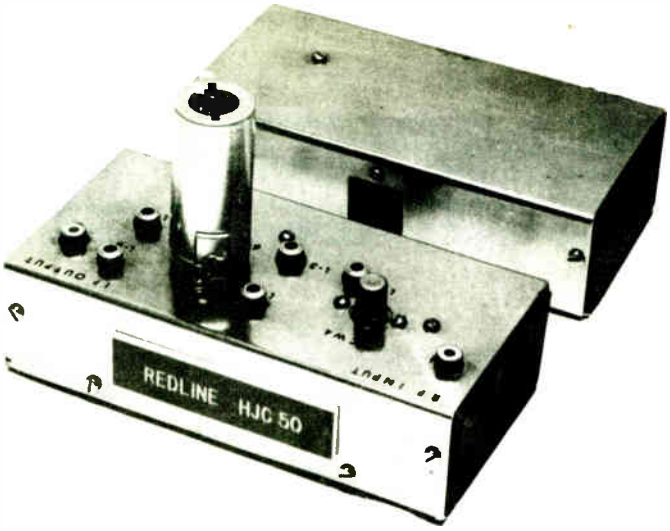
4. PRETUNING AND POLARIZATION

All "J" Beam Antennas are labaratary measured and fashianed ta deliver specified perfarmance. All madels can be vertically ar harizantally polarized withaut additianal hardware.

5. LIFETIME DURABILITY

"J" Beam elements are af heavy walled aluminum tubing. All clamps and fittings are forged with a special metal allay that cannot rust or form electrolytic carrasian. See specificatian details with above illustration.

GAIN INC. 1209 WEST 74th STREET • CHICAGO 36, ILLINOIS • PHONE TRiangle 4-2610



Bargain?

Every time we look at the prices being charged for other six meter converters we wonder what we are doing in there with the lowest price unit.($31.95). We wonder more when we fire up the noise generator and test the other converters alongside the Redline HJC-50. None came within 1/2 db, even at well over twice the price. Most of them were about 3 db worse, with the most miserable of them up an unbelievable 12 db! We still guarantee that the HJC-50 will outperform any other converter (except our DGC) at any price or your money back.

Now, about that price. If we were just knocking together little gold plated noise generators we might be able to make a profit at the $32 level. Watch for our new model HJC-50A converter which will be absolutely identical to the HJC-50 except for a higher price. We expect to announce this model soon.

We are a little upset about selling power supplies too. We like to build VHF gear, but power supplies? Echhh. Our solution to this is simple; before long we will have the power supply built in our 50 mc model just as it is in the 144 mc unit. This will probably be designated HJCWB1PS-50 and no doubt will sell for something on the order of $49.95. In the meanwhile we will continue to fill orders for our HJC-50 converters at $31.95 and the HJS power supplies for $9.95.

Perfectionists are welcome to hop on our waiting line for the $98.50 DGC converters and DGS power supplies ($59.50). These are better than the HJC's. Models are available for 50, 144, and 220 mc. Don't bother us with 432 mc units yet...we'll let you know.

Two meter addicts will want to invest in an HJC-144 (power supply built right in) for $49.95.

REDLINE

Jaffrey, New Hampshire

de k5jkx

. . . from page 1

shape of the spectrum shortly, unless we improve.

There's no instant cure for the situation, and Loucks himself is one of the first to point out this fact. What is needed seems to be more Good-Samaritanism among hams, and less petty bickering over AM vs. SSB, or Advanced Class vs. the Tech. How do we get it?

I think one good way would be for the old-timers to come back out of hibernation and tell us some of the history of ham radio. In the old days we had but a single route to a ticket—through another ham. Now we have so many ways it's perfectly possible for anyone to study up and get on the air, General Class, without ever once talking to another amateur. Naturally, this fellow won't know any of our traditions. But if he did, he might well be one of the most dedicated of us all.

This is an open invitation for any of you old-timers who want to help to send me the material; I'll be happy to print it. I think it may help some.

What do you think? —K5JKX

...from page 7

Reference Data for Radio Engineers, 4th Edition, published by International Telephone and Telegraph Corporation, pp. 750 through 761.

McLaughlin, J. C., and Hobbs, R. W., "Noise Factors Affecting V.H.F. Communication", QST, June, 1961, p. 15.

Morgan, Dean, "Tropospheric Scatter Techniques for the Amateur", QST, March, 1957, p. 11.

Special Scatter Issue of Proceedings of the IRE, October, 1955 (entire issue).

WIDE BAND FM

While it's true that a watt of RF, given the same conditions, will only put so much signal into a distant receiver, the amount of information which that watt of RF will convey depends on a lot of things.

And when all these things are added up, FM gives the most ability to talk from here to there, for every dollar spent on that watt. But it involves many differences.

One of the major differences in the receiver is that it has no AGC. Limiters do the same job; once both limiters are saturated, no amount of signal increase can increase the amount of audio output.

In absence of a signal, though, the limiters allow antenna noise to blast forth like a jet going over. For this reason, practically all FM receivers used for communications use some sort of squelch. Most of these are of a type called "differential" or "noise actuated". There are many variations, but the basic circuit shown in Figure 1 is used in 95% of the receivers usually available to us.

This works because the noise output of an FM receiver disappears when a good signal comes in. The noise output (above the range we can hear) is coupled to the grid of V1 through a small capacitor; V1 amplifies this noise and the variable resistor in V1's catnode serves as a squelch control. Output of V1 goes to a diode, where it is rectified and filtered to become positive DC. The DC goes to the grid of V2A, which in turn controls the bias on V2B.

With noise present (no signal) the DC from the squelch diode puts positive bias on the grid of V2A, which conducts. This causes a voltage drop across R, and the drop across R appears as "negative bias" to V2B since the cathode is more positive than the grid. V2B is thus cut off and can pass no audio; the speaker is silent.

When a carrier quiets the receiver, no noise is left to produce positive bias for V2A, which then conducts less current. Less "negative bias" appears across R, and V2B can amplify in its normal manner.

In the space available this month, I have hit only the high spots and much has been trimmed back (by the editor—jk). We hope soon to devote our entire space to receiver oscillator-multiplier-converter combinations. Many sets use but one crystal for both conversions.

And we're still ready to answer your questions. Send them direct to me (QTH at top of page) and we'll answer in this space. —73, Fritz

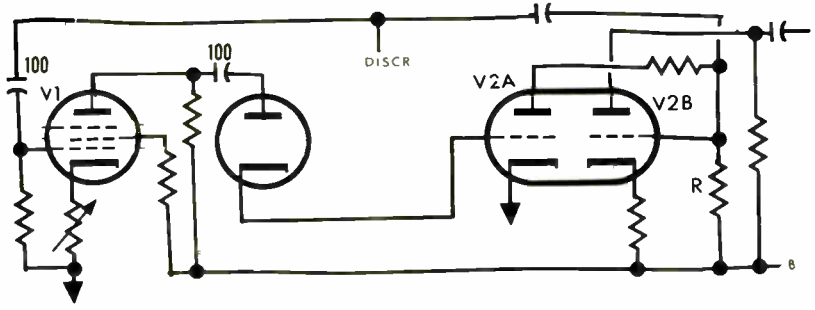


FIGURE 1. Simplified Schematic, Typical Squelch Circuit

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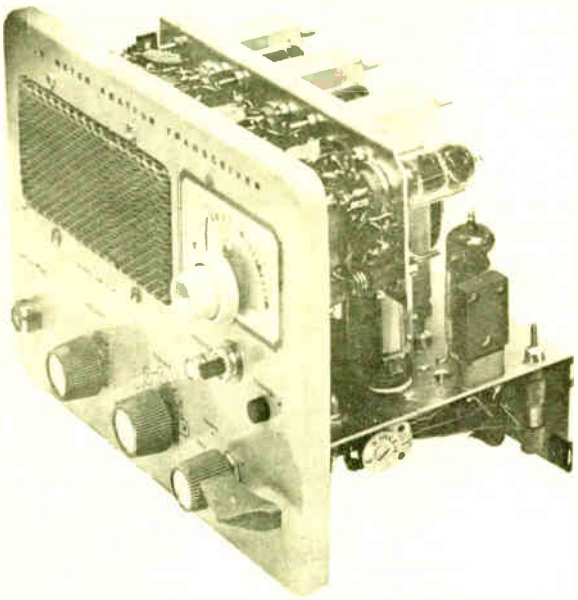

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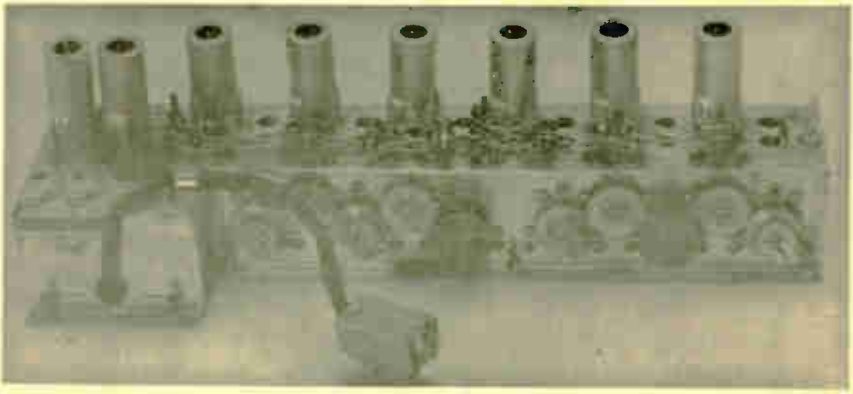
Vol. 1, No. 8

6 up The VHF magazine

March 64

20¢ per copy

BEFORE . . .



. . . AND AFTER

cover photos by Jim Dungan of Dallas

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EDITOR: Jim Kyle K5JKX

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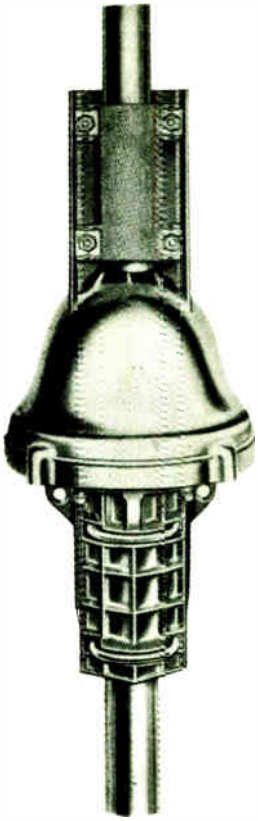

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For technical information, contact Bill Ashby K2TKN. Your local CDE Distributor will have the TR-44 in stock soon.

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. . . de K5JKX

ABOUT FREEDOM . . .

You're parked peacefully on 50.15 Mc, enjoying a wide-open band and making a contact every two minutes, when an authoritative knock sounds at the door. Reluctantly, you leave the rig and answer. Two burly policemen are there.

"Joe Ham?" asks one gruffly. You manage to gulp out a stuttering "Yes." "Come along," he says. "I have a warrant for your arrest on a charge of disturbing the peace."

At the police station, you learn the details of your offense. You had been operating a ham radio station. A neighbor with a defective TV set had sworn a complaint that you were disturbing him.

"Impossible!" you may snort. "Can't happen here. This is America, the land of freedom."

Swallow that snort. It not only can happen here, it did happen in Indiana last summer. And the ham lost.

Here's another one. In Santa Barbara, Calif., the City of Santa Barbara is attempting to obtain injunctions to halt operation of K6GHU, K6KCI, and WA6-IBR as "public nuisances." It's a clear effort by a local government to regulate ham radio, worthy of being carried to the Supreme Court if necessary.

Or consider the case of K3IOP. For anyone who happens to think that all's well with the world, what has been happening to 16-year-old Charles "Butch" Seaman in Elizabeth, Pennsylvania, a near-suburb of Pittsburgh, is a shocking awakener.

K3IOP is (I should say was) a 6-meter station. Elizabeth is in the service area of KDKA-TV, Pittsburgh, Channel 2. All you good 6-meter men know that some trouble is inevitable trying to use the band in a Channel-2 area.

Neighbors complained, and K3IOP tried to cooperate. But one in particular, a local political figure, would be satisfied with nothing less than his removal from the air. Complaints were made to the FCC, and K3IOP was checked out on at least eight occasions. Of these, several were entirely secret and unknown to the licensee. The verdict? Operation of K3IOP was completely clean. No offense was being committed.

Commission officials then went even farther than required. Through cooperation of TV manufacturers, some 128 high-pass filters were obtained to be furnished to any TV-watcher who made his troubles known. The FCC Buffalo Field Office staged a demonstration for the Elizabeth Borough Council and proved that the filters would permanently and completely eliminate any interference to KDKA-TV by K3IOP.

So what happened? The town council voted a resolution to urge committees to pass laws against interference by ham operators. Rep. Holland, Democrat of Pennsylvania, blasted K3IOP on the floor of the House on August 6, charging that young Seaman had deliberately stepped up his power "blasting TV reception off the air."

With the political pressure being exerted from all directions, the Commission was forced to an unusual step. Along the way, Butch had passed his General Class exam—but the ticket was modified, by split vote of the seven Commissioners, before being issued. K3IOP is now probably the only amateur in the entire United States who is forbidden to operate in the frequency band 50-54 Mc. This action was taken under the "Public-Interest" provisions of FCC rules. Butch took exception. The hearing is set for March 4, in Pittsburgh.

I can hardly blame the Commission for taking the action it did, grossly unfair though it seems. After all, what's more

(Soapbox resumes on page 23)

Clegg VENUS - SSB Transceiver For 6 Meters

The Clegg Venus is a high quality, compact, attractively styled SSB receiver and transmitter that puts you on 50 mc single sideband without all the fuss, bother and expense associated with adapting low frequency SSB exciters, crystal controlled converters, relays, linear amplifiers, etc.

Employing all the latest circuit techniques, the Venus, in one small package, provides a combination of advanced operating features and conveniences heretofore unavailable in rigs at any price. Some of the outstanding features of the VENUS include a nuvistorized high sensitivity, low-noise front end; crystal lattice filter in both receive and transmit positions; ± 1.5kc receiver offset tuning; broad band circuits throughout providing maximum simplicity and ease of tune-up; and a separate front panel control for smooth injection of carrier for excellent quality AM and adjustable CW output.

ELECTRICAL SPECIFICATIONS

TRANSMIT: *Frequency Range:* 49,975 to 50,475 KC, standard (other ranges available on special order). *Power Ratings:* 85 watts PEP input — all modes (AM, SSB, and CW.) *SSB Performance:* (9 MC lattice filter). Unwanted sideband down more than 50 db at 1000 cycles. Carrier suppression greater than 56 db. Distortion products down more than 30 db at full ratings. *Frequency Stability;* Less than 500 cycle warmup drift after first five minutes. Less than 100 cycles/hour drift after warmup.

RECEIVE: *Frequency Range:* Same as TRANSMIT. *Frequency Stability;* Same as TRANSMIT. *Sensitivity:* .25 μV for 6 db S N on AM. .1 μV for 6 db S/N on SSB. *Selectivity:* 2.7 KC at 6 db, less than 6 KC at 50 db. *Spurious Responses:* Images and IF leak through down more than 60 db. *Overload Characteristics:* Less than 5% cross modulation results from any two signals separated by more than 20 KC if stronger signal is less than 2 MV across 50 ohm input. *AVC Characteristics:* Less than 10 db change in AF output for input change from 1μV to 400 μV (52 db). Fast attack, panel selectable release times of .15 or 1.2 seconds. *AF Power Output to Speaker:* More than 2 watts at 3.2 ohms. *Physical:* 15" wide x 7" high x 10½" deep. Weight approximately 22 lbs.

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VENUS 6 TRANSCEIVER — Amateur Net Price..... $495.00

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SSB for 432

by LEROY MAY, W5AJG
9428 Hobart Street
Dallas, Texas 75218

EDITOR'S NOTE: Our previous effort at running a surplus-conversion article met with disfavor, but we offer this gem from W5AJG without apology. No, we don't have any idea where you can get an ARC-27 spectrum amplifier to convert. But if you can find one, you'll find it to be well worth while to try Leroy's ideas on it. See "Open Bands" this month to find out why. —K5JKX

One of the really versatile units to be found in surplus these days is the RT-178/ARC-27 transmitter-receiver unit. A 432-Mc exciter using the RF subassembly from this unit was described in the December, 1963, issue of 73 Magazine, and a 220-Mc converter built from the receiver RF amplifier will appear there shortly. But these projects are just the beginning for the ARC-27.

The modification described here uses the "spectrum amplifier" of the ARC-27 as a 432-Mc SSB generator. It has been proved in on-the-air operation.

In the original equipment, the spectrum amplifier is used to form the final output frequency for transmitting. Receiving tube types are used throughout, with B+ not exceeding 200 volts. The conversion to a SSB mixer-amplifier is quite simple and will provide a 432 Mc SSB signal of approximately .3 watt average output (inserted carrier) ready to be further amplified, usually via the existing station driver and/or final.

The input SSB signal was chosen as 21 Mc, from a 20A, since this frequency is used to drive all the other VHF SSB gear at W5AJG. At first, the frequency choice caused some misgivings since when mixing 411-Mc energy with 21 Mc to get a 432-Mc sum output, the difference would be 390 Mc, not far removed from the desired output. However, it was decided to give it a try anyway.

Absolutely no trouble was experienced with the unwanted 390 or 411 Mc components, due principally to the excellent Q and discrimination of the Hubbard tanks contained in the Collins ARC-27 unit. These exceptional tank frames have a bandwidth of about 2 Mc between half-power points, and an operating Q of about 100. As used in the spectrum amplifier, they are operated in grounded-grid circuits which are balanced to ground and which need no neutralization.

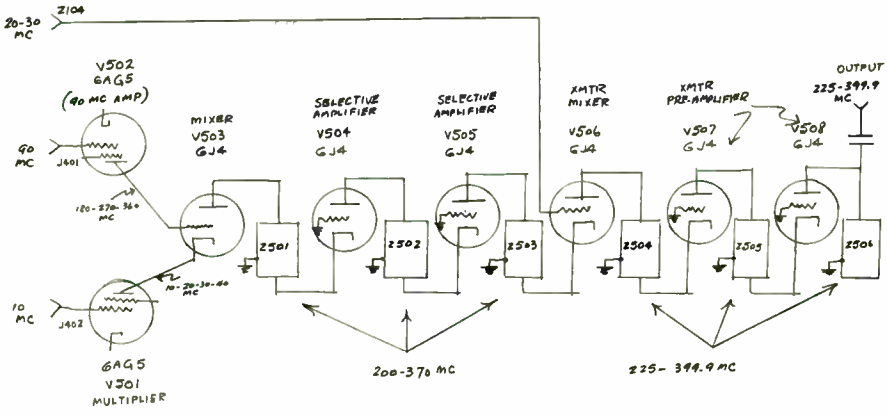
The mixer plate tank, plus two more amplifier tanks in the unit, are tuned to 432 Mc. In addition, all tuned circuits in the amplifiers between this unit and the antenna will add to the total unwanted-frequency discrimination. As used here, the .3 watt output of this unit drives a normal ARC-27 RF subassembly (see referenced "73" article) which in turn drives a pair of 4X150A's in Class AB_1. This gives a minimum of eight tuned tank circuits between mixer and antenna.

MODIFICATION THEORY

Before getting into the wiring details of this conversion, we'll look at the theory. The two block diagrams illustrate the original spectrum-amplifier lineup and the modified version, while the two schematics are similarly "original" and the modified version.

The two photos appearing on the cover of the magazine are "before and after" views of the unit. The original has a typical military look. The modified version is mounted on a 19-inch panel. The labels indicate frequency sequence in the multiplier chain. Only major components added were the 12AT7 oscillator tube at lower left corner, the crystal, and the VR tube next to the 12AT7.

The photo here shows the end portion of the unit, where the major modification occurs. It shows how the compartment



Z501 thru Z506 are Hubbard Tanks

is cleaned of relays, coils, and other items before modification.

Now to the theory. First, the original block diagram. V502 receives 90-Mc energy, and multiplies it to either 180, 270, or 360 Mc for mixer V503. V501 receives 10-Mc energy, and multiplies it to either 10, 20, 30, or 40 Mc for V503. The output of V501 goes to V503's cathode while that of V502 goes to the grid. The plate circuit of V503 then produces frequencies at 10-Mc intervals from 200 to 370 Mc, which are amplified by V504 and V505 before being delivered to second mixer V506 where another input of 25-30 Mc in integral steps is applied. Final output of the spectrum amplifier is a pure single frequency in the range 225 to 399.9 Mc.

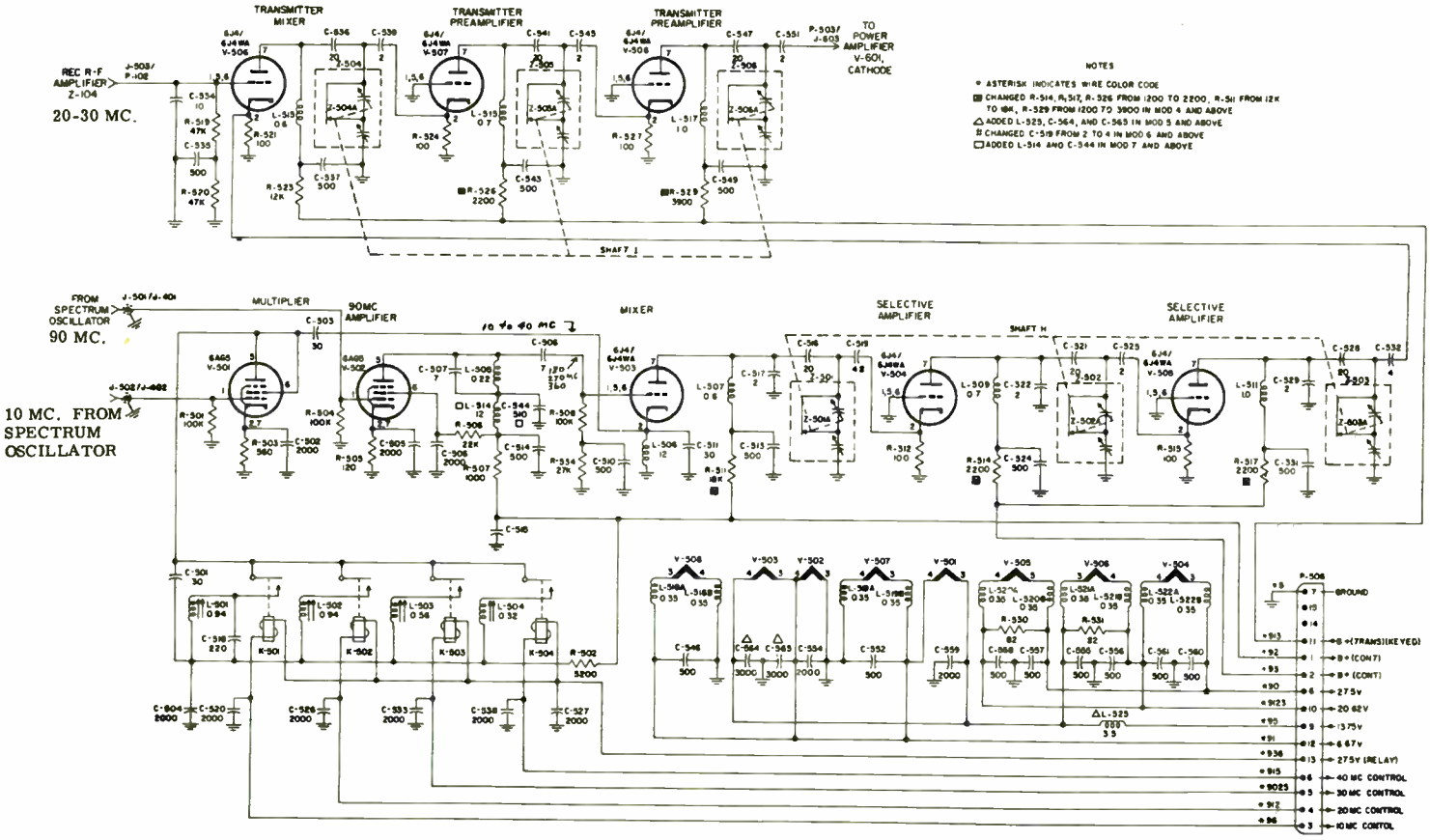
In the modified circuit (see block diagram) we add a crystal oscillator stage to drive V501, and use V501 to drive V502 as a tripler. With the crystal at 35.25 Mc and V501 acting as a buffer, V502 will triple to 102.75 Mc. The signal then goes to V503 and thence to the series of Hubbard tanks. V503 can be used as either a doubler to 205.5 or as a quadrupler to 411—I use it quadrupling here. V504 is also tuned to 411, as is V505. V506 is used as the mixer, with the 411-Mc energy fed to the cathode and the 21-Mc SSB input fed to the grid. V507 and V508 amplify the 432-Mc SSB product and give us about .3 watt output.

So much for the theory. Now let's see about the details.

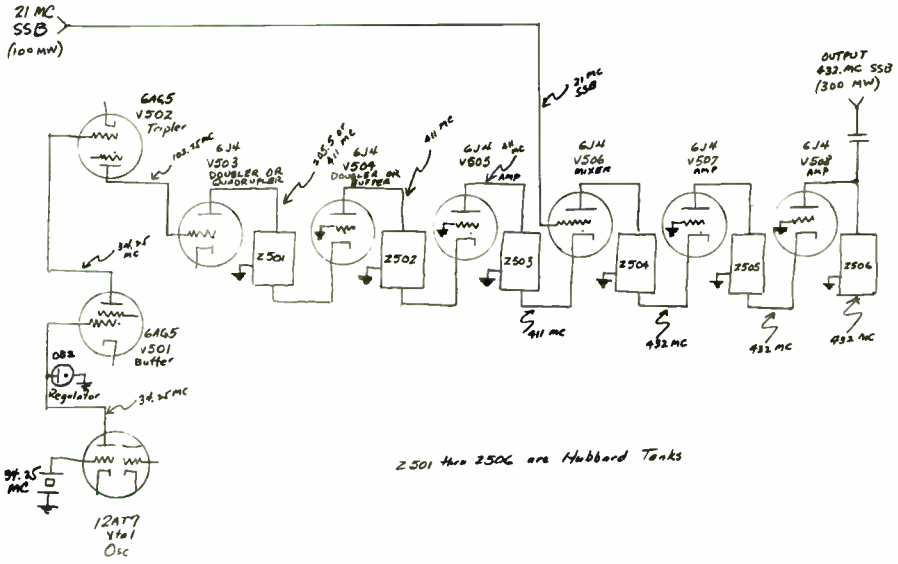
WIRING CHANGES

First step is to break all mechanical ganging of the RF tuners by removing the gear wheels. This will allow peaking of each stage individually. Install separate tuning knobs of your choice; standard 1/4-inch shafts prevail.

Next, clean out the end compartment as shown in the photo. Wire in the 12-AT7 crystal oscillator and the OB2 regulator tube. The crystal oscillator tank circuit may be the old L-501 and the buffer plate coil may be old L-502. Plate coil for V502 may be old L-503. Heat-



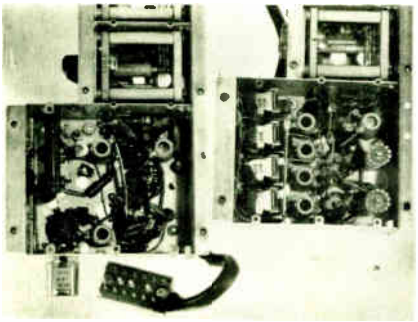
ORIGINAL SCHEMATIC -- UNMODIFIED



ers of the new tube may be connected as shown in the "modified" schematic. Cut out and discard resistors R530 and R531 across the heaters of V505 and V506.

No changes are made in the multiplier chain; at mixer V506 we substitute a 3900-ohm 2-watt resistor for R523 and at amplifier V508 we replace R529 with a 1500-ohm 2-watt unit.

In the grid circuit of V506, add a mica isolating capacitor to accept the 21-Mc SSB from the external generator. This drive must be held to 0.1 watt or so, and an attenuator or pad will be necessary.



Rewire power plug P506 as shown on the modified schematic. The idea is to leave the oscillator and V501 running at all times in the interests of stability, while keying the rest of the rig along with the exciter and final. This completes wiring changes.

TUNING UP

Since the Hubbard tanks will actually tune the range from 200 to 450 Mc, it is imperative that you know just exactly where in the spectrum you are tuning. If you have a UHF GDO available, this is easy. If not, you'll find it worth your while to stop and build one. A sensitive indicating wavemeter is also helpful.

Start at the crystal stage and adjust each tank in turn for maximum output. The RF tank assemblies contain adjustable series padders, tunable from the rear of the amplifier. These are used together with the main shaft adjustment for tuning. Be sure each stage tunes to the

(Continued on page 25)

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432 MC. TRIPLER - AMPLIFIER

Tube Complement and Circuit Description

Type 6360, the grids of which are excited at 144-146 megacycles by an external transmitter of 5 watts power output or greater. The plate circuit of this 6360 is tuned with a pair of silver plated parallel lines to 432 megacycles. This drives a 2C39-A in a grounded grid circuit. The tank circuit of the 2C39-A is a silver plated cavity. This tube is air cooled with a blower fan.

Power Output

Guaranteed 10 watts OUTPUT with 28 watts input to the final (400 V. @ 70 ma.). Plate dissipation of the 2C39B is 100 watts, so plate voltage may be increased to 600 V.

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The Simple Way to Six

by Frank L. Griffin, WB6AOW
Santa Cruz Island, Calif.

Just to keep the record straight, the rig described in the following paragraphs is not claimed to represent the state of the art, and in fact it could be improved in many ways.

But it is a bottom-of-the-junkbox unit, capable of giving good performance at a cost approaching zero, and gives a signal some 12 db stronger than a Sixer.

So despite its technical shortcomings, because it is so simple to put together, here's the "Simple Way to Six."

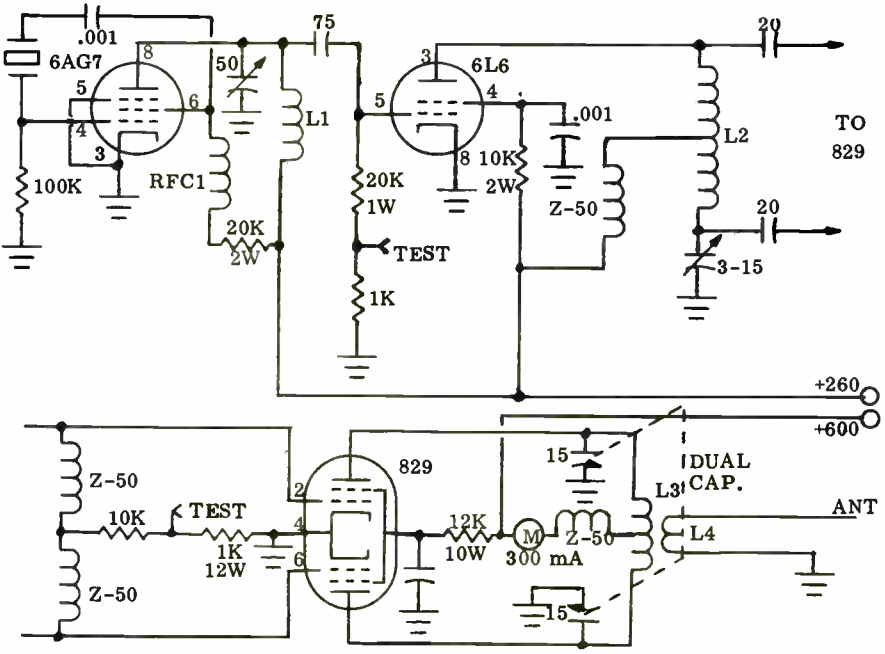
The tube lineup may be startling—6AG7 to 6L6 to 829—but these oldies are cheap, easy to come by, and work very well at 50 Mc. RF output (measured) with 600 volts on the 829 plates is 50 watts, no small signal on a band dominated by 5-watt transceivers.

The hefty driver stages develop more than enough soup with 260 volts applied, overcoming one of the more major objections to the 829. Grid current runs at 13 mA.

Because the drive is heavy, and the simple interstage coupling used gives little protection against oscillator harmonics, a coaxial filter between transmitter and antenna is recommended for use in Channel-2 areas, and elsewhere if TVI should be reported.

The circuit is straightforward except for the electron-coupled-Pierce oscillator/multiplier, which can use either 6, 8, or 12-Mc rocks interchangeably.

For a modulator to go with this rig,



L1—15 turns No. 12, 5/8" dia, 1-7/8" long. L2—11 turns No.12, 5/8" dia, 1-3/8" long, center-tapped. L3—8 turns No. 10, 1-1/8" dia., 1/4" long. L4—2 turns No.12 1" dia, 1/4" long. XTAL—see text for details and freq.

Easy Modulator

Another Griffin Goodie from WB6AOW

Want a hundred watts of good audio for an 829 or 5894 rig for a lot less than you might think? And one which can be used for less-powerful rigs by simply turning down the gain control? Read on.

The principle we're going to use isn't exactly new, but it's not widely known either. It employs beam power tubes in an unusual triode connection, with the driving power applied to the screens and the control grids balanced by resistors.

As used here, the tube lineup is a 6SJ7, a 6V6, and two 807's (1625's, available at 5 for $1 from Burstein-Applebee, can replace the 807's; only change required is to provide 12 volts for filament). The 6V6 is transformer-coupled to the 807's through a 4:1 driver unit.

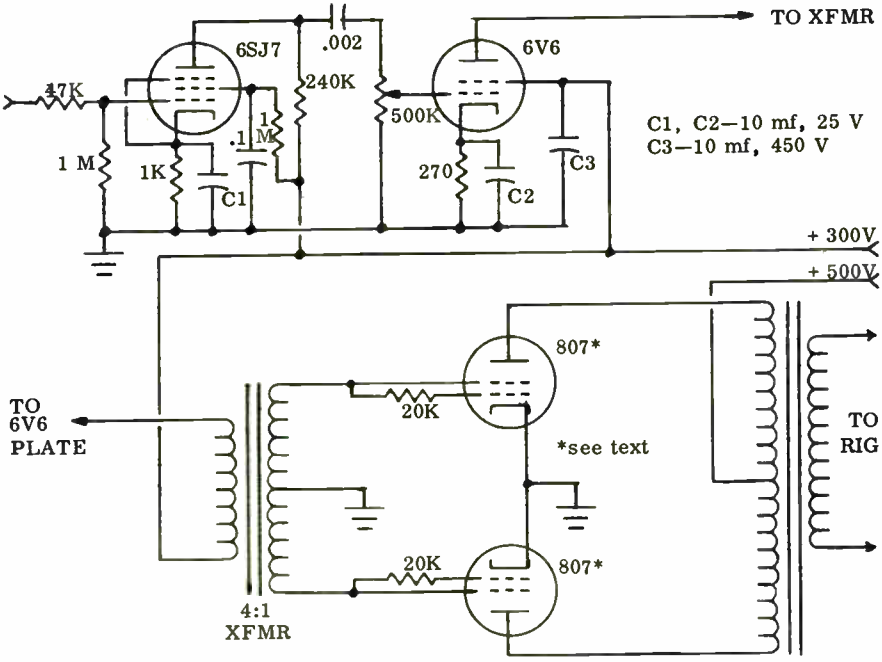
With 500 volts applied, peak audio power output measured 100 watts on a lab-type wattmeter, and average output with voice was 40 to 60 watts.

The entire thing was built from contents of a not-too-well-stocked junkbox, to go with the 829 rig described in this issue. This included the transformers, which do not appear to be critical.

While recommended plate load for the 807's is 2500 to 3000 ohms, I have had excellent results by merely using the closest thing available in the junkbox. I know I'll get some argument on this, but it's worked for me many times.

One highly important point: under no circumstances should this, or any other, modulator be operated without a load on the secondary of the mod transformer. An unloaded transformer can pop far faster than you might think. You can improvise a load from lamp bulbs, but be sure something is out there.

For the record, resting plate current of the 807's is 20 mA, while current goes to 220 mA on peaks. Don't exceed 220.



Do-It-

by Irving Appel, K5PIA
1145 N.W. 26th Street
Oklahoma City, Okla.
(6Up Staff Photos)

GIN POLE in use to hoist Rohn 25 at new location of W5PPE. Author K5-PIA, on roof, watches as Jim Speck lifts second section of tower into position. While gin pole allows one man to do job alone, it's still easier with at least two people on the task as then one can stay topside, other hoists.

Spring is on the way, and that means it will soon be time for tower work. I needed to do some, and so did several of my friends.

To handle tower sections when you're 50 or 60 feet in the air, you need a gin pole. But for the amount of tower work I intend to do, I can't see paying the tab the tower makers ask for their poles. So I built one. You can too, if you can handle a welding torch.

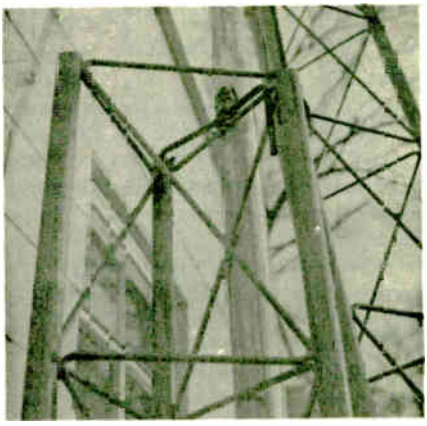
Even if you don't know how to weld, it shouldn't cost much to have the two welds necessary made at any welding shop.

The materials you'll need are a 16-foot length of heavy steel tubing (I used a 2-inch-diameter clothesline pole), about 3 feet of concrete-reinforcing rod, a hook-on pulley, and some strong rope.

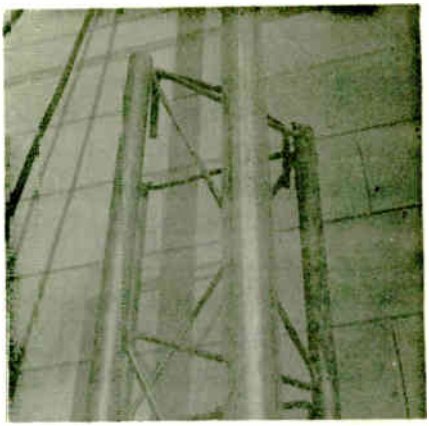
Cut the reinforcing rod in two, and bend each piece into a U shape which will fit inside the tower vertical members as shown in the photos (opposite page). Cut the ends of the U's to about 4 inches on one piece and about 2 to 3 inches on the other.

Weld the shorter U to the long pole at a point about 12 feet from the end, with the legs of the U pointing toward the short end of the pole. Fit the assembly onto the top brace of a tower section, bending the U as necessary for an easy fit, and place the longer U in position at the lowest tower brace on which it will fit. Mark the pole, remove it, and weld the U into place. Bend this one also as necessary for an easy fit between gin pole and tower section. The idea is to be able to hook the bottom U on a brace, then to slide the upper U on the top brace, and have a 12-foot extension with which to

Yourself Help



INSIDE VIEW OF TOP bracket shows how it fits over upper tower brace.



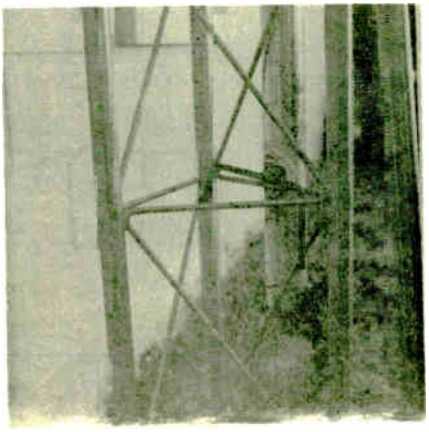
OUTSIDE VIEW OF TOP bracket gives another look at the hook arrangement.

hoist the next section into place.

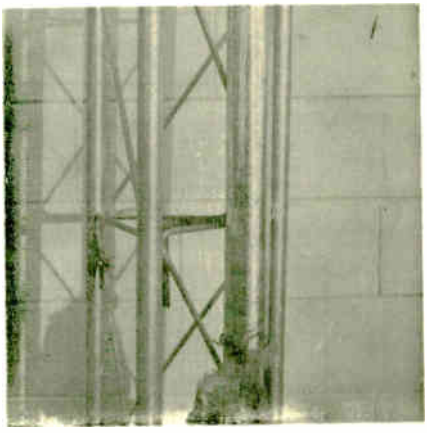
The hook pulley merely hooks into the open end of the pipe, as shown in the big photo, and the rope is run through it and tied to the next tower section. After the section is bolted in place, the gin pole is lifted free and moved to the top of that section in turn, until the whole tower is up.

For about $5 and a couple of hours time, it sure beats carrying sections up the tower on my back!

LOWER BRACKET INSIDE VIEW is similar to top bracket. Note bends.



LOWER BRACKET OUTER VIEW ends series, shows additional length of U.



The TV Special

Staff

One of the big troubles with experience is that you tend to forget that not everybody has quite so much, and that things which are commonplace to you may still be quite new to the other fellow.

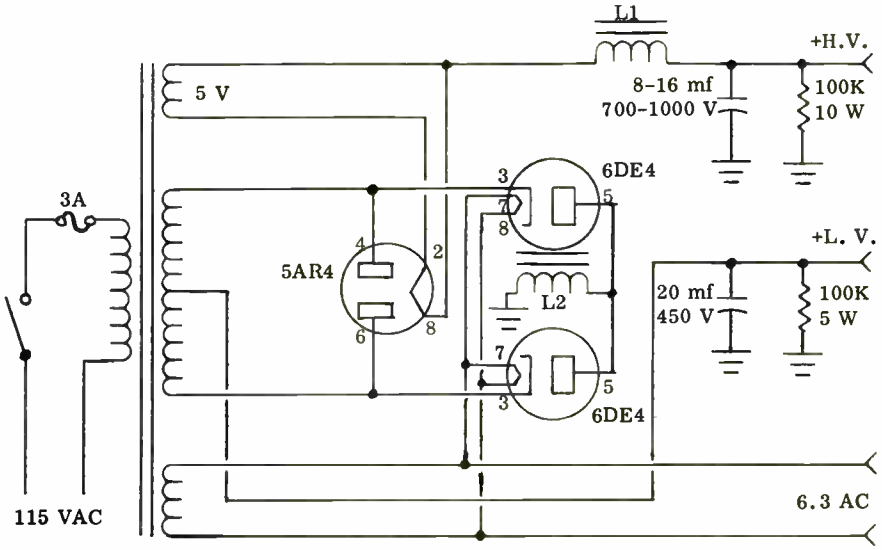
So if the "TV Special" power supply is old hat to you, flip the page and read of DXploits. But if you need a 600-to-800 volt power supply for a 100-watt rig (as for instance the 829 rig on page 7 or the modulator on page 10) and don't know where to find one, keep reading.

We couldn't even begin to give source credit for the circuit. It's been in QST, RCA Ham Tips, G-E Ham News, and the big E&E Radio Handbook. But it's still new to quite a few fellows.

The schematic tells the story. The transformer itself can be almost any TV type. The one in use here measured to be 400 volts AC each side of the center tap, and it gives 1100 volts DC with only bleeder load, dropping to 800 volts at a load current of 200 mils. This, of course, made surplus oil-filled filter capacitors necessary. Had the voltage been kept below 700, electrolytics are available. Be wary of series-connecting 450-volt units; we've scraped up quite a few remnants of blown capacitors trying to do it this way.

The common-cathode tube can be most any type; 5U4-GB or 5AR4 is recommended. Don't substitute for the 6DE4's, however. Few tubes have enough heater-cathode insulation to stand up in this position.

Output power can be split between the high and low positions as desired. Low output voltage is almost exactly half that at the high position. Send-receive relays are best placed at the outputs.



Open Bands

There's only one reliable fact about VHF propagation—no matter how much we think we know about it, it will continue to surprise us.

Like back in mid-December. Nothing in December, 1962, prepared us to look for any spectactular openings this year.

And we all know that sporadic-E isn't predictable, so it came as a complete surprise to most operators when, 30 days later, 50 Mc opened again to almost everywhere in the eastern half of the country.

The January openings, on the 13, 14, 15, and 16 (GMT), all followed a similar pattern. W3BWU expressed the confusion of many operators with a comment in his report, "You figure the cloud pattern for this one." The details appear a bit farther on, but in general it looked as if at least four or five clouds were active at the same time.

During these four days, a complex pattern of fronts lay stalled across the area involved in the opening. This made it appear to be tropo to some operators, but typical symptoms of E-skip were also present to muddle the issue.

Our best guess—and it is a guess—is that both tropo and E-skip were present. The tropo would account for much of the north-south work along the Atlantic seaboard, while E-skip would provide those farther west an opportunity for the fun. Possibly some skip signals got into the tropo pattern, and some tropo signals into the skip, as well.

All of which reminds us of the brief item on page 16 of our October issue on the latest theory explaining sporadic-E. This says that E-skip is linked to wind shear action about 60 miles above the surface of the earth. That blizzard pattern could easily have caused some. Looks as if it's time for our propagation experts to step forward and look at our data.

In the meantime, rush your February reports to this department. Did it happen again in the middle of a third month?

Now for the details. All times GMT, activity listed in sequence by days for each band:

50 MEGACYCLES, as mentioned above, provided most of the confusion for the month. Aside from the wide-open days, though, activity was light.

JANUARY 4: At 2119, WB2CWG, Kerry, in Westfield, N. J., worked W3JZY in Maryland. At 2200, W1EXZ, Bob, in Essex Junction, Vt., heard WA4JBB in Kentucky for about one minute.

JANUARY 5: At 1442, WA4IRX, Al, in Memphis, heard Alabama on weak tropo. One minute later, W2NSD/1 worked W4LZW. WB2CWG worked K4VWH, Virginia, at 1906, and W2NSD/1 at 2029. It was the last day of operation from 73 Mt. until the snows melt come spring.

JANUARY 6: WB2CWG reports working K3AZH, Delaware, 0239, and W1VNH, Mass., at 0307.

JANUARY 12: From South Plainfield, N. J., WB2CUD reports working some 25 stations in 4, 5, 8, 9, and Ø call areas between 1731 and 2355. States ranged from Florida west to Mississippi and north to Illinois.

JANUARY 13: First big day. Earliest report is from WA9HUX, who says that between 1515 and 1740 he worked three WA4's and as many 1's. He was working K3UVH when the band folded for him at 1740. Some VE3's were heard also. At 1708, WB2CWG got into the act, working W4OQG in Tennessee, followed by WA4JKN (1726) and WA4JQT (1731) also in Tennessee. At 1823 Kerry worked K4YMD in Georgia followed by WA4JDR, also Georgia, at 1835, and finally at 2233 KØYYV in Missouri. WA4GDC, Kris, in Sebring, Fla., found the band

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¾ Meter, 11 element, Boom 5' Model No. A430-11	7.75

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Utilize two of our standard VHF beams 3 db gain over single beam. Complete with two antennas, stacking bars, and all hardware. Feed line same as single beams.

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Universal matching stub provides ohm match to 300 ohm 16 elem Model No. CL-MS Freq.

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1¼ Meter, 32 element stacking kit Model No. CK-232
¾ Meter, 32 element stacking kit, Model No. CK-432

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Order four 16 element antennas ar ment stacking kit, complete wi hardware, and matching stub. included.

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2 Bay stacking Kits available	3.95
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Model AM-2M—2 meter, with mast	$8.70
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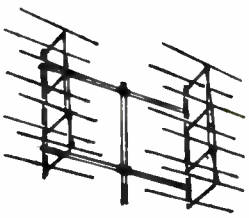

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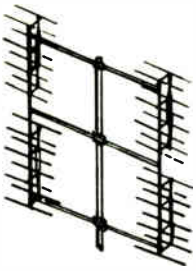

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open at 1730 but due to net duties couldn't take part until 2000. Meanwhile W3BWU in Pittsburgh raised and lost WA4AXB at 1937, was called by but lost K4RNG at 1939, and missed a whole string of 1's between 1951 and 2010. WA4GDC tried for WA8DPY, Ohio, at 2005 but missed; two minutes later Kris hooked K3HIL in Pennsylvania for his first DX of the month. At 2010 W3BWU worked VE1AI in Nova Scotia and at 2021 Ed was called by W1WPS but lost him. Kris worked WB2GVF in Pennsylvania at 2025, while W3BWU made it with K4RNG at 2026.

Meanwhile, WA9BFH (operating W9HHX between engineering classes) worked into New England. At 2000 Bernie scored with WA1ABO in Mass., at 2010 with W1-WHI in Maine, and at 2045 with K1FSH in Rhode Island. Bernie described the action as a temperature inversion. At 2045, WA4GDC moved north to work four W2's in N. Y. and N. J. in 30 minutes, while W3BWU worked VE1CL, New Brunswick, at 2102 and heard VE1IB at 2125. Six minutes later Ed worked WA9JVL in Indiana, and he reports he was hearing Florida, New England, Nova Scotia, and Indiana at the same time, while the New Englanders were working "over the top" to Illinois, Iowa, and Missouri. At the time Pittsburgh had 18-1/2 inches of snow and strong winds. Back in Florida WA4GDC worked North Carolina, WA4-HUV, at 2145, and Delaware, K3MPZ, at 2213. Between 2230 and 2330 W4DSK in Florence, Ala., heard WA2ZEQ in QSO with W2LBO. At 2234 WA4GDC called W3JQZ, Maryland, without result and at 2240 he raised WA4GTD, N. C. Eight minutes later Kris was working WA4IQS, Virginia, as the activity moved back northward. By 2322 he was working N. J. again (WA2QCQ) and at 2343 Ohio, K8RJG, was hooked. Meanwhile at 2300 WA9CWZ/Ø in Kansas City, Mo., heard several 4's and 5's, and somewhere in all this Phil, K9DTB, in Villa Park, Illinois, worked K1PBE, Mass., on SSB. No time was given. The activity didn't end at 2343; it just moved on into—

JANUARY 14: WA4IRX got into it one minute after midnight GMT by working WA2CJS, New York. At 0008 Al moved on into Mass., working K1PYX, and at 0020 he nabbed WA2TPR back in N. Y. WA4GDC at the same time called K8ZHP in Ohio but with no result. A minute later Kris hooked K8YCH also in Ohio, and at 0028 he worked WA8ITO in Michigan. At 0030, W1EXZ up in Vermont began hearing Ø's but the band faded for him 20 minutes later and didn't come back. At 0034, WA4IRX worked K3TTQ, Pennsylvania, and at 0039 Al got K3IWK, also in Pa. Four minutes later the Memphis path moved to New York and Al was working K2UVW.

At 0047, WA4GDC worked WA4GDY in Tennessee and heard W. Va. at the same time. But from this point on to the end of the session, all remaining contacts reported were by WA4IRX in Memphis. Al found the band suddenly dead at 0056 and from 0058 to 0132 worked K4JMF, a local (40-mile path) unworkable during openings. Two minutes after the QSO ended at 0132, the band reopened and Al heard K3DHM. At 0135 he worked WB2-ECL, and at 0140 the band closed for keeps. Next evening, however, WA4GDC reports hearing half of Texas at 2300—Kris couldn't get through the QRM. And from 2330 through 0030 of the 15th, WB2-CUD reports working 11 stations in the 8, 9, and Ø call areas. States included Nebraska, Iowa, and Wisconsin.

JANUARY 15: First wind of this opening was, of course, WB2CUD's 2330-the-day-before work. Next was from WA4-GDC (0005) followed by W3BWU (0116), WA4IRX (0148), WB2CWG (0156), and WA9ETE (0300). Here's how the paths moved: At 0005, WA4GDC called Mo. but had no luck. At 0010 he heard more Missouri, and at 0028 called K1JMO in Massachusetts. For the next two hours, reports Kris, the band was a mass of QRM extending past 52 Mc! His first QSO was at 0225, with K1NEM in Mass. From Memphis, WA4IRX describes it as "millions of stations going back to other call areas" but he did hook Conn. (K1-FTY) briefly at 0150. In Pittsburgh, Ed had better luck, working K1FTY at 0116 but his next QSO was at 0208, with VE1-

IB in Nova Scotia. In between, he tried for and missed three Ohio stations and K1QOY. WB2CWG worked WA4EIH in Virginia at 0156. WA4IRX landed K1NAY in Mass. at 0204. WB2CWG caught WA4-CTL, Kentucky, at 0209, and WA8EQH, Ohio, at 0214. 0222 found WB2CWG in QSO with K9FNB, Illinois. Meanwhile, W1EXZ was working K4VRB, Tennessee, WA4SJA, Alabama, W4KWJ, Alabama, and WA4EXM, Tennessee, between 0210 and 0310.

At 0224, WA4IRX worked WB2BML in New York, and 10 minutes later Al hooked but lost K1QVW. From 0227 through 0257 WB2CWG was working into Indiana and Missouri. At 0240 WA4GDC worked K3-OII in Pennsylvania, and at 0249 K3YPL. From 0244 through 0315 WA4IRX heard 1's and 2's answering 8's, 9's, and Ø's. Meanwhile WB2CWG was working into Tennessee and Alabama, and at 0300 WA9ETE was hearing 1's, 2's, 3's, and a few 4's. At 0255 WA4GDC was working New York, and from then until Kris hit the sack at 0430 the opening from Florida remained up the seaboard. In Memphis, WA4IRX kept working 2's until the band died for him at 0353; last 3 contacts suffered bad QSB.

At 2324 (next evening) WA4IRX heard K1IEV, and five minutes later Al worked WB2GDE in New Jersey. From 2334 to 2340 Al heard 2's and 3's working 9's and at 2346 he snagged K1FHS in R. I.; at 2350 WA4GDC heard Missouri working Delaware, and at 2355 Kris snagged WAØETV in Missouri while WA4IRX got W3MSP but lost him in QSB. The rest of the fun was reported for—

JANUARY 16: WA4GDC led off with K3QAU, Pennsylvania, at 0002. By 0030 the fun was to the west and Kris worked WA5CSA in Texas while hearing N.J. at the same time, as well as WØGIP working a 2. At 0025 WA4IRX made a band check with W5KXG, 20 miles away. IRX was hearing Florida at that time; KXG was hearing 5's. At 0032 IRX worked K4RVU, Virginia, and at 0036 he worked K2SGH while hearing 5's from the back of the beam. The northeast opening went out at 0042 and at 0050 Al worked WA5-GVE in Houston. W3BWU reports hearing several 5's at 0100 including K5GBE. From 0115 through 0315 WØHAN, North Dakota, reports hearing WA4REJ and an AF Mars net on 49.980. At 0135, WA4-IRX reports working W5CK, Albuquerque, but five minutes earlier WB6AOW, Santa Cruz Island, near Santa Barbara, heard K4YPY in Nashville. Double hop, or just long single? At 0152 WA4IRX and K7-PRS got together (reported from both ends) and a few minutes later PRS got WAØCCQ. Other contacts from Phoenix by PRS were with K5ZZN, and at 0200 with K5QYE, Arkansas. The skip stayed short until about 0300; from 0300 through 0337 WA4IRX read the mail on an El Paso net, but the band died when they stood by for him. Locals 7 miles from Al were still copying strong, and with persistence they finally squeezed out the contact, with NCS K5QPV, at 0350. Al reports dead band at 0401, and adds that K5QPV was last DX heard in Memphis in January. Back in Phoenix, W7RUC was heard working W5NU and K5VMC on SSB around 0200-0300. The band closed there at 0350. Along the way, K9DTB in Illinois hooked up with K1WTK in Mass. on SSB; no time was given.

JANUARY 18: After that frantic four days, the rest of the month showed only a trace of activity. WA4GDC heard 5's at 0035, and worked W5HUF in Louisiana at 0045 before the band folded at 0115. K1YHY, Manchester, N. H., heard several 8's, 9's, and Ø's between 2215 and 2300, and worked K8IXU at 2245. And that, dear reporters, was all for January.

144 MEGACYCLES had nothing spectactular to offer for the month; however, the lack of Atlantic openings tends to make the 50-Mc fun look more like E-skip than like tropo.

JANUARY 2: K8KEQ/3 reports on his regular 1215 sked with WA2DRK; marginal copy this date. K8ZES, Galion, Ohio, reports conditions nice to northwest; Sid worked WN8JHF, with a Twoer 100 miles away, at 0233, followed by WA8EOC at 0249 and K8ROA at 0309, all at the same range.

JANUARY 3: The K8KEQ/3-WA2DRK sked was marginal this date also.

JANUARY 4: K3GGZ, Stan, reports working K2GUG at 180 miles at 1909 and K2MNB, 150 miles, at 2158.

JANUARY 5: K3GGZ reports working K8DBA, 180 miles, at 0253. WB2CCO, Plattsburgh, N. Y., reports working W1JZD, 190 miles, at 0400, followed by seven VE2's. K8ZES reports working K2MNB, 225 miles, at 0129, and K3BLM and W3PGV, 150 miles, between 0349 and 0357.

JANUARY 6: K9WZB, Carlisle, Ind., reports working W8SDJ, Cincinnati, 275 miles, at 2250. The K8KEQ/3-WA2DRK sked produced marginal copy again. WB2CCO worked nine VE3's between 0159 and 0246, most using Twoers or equivalent. Average range 150 miles. Later Bernie worked K2CBA.

JANUARY 7: K9WZB reports working WØDQY, St. Louis, 370 miles away, at 2340.

JANUARY 8: For the first time in the month, the K8KEQ/3-WA2DRK sked gave good copy. WB2CCO worked W2HF at a range of 280 miles at 0230.

JANUARY 9: The K8KEQ/3-WA2DRK sked was marginal again. K3GGZ worked K8SKZ, 200 miles, at 0308.

JANUARY 15: WB2CCO worked W2RTE, 220 miles, for their 21st consecutive successful contact on weekly skeds. K8ZES worked K8DZH, 100 miles away with a Pawnee, at 2151. At 2152, K9WZB worked K9TEW, 100 miles.

JANUARY 16: K3GGZ worked K8DBA, 180 miles, at 0055.

JANUARY 18: K8ZES worked K9OVR, 150 miles running 225 watts, at 1652; 34 minutes later Sid worked K9LQZ, same range but only 12 watts.

JANUARY 19: At 0515, K3GGZ worked K8DBA, 180 miles, and at 0543 Stan got WA8DKT, 190 miles. At 2017 K9WZB worked W8AVR, 215 miles.

JANUARY 20: The K8KEQ/3-WA2DRK sked produced good copy again.

JANUARY 21: K9WZB worked WA9DOT at 2150 over a 180-mile path.

JANUARY 24: K8KEQ/3-WA2DRK sked copy good; KEQ also heard NYC signals.

JANUARY 27: Next copy on the KEQ-DRK sked was this date; marginal.

JANUARY 29: Marginal again on sked.

JANUARY 30: Still marginal. K9WZB worked WA9CVD, 200 miles, at 2140; K8RZB, 210 miles, at 2237; and WA8-EAI, 200 miles, at 2240.

JANUARY 31: K8ZES worked WA8DFA at 0151 over a 150-mile path. K3GGZ worked K2MNB over a similar path at 0202. The KEQ-DRK sked was still marginal.

220 MEGACYCLES is still a K8ZES-only proposition so far as our reports are concerned. This month, Sid reports two new contacts. On the 5th, he hooked up with W8CSW at a range of 35 miles, and on the 13th with W8ACS, 20 miles away.

432 MEGACYCLES really has the biggest news of the month for the serious UHF worker. Down Texas way, W5AJG has been quietly going SSB on 432. How he does it is detailed elsewhere in this issue, but after weeks of tests he induced K5DSM in Houston to join him SSB and they now have an almost-daily circuit from Dallas to Houston in use. They report the improvement to be much better than that experienced when switching to SSB on 144.

W5HPT, Vic, in Bedford, Texas (between Dallas and Fort Worth) has also gone SSB with the ARC-27 spectrum amplifier, feeding a single 4X150 at 96 W input. Other Texas 432 hounds include W5LDV, Houston, who's also going SSB, K5LLL, Houston, and W5FSC, Houston.

K3MOB reports that Ted, W3RUE, has a 432-Mc beacon going nightly from 2130 to 2140 EST for area enthusiasts who need a signal for converter touchup. To hold the beacon longer, find Ted around 144.1 just before 2130. Other 432 addicts in this area include W3BQG, W3SXA, and K3MIW.

From California, W6IEY tells us that W6PMV is on 432 FM using a TRC-8 to drive a varactor doubler. The rest of the San Diego area gang are rushing to get FM detectors into their receivers.

HEY THERE!

HALP!!! This agonized plea for assistance, gentle reader, is directed straight at you. Nobody else. You're the only one who can give the desired aid at this point.

Several of you have had the kindness to write, commenting on the pleasure you get from watching 6Up grow issue by issue before your eyes. Remember, though, that nothing grows without the proper kind of nourishment. Where magazines are concerned, that nourishment consists of three things: Proper editorial content, as many readers as possible, and a healthy percentage of advertisers.

And all three things depend on each and every one of YOU. To put the proper things in the magazine, the staff must know what type of material you prefer. To increase the circulation, we must have your help. And to induce advertisers to invest in any space (even at our phenomenally low rates) you must prove to them that the investment is worthwhile.

So we're asking your help now. Here's what we want you to do: Answer the questions below, and send this page back to editor K5JKX posthaste. If you don't want to mangle your magazine, use a 4-cent postcard. If you prefer to remain nameless then leave the "name" and "call" spaces blank, but please answer all the rest. And then stand by to watch 6Up continue its path of improvement—with an even better mandate from you, the readers, about what you want in YOUR magazine.

This is important to you. If you don't act, you'll have no one but yourself to blame should the content of the magazine displease you. So do it now, before you forget!

NAME _____ CALL _____

How did you first hear about 6Up? _____

Which article in THIS issue do you like best? _____

Which in this issue do you like least? _____

Which in ALL issues you've seen is best? _____

Which worst? _____

What would you like to see in future issues? _____

How long have you been licensed (we don't care about the "class")? _____

How much has your VHF station cost so far? _____

Do you plan to make any major changes this year? _____

What are they? _____

Does your parts dealer have 6Up? _____ Who is he (we'll send him some)? _____

...de k5jkx

in the public interest—allowing a bright (straight A's) young high-school student who wields no political power to pursue an interest in electronics which might lead to a brilliant advance in the state of the art some 10 or 20 years from now, or permitting a couple of dozen disgruntled dowagers, all with votes in the here and now, to view their favorite brand of pre-digested "entertainment" on the boob tube? The answer is, of course, obvious.

And it must be said in the Commission's favor that they went the extra mile—even two—in defending K3IOP. They didn't succumb until the battle reached the highest plateau, the United States Congress.

However, sauce for the goose should also be succulent for the gander, and I propose that any of the rest of us who do not desire to find ourselves victims of similar action in the future ought to do some agitation of our own. I have some rather specific ideas for this agitation.

Most of us may not realize it, but the FCC has a set of rules and regulations which set limits on operation of TV receivers. They are contained in "Part 15" of the rules. The recent renumbering of FCC regulations did not affect this section.

You may have heard of "Part 15" since it is also the authority for the completely license-free 100-milliwatt CB-type hand-carried transceivers. The rules section itself deals with permissible radiation from unlicensed devices, and includes some strict limits for allowable radiation from TV receivers, both of the local oscillator signal and of the sweep-circuit pulses which frequently blank out parts of the lower ham bands.

If a single TV viewer can bring enough pressure to force the FCC to modify the license of K3IOP to prevent him from operating on the 6-meter band, all the rest of us hams working together ought to be able to bring enough pressure upon our own Congressional representatives to get the Commission to send monitoring units

into Elizabeth for strict enforcement of the provisions of Part 15, on the part of all TV viewers.

And by strict I mean specifically bringing sufficent pressure to bear to seek and obtain convictions for clandestine operation of an unlicensed radio transmitter against each and every viewer caught operating an illegal receiver. This offense carries a maximum penalty of a $10,000 fine plus a rather lengthy prison term.

A bit unreasonable, you might say, but just how reasonable was the original action? How reasonable was the action of the Elizabeth Borough Council in ignoring the FCC demonstration which proved that the fault was in the TV receivers, not in the operation of K3IOP? And how reasonable was the inflammatory statement of Rep. Holland?

How can we bring the pressure to bear? For those of us who are of voting age, the answer is simple. Write, wire, or better still send a ham radiogram to each and every member of your congressional delegation. Tell them that you believe in fair and equal enforcement of federal laws and regulations, and request them to ask the FCC to enforce the radiation limitations of Part 15 specifically in the area of Elizabeth, Pa., in order to equalize the presently unequal action taken against young Seaman. You can send a copy of this editorial if you like.

If you don't get some sort of reply out of your Congressmen, fire off another letter in a few weeks. Remind them of your earlier letter, and point out that your memory will last at least through this coming November. Keep it up until you hear something. The squeaking wheel always gets greased if it just keeps squeaking long enough. And if as many as 100 hams in any one state should hit their Senators with simultaneous requests of this nature, we might even get a subcommittee hearing of some sort started. After all, this is an election year, and a politician can always use publicity.

Those of us who are not yet of voting age face a bit tougher battle. Parents and older relatives are sometimes surprisingly reluctant to enter such a con-

troversial affair. However, if you talk it up on the air some you may reach other hams who do carry some weight with the Congressmen and who may not have heard of the case. And if you're just a year or two short of the magic mark, it won't do any harm to write the Congressmen anyway. They remember too.

Incidentally, I received several requests for permission to reprint in club bulletins the editorial "about public service" which appeared here some time back. If any of you club-paper editors want to reprint this one, permission is hereby freely granted. Would appreciate source identification, and a copy for my files, but it's not absolutely necessary. The important thing is to spread the word and get something started, before a precedent which directly threatens the continued operation of every amateur radio station in this country is allowed to freeze into being!

And it might not be a bad idea, while we're pressuring Congress as best we can, to take the time to drop a QSL to K3IOP as well. He's probably not too enthusiastic about the wonderful world of ham radio at this point, and I can hardly blame him. But I think that if he knows that some 56,000 VHFers the nation over are with him, on his side, the troubles may be a bit easier to bear.

What do you think? —K5JKX

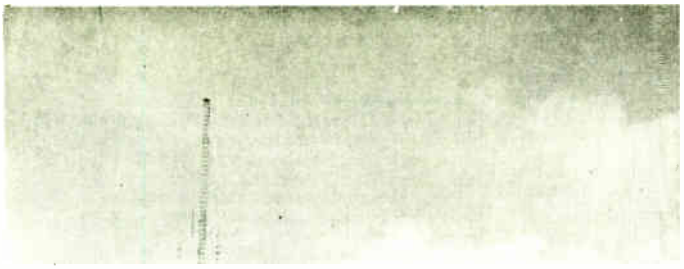
432 SSB

. . . from page 8

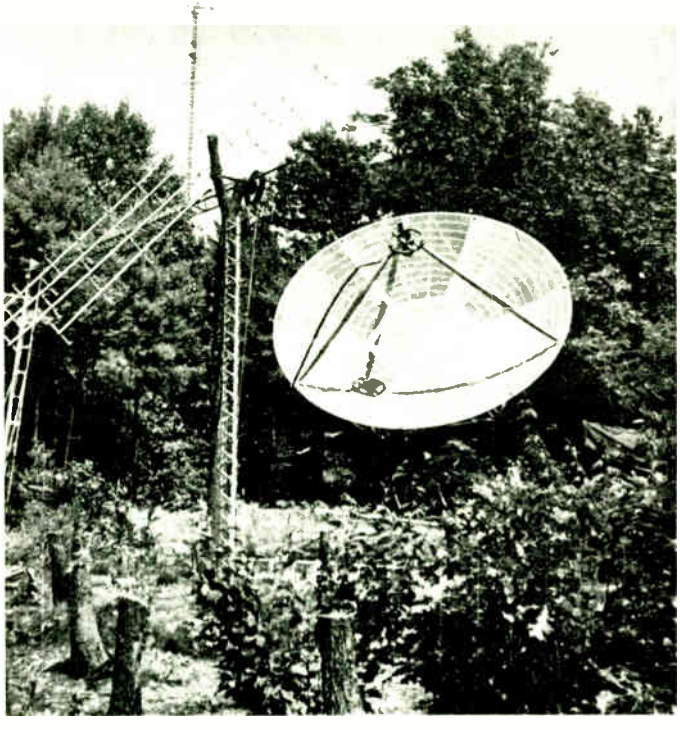
proper harmonic, and finally peak all of the stages for maximum 411-Mc output in tank circuit Z-503.

Inject the 21-Mc SSB and tune tank Z-504 for maximum 432-Mc output. Tune the following two stages for maximum output also. With inserted carrier, output from Z-506 should be between 250 and 300 milliwatts.

It should be obvious, also, that the same modifications will allow operation on 220 Mc as well. The only change required would be a different crystal frequency and different tuning of the multipliers. —W5AJG



W1BU



Moonstruck

Dave Bell, W8GUE/6
4209 North Marengo Ave.
Pasadena, California

I could see the outline of the big dish against the full moon as I followed Jack through the hanging feedlines to Building C (the chicken coop.) I fought my way through the bushes which had somehow survived the throngs of hams who had pushed them aside. Jack threw a switch with the ceremony of lighting up a world's fair. He has a flair for the dramatic. And well he might. The floodlights illuminated a huge dish, twenty-some feet in diameter, which at that moment looked like the pride of Goldstone.

"There she is, David," he said with amazing reserve.

I mumbled a wow or a gee or similar.

"It's just a leetle one," he said, "but it'll hit the moon all right."

After fumbling a moment with his coat-hanger "lock," Jack stepped into Building C.

"C'mon in here and get warmed up."

I told him I'd be in in a minute and walked over to the dish. It was held 15 or 20 feet in the air by two huge, steel pipes buried in several yards of concrete. In the glare of the lights I could see what looked like an automobile differential welded to the top of the supporting pipes, and on this was mounted the aluminum and chicken wire dish. A huge counterweight balanced the affair. It occurred to me that all Jack needed was a beanstalk and he could have convinced the "Twilight Zone" producers that he had stolen the giant's sieve.

"C'mon in here. You'll freeze yourself out there."

Building C hadn't warmed up much, but Jack was rubbing his hands over the kerosene stove. He pointed to several, orange-crate supported benches which bulged with equipment.

"That's the deevice."

I looked at the collection of commercial, home-brew, and bread-board gear.

"Isn't that a sight?" he asked.

I had to agree that it was.

"Sammy ought to be on right now. Soon as everything warms up we'll be hearing *moon-bounce*."

I looked at the equipment. A commercial power supply with controls completely foreign to the ordinary ham (me.) A rack full of what I think were filters of various kinds. The only recognizable object was a *BC 453* surrounded by a dozen tubes and i-f cans to "get the frequency down to earth."

Jack bent over the receiver, pointed to a spot on the dial, and said that was Sammy's frequency. He rocked the receiver dial back and forth, squealed the Q-multiplier a couple of times, and adjusted the parametric amplifier power supply.

"I don't hear him," he said with mock incredulity. "I can't understand it." He looked at me as if he expected me to come up with a solution.

"I know," he said, "we forgot to point the *thing*." He laughed at his joke and pushed the warped, coop door.

"You tune and I'll aim," was his parting shot.

I moved to the door to watch him point the antenna. When he had it untied and free-swinging, he aimed it roughly at the moon, then climbed a step ladder at the base of the mount to check his compass readings against his pocket-chart. After several trips up and down the ladder, several looks at the chart, and innumerable sightings through the telescope, he tied everything down and came back inside.

"Hear him yet?"

I had neglected to tune. Getting the dish on target was a fascinating operation. Jack rocked the *453* dial back and forth. He squealed the Q-multiplier. He looked at his watch.

"Be about a minute before the moon catches up with the dish," he said, and went back to tuning. We listened to the roar and hiss come out of the small speaker. Jack boosted the volume and started a rustic tape recorder. He again looked at his watch.

"Maybe the moon's running a little slow tonight," he said, and then laughed.

UHF noise, tube noise, and Q-multiplier squeal filled Building C and much of the empty countryside.

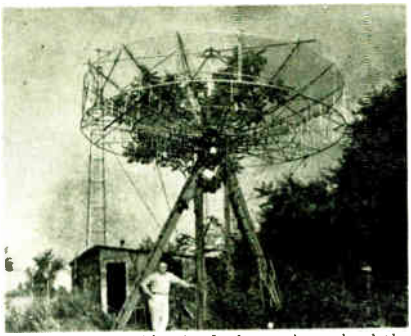
"Hear anything, David?"

"No," I said.

"You don't?"

"No."

"Well, I don't either," said Jack. "Must be something wrong."



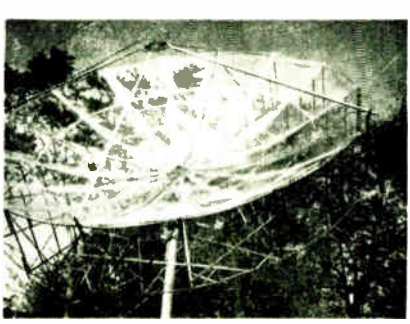
We went outside. As Jack gently nudged the dish, I sighted the moon through the telescope.

"Put the cross hairs on the leading edge of the moon."

I did as I was told. The cross hairs were just off center. At that moment, from Building C, came a low, beat note. It went off, then came on again.

"There's old Sammy. We found him," said Jack. "I knew he was there. Just takes a bit of looking."

He was there. And loud. From the Rhododendrom Swamp of Waltham, Mass., to the moon, to the semi-wilderness of Dorset, Ohio



in about two seconds. Quite a trip at 1296 megacycles. And there I stood on a ladder under a chicken-wire dish listening to the wavering note.

"He's not very loud yet," said Jack.

I thought he was at least S-9 on any conservative meter.

"You got it on the leading edge?"

I checked the moon in the cross hairs.

Jack tied the antenna down while I kept him sighted on target. We went inside to listen to the loud series of dashes which signalled another success for Jack and Sam. After we listened for a few minutes, the moon moved on and the signals faded out. Jack rewound the tape recorder and lifted off the tape.

"That was a pretty good test," he said with

rare modesty. "Let's go in and play this to Sammy."

The familiar sideband kilowatt at W8LIO was warmed up (as usual) and set to 7250 kc for the schedule with W1BU/W1FZJ.

"Hello, Sam; Hello, Sam; Hello, Sammy. This is W8LIO calling you. W1BU, this is W8LIO."

Immediately came the answer.

"W8LIO, this is W1BU."

This standard reply caught Jack off guard.

"Who's this?" he asked.

"This is Lew, W1ICP."

"Is Sammy there, Lew?"

"He's coming in now."

"OK. I'll play my little tape for you boys if you're ready."

Jack started his battered tape recorder, a twin of the one in Building C. He plugged the output of the recorder into the *20-A* and the *4-1000* linear lighted up with what, moments before, had been a 1296 mc signal. After playing a minute or so of the loudest portion of the tape, Jack picked up the microphone.

"I guess my receiver is working OK, eh Sammy?"

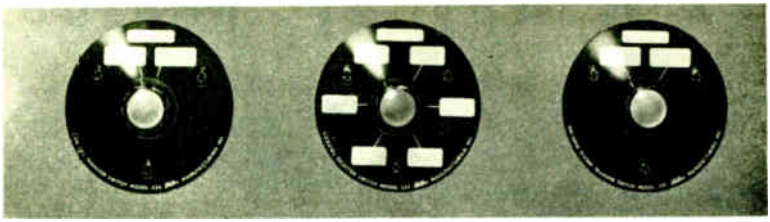
"It sounded pretty good tonight," said Sam. He's not noted for superlatives.

"What did you think of it, Lew?" asked Jack.

Lew, it seemed to me, sounded a little breathless. If so, it was understandable.

After the schedule was affirmed for the following evening and W1BU had signed off, an AM station came on the frequency complaining about the nuts who imitated Russian jamming signals. I suppose Jack's tape recording did sound a bit like a jamming station. It occurred to me then that hams are in two general categories: the pioneers and everybody else. For a moment that night, I was among the pioneers. . . . W8GUE/6

Fred Collins W1FRR tuning W1BU



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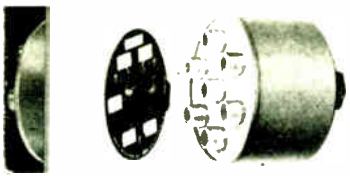

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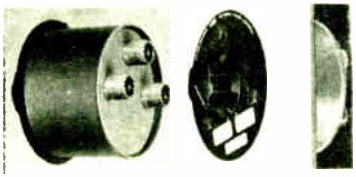

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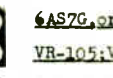

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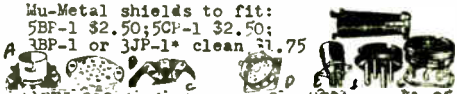

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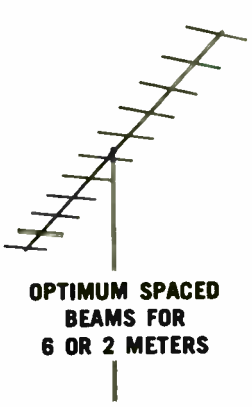

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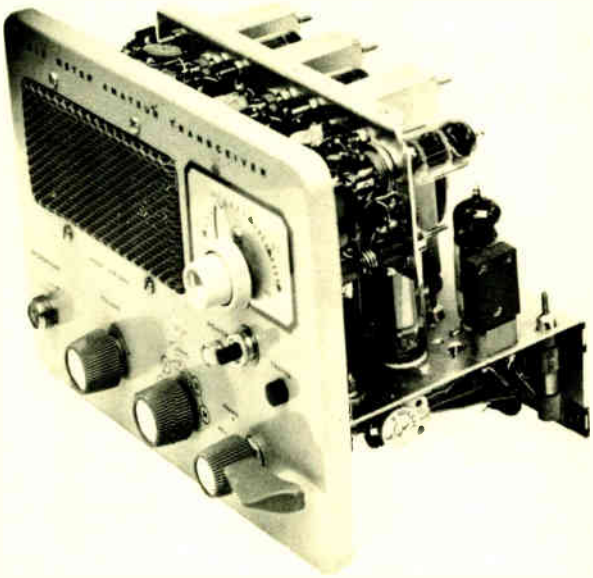

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All on 50 Mc!

see page 8

Etched Circuits The Easy Way, Something (Almost) New-MCW, UHF Frequency Measurement, More Accurate Baluns, Caribbean Report 1964, Open Bands, WBFM

EDITOR: Jim Kyle K5JKX Vol. 1, No.7 February 1964

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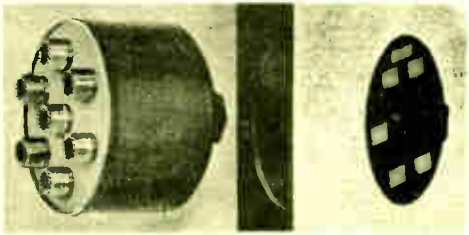
WATERS
DUMMY LOAD/WATTMETER — Model 334

The Waters Model 334 Dummy Load/Wattmeter is an RF power absorption device and an RF wattmeter for making non-radiating performance tests on radio transmitters.

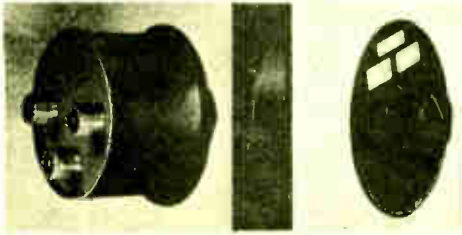
It combines a structured monolithic 52 ohm load and an integral direct reading RF wattmeter. The load is contained in an hermetically sealed, liquid dielectric filled container providing RF shielding and cooling. The unit is rated for continuous operation at 50 watts and intermittent use to 1,000 watts over a frequency range of 2 to 230 megacycles. A thermostatically operated warning light indicates when the maximum safe operating temperature is reached. RF power connection to the Dummy Load/Wattmeter is by means of an SO-239 UHF coaxial connector on the rear panel.

SPECIFICATIONS

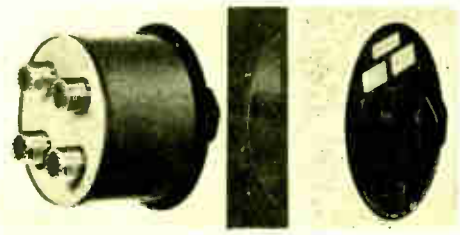
Frequency Range	2 to 230 mc
Load	Non-inductive, oil cooled
Load Impedance	52 ohms
VSWR	Less than 1.3:1 up to 230 mc
Power Range	50 w continuous, 1,000 w intermittent (Maximum inner case temperature of 220°F will be reached in 5 to 7 min. at 1,000 w input. Warning light signals this point.)
Wattmeter Range	3 calibrated scales: 0-10 w, 0-100 w, 0-1,000 w.
Wattmeter Accuracy	2-30 mc, ±5% of full scale 30-150 mc, ±7.5% of full scale 150-230 mc, ±10% of full scale
Input Connector	Hermetically sealed SO-239 UHF, mates with JAN standard PL-259 (Amphenol 83-1SP)
Size	4¼" wide, 9" high, 10¼" long
Weight	12 lbs.
Price	$79.75



COAXIAL SELECTOR SWITCH — Model 335



ANTENNA SYSTEM TRANSFER SWITCH — Model 341



COAXIAL TRANSFER SWITCH — Model 336

Waters Manufacturing, Inc., Wayland, Massachusetts

. . . de K5JKX

ABOUT "PROGRESS" . . .

If you've been reading my comments, both here and elsewhere, for the past 18 months or so, then you know I feel quite strongly that the ARRL is in general a real good thing (see February, 1963, VHF Horizons, page 3, "Scatter"). You also know that I reserve the right to jump in with both feet whenever I think HQ is off base.

Get ready up there in Connecticut, gang—here I come.

The specific case in point is on page 25 of the January, 1964, QST. It's a "500-watt" rig for 50 Mc, co-authored by W6SAI and W6KEV. They're both good guys, and this was a good rig. Once. But let me back off a bit.

Naturally I try to read all the radio magazines. I usually go through each of them first to find out if there's anything on VHF or UHF and read that first. So when the January QST came, my first stop was on page 25.

The tube lineup hit me between the eyes. A 6V6 driver? A 6AG7 oscillator? All this power at subharmonic frequencies to push a bottle that needs only about a tenth of that drive power to reach its maximum output?

But more than that, the lineup had a naggingly familiar look to me. A 6AG7 to a 6V6 to a 4CX300A, and the whole works sponsored by Eimac? Hmm. . . let's see, now.

It took about half an hour of digging in the archives of my ancient QST's to find it, but sure enough it showed up. Page 4 of the September, 1958, issue—the Eitel-McCullough ad for that month.

If you have that issue, look up the ad and compare the photos. It's the self-same identical transmitter. If your eyes are sharp enough you'll see that the panel paint is chipped in exactly the same places, though the chipped spots are a bit larger now.

But you'd expect that after 5 1/2 years of use, in any rig.

The current article, however, fails to mention that the design is 5 1/2 years old. The copy says merely that the rig has been used "over two years", leaving the impression that it's a fairly recent design and representative of well-tested but current state-of-the-art practices. Which it isn't.

All of this leads me to believe that just perhaps the article may have languished in a file drawer somewhere for about 3 1/2 years between its writing and its publication. I don't think this is the fault of W6SAI and W6KEV.

Back there a spell I said this was a good rig "once". Let's see why it's not so good now (this makes a little more sense if you follow the schematic, page 26 of the January QST).

The 6AG7 is used as a Pierce type oscillator, operating at the fundamental with rocks in the 6.3-Mc range. Thus the oscillator output will have components at 6.3, 12.6, 18.9, 25.2, 31.5, 37.8, 44.1, 50.4, 56.7, 63, etc. Mc. All of this (at a respectable power level, too!) is capacity-coupled to that little powerhouse, the 6V6, for amplification.

The 6V6, fortunately, is link-coupled to the final, so only those frequencies in the region of 44.1, 50.4, and 56.7 are likely to get through. Even so, beware in Channel 2 areas! And with 41-45 Mc now standard for TV IF strips (it wasn't when the rig was designed) I'd hate to see one of these on the air anywhere near me.

I probably will, though. In the few days between receipt of the mag and the writing of these words I've heard at least three of the local gang declare their intentions to build it. Maybe somehow I can help talk them into changing that

(The rest is on page 22)

etched circuits

by Joe Williams, W6SFM
4150 Beck Avenue
North Hollywood, California

The etched circuit has been with us for more than 10 years but we amateurs have been slow to seize upon it as the answer to a lot of our construction woes. And the reasons are very clear. In order to build a simple circuit, such as a transistorized overtone oscillator, the etched circuit procedure involved such a disheartening array of bottles, brushes, and other paraphanalia that we just turned away and stayed with the old methods.

The average ham's reaction to homebrew "printed" circuits became one of "Who needs them?" A most understandable attitude, but space age technology in the electronics field has caused us to look with envy at the compactness and light weight of some of the modular circuits geing turned out for industry and the military.

Nowadays, the password is microminiaturization and complete circuits—semiconductors and all—are being "printed" in one fast operation.

Hams may not really need the miniaturization that has been developed for space vehicles, but maybe it's time for us to take a second or even a third look at our current "conventional construction techniques".

Let's take a moment to look at etched circuit principles. Basically, an etched circuit is created by masking certain portions of a copper-and-plastic laminated board, to make a circuit (or a series of circuit elements) remain after the unwanted copper has been eaten away in a special bath. To do this, we use special materials to act as an etch-resist.

We apply the resist where we want copper conductors and connectors to appear on the completed board. Up until now the preparation of the board has always been the big catch. The resist had to be applied with a brush or a clumsy ballpoint dispenser, and allowed to dry for half an hour before proceeding to the next circuit elements. This required a lot of freehand art talent, and more patience than most of us have.

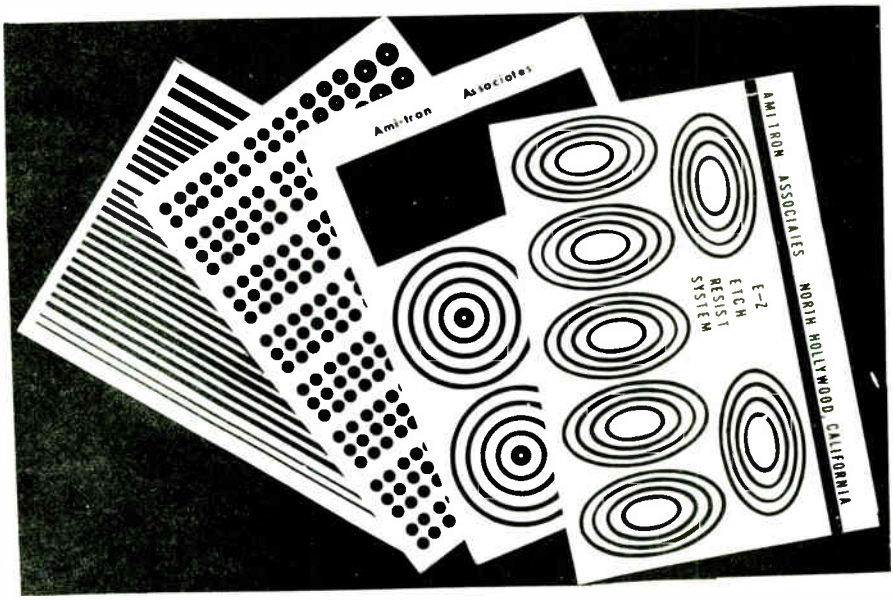
Strips of pressure tape have been used to make conductor runs in etch work but they tend to leak at overlaps and it's almost impossible to make a decent curved line with tape. One alternative to these direct procedures has been to go in for the photographically produced board which involves fancy artwork, sensitized copper, and darkroom procedures. Small wonder that no torrid love affair ever quite developed between hams and etched circuit boards.

Now, though, the picture has changed. The recent appearance on the ham and industrial markets of etch-resist transfer sheets has made etched-circuit construction not only easy but fast and fun.

Transfer sheets have been around for quite a while and they are used in industry to mark chassis and panels with letters, numerals, and other symbols. The transfer sheet that applies etch-resist directly to a copper board is brand new, however, and it shows promise of becoming a standard item for ham circuits and for industry prototypes.

A sheet is simply placed, pigment side down, on the copper surface and the desired circuit element shape is transferred to the board by rubbing the back of the sheet with a pencil or a ballpoint pen. Then the sheet is rolled back, and the resist stays on the metal. You don't have to be an artist to make attractive and functional boards, and the transparent sheet lets you see exactly where the resist is being applied.

If an error is made, the old resist is just scratched off with the pencil point; a fresh resist image can be immediately applied. The presently available etch-



ed-circuit kits (marketed by E-Z Etch) contain transfer sheets having straight lines, circles, ellipses, and dozens of "pads" of different diameters. With the circles and ellipses, just about any imaginable curved line can be made up. The pads are used to make various connectors and work fine as transistor "sockets". The multiple connections needed to be able to sweat on a PC tube socket can be quickly and neatly laid out with pads of appropriate size.

The briefest suggestion for etched circuit work is simply this: plan the board to satisfy the circuit. There are, however, a few little tricks that can save time and effort as the layout is planned.

Study the schematic and make a couple of pencil sketches to figure the parts arrangement, then plan in the signal and power connections. The biggest pitfall in etched-circuit design seems to be that problem so closely akin to painting one's self into a corner: getting a conductor boxed in so that it has to cross another conductor to get to its proper termination.

Where conductors must cross, pick a spot where a resistor or other component is to be connected and pass one conductor through the gap that is created for the part. In commercial work, parts are usually mounted on the "back" of the unit so that the assembled circuit can be "dip" soldered. Since ham circuits are hand-soldered, parts can be mounted on both sides of the board to achieve maximum component density.

The etching process itself usually takes one of two forms in homebrew circuit-board work. The board can be etched in an open tray containing the etchant, or the work can be done within a tough plastic bag which is sealed and laid flat.

The E-Z Etch kit comes with the plastic bag etching vessels and the proper amount of dry etchant crystals. The etch bath is prepared by adding a pint of hot tap water to the crystals. Etch time is from 45 minutes to an hour; the board is removed and rinsed in clear water when the etching has been completed.

To remove the etch resist from the copper circuit elements the user can rub with very fine steel wool, or the resist can be wiped off with a little lacquer thinner. If the work is not to be soldered right away, the resist can be left on to prevent oxidation of the copper surface. The fibreglas boards furnished with the kit can be drilled, punched, sheared, or filed before or after the etching process.

(E-Z Etch kits may be obtained direct from W6SFM—EDITOR.)

Something (almost) New

by Rod C. Rigg, W6YGZ
1305 Occidental Avenue
Stockton, California

You 6-meter boys feel a bit confined now that skip is perty meager? How about you fellers using the Sixers and whip antennas; like to run the big boys a bit of competition? Well, have you ever considered AM?

I don't mean talkin' type AM—I mean the clickin' kind. Yep, CW is 100% amplitude modulation; it's either full on or not there at all, and if that isn't modulating its amplitude I don't know what is!

Now if you just add a sprinkle of audio tone so the fellows without B F O's can copy, you've got the answer. MCW (or A2 emissions as the FCC calls it) can be used in any of our phone bands on VHF, and can be copied at greater range than the phone modulation can be. Now the Gonset gang and the 6er boys can get in on the fun too.

If you want to do it the easiest way, just lay the mike very close to the speaker of a code practice oscillator. This is a good way to get started, but not the most effective use of MCW. If you do it this way be sure to put the mike close to the speaker (to exclude extraneous noises and room echoes) and make sure you keep modulation down to 100%. This form of "poor man's" MCW will do better than phone but not as well as regular MCW in which both carrier and tone are keyed.

For those of you who have transistorized CPO's which work into 'phones only another method is available; it appears in Figure 1. Make sure the whole mess is shielded. Leave the 'phones connect-

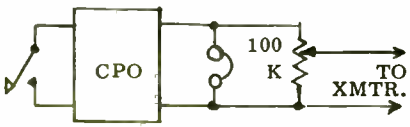


FIGURE 1. Oscillator Hookup

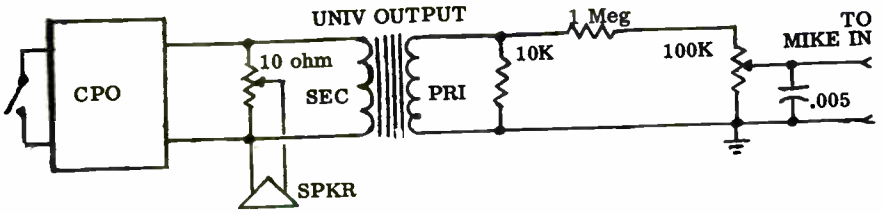


FIGURE 2. Hookup for Loudspeaker-Driving Code Practice Oscillator

ed; these things usually won't oscillate without them. Besides, you have to have something to monitor with, don't you?

For that matter the same gimmick can be applied to the big loudspeaker CPO's. Figure 2 shows how.

But if you really want to go first cabin then you'll figure out a way to key tone and carrier at the same time. This will cut through the ol' ether real Jim Dandy. The reason you must key tone when the carrier is keyed is because you would otherwise have the modulator running at full tilt with no load; this makes good sales figures for tube makers, but is a bit hard on your pocketbook.

To key the carrier, check the rig's instruction book. You may be surprised. The Heath Sixer can be keyed by plugging the key into the meter jack on the back of the rig. Others can be keyed as shown in Figures 3 and 4. Watch out for high voltage when using the screen-grid keying circuit.

"But wait," I can hear you from here. "You haven't told us how to key the whole shootin' match at the same time! ???"

There's one surefire simple way to do it; key a small DPST relay and use one set of relay contacts to key the rig and the other to key the tone. Figure 5 shows what I mean.

It won't take much of a relay to do the job, but make sure it is fast acting. Select the relay in terms of the voltage available to run it and, for the sake of your nerves, pick a nice quiet one. Keep the voltage low to avoid the danger of shock. Six volts AC would do fine because that's available from most rigs. If you have an old DC relay hanging around, just hook up a silicon diode in series.

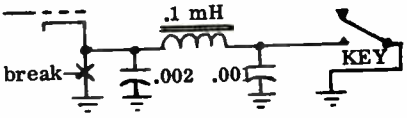


FIGURE 3. Cathode Keying

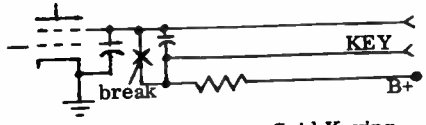


FIGURE 4. Screen-Grid Keying

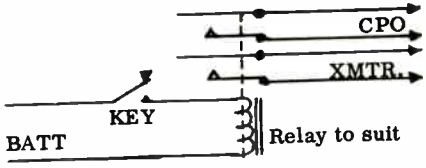


FIGURE 5. Double-Keying Circuit

I'm sure somebody would enjoy figuring out improvements to this setup so I will generously leave room for the superscientists to go to work on it. Meanwhile the rest of us should have no trouble making the grade on MCW with this lashup.

Once you get bitten by the code bug you will find it a lot of fun, and it's about the best way to practice code if this be your goal. I have no bones about phone operation; I use it all the time. But MCW adds another dimension to the VHF bands. Don't be afraid to be first; stick with it. You'll wind up having a ball. —W6YGZ

UHF Frequency Measurement

by Dr. W. L. Lamb, WØPHD
P. O. Box 26
Warren, Minnesota

I would guess that nearly all VHFers have at one time or another encountered the problem of determining the wavelength of some UHF source that was beyond the range of instruments on hand. When this happens the usual answer is to set up a Lecher-wire hookup, but accuracy of the typical hookup is problematical.

The other day I had an "eyeball QSO" with Bill, WØAWK, and was intrigued by the way he has refined the use of the Lecher-wire technique to make it simple and accurate. This is the way he does it:

Set up the Lecher wires in the normal way. Couple the RF under test into a small pickup link on the end of a piece of coaxial cable of convenient length. Feed the Lecher wires with the coax cable and measure the voltage that is developed at the junction of the Lecher wires and the coax with a sensitive RF voltmeter. This junction is the fixed reference point. The second (variable) reference point is the shorting bar which can be moved up and down the Lecher wires.

Since the shorting bar is a short circuit, it sets up a standing wave on the Lecher wires and a zero-voltage point reoccurs down the line every half wavelength back toward the source. The technique is to find the first position of the shorting bar (as it is moved away from the reference point) that reflects the short at the voltmeter and gives a zero reading. The distance from the reference to this point represents a half wavelength; we can get the frequency from the formula F = 5905/half-wavelength in inches (F will be in megacycles).

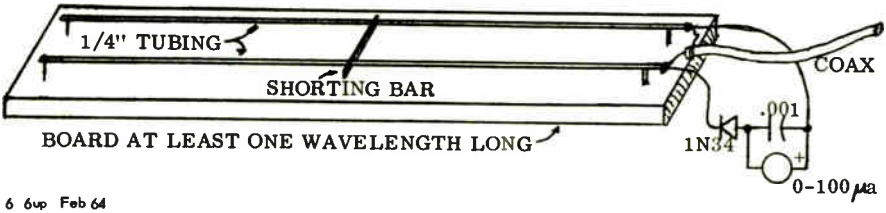
The accuracy of this method lies in the fact that the voltmeter is very responsive to the exact point of short. Even a slight error results in some deflection.

If more accuracy is desired, the same setup can be used but certain additional factors must be taken into account. The speed at which the RF travels down the Lecher wire lines is nearly the same as that in free space but not quite because of capacitance effects. The difference in speed is called the "velocity factor" and is always less than 1. Velocity factor can be calculated if you have one source of known, accurate frequency. Measure it by the technique described here, using the distance between two successive nulls as the half-wavelength. Then plug the known and measured results into this formula: VF = Freq x Length/5905.

With the velocity factor known, future measurements require that the frequency calculated by the first formula be multiplied by the velocity factor to find the actual frequency. Wavelengths measured can be divided by the VF if you prefer.

The RF voltmeter used, by the way, can be either the RF probe on a VTVM, or it can be one made up especially for the purpose with a diode and a 100-microamp meter as shown in the illustration.

I feel indebted to Bill for showing me how to build this useful piece of gear which allows me to measure frequency in the UHF range, with ease and accuracy far beyond what one would expect for the small dent in the pocketbook. —WØPHD



6 6up Feb 64

vhf baluns

by Frank L. Griffin, WB6AOW
Santa Cruz Island

Do you have a new skeleton slot or other 300-ohm antenna you're going to feed with coax, and want to save that eight bucks it takes to get a commercial balun? And have you tried to cut a balun but still not found the length you're looking for? Read on, friend.

A suitable device for converting balanced to unbalanced systems, or vice versa, is the trombone balun shown in Figure 1. Here's how it works in brief:

The balun loop is cut exactly a half wavelength long (electrically) at the desired operating frequency, so that any

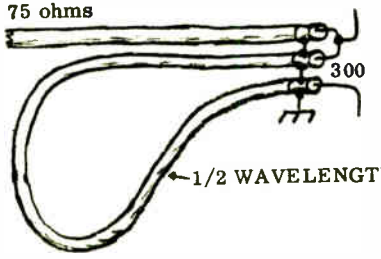


FIGURE 1. Trombone Balun

voltage fed into it at one end will be reproduced out of phase at the other end. The balun loop effectively drives one half of the load, while the transmitter (through the feedline) drives the other half of the load, in series. This makes the voltage across the full load equal to twice that which is present across the feedline. It is a 2-to-1 voltage transformer, which is the same as a 4-to-1 impedance transformer. As shown, the balun operates over a frequency range of approximately ±5% of center frequency.

To construct such a balun, use coax such as RG-8/U, RG-11/U, RG-58/U, or RG-59/U. Cut a section of coax which is somewhat longer than 1/3 of a free-space wavelength at the desired frequency. The propagation constant for all types of coax mentioned above is 66%, so a half-wave coax balun will be 2/3 of 1/2 wavelength long. Actually, about 70% of a free-space half wave is a good starting length.

Trim the coax ends back about half an inch, exposing center conductors, and cut away the outer insulation to bare about the same amount of shield. Now measure the length from end to end of the center conductor, and trim as necessary.

Construction itself is as shown in Figure 1, and all shields are soldered together. "Stacking" the three coax ends as shown in Figure 2 makes it easy to tie all shields together. The balun loop can be coiled tightly, or left in a long "trombone" shape.

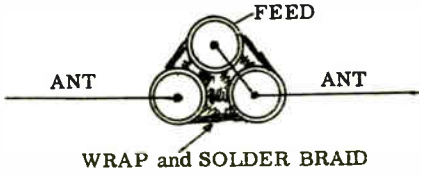


FIGURE 2. Stacking Coax Cables

Calculated lengths for both 50 and 144 Mc balun loops are listed in Table I for your convenience. You can calculate it if you like: length = 3936/F in Mc.

However, the calculated length is not always correct due to practical factors which enter into the finished product. An exact balun can be had by cutting the coax to precise electrical length. Here's the procedure to use:

1. Use a short length of coax from the signal source (transmitter, etc.) and connect as shown in Figure 1.

2. Connect a VSWR indicator into the short feed line.

3. Load the output terminals of the balun with a non-inductive resistive load which has a resistance three times that of the feedline. This load should preferably be a high-wattage, close tolerance resistor that will dissipate the generator power.

(Next page page 20)

Caribbean Report 1964

by Harold Lund, VP7CX
RCA San Salvador AAFB
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Patrick AFB, Florida

Operation on Six this past summer from the Bahamas showed that Sporadic-E propagation in the Caribbean is quite good. There are probably many openings that go unnoticed because of the lack of six-meter activity. Here is a brief run-down on some of the stations known to be active at the present time along with some expected to be on before next summer.

Venezuela will be mentioned first although technically it is out of the Caribbean. Most active has been Carlos, YV5AGM. His excellent VHF location on a mountaintop about 15 miles from Caracas has helped him provide a new country for many hams in the States. A television set tuned to channel 2 helps him watch for band openings. His transmitter is an Elmac AF-68, so he is likely to be found anywhere on the band. He has worked all U.S. call areas except W6 and W7.

The next known activity north of Venezuela is on the island of Trinidad. I heard two W6's working a VP4 on CW early in June, but did not catch his call. I have heard no reports of his having been worked on phone.

VP2SY on the island of St. Vincent will be active before next summer. He now has a transmitter donated by W3BWU and a converter and an antenna are in the process of being shipped. His crystal frequencies are 50.060 and 50.063. QSLs for Washington should go via K2MRB.

It is expected that VP6AQ on Barbados will be active before next summer. Jack now has plans for equipment underway and has been sent a crystal for 50.090.

Next up the island chain is John, FG7XT, who has provided a new country for many six-meter operators this year. He puts out a terrific signal with his Clegg Zeus-Interceptor combination. QSLs for him should be sent via K5AWR. His usual operating frequency seems to be just below 50.1.

There is a possibility of operation from Antigua, but it is too early to be certain. This would be a very welcome addition to Six as it is a fairly rare country on the low bands. A very willing operator has been located, but so far we have been unable to locate suitable equipment.

There has been some activity from the Virgin Islands by KV4CQ. Unfortunately this activity has not coincided with the E skip season. Anyone planning a summer vacation in the Virgin Islands should give serious consideration to taking six-meter gear along. As it is U.S. property, there will be no problem getting permission to operate.

It shouldn't be necessary to elaborate on the activity in Puerto Rico because of the great number of stations on. I have worked 35 different KP4's from this QTH and I'm sure that is a small fraction of the stations on Six down there.

From Puerto Rico we'll move west to the Dominican Republic. The historic capitol city of Santo Domingo now has two active six-meter stations, HI8XAG and HI8RO. Both are running Heath Sixers. However several others have shown interest in Six and may be on before next summer. HI8XAG has crystals for 50.022 and 50.034. Other crystals that have been sent to Santo Domingo for use by anyone needing them are on frequencies of 50.012, 50.035, and 50.070. Propagation is excellent from here to the U.S. In a 9-day operating period, the band was open to the states 7 days with

a total of over 200 stations being worked. This is another good vacation possibility as an American citizen can be licensed.

There is no one active in Jamaica at present although several stations are said to have equipment for Six. Most took down their antennas with the decline of the sunspot cycle. If you work any of these stations on the LF bands, drop a few hints. E-skip should be very good down there.

There is some activity in the Turks Islands. Stations known to have been active are VP5s BB, CH, and CW with BB probably being most active. He has been operating mostly in the American phone band, but now has a crystal for 50.060.

Cuba can also be skipped over lightly because of the many stations active on Six. Unfortunately I can't hear them at my QTH due to the skip distances.

There has not been too much activity from the Bahamas with only VP7CT and myself active. Ted is no longer in the Bahamas and QSLs for past contacts go to W3LBJ. My favorite hangout is on 50.046 and it is preferred that my QSLs be sent via W9FVO who will forward them to me. It looks as though there will be some activity from New Providence Island (Nassau) next year.

Most of the stations mentioned should be workable throughout most of the U.S. It just takes patience, alert operating, and being at the rig at the right time.

A look at a map of the Carribean and the ARRL country list will show the many countries it should be possible to work. Many of these places suffer from a lack of activity even on the low bands. A few of these islands are favorites of DX-peditions and it is hoped that six-meter gear will be taken along in future.

At present everything possible is being done to encourage activity in this area. I would appreciate anyone willing to help with this project dropping me a line. See you on Six. —VP7CX

short stuff

SILICONIZING SELENIUMS

Are you blowing your top-hats? You may not know that silicon rectifiers can't always be used as "plug-in" replacements for selenium-rectifier stacks.

The reason is that silicon rectifiers are single-junction affairs, while the seleniums are stacks. In addition, selenium rectifiers can stand momentary overloads; silicon diodes destroy themselves in a matter of microseconds if this happens. And in a power supply, the input filter capacitor is a virtual short-circuit until it charges, providing a "built-in" overload for the diode!

The cure is simple. Add a current-limiting resistor in series with the diode (between 24 and 100 ohms; wattage should be from 5 to 25) and a .001 to .005 mf capacitor in parallel with the silicon. Neither value is critical; with both the resistor and capacitor in place the diode has full protection. —K3MZO

POLITENESS?

A few years back when a contact with Oklahoma was a rarity for the southern part of Texas, our QTH (it still is on 6), we were having a ball working the Ohio, Michigan, and Illinois boys, not to mention a Wisconsin station. But we were plagued by an apparent local. I'll call him W5WAD, for that was his call.

Every time we finished with a WØ, or a 9 or an 8, this local would call us.

Finally we got sick and tired of hearing him, and answered with what we are sure was a note of disgust in our voice.

He announced himself as W5WAD, in Kingfisher, Oklahoma, and said we were his first Texas contact. He was our first Oklahoma, as well, and very few fellows in Houston had worked Oklahoma at that time.

Wonder what DX you missed last time you ignored what seemed to be "a local pest"? —W8BPY

Open Bands

Here it is the middle of winter and by all rights 50 Mc ought to be dead and the activity should be concentrating on our higher bands.

But someway the factors which affect VHF/UHF propagation failed to read all the theory books this winter. And while 144 Mc was only fair throughout December (according to our reports) it was a far different picture on 50 Mc. If you missed the fun December 14 and 15, you have only yourself to blame. And it was fun. We haven't yet figured out just how many E-clouds had to be floating around up there, but among other things there were two double-hop setups, and at one stage VP7CX was working up the East Coast while Tennessee was talking to Texas and Florida was in QSO with Michigan, all at the same instant!

Here's the day-by-day breakdown. As always, times are GMT which makes a few contacts show up listed for the day after they happened, local time.

50 MEGACYCLES, as we just said, provided the bulk of the news. While the biggest part of the fun took place on the weekend of December 14-16, the band could hardly be called dead any time during the month.

DECEMBER 3: VP7CX starts the log of activity; Harold worked W4ULE at 0232.

DECEMBER 4: WA4GDC, Kris, in Sebring, Fla., found his first opening of the month beginning at 0135 when he and K9ZBS, Illinois, got together. Fifteen minutes later Kris worked WØGIP in Kansas and simultaneously heard Arkansas and another Kansas station. At 0156 the target moved to Michigan and K8GXZ. Ten minutes more and Kris was working WA9EEH in Indiana; final contact was K9VNM, Wisconsin, at 0216. During all this Al, WA4IRX, in Memphis, was hearing carrier bursts to the northeast but no identifiable stations. Al first logged the bursts at 0028.

DECEMBER 5: Things moved west at this point. W6IEY, Dick, near San Diego, reports hearing KØFTG and other Colorado stations between 0300 and 0400. In the east nothing was reported.

DECEMBER 7: Only reporter of this day's activity was WA4GDC, so the cloud must have been fairly small. Kris says it started at 1737 when he worked WA9-DOT in Wisconsin, and for the next hour he was talking with five other stations in Indiana and Illinois. At 1858 the cloud moved south a bit and he picked up W5AIK in Fort Worth, followed by WA5CHK in Houston at 1950. From then until 2035 activity remained centered in Texas and W5TPT and WA5FBK were worked.

DECEMBER 11: WA4IRX reports hearing unidentified audio bursts at 0026.

DECEMBER 12: At 0002 WA4IRX again heard good audio bursts to the northeast, and at 0130 Al heard WØEEQ working into northern Tennessee. Later, from 1928 to 2021, WA4GDC worked three KP4's; the band folded for Kris at 2200.

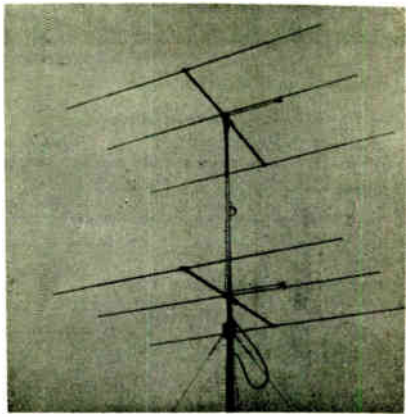
DECEMBER 13: WA9EJA, Phil, whose QTH is Clinton, Illinois, started this day at 0003 by working WA5DXA. At 0114, WA4GDC worked WAØBPC in Butler, Mo. By 0130 Kris had WA4KOG in Tennessee, and at 0139 WA4IRX reports hearing various Florida stations working W5's and WØ's. At 0150 WA4GDC worked WA5AAK in Arkansas, followed by W5EUB down in Houston at 0220; WA4IRX reports the band folded for him at 0244 and WA4GDC pegs the time for him as 0300, with WØ-GIP in Independence, Kansas, the last station heard in Sebring. Next evening, Kris found things hopping at 2320 when he worked K5VGA/5 in Texas, followed by K5CDF/5 in Oklahoma City at 2348 and WA9KHO in Illinois at 2358. The next two minutes made it 2400 and—

DECEMBER 14: Continuing with WA4-

GDC's report, Kris worked WAØFPW in St. Louis at 0014, still hearing Texas and Oklahoma. The opening remained to St. Louis and vicinity until it ended for Kris at 0208. Meanwhile, WAØDJA (who reported via WAØDXZ) says he heard a "good opening throughout the Midwest" from about 0000 on, and WA9EJA worked WA5EMP at 0140. Beginning at 0005, WA4IRX got "patchy copy" from Virginia, South Carolina, Florida, and one mobile in Georgia, and by 0034 things were good enough for Al to work WA4NIG in S.C. By 0114 Al's beam was to the west and he worked K5TGR, Beaumont, Texas, at that time. Al's opening was to the Gulf Coast area until he found W5MPC in Amarillo at 0159, and that QSO lasted for 52 minutes! At 0305 the WA4IRX trail turned north to WØDKB in Colorado, and a few minutes later Al reports sadly "the band went out at 0319 while I was just getting Louisana, my 44th state." The fun wasn't over for everybody, though, for WA9EJA up in Illinois worked WA5-HUR at 0535. Next evening EJA found WA4JMI at 2354, getting a 6-minute head start on the doings of—

DECEMBER 15: These happenings are hinted at in the report from WAØDXZ, Angelo, who says that beginning about 0000 he heard some 25 stations in Iowa, Michigan, New Jersey, Alabama, North Carolina, Missouri, Tennessee, West Virginia, Virginia, Wisconsin, and Texas. Now from elsewhere let's see the details, in as close to chronological order as we can manage. At 0000 K3MOB in Pittsburgh worked WA5EOG and Dan says he also heard Minnesota. Eight minutes later WA4GDC reports working W9AUD in Illinois and at the same time hearing WØAJX working into Alabama.

At 0019, WA4IRX heard W5SFW from Amarillo; at that time, says Al, Phil's was the only signal on the band in Memphis. Four minutes later WA4IRX hit it with W5SYB, also in Amarillo. Another five minutes brings us to 0028, when the report from VP7CX in the Bahamas begins. Harold says that between 0028 and 0238 he worked about 15 stations in New Jersey, Connecticut, Ohio, N.C.,



PAIR OF HILLTOPPERS serve for fixed-station use at K3KCA, Scranton, Pa. Spacing between bays is 75.5", and John feeds the array with polyfoam line. Best groundwave DX—W2NSD/1.

Pennsylvania, Virginia, and West Virginia. 0049 found WA4IRX in Memphis working K5AWD in Oklahoma City, and a few minutes later Al was finding Colorado stations: WØDKF, Aurora, at 0101, WØDPU/Ø at 0120, and WØEEH, Denver, at 0132. In the meantime WA9EJA and WA4CVB made contact at 0130. By 0150 WA4IRX was beginning a 35-minute QSO with WØCUL in Kansas. At 0219 WA9-EJA worked K5YGN. Back to WA4IRX at 0249, when Al worked WØFJZ in South Dakota. Between then and band-closing at 0447 all remaining reports of the session are from WA4IRX, except one from VP7CX who, at 0327, heard K9YJA calling a W7. Between 0315 and 0447 WA4-IRX worked four Colorado stations beginning with WAØHFR, Denver. At 0341 it was WØDYB, and 0424's contact was WØEYE, Boulder. Final, at 0432, was WAØBBI in Aurora, and five minutes later all was quiet.

However, all this was just the first session of December 15 GMT; keep in mind most of it happened the evening of December 14 local time. And, though it was a bit wild, it pales compared to the next evening's session.

This one began at 2215, when WA9EJA

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Utilize two of our standard VHF beams 3 db gain over single beam. Complete with two antennas, stacking bars, and all hardware. Feed line same as single beams.

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6 db gain over single beams. Complete package with four antennas, stacking frames, phasing bars, Q sections, and all hardware. Standard Quad 200 ohm (52 ohm thru balun), may be ordered for 300-72 ohm.

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Order four 16 element antennas and ment stacking kit, complete with hardware, and matching stub. An included.

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Model No. ABW-144 Single 2 meter Big Wheel	$10.95
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MOBILE HALOS: Aluminum construction; machined hardware; Reddi Match for 52 or 72 ohm direct feed. 2 meter. Dual hals two bands one 52 ohm feed line.

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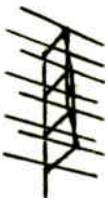

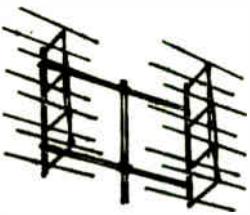

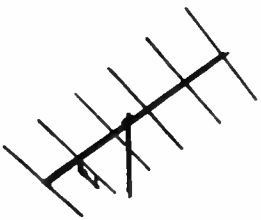

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For Tracking Oscar III

For satellite tracking, back scatter, or point to point communications. The Twist provides either vertical or horizontal and left or right circular polarization. Ideal as a combination point to point or base to vertical mobile antenna. Reddi Match driven elements for direct 52 ohm feed. Cut to frequency within 130 to 150 Mc. range.

Model No. A144-20T Single 20 element TWIST $24.95

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MOBILE ANTENNA of K3KCA looks just like a 6-section telescoping ladder atop his truck—and that's what it is. John has insulated the ladder from the truck with wooden strips on each carrier, and feeds it on 50 Mc with a length of coax terminating in two clips. Proper clip placement results in an SWR of 1-to-1, and mobile-to-mobile range is at least 30 miles. What next?

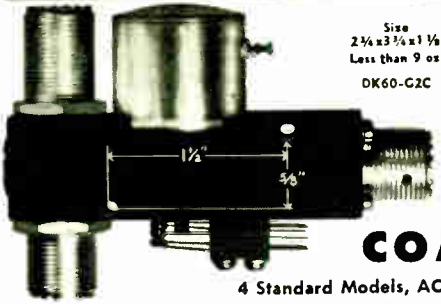
worked K3RQM and at the same time WA4MYH, Owensboro, Ky., worked W1-DVD in Massachusetts. Ten minutes later WA9EJA worked WA2JCB while WA4MYH was working K2OUD. By 2236 MYH was in QSO with K3UIU in Pennsylvania, and at 2240 WA9EJA worked K3-SNZ. One minute later WA4MYH found W3LDA, and at 2246 he moved up to work K1VUU in Maine. WA9EJA stayed in K3 land, working ABK at 2247, ZQH at 2251, and YPL at 2255. At 2300 things moved around some and WA4MYH worked WØ-DRJ in North Dakota, followed by WB2-HGZ in New York at 2312. Another eight minutes and the opening reached down to WA4GDC, who called W3BWU at 2320 but had no reply. At 2321 WA4IRX arrived at his rig to learn that the band had been open in Memphis for "about an hour" according to the locals. Ten minutes more found WA9EJA working WB2CUD, and at 2332 WA4IRX worked WA2FEL in New York. WA4GDC had his first contact of session at 2335, working WA8IDB in Ohio and at the same time hearing N.Y., Virginia, and D.C. stations. One minute later and WA4IRX was working WA9EYM in Wisconsin. Another minute, at 2337, WA9EJA was working WA2QZQ. 2344 found WA4IRX working WA2NDG in N.Y. and at 2353 WA4GDC worked K8YVG in Michigan while WA4MYH worked K2UCO in New York. Final contact of the 15th in our reports was at 2357 when WA4IRX worked W3BWU, but the session was just getting started when midnight passed in London.

DECEMBER 16: WA4GDC begins this part of the report with his 0003 contact with K8WDP in Ohio. WA4IRX was close behind, working WB2HCT in N.Y. at 0008. Back to WA4GDC at 0017, when Kris and WA8KXU in Michigan got together. 0024 found WA4IRX making QSO with WA4FQU in N.C. while WA4MYH was working K5VKL in Texas. At 0032 MYH worked WA5JDU in Austin, and two minutes later WA4IRX made contact with K8HZE, Akron, Ohio. WA4GDC worked WØUBY in Iowa at 0042, and one minute later WA4IRX had W8LJS, Ohio. At 0050 Kris worked WA9FKZ in Illinois, and at 0052 Al, IRX, worked K8PEJ in Detroit. A new twist came in at 0059 when Al found and worked WA4HAU in N.C., while at 0102 WA4GDC and W9TTN began QSO.

At 0114 WA4IRX worked WA4JEX, also in North Carolina, and 11 minutes later WA4GDC worked WØCSO in Kansas for Kris' last contact of this session. WA4-IRX worked WA2AWD in New Jersey at 0131, and things were quiet for about a half hour after that contact.

But at 0204 WA4IRX found the band open west, and worked WAØBRZ in Denver. A few minutes later (at 0228) Al began hearing W6's, and at 0236 he worked K6YWQ in southern California. At 0240 WA9EJA worked WA4MPC, indicating the eastern E-cloud was still active. At 0251 Al in Memphis worked WA6NNW in West Covina, and nine minutes later WA4MYH reports hearing "many California stations" but being unable to work any of them. This almost had to be rather short double-hop instead of long single-hop, as WA4IRX in Memphis was still in QSO with California. From the other end, W6IEY reports hearing Oklahoma, Texas, and Tennessee between 0310 and 0330, but says nothing about anything farther east.

Things remained active a bit longer for WA4IRX, who worked WA5DHF in Ama-



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Ruggedly built, individually inspected to assure dependability. Quality and versatility make DK60 Series relays adaptable to a multitude of applications, military, industrial and amateur.

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r.f. RATINGS: 1 kw power rating to 500mc. 20 watt power rating to 500 mc in DK60-G and DK60-G2C in de-energized position. The DK60-G and DK-60-G2C have a special isolation connector in the de-energized position to reduce crosstalk to a minimum.

AUXILIARY CONTACTS: Form 2C (DPDT) on DK60-2C and DK60-G2C, Bifurcated contacts rated at 5 amperes at 110-V AC non-inductive.

VSWR: Less than 1.15:1 from 0 to 500 mc (50 ohm load). 72 ohm relays available.

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STANDARD RELAYS WITH TYPE UHF CONNECTORS INCLUDE:

DK60—SPDT r.f. switch. $12.45

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SIZE: 4" x 3½" x 2⅜"; Wt.: 1 lb., 8 oz.

Weatherproof coaxial relay for remote switching of r.f. sources. Mounts on mast with remote switching up to 3 antennas. Not a rotating or stepping switch, but the common connector can be switched from any of 3 positions directly to any other 3 positions. Also may be operated so that any multiples of the 3 positions may be connected simultaneously to connector. Simple installation, save money by running one cable instead of several to your antenna array.

SPECIFICATIONS — 0 to 500 mc; power rating r.f. contacts (cold switching) — 1 kw; VSWR — less than 1.1:1 at 100 mc; Isolation — greater than 40 db at 100 mc; Life expectancy — over 1 million operations; Duty — continuous; 50 ohm impedence.

COIL VOLTAGES — 6, 12, 24, 28, 32, 48, 110 and 220 D.C. and 50-60 cps A.C. (Additional charge of $2.70 for 110 and 220 VDC.) Recommended voltages for exterior installations are 6, 12, 24, 28 v DC or AC.

MOUNTING — Supplied with bracket that accommodates 2 standard TV mounting straps for easy installing on antenna mast.

MODEL DK72 with UHF Connectors _____ **$22.95**

Available with type N, BNC or TNC coaxial connectors at $26.95.

Available in 72 ohm impedence in type UHF or N, $1.50 additional.

Please specify coil voltage and type connectors other than UHF.

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NEW COAXIAL TRANSFER SWITCH

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rillo at 0343 and WA5FPS in Albuquerque at 0353 to wind up the session.

Next evening's session didn't measure up to that record, but was still above average for the season. It began about 0353 when WA4IRX worked K3ABK in Pennsylvania, followed by K3ZXR at 2349 and by K3DZS at 2357, both also in the Quaker state. One minute before midnight WA4-MYH worked K4LLN in Virginia.

DECEMBER 17: WA4GDC began this day also when he worked K1JMO up in Mass. at 0014. One minute later WA4-IRX worked WA2FYE in New York. At 0029 Al worked K3YMB in Maryland, and at 0103 K4PUD in Virginia. Kris, GDC, worked K8YVS in Ohio at 0111 and WA8-HPG in Michigan at 0125. WA4IRX came back at 0131 with a QSO with WA4IAS in Williamsburg, Va., and at 0143 Al got together with WA4GDR in Richmond, Va. During the QSO, Al reports, GDR faded out for about 10 minutes, then came back to report that during that time he had been working Oklahoma. Final report of the session was at 0305 when WA4IRX worked WB2LIG in New Jersey.

DECEMBER 18: Only report for this day is from WA4GDC, who heard W5KYR (Texas Panhandle) and K5YUY (near Dallas) from 0038 to 0100.

DECEMBER 23: Five days of dead band ended with a report from WA4GDC. Things began at 0350 up the coast into N. Y. and Mass., but at 0434 Kris was called by WA4BWK/5 in Oklahoma. It ended without getting started, but a minute later WA2WNY was calling. This also faded out without result, but at 0438 (3 minutes later) Kris worked WA5CSA, Ft. Worth, and at 0445 WA5IDH, also in Fort Worth. That ended it except for a signal from KP4BJB heard by Kris at 1850.

DECEMBER 25: "A Christmas Eve present" was W6IEY's description of an opening from 0434 through 0500 during which Dick heard K7BFM, Nevada, W5-SYB, Texas, and stations in Utah and New Mexico as well. He worked KØIMU in Colorado during the opening. During approximately the same opening W5SYB worked an even dozen Californians.

DECEMBER 27: Last openings of the year reported to us were a western one at 0345, when W6IEY heard K7RWT but everything faded fast, and one in the east at 0720, when K3MOB heard WA4FFY. This one too ended before contact could be made.

144 MEGACYCLES didn't have much to offer but this was due as much to a lack of reports as it was to any real lack of conditions. Much may have been happening that we didn't hear about since only WB2CCO and K8ZES had anything to say. Here's their joint report, by days:

DECEMBER 4: Normal conditions for K8ZES, Galion, Ohio.

DECEMBER 5: "Decent" to northwest of Galion but no contacts mentioned.

DECEMBER 6: Normal again.

DECEMBER 7: Again "decent" to NW but no contacts reported.

DECEMBER 8-24: Normal in Ohio.

DECEMBER 18: WB2CCO reports he worked WB2LMA, 140 miles, at 0312, and K1AFR, Conn., 275 miles, at 0413. Bernie's QTH is Plattsburgh, N. Y.

DECEMBER 25: "Fair" conditions in all directions, says K8ZES. Quite a bit of activity as well but no details.

DECEMBER 30: Nice conditions in all directions from Galion, says Sid.

DECEMBER 31: Excellent conditions in all directions but nobody on, reports K8ZES. WB2CCO worked VE3CKB at 0348, range was 110 miles.

220 MEGACYCLES produced only one report for the month; it came from K8ZES. Sid marks December 8 as the date of his first 220-Mc transmission (to WA8DON in Marion, Ohio) but adds his converter wasn't working right at that point. By the 22, all was together and Sid's first 220-Mc QSO was with WA8DON over a 20-mile range. On the 28 and 29, Sid's 220 carrier was heard in Cleveland by K8OXZ and W8-VRX, and skeds were made for New Year's Eve (but failed). The night of the 31, however, Sid raised K9QCB at Tipton, Indiana, 175 miles away, on 144 and

BETTER THAN EVER FOR '64!

Clegg's GREAT NEW

INTERCEPTOR B

HERE'S THE ULTIMATE RECEIVER FOR THE SERIOUS VHF OPERATOR WHO WANTS TOP PERFORMANCE ON AM, CW, OR SSB

Now the top favorite of VHF Amateurs everywhere, Clegg's INTERCEPTOR receiver, in 1964 offers even more spectacular performance.

The new "INTERCEPTOR B", now available at your dealers, is a dual conversion 50-54 mc receiver with a self-contained crystal controlled converter for 144-148 mc reception. A switchable crystal lattice filter permits extremely sharp selectivity for SSB and CW as well as providing 8 KC of bandpass for strong local signals and net operation. Both diode and product detection are provided. Automatic and variable threshold noise limiters function respectively for AM and SSB/CW reception. A new electrical band spread control provides ± 1 KC to the receivers main tuning dial for ease in tuning SSB and CW signals.

Converter input provides for 220 - 432 mc and up, as well as for excellent general coverage of the lower frequency bands using Clegg's new ALLBANDER converter/speaker combination (described to the right).

Space will not permit a complete description of this fine new receiver, but we'd like to suggest that you see one at your dealers or write to the factory for complete data

SUPERB GENERAL COVERAGE 3 THROUGH 30 MC TO YOUR INTERCEPTOR RECEIVER (Either B or Earlier Model)

The new Clegg ALLBANDER converter/speaker combination, attractively packaged in a matching cabinet, now extends the tuning range of any INTERCEPTOR receiver to completely cover all frequencies (with the exception 22-27 MC) between 3 and 31 megacycles.

Frequency range and preselector controls provide easy selection and matching of the desired tuning range while the INTERCEPTOR contributes superb selectivity, sensitivity and stability. After adjustment to the desired frequency segment all tuning is accomplished with the INTERCEPTOR'S main tuning dial.

With the ALLBANDER your INTERCEPTOR will not only receive all ham bands between 3-30 MC but also intermediate frequencies where many desirable signals (WWV, Citizens Band, foreign broadcast etc.) are found.

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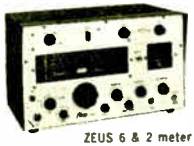
Clegg ALLBANDER Speaker—Amateur Net $129.95

Visit your distributor today and see the famous Clegg family that is making VHF history.



ZEUS 6 & 2 meter transmitter 185 watts AM & CW . . . $695.00 amateur net

THOR 6 6 meter transceiver . . . $349.95 amateur net.

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99'er six meter 8 watt transceiver . . . $159.95 amateur net

See your Distributor or write for information.

Clegg LABORATORIES
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RT. 53, MT. TABOR, N J
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found that Bill was also set up for 220 but with only 7 watts. They switched to the higher band, using CW. K8ZES was copied in Tipton "about S1" but he could find no trace of the low-power carrier. Work is continuing.

432 MEGACYCLES brought 2 reports, one a bit offbeat. The more-conventional was from W6IEY, who advises that inversions to the north from his La Mesa location have been few with only a couple during December.

The unusual one regards 420-Mc WBFM in the Detroit area. It's from K8QKT, who's already on the air at 424 Mc; he notes that K8GIV and WA8AMV are both building rigs to join him, and adds that "there isn't much activity—maybe because there is no one on but me." Bud offers his help in getting on this way, and says his total rig cost under $15. His QTH is 1527 Poplar, Royal Oak, Mich., and landline number is LI 3-4363 for you all near Detroit. Sounds interesting.

1296 MEGACYCLES also had a bit of news this time; maybe before long we'll have a set of reports for all bands from all over.

This comes from W6IEY, who tells us that WA6SSU has joined the crew on 1215 Mc with an APX-6. They're talking of a Mars R&D net for this band similar to that already active on 420-450. in the La Mesa/San Diego area.

TOO LATE TO CLASSIFY—Every month a goodly handful of reports comes in the day after I put the magazine in the mail to New Hampshire for printing. Naturally they are left out, and by the next month the news is usually a bit stale so these items never see print. If you've been sending reports faithfully and never see them in the magazine, this is probably what has been happening.

We're finally getting settled down to a fairly rigid schedule and I can say that any report which gets to Oklahoma City by the 2nd day of the month will make it [illegible]

off, and hides it (this doesn't happen often). Those that come in later than the 2nd may or may not make it in.

For instance, these lines are being put on paper on the 13th, and the mailman just delivered a whole handful of reports to me. We're lucky—they appear below. Let me hasten to add that this isn't always the fault of the reporter; mail delivery is sometimes pretty rotten.

So without further ado, here are those that came in too late to classify:

K8KEQ/3 in Jessup, Md., reports he has been continuing his daily skeds with WA2DRK, Long Beach, N. Y., at 1215 GMT on 145.477. Contacts were made on December 17, 31, January 2, 3, 6, and 8. All were marginal except those of the 17 and 8, which were Q5, S5 to S6.

Richard adds that he's looking for other contacts with New England, around that frequency and time, Mondays through Fridays. Either AM or SSB will do.

K5TQP, Fred, in Albuquerque, tells us he contacted W8PT and WØBFB on 144 in the December Geminids, bringing each of them to the 40-state mark. Fred also worked K9IUF and K9AAJ during the shower, and heard W8MVE.

Fred, with W5LTR and W5KDT, is running nightly tests with K7NII, Scottsdale, Arizona, on 144.090. Results so far are "poor but encouraging" he says.

Finally he notes that W5FAG, K5HMN, and W5CYZ in Santa Fe are now on 432. Fred intends to join them rapidly.

At the other end of the country, K3GGZ lists five 144-Mc phone contacts over difficult paths. They were on the 3, 6, 11 (2), and 12.

WA4FJM, Durham, N. C., has some 50-Mc news. Band was open for him to Texas, Louisana, and Arkansas from 0140 GMT to 0250 December 4; to Michigan, Minnesota, Oklahoma, Tennessee, Arkansas-Florida-Alabama at same time, then Arkansas, Mississippi, and California the night of December 15-16 GMT (opened 2240, closed 0230): to Illinois, Ohio, and Missouri from 2315 December 16 to 0430 December 17; and to Illinois from 0649 to 0720 December 27. The last opening was revealed by strong

BC Electronics

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G)UG-175 or 176/U,11¢;10/$1.00;9.50/c
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CO-AX CABLE

RG8/U,poly-foam,non-contaminable cover,BRAND NEW 50' $6.50;100' $12.00
RG9B/U,51 ohm,with UG-21B/U each end 30' new surplus,$2.25;4 for $8.50
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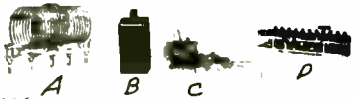
VARIABLE CAPACITORS-PI NET,APC,

A)5 gang,402 mmf/sec.total 2010 to load 160 meter,no inductance.3/8" shaft.60:1 wirm drive.* good $2.50
A)AS above,less drive $2.00
B)3 gang,440 mmf/sec.3.8" shaft $2.50
C)dual 150 mmf/sec.1 KV," " $2.50
H)dual 250 mmf/sec 1 KV," " $2.50
D)EFJ # 250D35,250 mmf,3½ KV $6.00
E)dual 140 & 365 mmf,for BC rec. 39¢
F)150 mmf,1 KV,MC type $1.00;3/$2.75
G)143 mmf,600v APC," shft,69¢;3/1.95

COILS-TRANSMIT,RF,IF,



A)160 or 10 meter trans.choice $1.50
B)85 KC IF,for BC-453,NEW $1.00,3/2.75
B)239 KC,for BC696,NEW 50¢ ea;3/$1.35
B)85 KC IF,later type,hi-Q,1.25;3/3.50
B)15 MC IF, " " " " 39¢;3/1.10
C)44 mmf,butterfly,w/6 meter coil 79¢
D)30 mc IF strip,less tubes 79¢;3/2.25

CENTRAL ELECTRONICS' "Q" MULTIPLIER

The important parts for this unit-380 mmf & du-30 and 60 mmf variable; 455 KC IF;20k pot;"Q" coil,wiring diagram & schematic. NEW $5.00 w/cabinet,no panel 3.75

Vacuum capacitor.50 mmfd 5 KV. * clean,good. $2.00;3/$5.50

"JUNQUE" BCX SPECIALS.Better,cheaper than surprise packages.Use as made or strip.

A)BC-733,108-110 MC ILS rec.Loaded with resistors,condensers,filters,slug-tuned coil can be tuned to 6 meters.Less tubes,relays crystals & dynamotor.Ex used,15 LBS $2.00
B)BC-357,75 MC marker rec.less tube,relay, has APCs,jacks,parts,good used 49¢;3/$1.35
C)BC-347,interphone amp.less tube 49¢;3/1.35
D)TU-3,400 to 800 KC tuning unit for BC-375. Variometers,RF switches,micas,etc. $2.95
E)TG-10,code keyer,for printed tapes.Has 25w audio amp,with 2 6L6.Ex used,working $15.
F)BD-57,code practice switchboard.Has 60 long frame jacks,20 cords with plugs.Cut up for patch panels.25 pounds.Depot repacks.$5.00 each 6 for $25.00
H)BC receiver chassis,5 3/4" x 4" x 1".Has loop antenna,2 gang 145 & 365 mmf variable IF,other parts,a termination.59¢;4/$2.05
H)As above,but have dual 40 mmf 150v &250 mmf 10v lytic;sockets,pot,parts.39¢;3/1.10

POWER SUPPLY COMPONENTS-XFOR,CAPACITORS

A)1600v NOT CT,225 ma,THORD.$5.50;4/$21.00
B)900v CT,160 ma.cased.10 LBS 4.50;2/$8.50
C)100v CT 100 ma;5v 3A;6.3v 3.6A;6.3v .9A. NEW,UTC.Solder terminals $5.50;4/$21.00
E)98,104,110,116 & 123v pri;10v CT 10A sec. Open frame ACME.for 813.5 LBS 4.50;4/$17.
F)1 to 13 hry,90 ohm,300 to 50 ma.1 KV.Saddle mount.Wire leads.3 LBS. $2.50;4/$9.50
G)3.4 hry,30 ohm,400 ma,5KV peak.Open frame, solder terminals.9 LBS.$4.00 ea;4/$15.00
H)5 hry,80 ohm,225 ma,400wv.6 LBS.ea $2.50
I)20 hry,300 ohm,100 ma,1½KV.4 LBS ea $1.50
J)1 mfd 3000v,late type AEROVOX,small $6.50
J)8 MFD 1500v DC(good for 2200) NEW $3.75
K)4 MFD,1000v DC,bottom mount,NEW ea $1.25
L)1 MFD,2000v,NEW 79¢ ea;3/$2.25 10/$7.00

MONARCH signal generator 100KC to 27MC in 5 bands 400 cycle modulator,attenuator.Used,needs repair.and or adjustment.$15.00

sigs on Channel 2 from WBBM, Chicago.

January report from Greg, K3UQD, in Pittsburgh, reveals he worked W1OP at 1552 Jan. 5, but contact was incomplete as band closed too fast.

K7JUE, Jerry, out in Tempe, Arizona, has several items to report, and his filling of the obvious "7" vacancy in our list of reporters is much appreciated. Jerry says he worked WØAWH, Missouri, at 0203 December 15, and 37 minutes later picked off WØRIU. Other band openings occurred during the month but Jerry didn't get to take part due to school work (he's at the University in Tempe).

Good news for the 6-meter SSB gang here, though: During any openings he can catch Jerry will be on 50.110 SSB, as will K7OED. This helps fill a big gap.

W1EXZ, Bob, in Essex Junction, Vt., had a 2-band report. Bob says Six was open for him on the 14th, 2216-2330, and he worked 3 Tennessee stations and one Kentucky during that time. In addition, during the Gemenids shower December 13 at 0115 Bob counted 120 pings per hour on 50 Mc. On the 29, with beam SW, he counted 144 pings per hour at 1516; no shower was scheduled and Bob says he's at a loss to explain this.

In addition to W1EXZ, two other stations are active on 50 Mc in the area he says. They are K1GCQ and K1GYT.

On 144, Bob reports hearing VE3BJA at 0008 December 21 and VE3TKB, 2032 on the 22nd. Neither was worked.

From K9WZB, New Carlisle, Indiana, comes the month's last report. Garry and K8VMA, Franklin, Ohio, are running a sked every night except Tuesdays and Fridays (local times) at 0245 GMT, on a frequency of 145.008 with CW. No luck reported during the month.

However, Garry lists WA9DOT as a contact at 0340 December 3; K8RZB (215 miles away) at 0250 December 5; W8SDJ (260 miles) at 0417 December 7; W8YLD in Dayton at 0519 the same day; W9QHR in Wisconsin at 2350 December 10; and W8MVE (0620) and W8DQR (0643) for the 11th. During the Gemenids, on sked with W4AWI, Garry heard him but couldn't make the contact. Garry's looking for skeds with Tennessee and Missouri, CW, Sunday mornings. He'll be on 145.007.

Have we heard from you yet?

REPORTING HONOR ROLL

Call	Reports
WA4GDC	6
WA4IRX	6
WB2CCO	4
K8ZES	4
K3GGZ	3
K5TQP	3
W6IEY	3
K7JUE	3
W2NSD/1	2
K3MOB	2
K4EBT	2
W5AJG	2
WA9CWZ	2
WA9EJA	2
W9JFP	2
W9OKB	2
KØDEL	2
VE2LI	2

BALUNS from page 7

If you can't get such a load, use a small resistor and just enough power to get a reading; keep test periods short.

4. Turn on the generator, tune it, and check the VSWR indicator. First indication will be about 1.3 to 1.5 to 1.

5. Cut the balun loop shorter a quarter inch at a time and recheck each time. As VSWR drops below 1.1 to 1, trim by only an eighth of an inch at a time. With care a 1-to-1 match can be made.

With the balun completed, remove it from the short feedline and put it on the end of the normal feedline. If you don't want to undo the work done, put a coax connector on the end of the short feedline and splice it to the normal coax. Balun output terminals go to the antenna.

With the antenna connected, the VSWR should still be very close to 1-to-1. If not, the antenna needs readjusting as its input impedance is not matching the feed.

One thing that has been bugging us about our converters is the problem of the power supply. This is particularly true on our DGC units, where the demands of the converter are really a bit beyond the resources of the average receiver. We have been making a matching power supply for $59.50, but we haven't liked doing it.

We've now worked out a solution to this misery. It was simple. We've changed the cabinet housing the DGC enough so we can fit a power supply in for those that want it. Thus it is no longer necessary to have two separate units connected by a power cable. The new model, the DGCWNB-50, 144, and 220, are the same price as the DGC: $98.50. The difference comes in the power supply. Now, if you want a power supply included you specify Model DGCWNB&PSBI and the price is only $119.50. You should also specify the band and output frequency you prefer (or the receiver you'll be using with it) and the type of connectors (UHF, if you don't specify) you need on it. Remember, money back guarantee for 30 days. Your Redline DGCWNB&PSBI must outperform any other converter made.

We've still got some of our HJC-50 converters for $31.95 and power supply HJS for $9.95. These will soon be supplanted by our HJCWBIPS-50 models which will sell for $49.95. These are six meter converters with 14-18 mc output. They work fine. The HJCWBIPS has the power supply built in. This is the same as our HJC-144 which also sells for $49.95 at the moment and has its power supply self-contained.

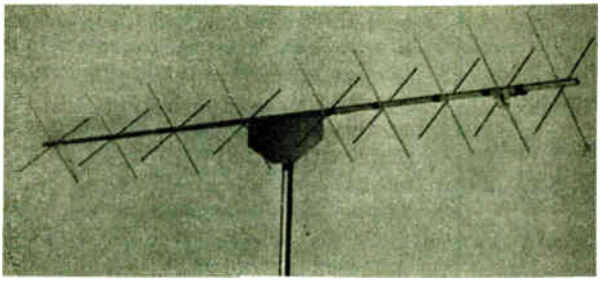
Tripler

OK, we're ready to start shipping the two meter triplers now. These gadgets are amazing. You plug the output of your two meter transmitter into the tripler (up to 10 watts on our current model) and out comes about five watts of 432 mc R.F., complete with modulation. These are designed to work with Communicators and rigs of that power level. You can't ask for an easier way to get a good signal up on 432. Order our Model TMT, price $59.95. No power supply needed since it furnishes its own power.

REDLINE

JAFFREY, N. H.

Flex-A-Ray by Medicom



FR-144 $29.95

FR-220 $23.95

FR-432 $17.95

The revolutionary circular polarized VHF antenna

You're over the hump with Flex-A-Ray
Flex-A-Ray has the bounce that counts
More DB per element
The DX X X X X X X X X antenna
Prices FOB Soulsbyville, Calif.

MEDICOM CO. BOX 632 SOULSBYVILLE, CALIF.

FREQUENCY	BALUN LENGTH
50 Mc	78-5/8 inches
51 Mc	77-3/16 inches
52 Mc	75-3/4 inches
53 Mc	74-5/16 inches
54 Mc	72-7/8 inches
144 Mc	27-3/8 inches
145 Mc	27-3/16 inches
146 Mc	27 inches
147 Mc	26-13/16 inches
148 Mc	26-5/8 inches

TABLE I. Balun Lengths for 50 & 144.

The balun is not a cureall for the VSWR problem as the antenna input impedance must be exactly 4 times that of the feed for the balun to function. However, with the balun and feedline properly matched to each other, you're in a position to hit the antenna adjustments safe in the knowledge that all else is right. —WB6AOW

de K5JKX

. . . from page 1

oscillator, but how about the hundreds of other VHF ops over the country? I fear that this article at this time may do far more harm than good to the 50-Mc cause.

Had it come out 3 to 5 years ago, however, it would have been a real step in the right direction. At that time almost no modern high-power 6-meter rigs had been described in print, and interest in them was high. This is a case where time has made a big difference.

It's not the only instance of such goings-on, either. You might ask W2AZL about his 2-meter converter article. Phil was still unhappy about that last time I talked with him.

So here's my gripe: You fellows at HQ get a lot of good material. Won't you please print it while it's still good instead of letting it die in the files? And if you can't do that, won't you give it the courtesy of decent interment, instead of putting the corpse on public display?

I think it's necessary, if we're to have any real progress.

What do you think? —K5JKX

WALKIE-TALKIE!

6 meter, 150 mw., 4 channel, transistorized transmitter with AM modulator. Complete with transistors and 50.5 mc. crystal. Requires only 12 volts at approx. 35 ma. Ideal for walkie-talkie or get 10 to 15 mile range with a beam.

Only $14.95 ppd. while they last.

6 METER CONVERTER WITH NUVISTOR PRE-AMP

Unbeatable performance at an unbeatable price. Only $10.00 ppd.! Complete with 6U8A, 6CW4 tubes and choice of 36 mc. crystal for 14-18 mc. output or 49.4 mc. crystal for broadcast band output. Fully assembled, tested and guaranteed. Sensitivity 1 microvolt. Noise figure 2.5 db

TNS NOISE SILENCER

Reg. $14.98 now only $6.00 ppd. while supply lasts. New, guaranteed, and complete with 6AL6, 12AX7, squelch control, and mounting brackets. Don't miss out. Order today.

CONVERTER SALE

New model series 300 with 3 VHF transistors, crystal, and more than 30 high quality parts. Carefully assembled and tested. Measures only 3" x 2¼" x 2". Low noise and better than 1 microvolt sensitivity. Made in USA and guaranteed. Available in the following models for 12 volts DC:

Model	Input mc.	Output mc.	Price
300-A	26.965-27.255	1.0-1.255	$8.50 ppd.
300-B	50-51	.6-1.6	$8.50 ppd.
300-C	50-54	14-18	$8.50 ppd.
300-D	144-148	50-54	$10.50 ppd.

Supply limited at these low prices—order now.

All above converters are supplied with Motorola type connectors. For two SO-239 connectors instead, add 75c. N.Y.C. residents add 4% sales tax.

VANGUARD ELECTRONIC LABS Dept. H-9
190-48—99th Ave. Hollis 23, N. Y.

WRETCHED K2PMM

BADGES

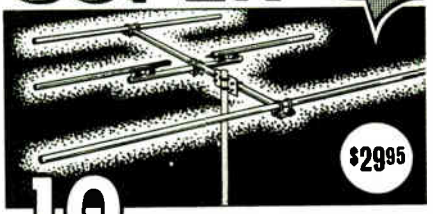
One of the big problems at hamfests and club meetings is to have everyone plainly enough marked with their first name and call. All sorts of stickers and pieces of cardboard have been tried, plus little cards which can be typed up and stuck in holders . . . all have the same problem: they are hard to read from any distance.

The best answers to date are these engraved laminated plastic name badges which can be read by Cousin Weakeyes from seventeen paces. You are in luck. We've arranged to make these darbs available at a real low price, all personally engraved. The badges are 3" x ¾" and come complete with a pin and safety lock. Please give your first name, call and specify whether you want the badge to be bright red with white letters or jet black with white letters.

$1.00 each.

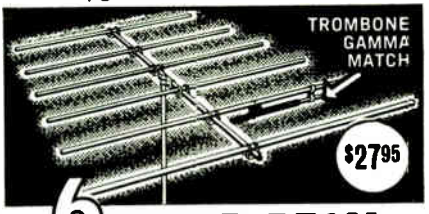
Order from
73 Peterborough, N. H.

new from **SUPER Q**



10 METER BEAM

- One Inch Elements for Low Q and Wider Frequency Range
- 12 Foot Boom for Wide Spacing
- Dipole Driven Element, 52 Ohm Feed
- Forward DB Gain 9.2 Front-To-Back 28 DB
- All Tempered Aluminum—Driven Element Assembled. Shpg. wt. 20 lbs.



6 METER BEAM

- Gamma Match for 52 Ohm Feed
- Resonate Frequency 50.4 Meg.
- Forward Gain 11.2 DB Front-To-Back Ratio 25 DB
- Boom Length: 15 Ft., 1¼ Inch Dia.
- 1" Dia. Elements for Low "Q", Wide Range
- Tempered Preassembled Aluminum Elements, Easy Installation. Shpg. wt. 20 lbs.

MONEY BACK GUARANTEE

— — — — — SEND CASH OR MONEY ORDER TO: — — — — —

SUPER "Q" PRODUCTS
3363 Verner, Kent, Ohio

☐ 10 Meter Beam @ $29.95 | Shpd. Exp. Collect Only
☐ 6 Meter Beam @ $27.95 | Ohio Res. Add 3% Tax

NAME _____
ADDRESS _____
CITY _____ ZONE ___ STATE _____

WBFM

Column conductor:
Fred E. Haneline, W9UDD
4811 Forest Avenue
Fort Wayne, Indiana

Last month we mentioned that WBFM gives the most ability to talk from here to there, on a dollars-per-watt basis.

One of the reasons it does this is that WBFM spends fewer dollars per watt by eliminating the low-efficiency, power-gulping audio system of an AM rig.

Unless some type of efficiency modulation is used, the AM transmitter has to have half as many audio watts as the DC input to the final RF stage. This about doubles power-supply requirements. In addition, final-stage components must be designed to take the modulation peaks.

Contrast this with the FM modulator, which frequently is the other half of the twin triode used as a crystal oscillator. It uses perhaps 2 mils at 150 volts. Also the final can be run at CW ratings since there are no modulation peaks. Most of the older FM sets (the types now available at low cost to amateurs) used no audio amplification at all. Figure 1 is the circuit Link used for years; the left side of the tube is the oscillator, while the right side is the complete audio system and modulator.

R1-C1 is a slope filter which improves signal-to-noise ratio by cutting down the highs. How the rest of it works must be the subject of a later column.

A phase modulator such as this is limited in frequency swing to the highest audio frequency available. This means that after modulation, the oscillator output must get a lot of multiplication to work up a 30-kc swing. Most of the older rigs now available use 1094 kc, x 4 x 4 x 3, or 1634 kc, x 4 x 4 x 2, to get to 52.525 Mc. High-band Motorolas used for 147.3 use 3065 times 48.

The rest of the transmitter is pretty conventional; however, only enough final drive for full CW output is needed, so the multiplier string can use small tubes.

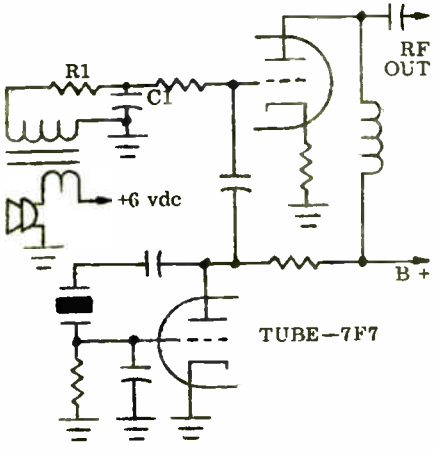


FIGURE 1. Link Oscillator-Modulator

So that the rig may be quickly serviced, several test points are usually either brought to easily accessible jacks, to a switch and single meter jack, or to a socket into which a test set designed for the particular unit can be plugged.

Older Motorolas had a switch-and-jack arrangement for a 50-microamp meter; later ones had an 11-pin socket for the test set. The same test set would service every Motorola made for 10 years!

Link used an octal socket and a similar test set. G-E units had many test jacks into which either their own 60,000 ohm 3-volt meter or any other 20,000-ohm-per-volt meter could be plugged. RCA sets could be serviced with the Motorola test set, or with their own. A ham version of the Motorola test set was published by W2JTP in the November, 1963, issue of CQ.

We're still waiting for your questions. The QTH was left out by accident last month, but I'm ready to try to help with any data I have. —73, Fritz

Make your

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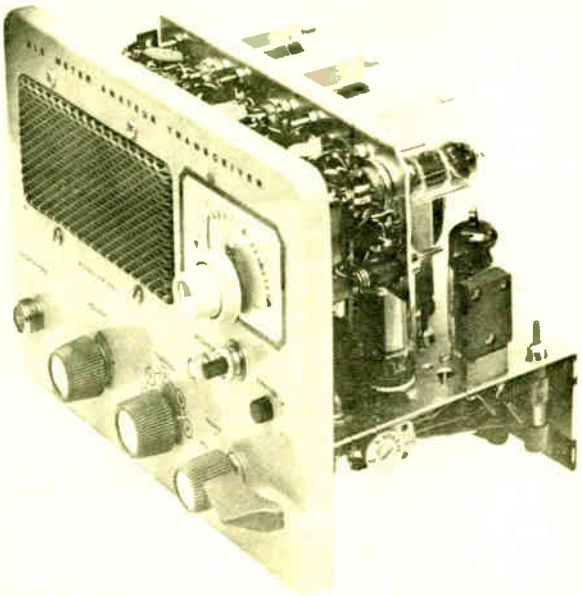
A SELECTIVE SUPERHET



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CONTENTS

6-Up, the VHF Magazine, is published monthly by 73 Inc., Peterborough, New Hampshire. To chew out the editor, however, use the Oklanoma City address. Editorial telephone is 405-GArfield 4-3576 if complaints are urgent. Contributions of interest to VHF experimenters and DX chasers are solicited, as are photographs, skapshots, circuit data, and almost anything else. Send subscriptions ($2 per year) to W2NSD/1 in New Hampshire. Send everything else to K5JKX, Oklahoma City. Now get busy and read the cotton-picki[illegible] ruin your eyes with this extra-minute print.

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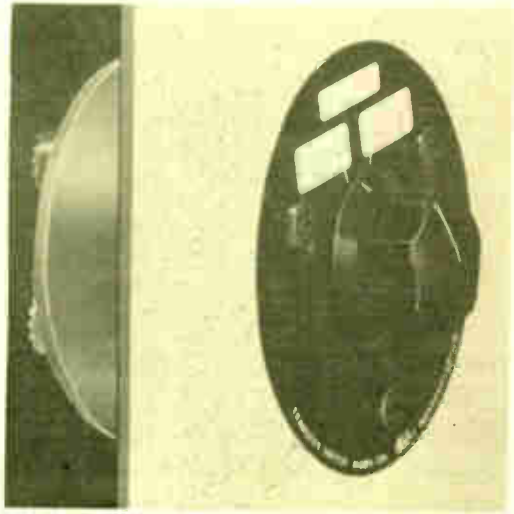

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. . . de K5JKX

ABOUT TRUTH AND TIMETABLES . . .

Strange thing about timetables and truths in the publishing business. Sometimes happy things happen, which in turn make you out to be a liar even at the moment you're trying to tell the whole truth and nothing else but.

Like last month, for example. On page 24 I presented a timetable of events in the production of each issue of 6-Up, concluding with the fact that the magazine reaches the reader by the 18th of the month. Only thing wrong with that fact was that it turned out not to be one. Reason was mentioned at the bottom of page 10. We took up the unexpired subscriptions to VHF Horizons, and the subscription list arrived in New Hampshire on the 15th. All 3,600 names of it. All on computer cards and we use the Elliott addressing machines, which meant that 3,600 new stencils had to be cut soonest. In addition, since this brought our circulation up around the 6,000 mark all of a sudden, we had to run the poor presses overtime and used up what we had thought was a six-month supply of paper.

Because of the added number of copies, everything slowed down. We did get most of our original-subscriber copies out, a mere couple of days behind schedule. The VHFH subscribers' copies trickled out as rapidly as we could get the address stencils cut for them. But nobody was reading his August 15 issue on August 18.

And understandably, this led to some disappointments and slightly hard feelings. A reader in Denver wrote to take us to task, and all I can say is that his complaint was well taken. With luck and all that, this issue should be in your hands closer to the publication date--but I have learned. No promises this month. Just hopes.

You may be noticing the difference in appearance. The book is getting so big so fast that we had to purchase an IBM typewriter (ouch) to be sure that every page was readable. New printing equipment is also en route to Peterborough.

A word regarding size and such. You probably saw the striking difference in the amount of advertising between the first issue and number two. Though some readers object to advertising, we sort of think that, manufacturers and their products are essential to VHF/UHF hamming. The more we respond to them, the more we prove that VHF is here to stay and is something a lot bigger than just "a splinter group."

A lot of people already know that, of course. We just think everyone ought to. What do you think?

--K5JKX

A 'Pure' ARC3

by Jim Speck, W5PPE
1609 Glenbrook Terrace
Oklahoma City, Okla.

When the ARC-3 became available on the surplus market and from MARS a few years ago, it was recognized as being a real find, and at least one conversion article has been written on it.[1] During the period it has been available, a large contingent of VHFers in northern and central Oklahoma have performed the minor changes required and have built power supplies.

The result is a 2-meter transmitter with the following specifications: 10 watts output, high-level plate modulation using a carbon microphone, one-knob tuning after QSY, built-in antenna relay, compatible with 8-Mc crystals. Other features which are available if a husky 24 VDC power source is made available include automatic tuning of the transmitter and MCW operation with a side-tone output. Refer to the one article previously referenced if these features are desired, and also for conversion data on the receiver; the receiver is omitted here because of its limited usefulness to serious VHF operators.

The previous paragraph listed the advantages of the ARC-3; now let's examine the disadvantages of the "least change" conversion: one is stuck with a large package; the power supply is generally half as large as the transmitter itself; the carbon mike is far from the ultimate in microphones; any number of unnecessary parts remain in the transmitter; and lastly, the hookup wire is at least 15 years old and tends to crack and lose insulation when flexed.

To get rid of the disadvantages while retaining the advantages, major surgery was resorted to. However, the outcome was a "pure" ARC-3. The account which follows refers to the schematic, Figure 1, which is reprinted from the original Tech Order on the equipment.

STARTING THE JOB

The starting step is drastic; strip out old parts. Specifically, remove all relays except the antenna changeover relay, chopping all wires which connect them. This includes the crystal selector relays, with their associated phenolic sheets and bakelite crystal sockets. Remove all front panel plugs and cut their connections. Remove the barometric volume control (outboard of the 6V6 oscillator) and salvage the potentiometer, to be used as the mike gain pot. Remove the channelling motor and drive assembly complete up to the sliding coupling to the first tripler tuning capacitor. Remove filament-circuit resistors R129 through R133. Remove the 12SH7 tube, the plug-in plate current relay next to

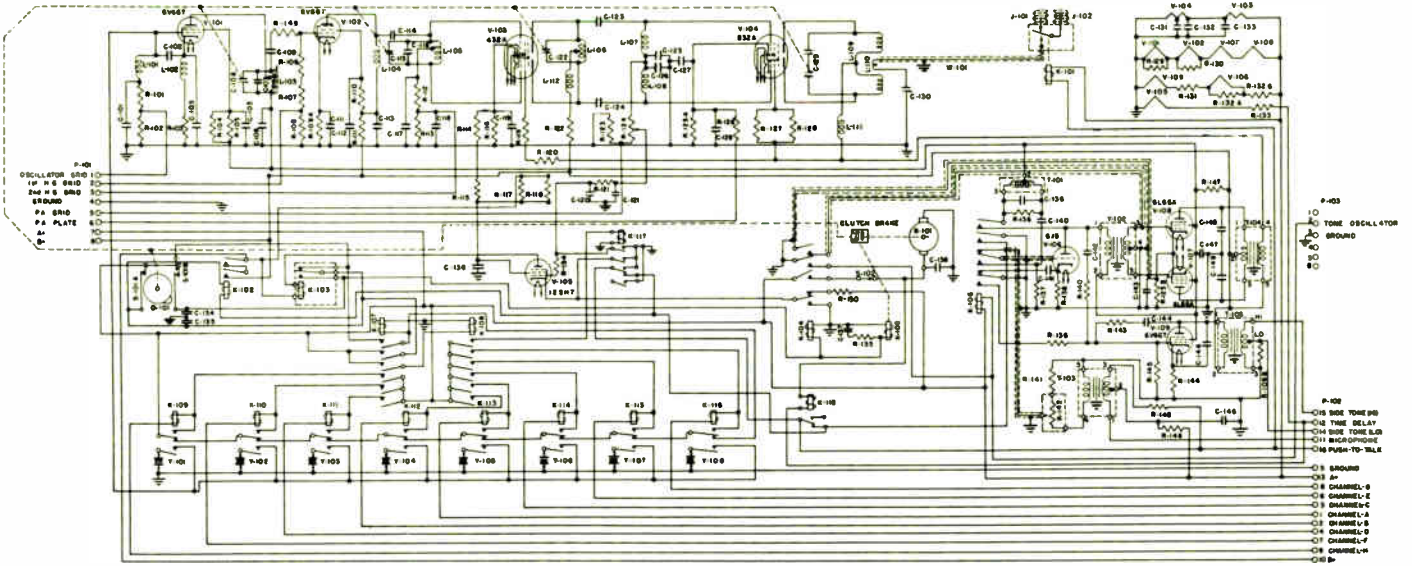

FIGURE 1. Radio Transmitter T-67A/ARC-3, Schematic Diagram. Reproduced from T.O.

it, and their sockets, cutting the wires. Remove the component-mounting boards containing R117 and R118, R112, R138, and T101. Save the boards to salvage some of the resistors for later use. Remove and discard T102, T103, and T105. Now strip all wire from the set, using a soldering iron and soldering aid to clean the sockets and tie points which will have to be reconnected later in the conversion. If desired, wiring in the oscillator-tripler 6V6 stages and the wiring connected to either of the 832's may be left if it appears to be in good condition. Remove and gently junk the 6J5 and 6V6 sidetone amplifier. This concludes the first step. Now we begin to put things back.

POWER SUPPLY AND CONTROL CIRCUITS

Remove the front panel by taking out the screws at either side and in front; then mount a shell-mounted TV power transformer[2] in the space formerly occupied by the auto-tune motor. A coping saw with a good blade may be used to enlarge the chassis hole to accept the transformer.

The filter choke mounts over the relay-contact access holes, while the 50-50 MF/450-volt can-type electrolytic capacitor mounts in place of the old five-pin socket of the plate-current relay. The dual-1000 MF/15-volt filter for the relay supply mounts in the 12SH7 socket hole. Silicon rectifiers (three 400PIV or two 600PIV units per leg, with .001 MF disc ceramics across each for transient protection and 470K 1/2 watt resistors for voltage division) mount on an insulated terminal board underneath the filter choke. The relay supply diode is a 750 MA 200PIV unit.

The relay circuit is somewhat unusual. It involves a P&B KA-11A, with 6 VDC coil. One set of contacts controls the transmitter while the other set mutes the receiver. Transmitter control with only one set of contacts is achieved by grounding the relay arm and connecting the normally-open contact to the power-transformer center tap. The other contact straps to the rectifier side of the surge-limiting resistor. When the relay is keyed, the transformer is grounded and B+ is produced. When the relay is released, the arm shorts out the filter capacitors by way of the resistor, which prevents "tail-off" of the signal. A bleeder is provided by biasing resistors R114, R115, and R116, though no need exists for a bleeder in normal operation.

Wiring of the power supply as well as of the modulator is shown in Figure 2.

MIKE PREAMP, CLIPPER, AND MODULATOR

The tube lineup chosen was based primarily on content of the junk box but this was not the only criterion. A 6SN7 serves as mike preamp, a 6H6 clips the signal, a 6SL7 is the floating paraphase phase inverter, and the modulator tubes are 6L6GA or 5881's. If you want to use miniature tubes, a 12AU7 replaces the 6SN7, a 6AL5 the 6H6, and either a 12AT7 or 12AX7 may be subbed for the 6SL7. No change in the modulator section is recommended.

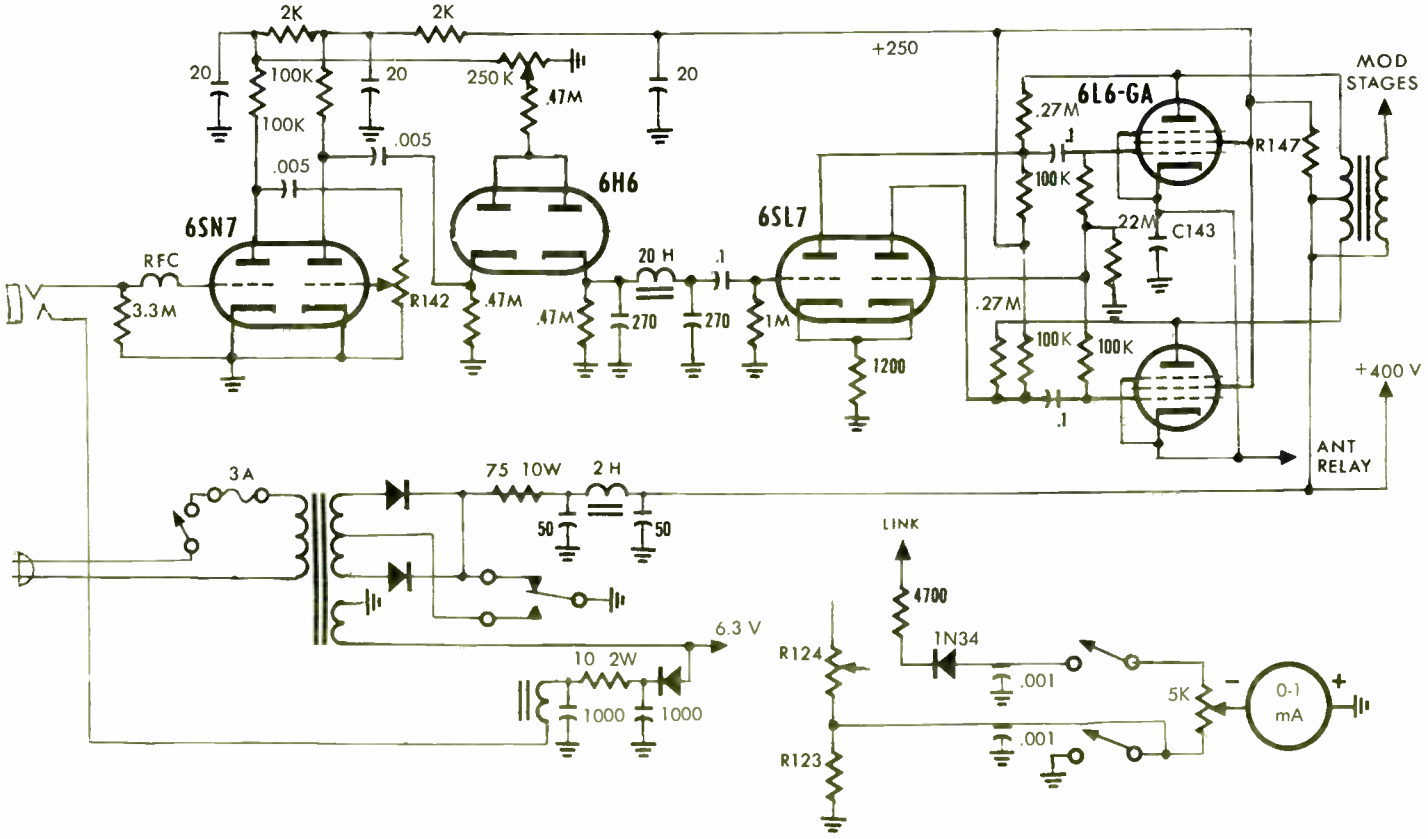

FIGURE 2. Modulator, power-supply, and control circuitry added to ARC-3. See text for details.

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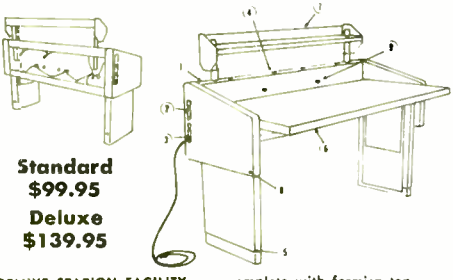

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The 6SN7 uses the same socket originally occupied by the 6V6 sidetone amplifier. Remove the socket by releasing the snap ring, and reinstall with a shield cover under it. The shield cover used here was salvaged from an ARN-5 glide path receiver. The bottom of a juice can, with a hole 1-5/32" in diameter punched in it, makes a good substitute. The circuit of the preamp is a little unusual in that both cathodes are grounded but this was the only way RF feedback could be controlled. Hum pickup problems existed until all grounds in the 6SN7 stage were brought to a single common point, which in turn required an insulated mike jack and insulation over the shields of the wiring.

The clipper and filter are standard circuits, as is the phase splitter. The 6J5 and driver transformer were removed to allow use of a simple feedback arrangement around the 6L6 stage; this consists of the 270K resistors from the 6SL7 plates to the 6L6 plates. This hookup provides about 10% feedback, which improves the low-frequency response of the modulator enough to avoid any cant problems with the flat tops of the clipped waveforms.

The antenna relay is connected between the 6L6 cathodes and ground, providing 25 volts of bias for the 6L6's and operating the relay on pure DC while transmitting to boot.

REWIRING THE RF SECTION

Rewire the RF stages following the original schematic, Figure 1. The 6V6 filaments should be connected in parallel, and the 832 filaments put in the 6-volt hookup (ground pins 1 and 7, 6 volts to pin 5). The grid leak resistor of the oscillator is on one of the mounting boards removed earlier, as is the screen resistor. These parts should be removed from the boards and mounted by their leads near the oscillator tube socket. The 832 grid leak should be located and connected in the same manner. Disregard the low-value resistors used as meter shunts, which are shown connected from grid leaks to ground. The only one of these which will be used is that in the final grid circuit. Finally, mount a crystal socket on the front panel and connect to the oscillator.

METERING

An 0-1 MA meter is mounted inside the old crystal compartment with a 5K pot and DPST switch under it. The schematic for this is included in Figure 2. With the pot full counterclockwise and the switch open the meter reads about .4, when the drive is peaked and the tuning tracking. When the control is rotated clockwise from the "off" or grid-current position, it reads relative output and can be set at a convenient point for peaking adjustments and for monitoring.

The wiring to the meter is routed on top of the chassis across the front and down the RF side to the feed-thru bypass capacitors. The 1N34 and 4700-ohm resistor are mounted by their leads from the link-to-coax tie point on the final 832 socket, to the feed-thru. An RF choke must be

connected from this tie point to ground to provide a DC path for the meter.

TUNE-UP AND OPERATION

No attempt was made to bring the main tuning shaft to a knob on the front panel in this transmitter, although it may easily be done, because the rig was to be used on only one frequency as a net-check-in unit. Thus tune-up requires removal of the snap-on cover under the 832 tripler for access to this shaft.

First position the shaft to the vicinity of the output frequency as read on the scale near the 832 tripler, on top of the chassis. Plug in a rock and key the mike. Peak final grid current by adjusting the tuning capacitors (these are labelled 2 and 3) which tune the 6V6 and 832 tripler plate tanks. With antenna or dummy load connected, adjust the final tank (adjustment 4) for maximum indicated output. For more output, try adjusting the link position and link-tuning capacitor.

The modulation-set pot (the 250K pot in the plates of the 6H6) may best be set by viewing the RF signal on a scope, although on-the-air checks with a reliable observer can substitute. With mike gain set at maximum and with loud talking or whistling into the mike, set this control for a modulation level of almost (but not quite) 100%. The mike gain can then be set for any desired amount of clipping. With a moderately loud voice close to the mike, one should be able to get at least 20 db.

REFERENCES

1. Kincaid, W. B., "Converting the AN/ARC-3," CQ, February, 1962.

2. Obtainable under nearest rock or from friendly TV serviceman; to learn what to do with the rest of the parts from the junker TV set he may give you, see McCoy, Lewis G., "65 Watts at Low Cost," QST, March, 1961, page 20.

Feedback, etcetera

Feedback again this month; this via Harold Davis, W8NMF. Seems like last month's issue, on page 9, at the end of W5AJG's article on the 758-A wavemeter, included a note mentioning that the 758-A "may be purchased" from Capitol Commodities Company, Inc., in Chicago.

But it just ain't so. Our information was wrong; about two years wrong, to be exact. They haven't had any for that long. So now they have a passel of orders for something they don't have any more of in stock, and they're not exactly happy with it at all. Understandably.

Please don't send any more orders for this item to them; if you already did, they'll be refunding your money soon now. And if any of you happen to know where a 758-A can be purchased now, let us know and we'll tell the rest of the gang!

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OPEN BANDS

50 Mc produced mixed results during August. For a number of locations, the band was virtually dead all month; not at all like the red hot conditions which prevailed throughout the preceding two months. However, other ops in other locations report quite a respectable number of openings.

The following list by days is entirely in GMT, which often makes a report show up a day later than the local-time day upon which the contact was made. Incidentally, many of the reports received this month were in GMT; a few were not. If you'll all convert them to GMT before sending them in, we'll have less chance of making a mistake. To convert EST to GMT, add 5 hours; for CST, add 6; for MST, add 7: and for PST add 8.

JULY 31: K1BHY, Monroe, Conn., reports the band was open from 1400 to 2200; he worked WA5FTB/5 in New Orleans, and heard 4's and Ø's. WA4IRX, Memphis, Tenn., worked WA9IWK/mobile who was 40 miles west of Milwaukee, from 1845 to 1849.

AUGUST 1: K1BHY reports the band open from 1400 until 0200 August 2 GMT; he worked W8PNJ, Ohio, and heard 4's, 9's, and Ø's. WA4IRX worked K4PND, 150 miles distant, on ground-wave at 1306; later, at 2350, he snagged VE3BGA, Ottawa.

AUGUST 2: WA4IRX worked a number of Minnesota stations between 0005 and 0051, then moved up to VE4FG in Winnipeg at 0118.

AUGUST 3: KØDEL, Aurora, S. Dak., worked Ohio stations between 0045 and 0115 with extreme fading. WA4IRX heard K9HBT in Wisconsin at 0022, then at 0024 extreme noise (S7) blanked him out. Noise lasted until 0110, then stopped; VE4MA and VE4GI were coming through. No contact made.

AUGUST 4 through AUGUST 6: Dead according to all reports received.

AUGUST 7: Fairly open band again. WA4GDC, Sebring, Fla., reports working WA4IRX at 0033; WA9BTT, Illinois, at 0035; K5YUY, Dallas, at 0113; and WØCVR, Kansas City, at 1330. In between he heard W5EFH in Dallas and WA5CRB in Arkansas, as well as a pair of Missouri stations. At 1430 the skip had shifted north and he was hearing 1's and 2's weakly; then at 2055 on another opening he worked KP4BEL. At 2250 he was hearing WA4KOG, and at 2300 WA5CRB was back in. From Memphis, Al confirmed the 0033 contact and reported he also worked Grid,

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The above unit is available mounted in 3x4x5 aluminum case with all connectors on rear. Front of case has green jewel on-off lite & 0-100 gain control. De-lux mount—ADD $6.50

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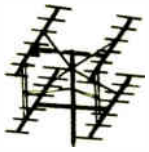

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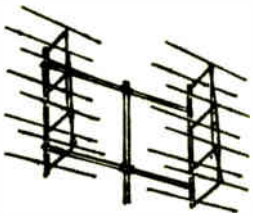

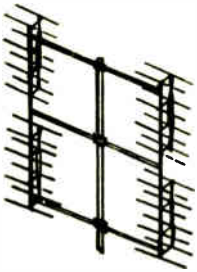

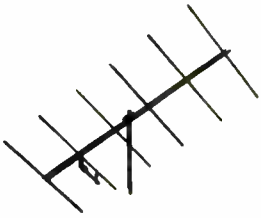

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W4GJO, at 0045. WA9EJA, Clinton, Illinois, reported hearing 4's during the day.

AUGUST 8: WA9EJA was hearing 4's and 5's, while W6IEY in southern California was hearing Washington state and Oregon from 0210 thru 0300. WA4GDC worked K1WHR in Massachusetts at 1410; K1FJY, also in Mass., at 1435; K1PZF, Rhode Island, at 1457; and WA2PRR, New Jersey, at 1514. WA4IRX reported the band unstable from his Memphis location, but he did hear KØEFT, Sioux City, S. Dak., at 0037; WAØFJS, Nebraska, at 0134, W7VDZ, QTH unknown, at 0146 and again at 0222; and WØBRH, Denver, at 0213.

AUGUST 9: K5BDQ, Kit, in Victoria, Texas (near Corpus Christi), found the band open to 6-land around 2225 to 2244; he worked W6QWT and WA6YTK, and heard Tucson stations. WA4IRX heard only an unidentified W5 around 0156. WA4GDC worked K5IVB, Dallas, at 1400, and two more Texans between 1428 and 1438. He also heard K1ZPF at 1735. Ten minutes later he worked W1WIA, New Hampshire; at 1814 he got through to K3NZI, Philadelphia, and at 1823 worked KeROU, also in Pennsylvania.

AUGUST 10: W6IEY worked K5WKQ, Texas, at 0025, and reported he heard WØBMI, Colorado, at 0150; K7GND, Utah, 0300; and W7FFE at 0345. At 1940, he heard L. A. stations working Colorado. WA4IRX's log shows K1BCS heard weakly at 0135; K1YNK, Mass., worked at 0152; K1SAK, Rhode Island, worked at 0210; K4ZWV, Kentucky, heard about 0220, and K2JPM heard at 0226.

AUGUST 11: K4EBT, Tampa, Fla., reports working K4GRY, Virginia at 2310, and WA8DDM, Ohio, from 2325 to 2331. WA4GDC worked two Ohio stations between 2227 and 2242, then worked WA4JIN, Tennessee, at 2250 and W4YYN and WA4GKK, also in Tennessee, as a round-table at 2315. Heard later were WA5ESZ, Arkansas, and K4KVB, Alabama. WA4IRX in Memphis heard WA2GCE at 1240 and VP7CX at 2343, but he made no contacts.

AUGUST 12: Between 0001 and 0007 WA4IRX heard two Florida stations; this was a continuation of the previous opening. WA4GDC heard K1ZPF, Rhode Island, at 1040. K4EBT worked K1ZPF from 2045 thru 2053. W2NSD/1 (who he?) reported working W4BVU/mobile-in-motion in North Carolina at 2130.

AUGUST 13: Al reports nothing doing in Memphis, but good activity went on elsewhere. WA9EJA reported working CO2GS, Havana, from his Clinton, Ill., QTH at 0203. This would have had to be multiple-hop. He also worked two Texans between 2245 and 2400. WA4GDC worked W9VMH, Indiana, at 0025, and heard a number of other stations in Illinois, New Jersey, and New England from then until 0114 when he worked W9AUD in Illinois. He then worked a number of Illinois and Missouri stations before 0200. At 0235, he heard Tennessee, and at 0255 K5RLM in Calumet, Oklahoma.

AUGUST 14: Another fairly active day. WA4IRX says he was mobile in Nashville so didn't work anyone, but he heard K4YDX working 6's, while K4ZLB was working Louisana and Indiana, and other Nashville stations were working Texas. At the same time, Memphis stations were working KP4's at the start of the opening, about 0001 through 0230. WA9EJA got K8REG/5 in New Mexico at 0052, while WA4GDC reports working a number of KP4's immediately after 0035. He said he heard one KP4 working a Colorado station. He heard Oklahoma about 0200 as the cloud moved west.

AUGUST 15: WA4IRX reported local activity only. KØDEL, however, worked both Dallas and Houston between 0000 and 0015, and reported sigs still in at 0200. WA4GDC worked W1WIA, New Hampshire, at 1515, and heard Rhode Island weakly. At and after 2258 he worked a number of Massachusetts and Pennsylvania stations. At 2350 K1SLL, Conn., was worked, followed by WA2UOY, N. J., at 2359, who was accompanied by 5's and 6's.

AUGUST 16: VP7CX boomed in at WA4IRX at 0040, with W5SFW only 12 minutes behind him. At WA4GDC Slew Foot was also among those worked (at 0027) and others included K2SBK, N. J., at 0015; K5KZD, Texas, 0045; K5TYG, also Texas, 0107; two Ohio stations between 1350 and 1360; two Kentucky stations from 1409 to 1415; K9AIP, Indiana, 1442, and five Ohio and Michigan stations from 1500 to 1555. In Tampa, K4EBT, Milt, reports the band open from 1310 to 1615; he got 12 Ohio stations, 1 Virginia, 1 Iowa, 1 Michigan, and 1 in St. Louis in the opening.

AUGUST 17: Dead according to all reports.

AUGUST 18: WA4GDC heard Ohio and K9 from 0045 to 0230; no QSO.

AUGUST 19: W2NSD/1 worked WA2INO/mobile, New Jersey, at 1631. No other reports of openings.

AUGUST 20: Through WA9CWZ, WA9BTT reports opening to Kansas City from Macon, Ill., from 0000 through 0500. W2NSD/1 worked a Pennsylvania station, W3VDY, at distance of 295 miles on ground wave. W3VDY was using a barefoot Gonset III.

AUGUST 21: WA9CWZ heard W9CIU, Wisconsin, about 0315. Also heard but could not identify SSB stations through Michigan, Cleveland, Indianapolis, and Kentucky, until 0400.

AUGUST 22: Dead according to all reports.

AUGUST 23: From 2204 to 2315, WA4GDC heard KP4's working W1's and W2's. At 2340, he heard WA9FBE. No other activity reported.

AUGUST 24: CQ Contest Weekend. K1BHY worked two N. C. stations and heard 1's, 2's, and 3's from 0000 to 0200. W2NSD/1 found

band open to Ø's for an hour from 1900 to 2000. WA4GDC worked many stations from MASs. to Kansas, including Ohio, Michigan, Kentucky, New Hampshire, Illinois, Iowa, and Missouri. It appeared to be one continuous opening from 1357 through 2258. From Memphis, WA4IRX reported similar doings, working N. C., Virginia, Maryland, N. J., Michigan, Indiana, and New York before the contest started. Then he heard a WØ, some K5's, and Arizona, but could get no contacts. The fun began around 1437, and lasted through 2332, extending to the next day.

AUGUST 25: WA4IRX heard Arizona stations from 0000 until 0046, when he snagged K7KRV in Mesa. Later, at 0124, he heard K5BPQ, El Paso. KØDEL reported hearing Texas stations right at the noise level around 0200, while W6IEY heard W5WAX in Oklahoma at 0400, as well as KØZZM/Ø in Colorado at 0043 and W8KHC/Ø in S. Dak. at 0054.

AUGUST 26: Only report of activity is from W6IEY, who heard Washington state and Oregon stations from 1740 through 1819, and worked K7YFS/7 in Washington.

AUGUST 27: WA4GDC heard 1's and 2's from 1530 through 1545; he worked a New Jersey station at the latter time. W6IEY heard W5SFW and an Oklahoma station at 2310. W2NSD/1 reported very good luck on ground wave this date, working Sixers and 99ers throughout 1, 2, and 3 zones. Best DX was K3YOA, Philadelphia, 260 miles, who was using a 99er.

AUGUST 28: WA4IRX reports hearing K4YSN, Miami, at 2327; and working WA5DHF, Amarillo, at 2351. WA4GDC called a CQ about 0130 and was answered by W2NSD/1; at 2150 he heard 2's weakly, but a few minutes later things picked up and at 2201 WA2SPL was worked. From then on through 2347 the activity was good, with Virginia, Ohio, and Missouri among the states worked. In addition to the WA4GDC contact, W2NSD/1 contacted K2ZSQ; Bob reported no sign of the opening at all in Rahway, N. J. At 1340 NSD worked K3KEO, Delaware, 325 miles, on extended ground wave, and at 2247 snagged WA4FRW, Ala.

AUGUST 29: W6IEY heard Washington stations from 0320 to 0345, and worked WA6MNO over the difficult northern-to-southern California path. WA4IRX heard WA5GAX, Amarillo, at 0009, and worked K5FVH, also in Amarillo, at 0013.

AUGUST 30 and 31: Dead according to all reports.

Some general 50-Mc DX notes of interest: WA4GDC passes along a tidbit from VP7CX; Harold expects to indulge in a bit of VP2 activity from Anguilla and Tortola during the first week of October. W 2NSD/1 has been hearing and working low-power stations through a 260-mile radius since August 26; best times are from 1100-1400 and 2000-2100. K1JRL, in New Hampshire, reports a daily net on 50.4 Mc with five or more check-ins each morning at 0600 EST; visitors invited. K6GTG, Riverside, Calif., is looking for skeds on 50 Mc as well as all other

Redline

Hi:

The response to our ads in 73 and 6up have been absolutely amazing. And we've learned a lot already. As was probably obvious from our ads, the product that we wanted mostly to make was our last-word-state-of-the-art DGC converters. But when we figuredcout what our price would have to be on these converters if we were to stay in business we were dismayed and shocked. How can anyone expect to sell a converter for $100 when there are so many around for about $50? We knew that these cheaper converters were a mass of compromises, but we weren't sure that enough VHF'ers were aware of it to keep us in business making DGC's.

The normal reaction to a worry such as this is to develope a converter to compete with the inexpensive models. This we did. Just to make sure that this one would sell we made darned sure that it would outperform every other converter on the market.

The surprise came when we ran our first Redline ad and found that the demand for really good converters was not as miniscule as we had supposed. This called for rush orders for the special parts required and much midnight slaving. We're busy filling orders now and can promise you three week delivery on DGC's.

It should come as no surprise that the first purchasers of our Redline DGC converters were some of the top DX VHF ops, including several fellows who are considered to be among the best in making their own gear...as one of them said, "Why knock myself out for weeks trying to duplicate something that you've already done?"

Frankly we are a bit disappointed in the amount of interest shown in our HJC converters. Is it possible that no one wants a really first rate second rate converter? Think over our iron-clad guarantee: the HJC Redline converters will outperform any other converter, regardless of price (except the DGC), or your money fully refunded. Note: since you may become so excited over all of the new stations you will be hearing with the HJC converter you may want to invest in a DGC. If so we will allow the full purchase price of the HJC toward the DGC if you return it within 90 days in good shape.

The HJC converter is really a good deal. It has a nuvistor front end for very low noise figure, is built on a plated steel chassis for good looks and rigidity, has rather thorough shielding, crystal controlled oscillator for good stability, and pulls in the weak ones. The output is designed to best match general coverage receivers (14-18 mc). The price is only $31.95. It's worth a lot more. The mating power supply is $9.95 (model HJS). Works.

The DGC converters are packed with nuvistors. They are built in a piece of solid extruded aluminum that looks like an I-beam instead of a chassis. The idea is to provide the ultimate in both shielding and rigidity. Why do we go to all this bother? High gain and a low noise figure. This does even better than the others claim in their ads. The DGC is available, custom made, for 50-144-220 mc. The output will be anything you specify, though we recommend 14-18 mc as optimum for most receivers. The DGC's are $98.50. A matching power supply, voltage regulated, highly filtered, etc., is $49.50.

Please don't wait until three weeks before the VHF Sweepstakes and try to order a DGC in a panic. First of all we have to have time to build the converter to your specifications; secondly we have to have time to run a full set of curves on it and rigorously check it out; thirdly we have to have time to put your name and call on your custom made unit. There is no point in trying to badger us by phone or personal visit. Forget it. When you are ready for a converter send in your order and we will get working on it as fast as we can.

Val K1APA & Sam W1FZJ

HJC

Redline **Jaffrey, N.H.**

VHF bands; he runs high power and has big antennas.

144 Mc activity was fairly good during the month of August, with one top op, at least, reporting an opening every night for two weeks in a row. All openings except one were of the tropo variety, but there was at least one aurora also. As winter approaches, we can expect more of this too. Goody!

Like the 50-Mc reports, all times given here are in GMT which may move a date around a little. However, days upon which no activity was reported have been omitted in the interests of space.

AUGUST 5: K8ZES, Galion, Ohio, worked W9JEC, S. Holland, Ill.

AUGUST 6: K8ZES worked K9PRB, Joliet, Illinois.

AUGUST 8: W2NSD/1 worked WA2FSQ, Fort Lee, N. J., at 0047, at 185-mile range.

AUGUST 9: K8ZES worked VE3CMR, Windsor, Ontario, who was on with a Twoer. Many Indiana and Pennsylvania stations were also in.

AUGUST 10: K3GGZ worked K8YWF, 150 miles, at 0205; at 0248 he worked W8PHJ, 240 miles distant.

AUGUST 11: K3GGZ (QTH Enon Valley, Pa.) worked WA8DKT, 180 miles, at 0102, and WA8AVK, 150 miles, at 0534.

AUGUST 18: K1YJB, Brunswick, Maine, worked a number of stations in Mass., N. Y., and N. J. while running 30 watts input from 0400 to 0644.

AUGUST 19: W3BYF, Allentown, Pa., reports aurora opening during which he heard a number of VE3's, VE2, W4, and W8, plus a flock of W2 stations.

AUGUST 20: Excellent night. K8ZES worked West Virginia and Pa., heard Tennessee and Ohio. W5PPE, Oklahoma City, worked Kansas, Wisconsin, Illinois, Iowa, and Missouri between 0400 and 0600; Jim reported the first 100 kc sounded like a 20-meter pileup.

AUGUST 22: W3BYF reports a "very short" opening; Pres says he heard only W8KAY and some W1's, with beam heading northeast.

AUGUST 23: K8ZES reports "best west opening of the year" for this date, but no other reports of it were received. Sid said he had almost a pipeline to the St. Louis region during the opening, which continued most of the evening. It peaked about 0200 August 24 GMT, and lasted through 0630.

AUGUST 24: Contest weekend. K8ZES reports working 149 stations in 63 counties. K3GGZ worked a number of stations, including one at 210 miles (W2CG, at 0100). Among others Stan nailed were WA2RDE, at 0042, 170 miles; K8DBA, 0547, 180 miles; K8PBA, 2313, 200 miles; W8AOE, 2359, 180 miles; and WA2LSF/VE3, 0045 Aug. 25, 155 miles.

AUGUST 27: W5PPE worked W5FYZ, Minden, La., at 0508 and heard KØTPH, Colorado, later. Ernie told Jim the band had been open from Minden to somewhere, every night for the preceding two weeks.

AUGUST 28: W2NSD/1 reports that from this date through the end of the month Gonsets and similar power stations in New York City were easy copy from 73 Mountain, N. H. Range is 180 miles.

AUGUST 29: Another W2NSD/1 report; opening up and down the coast and high point was working K1IED/4, Virginia, 480 miles distant. IED was 25 db over S9.

General notes and news: WA4IHH, Stuart, Fla., reports statewide two-meter activity increasing in Florida, with some stations going to RTTY. W2NSD/1 reports his normal working frequency is 145.37 Mc. Who said nobody ever operates in the middle 2 megacycles? K1YJB's normal frequency is 144.45. VE2LI, George, is looking for skeds on 144 and 432; write him at 4665 Connaught Avenue, Montreal. Usually the Oklahoma City gang can be found on either 145.1 or 144.18. Where does everybody else hang out? Let us know and we'll print it if we have room enough.

220 Mc activity is still going on, but this band brought fewer reports than any other this month. K8ZES reports that WA8DON, Bob, in Marion, Ohio, has been on the band for some time and is working into Pennsylvania with great success. Sid adds that he is building converters for the band, and has a 16-element collinear antenna up 90 feet.

W6IEY reports that he has just completed the conversion of a transmitter, the AN/TRC-8, for 220. He passed along details which will be appearing in these pages shortly; the conversion is simple but we don't have room this month.

W2NSD/1 says he expects to be on 220 by the middle of September, from his "73 Mountain" location at Jaffrey, N. H., 8 miles west of Peterborough.

432 Mc seems to be on the pickup around the country as winter draws nigh. Almost as many reports came in for 432 as for 144, which is a definitely happy state of events. W6IEY reports a 432 "R&D" net active in the La Mesa area every Saturday and Sunday morning as well as Wednesday evenings. Los Angeles is worked regularly.

W4HHK reports getting state number 9 on 432 by working W4HJQ, at Glendale, Ky., on the morning of August 31. Range was approximately 350 miles. W4HJQ also has 9 states on 432. Paul passes along info on other 432 regulars in the south: W5RCI is running a 300-watt final; W4HJQ is breaking in his KW final; W4RFR is testing a gallon; and W4TLV is about ready to fire up his. W4HHK is using a paramp.

From W9OKB, Ken, we learn that W8PT has reached the 7-state mark by working (guess who?) W4HJQ. That KW seems to help. K9IUF also worked HJQ, as did K9AAJ in Illinois. W8PT is finishing up a 400-watt rig to accompany his quad yagis, and listening for a beacon signal from W3RUE. WA9HUV, near Chicago, is using an all-Nuvistor transmitter running 4 watts to the final (a 7768); it's worked across Lake Michigan to W8PT. And W9BTI, in Wisconsin, is trying a new converter mounted at the antenna, 90 feet up.

K8ZES says he is getting ready for 432 as well as 220, working on the converter. No antenna up yet.

VE2LI reports 50 to 90 percent success on his skeds with K2CBA on the Montreal-to-Albany path, approximately 200 miles. The night of August 28 George hooked W1QWJ in Springfield, Mass., a 250-mile path, for what they believe is the first VE2/W1 432-Mc QSO. George is running 100 watts from a 4X150A in cavity, to a 32-element beam at the 65-foot mark. Receiver uses a 416B with 5-db noise figure. The K2CBA sked is at 0400 GMT Wednesdays and Thursdays on 432.000.

CQ's Contest

by Wayne Green, W2NSD/1
Somewhere in New England

The mountains of New Hampshire were only sparsely populated by ham stations this time. During the ARRL June VHF QSO party every possible knoll had at least one ham station, and popular spots like Mt. Greylock in northwestern Massachusetts were teeming with mobiles and small groups of frustrated hams.

The bands were awfully busy in June too. The CQ contest started at 1 p.m. on a Saturday afternoon and six meters sounded pretty much like a normal Saturday afternoon, with the exception of a half dozen or so contesters. Even when the band opened for some 30 minutes around 1430 there wasn't much flurry. I worked a few stations out in Iowa and Nebraska and then things folded up.

In looking over my log, I can only find about a dozen fellows who showed any indication of being actively in the contest.

Two meters was about the same as six. My 96-element beam was more effective and about three hours of operating brought me up to 88 contacts, which seemed like a good place to stop. The two meter band was in poor shape, according to all of the fellows I asked; apparently mine was one of the few signals getting through. I only counted about eleven fellows in the East who were contesting. I did manage to contact 53 counties, which should at least put me tops in New Hampshire.

It is interesting to note the improvement in DX with my 96-element beam as compared to the 5-element I had previously. I had a range of about 100 miles before; now it is a good solid 200 miles, even when working Communicators. I'm anxious to see what it will be like with the 288 elements up there!

THE FUTURE

I'd like to have our VHF station on every band on every mode, but the problem is simple: I haven't got the time to do much about it, what with 73 and 6-Up going full blast. I haven't been able to find a ham who knows enough technically for our staff to put to work on the problem either.

The plans are for 288 elements on top of a 120-foot tower for two; 32 elements on a 60-footer for 220; 192 elements on a 100-foot tower for 432; and 16 elements on a 100-footer for six. On 1296 we'll put up whatever we can scrounge. The rigs are to be a KW each on 50 through 432. On the low bands we have a couple of complete stations set up, with a 3-element beam on 20, a tribander, etc., etc. We are planning a complete FM setup on 6 and 2 with 432-Mc FM link to the 73 shack; we have a complete TV setup, and RTTY gear all over. All we lack is somebody to hook it up and keep it running. Anyone interested?

Perseids Report

The consensus regarding this year's Perseids appears to be that they were better than ever; however, the actual number of contacts reported was down somewhat from last year.

The shower apparently peaked up on August 12 (GMT) but there was also plenty of action on the 11th and the 13th. Nothing of consequence happened before the 10th or after the 14th. Here's the breakdown by days, with all times given in GMT.

AUGUST 10: From W4WNH--on 0100 sked with W1JSM, heard calls at 0119:45; on 0530 sked with W1AJR, heard calls at 0147:52; on 0630 sked with W7LEE heard possible pings only; eavesdropping on 0830 to 0930 skeds of K7HKD with W5UKQ and W5RCI copy was good, and RCI was heard through backscatter from bursts; on 1130 sked with W7LEE only pings again; on 1400 sked with W1AZK calls were heard twice at 1411:34 and four times at 1413:48 and 1425:30.

AUGUST 11: From W4WNH--on 0530 sked with W1AJR heard calls at 0534:52; on 1030 sked with K1QGY heard two S2 very weak; on 1130 sked with W7LEE only possible pings again; on 1400 sked with W1AZK heard calls twice at 1401:50 and 1403:40.

AUGUST 12: From K6GTG--on 1300 sked with K7HKD heard S3 at 1322:40 and again at 1325:40. From W4WNH--on 0300 sked with W1JSM received calls and report at 0357:15 but no QSO; on 0530 sked, W1AJR, heard calls at 0549:31, saw big sig from K7HKD on scope, also saw WØENC around same time; on 1400 sked with W1AZK, made QSO at 1429:31.

AUGUST 13: From W1JSM--near miss on 1000-1100 sked with W9AAG with good sigs but no QSO made; at 0442:20, made QSO with W5JWL on 30-second burst. From K6GTG--copied by WØEYE at 1147:00 on 20-second burst but no QSO. From W4WNH--near miss with W1AJR, all except final R! Heard K8AXU-K7HKD apparent QSO at 0926, with backscatter pings. At 1059:30 got calls and report from K1QGY but no QSO.

AUGUST 14: W4WNH made QSO with W1JSM at 0322:17; on 0530 sked with W1AJR, Shelby heard calls at 0546:50, 0547:30, and 0555:44. On K6GTG-K7KHD sked, GTG heard S3 sigs at 1334:31 and S2 at 1355:41. No QSO however.

Shelby summed it all up fairly well when he described it as "one of the best showers I have yet seen." All concerned are eager for more.

Coming Events

OCTOBER 12: Syracuse Shindig. One of two biggest of year. Be there!

Restricted Reading

As most of you know, 6-Up took up the unexpired subscription list of VHF Horizons effective with the previous issue.

In the couple of days before deadline, we have begun receiving letters from unhappy VHFH subscribers; one describes our magazine as being "useless while another uses the term "not worth its paper."

Unlike most magazines, 6-Up is not a profit-seeking venture. It was originally established to provide a meeting place for serious VHF workers to exchange opinions, to provide up-to-the-minute operating news, and to provide a medium for getting late technical developments from the engineering-level journals down to those serious hams who don't normally have access to this data.

The first issue of 6-Up was comfortably in the black; subscriptions came in considerably more rapidly than any of us had expected. And something else happened too--we were approached about handling the unexpired subscriptions of VHFH.

At first, we didn't particularly care to do this; the resulting increase in circulation, we knew, would run our costs far into the red, and we would receive no renumeration for doing this. However, with our non-profit motive before us, we finally agreed to fill these subscriptions so that the former VHFH readers would at least get a magazine devoted to their field of interest, even though it wasn't the one they had subscribed to. The only apparent alternative for them was no magazine at all.

That's where it stands now. We are firmly in the red, and probably will continue in this state until some of the VHFH readers renew their subscriptions. The reason for the red ink is simple--printing 6,000 copies of this magazine costs 6 times as much as printing 1,000.

If you were a VHFH subscriber, and feel that 6-Up is useless to you, we'll remove you from the mailing list at your request. This will help reduce our printing costs, and leave you in the same position you would have been in had we not taken up the list.

But we really hope you'll stick around a few months and watch us grow. The standards for technical content of 6-Up have been set considerably higher than those I kept at VHFH, and as time goes by we may even be using "fine, glossy paper"--though I can't see why the grade of paper should be thought more important than the grade of information which appears on it. I think if you just wait a while, you'll stay with us.

What do you think?

--K5JKX

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H) 3-15 mmf, VHF trimmer, screw driver, 19c ea;
I) 10-125 mmf, silver ceramic, CRL 18c; 6/$1.00

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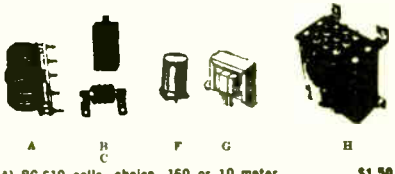

A B C F G H

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G) 1-13 hry, 350 to 50 ma; 93 ohm, (3) $2.50
H) 98-123v tapped pri; 10v, CT, 10A, 10KV $4.50

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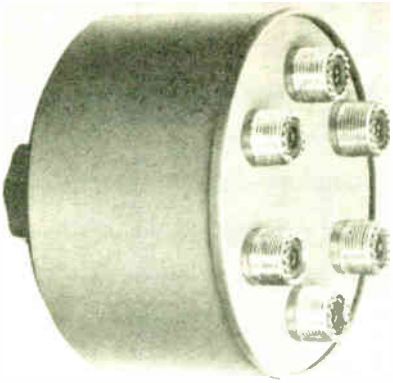
6 up The VHF magazine

now incorporating VHF Horizons!

JIM KYLE K5JKX, editor
2236 N.E. 44th STREET
OKLAHOMA CITY 11
OKLAHOMA

CONTENTS

6-Up, The VHF magazine is published monthly by 73 Inc., Peterborough, New Hampshire. To chew out the editor, however, use the Oklahoma City address. Editorial telephone is 405-GArfield 4-3576 if complaints are urgent. Contributions of interest to VHF experimenters and DX chasers are solicited, as are photographs, snapshots, circuit data, and almost anything else. Send subscriptions to W2NSD/1 in New Hampshire. Send everything else to K5JKX, Oklahoma City. If you like us tell all your buddies. If you don't, don't tell anybody!



COAXIAL SWITCHES

SPECIFICATIONS:

ANTENNA SYSTEM TRANSFER SWITCH—Model 341

APPLICATION: Switching of an RF device to either of two antennas; two RF devices to one antenna; etc.
SWITCH TYPE: SPDT
CONNECTORS: 3 UHF (SO-239)
INTERNAL CONSTRUCTION: Ceramic with Silver Plated conductors
POWER CARRYING CAPACITY: 1000 watts
INSERTION LOSS: Negligible
VSWR: Less than 1.2 up to 150 mc.
MOUNTING: Designed for mounting behind a panel with three 10-32 screws
HARDWARE SUPPLIED: Mounting screws, escutcheon plate with provision for erasable markings, and knob.
AMATEUR NET: $11.45

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APPLICATION: Switching of RF sources, antennas, etc.
SWITCH TYPE: Single Pole-Six position
CONNECTORS: 7 UHF (SO-239)
INTERNAL CONSTRUCTION: Ceramic with Silver Plated conductors
POWER CARRYING CAPACITY: 1000 watts
INSERTION LOSS: Negligible
VSWR: Less than 1.2 up to 150 mc.
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INTERNAL CONSTRUCTION: Ceramic with Silver Plated conductors
POWER CARRYING CAPACITY: 1000 watts
INSERTION LOSS: Negligible
VSWR: Less than 1.2 up to 150 mc.
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HARDWARE SUPPLIED: Mounting screws, escutcheon plate with provision for erasable markings, and knob.
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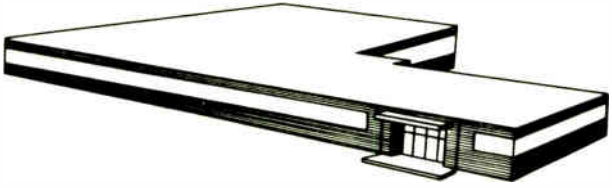


A Flat "Dish"

Ask any VHF man what type of antenna gives the greatest possible gain for such circuits as the earth-moon-earth hop, and the chances are he'll answer, "A dish."

While this answer is not necessarily correct, in theory at least (a perfectly functioning broadside array of equivalent physical size can give greater gain--but practical arrays of this type usually don't), the fact remains that the "dish" or parabolic reflector is by far the most popular variety of maximum-gain antenna in use today on bands which allow its capabilities to be fully employed. In practice, this means 432 Mc and above.

Unfortunately, good parabolas are expensive. Recent ideas of a moonbounce experiment which would have required fantastic antenna gain (in excess of 60 db) brought this home with some force. A really big dish costs really big money. And homebrewing one is more than just difficult.

All of which, together, makes it news that another type of reflecting antenna is in existence which can equal or exceed the parabolic dishes in performance, square inch for square inch! What's more, it's been around (albeit ignored) for at least 14 years.

The antenna referred to is the large-aperture corner reflector. It has been almost totally ignored in this country though the British have done quite a bit with it. Kraus, in his famous volume on antennas, devotes only a quarter of a page to it, then restricts the discussion to the small reflector.

On the other hand, Dr. E. B. Moullin, of Cambridge University (and the British equivalent of Dr. Kraus) devotes fully half of his more-than-500-page volume titled "Radio Aerials" (published in 1949) to "the Vee reflector"--and a major part of his discussion deals with the large-aperture variety.

If your acquaintance with the corner reflector stems mainly from reading the various antenna handbooks and other ham-directed literature, you've probably learned that this type of antenna has a normal gain of 10 db, and a possible gain of 13 db.

These figures are true enough of the 90-degree-angle small corner reflector--but that's as far as they go! With bigger reflectors, you can get 20 db fairly easily--and it isn't so terribly difficult to get even more.

The large-aperture corner is characterized by two major differences from the more familiar type. First and most obvious is that it's much larger. A 10-foot mouth height is not unusual for one at 432 Mc. The second is that the distance from the apex to the antenna element itself is usually much larger.

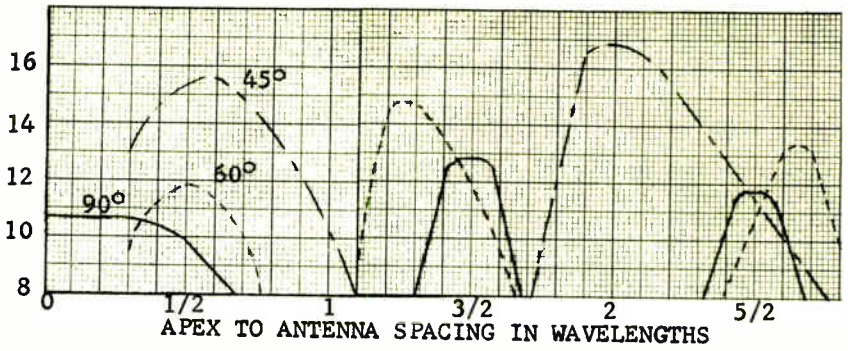


FIGURE 1. Gain Versus Spacing

Figure 1 shows how the gain of three different corner reflectors varies as the antenna is moved out from the apex of the corner. This assumes that the reflecting sheets are infinite in area, and naturally in practice this cannot be so --but you can still see the noticeable increase in gain at the 3/2 wavelength spacing region, compared to gain at the more conventional 1/2 wavelength spacing.

To realize these gains in practice requires that the reflectors be considerably more than a half-wavelength wide; the higher gain figures require that the screens extend for 6 full wavelengths from apex to screen edge.

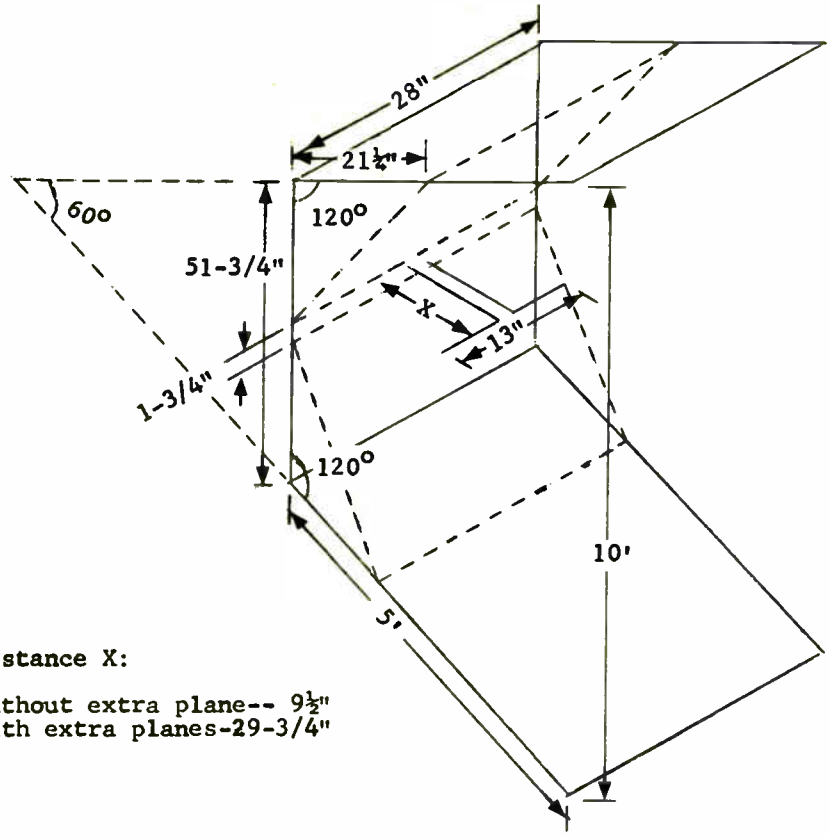
But in the course of his extended experiments, Dr. Moullin found that the configuration of the normal reflector could be changed--"amputated" would be a more apt word--without a noticeable change of characteristics. He dubbed the result the "trough" reflector, and a dimensional sketch of a trough for 432 Mc appears in Figure 2.

As shown, the antenna produces some 17 db gain. But we're not through yet. Later experiments showed that addition of two smaller internal reflectors (appearing in dotted lines in Figure 2) would make the pattern essentially the same as that of a cylindrical parabola. No more gain appeared but side lobes were eliminated.

Up to here we've been assuming that the trough or corner was being fed by a half-wave dipole; this is <u>not</u> the only available choice. For instance, the dipole can be replaced by a four-element colinear (Figure 3) which would have just over 4 db gain of itself. It would also have a narrower E-plane beamwidth. The 4 db gain of the colinear would add to the 17 db of the reflector to give us 21 db.

By duplicating the structure and stacking them so that the reflector tips just touch (a W shape) we could gain another 3 db; a double stack, two high and two wide, would bring us up to 27 db, with a structure 20 feet square.

In comparison, a 20-foot-diameter parabolic reflector at the same frequency would provide 26 db--one db <u>less</u> gain.



Distance X:

Without extra plane-- 9½"
With extra planes-29-3/4"

FIGURE 2. Trough for 432 Mc

The large-aperture corner or Moullin Trough is not an all-purpose cure-all, however. The big dish works nicely at all frequencies from audio on up; the big reflector isn't quite so wide-band. It far exceeds a Yagi in bandwidth, but ± 10 percent of design frequency is about as far as it is safe to go. Beyond this limit, the feed antennas must be changed.

Biggest advantage of the corner or trough, of course, is its elimination of the compound parabolic curve. The screen does not need to be solid; it can be of wire mesh, chicken wire, or even of parallel rods so long as the spacing stays less than about 1/20 wavelength. One-inch spacing is fine at 432 Mc and 1/2-inch works at 1296.

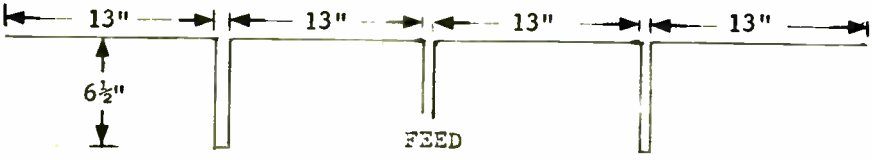
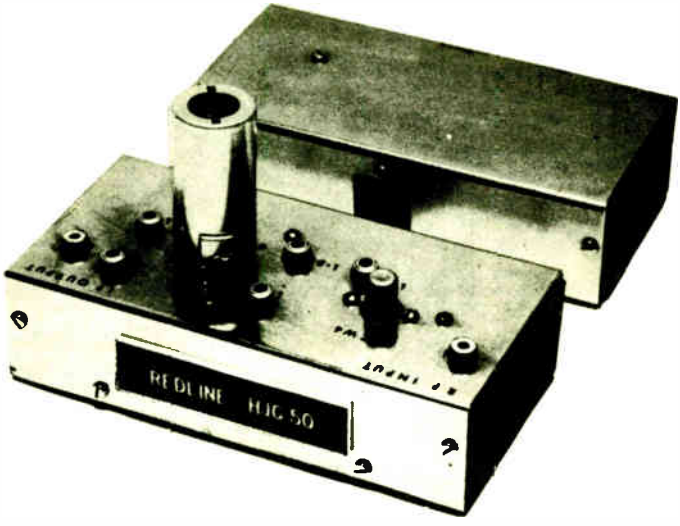


FIGURE 3. Four-Element Colinear

NEW!



An Economy Converter

6M . . . . . ONLY $31.95

Dear OM:

There are quite a few VHF converters on the market today. Some of them are pretty good, some are unbelievably terrible. After looking over the available converters we decided that we could do better. We have. Only a ham could afford to put the months of lab time into the development of something like this, trying every known circuit and testing each under the worst possible ham band conditions.

We reached several interesting conclusions as a result of all this research. 1) The noise figures claimed for several brands of converters seem to have been determined in advertising departments instead of labs. 2) If it doesn't work too well, gold plate it. 3) It is standard practice to use the cheapest parts available even if it does reduce the life expectancy of the converter or cut down on its performance. 4) Some converters were obviously thrown together from old magazine articles and there wasn't even a sign that an engineer had been near them. 5) There should be a market for a well engineered converter.

Naturally, for our own use, we pulled out all the stops and built the last word in state-of-the-art VHF engineering. When we figured out what it cost to build this converter we could see that this wasn't going to be very popular. Not many hams are going to spend $98.50 for a converter, no matter how unbelievably it performs. After all, how many hams are so avid about working DX that they want to pull extremely weak signals out of the noise? Just a handful of meteor-scatter addicts, aurora hounds and the like would ever need the gain and the rejection of adjacent signals that our DGC models afford.

Matching Power Supply HJS $9.95

Delivery Date, Sept. 1

You can't put units like our DGC Converters on the market and sell enough to stay around. Which thought sent us back to the workbench and eventually brought about the economy converter, the model HJC-50. This one is designed to compete with any other converter on the market price-wise and we are sure enough of its operation to give a money-back guarantee that it will outperform any other commercially made converter, regardless of price, except our DGC units. The HJC-50 uses a nuvistor front end for low noise figure. It is crystal controlled for stability. The HJC-50 is designed to he used with 14-18 mc receiver tuning. Thus you can tune the 50.0-50.4 mc band even if you only have a ham-band only receiver which tunes from 14.0-14.4 mc, and this covers virtually all of the presently used six meter band.

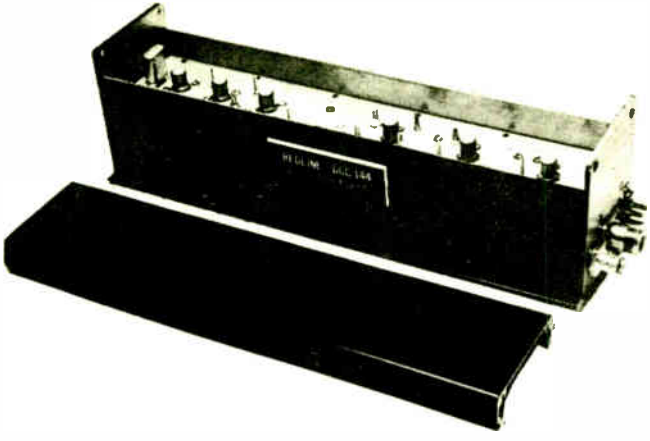
These converters are available by direct mail order only. This is necessary if we are to maintain our low price. The model HJC-50 converters are now in stock for imediate delivery and all orders will be filled the day received. The DGC converters are custom built to your specifications. Please, if you must have one of these, specify the band it is to cover (50-144-220-432 mc) and the i-f output frequency. We will build your unit and individually test it, furnishing you the test result certificate and customizing it with your call engraved.

The DGC converters are built into a solid aluminum extruded case which can be used on the operating table or else mounted on a rack panel. It is attractively finished in bright red and black. It is entirely nuvistorized, using the new 6DV4 (hang the expense) for the front end.

The HJC converters are available in the 50 mc model at present, with higher frequency models in the works. Watch for our ads. We have a lot more gadgets just about ready for production too.

Val Barnes K1APA & Sam Harris W1FZJ

CUSTOM MADE



Money Is No Object

Converter

DGC-50 . . . . . **98.50**	**These units are individually made**
DGC-144 . . . . . **98.50**	**to your specifications. Please state**
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REDLINE

Jaffrey, New Hampshire

Updating a 758

by LEROY MAY, W5AJG
9428 Hobart St.
Dallas 18, Texas

Approximately a quarter of a century ago, the General Radio Company announced their famous Type 758-A Wavemeter. This instrument was subsequently seen in about every radio lab doing any amount of VHF/UHF experimentation in the prewar and even well into the postwar era.

Many, many hams purchased the 758-A over the years and it was one of the few pieces of test gear available for this type work.

Although long since dropped from the G.R. catalog, these old-timers are still very useful things to have around. During World war II, apparently great quantities of them were made; they have since turned up as surplus items.

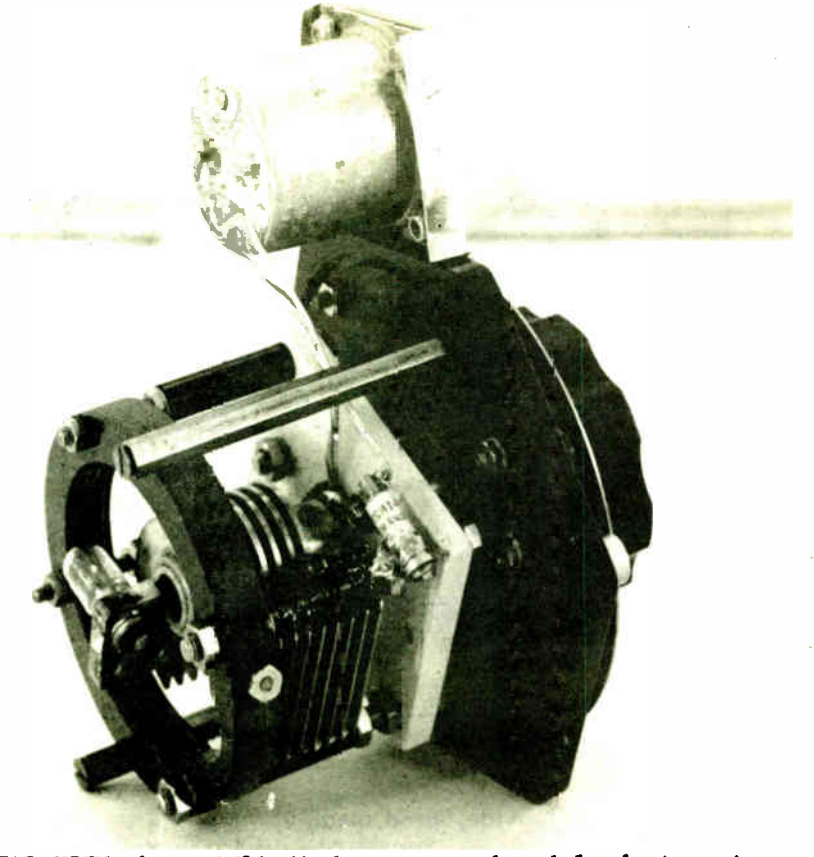
Not too long ago, Fred Eberle (W5QOA) called the writer and advised that the local junk-yard was sporting quite a few of these wavemeters buried in the tons of aircraft stuff that had just recently been dumped on the ground from the goodie wagon.

A quick trip and a little scrounging came up with a perfectly new condition 758-A at the usual junk price of two bits per pound. However, since the weight turned out to be 1 pound and 12 ounces, the owner drove a hard bargain and demanded 40 cents. Well, easy come easy go. Forty cents --whew!

So we finally owned one of these gadgets that we so desperately wished for back in the late thirties and early forties. (Price then, $23.) After a quick trial on 50, 144, 220, and 432 Mc to see if it still really worked--which it did--brother ham W5QOA was hot to hook a meter and rectifier on same. This we did, and the photo shows the results.

This arrangement works very fine and of course increases the readable sensitivity of the 758-A when coupled to very low power sources. Any small sensitive meter of about 1½" diameter and 100 to 500 uA will be suitable. The more sensitive the meter the better, of course. A simple bracket of thin aluminum is fashioned to accept the meter, and in conjunction with a diode of some type such as a 1N82, 1N21, etc., makes the 758-A into a 758-A-(25), meaning 25 years later!

The original description given in the G.R. catalog read as follows: "The Type 758-A Wavemeter is a tuned-circuit, absorption-type of instrument, in which the capacitance and inductance are varied simultaneously. This permits a wide range of frequency to be covered with a single coil. The coil is connected permanently into the circuit. The resonance indicator is an incandescent lamp."



REAR VIEW shows 1N21 diode connected and leads to meter.

The dial is direct reading in frequency and the range as marked is 55 to 400 Mc. Overlap is available at both ends of the dial travel and actually the unit will function at 50 Mc on the low end and 432 Mc on the upper end. Normally the lamp will glow on an oscillator of about 2 watts output, but the meter will deflect on a very small amount of coupled energy. The lamp may be removed if desired, since the meter has been added to the instrument.

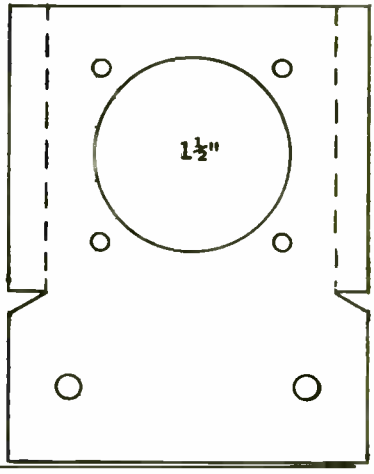
If you have one of these venerable devices, latch on to a surplus meter and diode and try out the scheme. One side of the diode is soldered on the stator of the capacitor and the other side goes to one terminal of the meter. The other side of the meter goes to the rotor of the capacitor. The G.R. Catalog referred to a capacitor as a "condenser" back in those days, but it is probably unwise to use such a term today. The younger set may get the idea we are describing a steam boiler, or air-conditioner, or something.

(NOTE: The G.R. Model 758A Wavemeter may be purchased on the surplus market from Capitol Commodities Company, Inc., 4757 N. Ravenswood Ave., Chicago 40, Ill. Price $5 each; order No. 9896, from Catalog No. 621.)

FRONT VIEWS show bracket holding microammeter; photo at left is slightly distorted but shows different type of meter.

Make lips 1/4" wide, bend them backward

Overall dimensions of bracket are 3-1/4" high by 2-1/2" wide; cut notches at side for folding lips back. Screw holes are to fit meter bolts; two holes in lower portion are spaced to match those on bakelite housing of 758A wavemeter. Material for bracket should be thin aluminum sheet or scrap.



VHF HORIZONS AND 6-UP MERGE!

In order to provide the best possible VHF coverage of amateur radio, while minimizing publication costs, VHF Horizons and 6-UP are merging. Effective with the August issue subscribers to both magazines will receive the new combined magazine or, if they had subscriptions to both, their subscriptions will be extended.

WHAT'S NEW?

The OC Vertical J

Years ago, one of the most popular 2-meter antennas in mobile use was a vertical half-wave dipole, end-fed through a quarter-wave matching stub. It appeared in all the handbook editions, and was widely used. Because of its similarity in appearance to the letter "J", this antenna became known as the "Vertical J".

As horizontal polarization became more popular across the nation on 50 Mc, mobile operators using vertical whips found themselves at a disadvantage. Some turned to the halo, and were happy. But in Oklahoma City, K5LDI took a different tack--he started talking the fixed-station operators into putting up Vertical J's with which to work the mobiles. He scaled the antennas up from the original 2-meter models.

In the past 3 years or so, the missionary efforts of K5LDI have begun to pay off. Almost every station in Oklahoma City now sports a Vertical J in addition to the beam--and they're being used not only for working mobiles, but also for local ragchews and net operations. And the Vertical J is coming back to life, this time on Six.

So what does all this have to do with new products? Here is the answer: the Oklahoma Central VHF Club has just begun manufacture of this popular antenna, with nationwide marketing planned, as a club project.

The OC Vertical J is the product of combined engineering abilities of a number of club members; it's built of steel tubing for strength, and all hardware is AN aircraft type for maximum durability.

The Vertical J has the happy ability of matching any type of feedline through proper choice of feed point on the stub end; the OC version comes marked for 52-ohm feed, and if the feedline is connected at the marked point the club guarantees the VSWR won't exceed 1.5 to 1 in the bottom 500 kc of the band.

The antenna can be mounted almost anywhere; W5PPE has his mounted right on top of his TV antenna, while other club members have been known to stuff the mounting pipe down a roof vent. Height is not particularly critical, which is another reason the antenna has become so popular.

The OC Vertical J is being sold through Trice Wholesale Electronics' ham outlet at 2408 South Western, Oklahoma City, for $12.95 plus shipping. It's too big for parcel post and club members recommend shipment by motor freight. If you're looking for an all-round general purpose 6-meter antenna, drop a line to Bob Singletary at Trice and let him know!

Feedback, etcetera

Gremlins! Seems as how the little varmints will sneak in almost anywhere--don't even have to turn your back for them to show up.

But at that, we got off light last month. So far only two major boners have shown up, both in the same article.

The one which suffered was W5PPE's "Designing the SSB T-Pad" and it all happened within a couple of inches on page 10. First the radical sign disappeared from the formula for determining input voltage; it should have read $E = \sqrt{50P}$, as you probably guessed.

The second one was a bit more serious; the two formulae for calculating resistance values are wrong! On page 10, anyhow. They're right on page 11. But on page 10, insert a 50 into each formula to make them read the same as on page 11.

In addition to these items, a footnote was left off the staff report on wide-band baluns; the footnote references appear on pages 3 and 4, but no list showed up at the end of the article. This is what should have been there:

1. Ashby, Bill, K2TKN, 1296 Mc Antennas, VHF Horizons, October, 1962, page 14.

2. Klopfenstein, R. W., A Transmission Line Taper of Improved Design, Proceedings of IRE, January, 1956, page 32.

OPEN BANDS

50 mc was hot indeed during the month of July and early August. Almost every day saw at least one E-cloud somewhere in the country, and several saw multiple hop propagation. Our special thanks to those of you who sent in full copies of your logs--such detailed data as that provided by K4EBT and WA4IRX, for instance, is extra-helpful. Here's the breakdown, by days: (all times in GMT)

JULY 1--Open from Tampa, Fla., to Ohio, Illinois, and Michigan from 2325 to 0150. Open from Memphis, Tenn., to Ohio, New York, Pennsylvania, N. J., and D. C. from 2357-0140, then shifted to west. Minnesota worked 0151 (July 2, GMT), Nebraska at 0300, Washington state at 0324 and K7ONU, Oregon, at 0327. Washington and Oregon probably double-hop.

JULY 2--Only brief openings reported, both by WA4IRX in Memphis. K1TOL, Maine, worked at 2311, and WA4IXI, Miami, at 0053.

JULY 3--Another good day from Memphis but no reports from the rest of the country. A1 reports Maine, Conn., N. J., Pa. and N. Y. C. between 0010 and 0108 (July 4, GMT).

JULY 4--Holiday but not for the skip. K4EBT in Tampa reports Ohio, Michigan, and Missouri between 1440 and 1830; A1 in Memphis reports openings from 1415 until 0433 (July 5, GMT), starting with extended groundwave to K4YUE and W4YMZ (250 miles; A1 runs 75 watts CW), then opening to N. C., Va., Pa., R. I., Mass., N. Y., and back to Va. at 1900. At 0015 WA4IRX picked up W8KNC/Ø in S. Dak. and shortly afterward WAØFJS/Ø in Nebraska; heard VE4GI in Winnepeg at 0118. Worked Oregon again at 0207; an hour later opening was to east, with stations in R. I., Mass., and Conn. worked.

JULY 5--Bangs off with a TV-DX report from W9SLM in Sheldon, Ill., who found KMID-TV (Midland, Texas, Channel 2) wiping near-local WBBM (Chicago) off his screen at 2400. Meanwhile Milt, K4EBT, in Tampa had been working Ohio, Mass., Pa. R. I., Delaware, and N. Y. C. all morning from 1225-1348, and Illinois, Texas, Arkansas, Oklahoma, Missouri, and La. from 1423-1645. From Memphis and WA4IRX, it was a bit lighter: New Mexico in the person of WA5FPS, Albuquerque, at 2343 followed by Arizona at 0009 and Colorado at 0020 and again at 0048. A1 reports hearing W4WR, Birmingham, Ala., 250 miles away, on groundwave at 0514.

JULY 6--Not too much from Memphis; CO2CL and XE1PFE were heard at 2333 and 0010 respectively but not worked. Opening from Amarillo at 0041, and to Gainesville, Fla., at 0403, wrapped it up for A1. In Tampa, though, Milt found better pickings, getting Houston at 2154, Alabama at 0040, Ky. at 0045, Illinois at 0051, and Virginia at 0130.

JULY 7--Another active day from Florida; pipeline to Ohio again starting with opening to N. Y. state at 1440 which went west. By 1559 was in Michigan. Not much during afternoon, but open to Virginia from 2200 to 2235. It started earlier in Memphis; at 1328 A1 was being called by VE3DMF but no contact resulted. Michigan, Wisconsin, and Nebraska were worked by 1545, and the cloud slipped west. Between 1645 and 1745 two Colorado stations were worked. Between 2254 and 2313 XE1's were neard but not contacted.

JULY 8--Apparently almost dead; XE1CZ heard in Memphis from 0058-0138 but no contacts and no other reports.

JULY 9--Dead.

JULY 10--Open for east only. Tampa to Illinois and Mo. between 2230 and 0029, according to K4EBT. WA4IRX worked W5BAK in San Antonio at 0117 and heard another Texan calling Maine.

JULY 11--Dead.

JULY 12--WA4IRX to WA2SBI, New Jersey, 1556. K4EBT to two Pennsylvania stations and one New Jerseyite, 2200-2226. No other reports.

JULY 13--Apparently one of hottest days of season with much of eastern half of country open. K4EBT filled 1½ pages of log; WA4IRX lists 17 stations worked. Best part for both was between 1406 and 0352 (July 14, GMT). At 0335, WA4LGN, Richmond, Va., heard W9MSO, Illinois, in QSO with K3VHW/Ø, Colo.

JULY 14--Very weak opening from WA4IRX, Memphis, to R. I. and K1VPK and K1TPK, 1442-1448. QRM from VE4MA; weak VE3's came in 1536. No other reports.

JULY 15--Dead.

JULY 16--Triple-hop reported by WA4IRX, through Omaha, to Billings, Mont., to Seattle. Time, 0142-0202 (July 17, GMT) and two Seattle stations worked. WNØDZI, listening on 6 in Prairie Village, Kansas, heard California-WØ QSO's, Washington, Oregon, and Florida between 0130 and 0200.

JULY 17--Another red-hot day in Memphis; double hop through Denver to Seattle area 0120-0227 (July 18, GMT) after hearing K7GBZ, Boise, Idaho, at 0110, followed by short-skip or long groundwave over 250-mile path to Birmingham, Ala., at 0530.

JULY 18--Back to normal; Tennessee-New Jersey path open at 2332; W1's heard in Memphis 0014-0040 but no contacts.

JULY 19--Only one report; WA4IRX-K5UNK, Albuquerque, 0025.

JULY 20--Open up east coast 1800-1858 from K4EBT; open to W2 from Memphis 2005-0149. Open to Kansas and Missouri from Florida, 0100-0125 (July 21, GMT). No other reports.

JULY 21--K4EBT reports working S. C., Okla., Tenn., and Ohio between 2225 and 2259. WA4IRX was hearing W6's, K7CYM in Montana, and K5RYD (location unidentified) a little later from 0258-0421.

JULY 22--From WA4IRX, early opening to Va., Pa., and N. J. from 1048-1139. K4EBT reports brief fling into Michigan, 2 stations worked, 2400-0018.

JULY 23--K4EBT started the day contacting W2NSD/1 somewhere in New England at 0010 (July 24, GMT), following with three more New England/New York contacts in the next hour and a half. No other reports received.

JULY 24--Dead.

JULY 25--Open two ways from Tennessee; WA4IRX worked Mo. and Md. at 2328 and 0036 respectively, heard Utah at 0051 and 0126. K4EBT in Tampa worked four Missourans between 0010 and 0134.

JULY 26--K4EBT reports Indiana at 2220, followed by Pa., Ohio, West Virginia, and finally closing with Ohio again at 0003. WA4IRX reports Michigan at 2335, later Maryland and closing for him with K1FOW, Mass., at 0043.

JULY 27--KØGFV heard KP4's at 1300 but no contact. K4EBT had 10-minute QSO with W9FWG, Indiana, 1925-1935, then band went out for him. WA4IRX had it better; five contacts in N. Y., N. J., Va., area from 1520-1635.

JULY 28--Began around 1703 with Tampa-to-Texas hookup, continued almost unbroken for K4EBT through 2157 when he signed with VP7CX. In between, Iowa, Illinois, Indiana, Wisconsin, and Michigan were worked with his 15 watts. In Memphis, WA4IRX hooked N. Y. and Mass. between 2227 and 2320; then the cloud swung west and next contact was with KØFQH in S. Dakota at 2336. Calif. heard at 2347 but no contact. A few minutes later, at 2353, Al worked his first Kentucky on short-skip, then racked up some more Ohio, Pa., and Va. contacts by 0054. Heard VE6OH at 0125 and K7MKW, Sand Point, Idaho, 0437.

JULY 29--At 0100 (July 30, GMT) KØGFV worked W2LBO. Only work reported from Memphis was long groundwave between 2230 and 0400.

JULY 30--Last item in WA4IRX log, K4YPY worked 200 miles away on groundwave, 1303. KØGFV reports two contacts at 0204 and 0206, with K9ZFK and WØYWP respectively.

JULY 31--Open from KØGFV's Downing, Mo., QTH to W3 and W8 from 1828-1853. Open from K4EBT, Tampa, to New Jersey, Pa., and Maryland from 2225 to 2325.

AUGUST 1--No reports.

AUGUST 2--KØGFV worked VE3BGA, 0007 (August 3, GMT).

To sum up, even the limited (though detailed) reports we received show that this July was as good as any in the past several years. Noteworthy is the exceptional number of contacts achieved with relatively low power; K4EBT runs 15 watts to a 2E26 and WA4IRX runs only 75 watts. Cross-correlation of the timing of various openings shows that nearly every state in the nation must have had at least one opportunity to

Continued on page 20

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Rugged, lightweight, and real performers. Booms 1" diameter aluminum tubing, elements 3/16" dia. aluminum rod pre-assembled on booms. Transformer dipole for 300 ohm match. May be ordered for 200 ohm. Available on 2 meter beams only gamma match for direct 52 or 72 ohm feed.

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1¼ Meter, 11 element, Boom 8.5', Model No. A220-11	9.95
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DUAL STACKS

Utilize two of our standard VHF beams 3 db gain over single beam. Complete with two antennas, stacking bars, and all hardware. Feed line same as single beams.

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6 db gain over single beams. Complete package with four antennas, stacking frames, phasing bars, Q sections, and all hardware. Standard Quad 200 ohm (52 ohm thru balun), may be ordered for 300-72 ohm.

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Mechanically balanced, lightwei tenna systems, with extremely hi major front lobe, low SWR, ar coverage: Large capture area an radiation provide excellent receiv mitting characteristics.

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2 Meter, 16 element Colinear, Model No. CL-116

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Universal matching stub provides ohm match to 300 ohm 16 elen Model No. CL-MS Freq.

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Order two 16 element antennas, a ment stacking kit, complete with and matching stub. Antennas not

2 Meter, 32 element stacking kit, Model No. CK-132

1¼ Meter, 32 element stacking ki Model No. CK-232

¾ Meter, 32 element stacking kit, Model No. CK-432

64 ELEMENT ARRAYS 2(

Order four 16 element antennas a ment stacking kit, complete wi hardware, and matching stub. Included.

2 Meter, 64 element stacking kit, Model No. CL-164

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Rugged, Full size, wide spaced Booms are 1¼" and 1½" diamet are ¾" heavy wall aluminum tul match for direct 52 or 72 ohm fe marked for quick assembly.

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6 Meter, Portable 48" x 4" folded. Model No. A50-3P

6 & 2 Meter, 10 element, Boom 12 Model No. A26-9

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Horizontally polarized, omnidirectional gain antenna features low-Q, large capture area, ease of matching and improved band width. Dual stacked gain figures (in all directions) compare favorably with the 7-element Yagi in its favored direction. Includes antennas, stacking harness, and all hardware.

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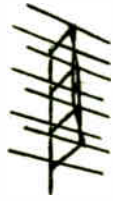

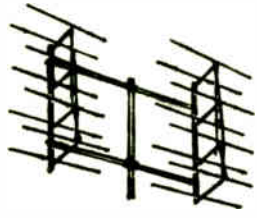

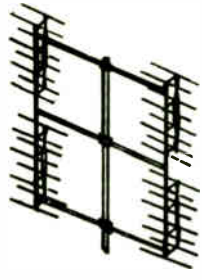

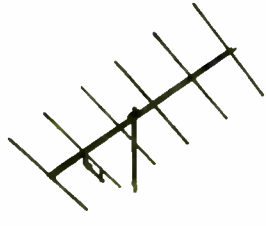

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All aluminum construction: machined hardware: gamma match for direct 52 or 72 ohm feed. 2 meter 144 to 148 Mc. 14" dia. 6 meter 48 to 56 Mc. 25" dia. Dual halo two bands, no switching tuning or traps, complete with mast.

2 Meter less mast, Model No. AM-2.....$ 4.95
2 Meter with mast, Model No. AM-2M..... 8.70
2 Meter Stacked, complete, Model No. AM-22..... 14.95
6 Meter less mast, Model No. AM-6..... 8.75
6 Meter with mast, Model No. AM-6M..... 12.50
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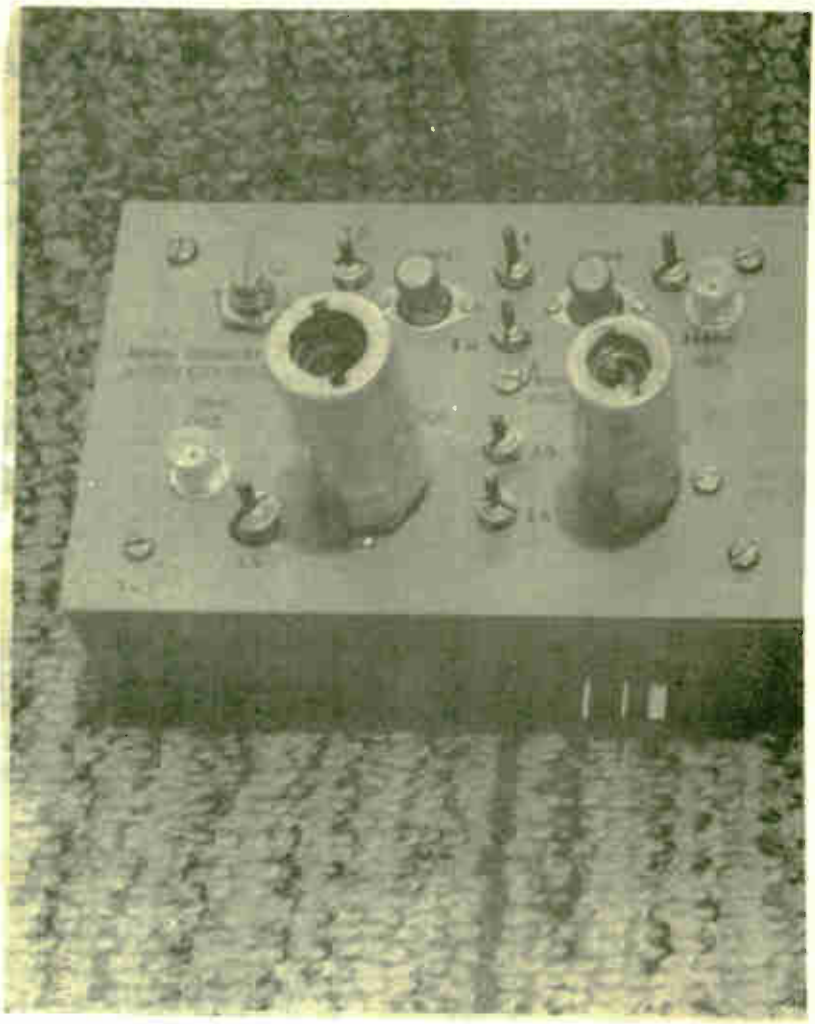

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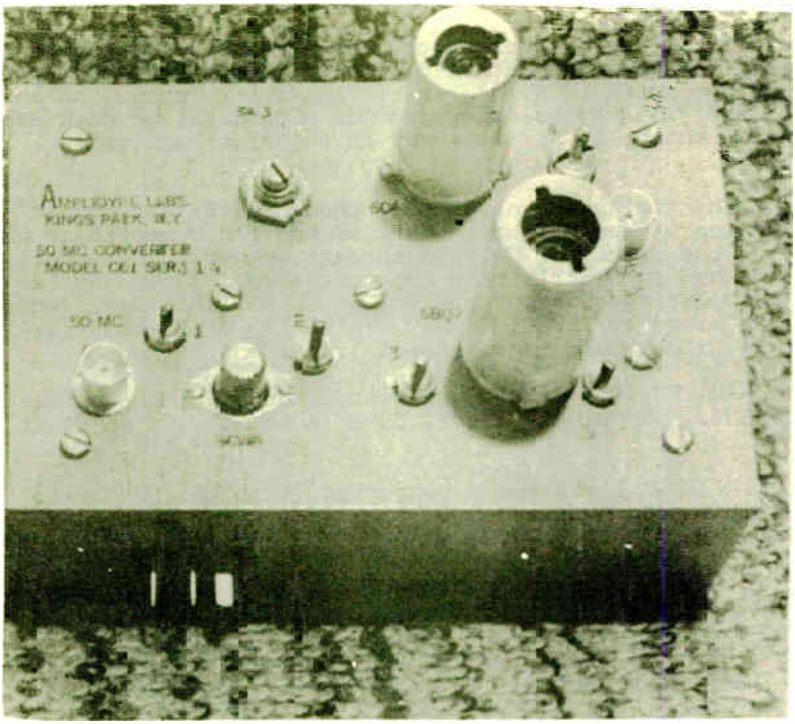

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Input	50-54	144-148
Noise figure	2.5db	3.0db
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BOX 673

Write for technical info

contact almost every other state. More reports for August will mean an even more detailed picture in the September issue; send yours in on September 1. And again, thanks to the ops who sent log copies--they provide much detailed data even if many of the calls are left out in the final analysis.

144 mc had its share of DX too, though no E-skip turned up in the mailbox. Most of the fun centered around the nights of July 26 through August 1, but there was some earlier in the month too. Top DX of the current report crop was probably VE3FPG, Welland, Ont., whose Twoer was heard by K3GGZ, Pennsylvania, 165 miles away airline. But along more conventional lines:

JULY 2--K3OBJ, Wilmington, Delaware, worked W1MEH on fone at 0204 GMT. Six nights later, K3OBU snagged W4FJ on CW at 0307.

JULY 21--K3GGZ lists these conquests (time in GMT, call, airline distance in miles): 0037, WA8FET, 190; 0218, K8PBA, 190; 0312, W8PHJ, 210; 0400, W3AOE, 180; and 0730, K8ZGV, 180.

JULY 26--K3OBU reports getting K2IEJ, WA2YXS, and K2DNR/2, all on CW, between 0300 and 0600.

JULY 27--K3OBU again, snagging K1WHT on fone at 0400. Also K3GGZ, with W8QLC at 1313, W3TWT at 1333, and K8HNW at 1353, at distances of 180, 190, and 240 miles respectively.

JULY 28--K3GGZ reports: 0323, W8PHJ, 210 miles; 1258, for K8OWU, 180; 1321, W3AOE again, 180; and 1400, VE3BSM, 160 mi.

JULY 31--Still K3GGZ: 0142, WA2UFF, 180; 0156, VE3CRY, at 180 miles.

AUGUST 1--K3GGZ: 0525, W2JUV, 185 miles. K3OBU, 0100, to K1YMQ, Conn., on fone.

DXpeditions and contests in the offing on Two: The afternoon and night of September 28, from 1400 to 2400 local time, is the 9th annual Big Blow of the Windblowers VHF Society, up in New Jersey. Four calls will be in use, in as many different states: W2NUL in Pennsylvania, K2KSH in N. Y., W2NLN in Conn., and W2ZDR in N. J. Any amateur working all four stations will receive a handsome certificate.

Word arrived too late to include last month about the July 13-14 hilltopping trek of WA2GUU et al, to Cooper Hill, Vt., but Hank advises that another such journey (this time to Mt. Aggy, Maine) is in the offing. No date is set yet; drop a note to WA2GUU, R. D. #2, Voorheesville, N. Y., to find out more about it.

And K3IFL, temporarily /5 at Fort Sill, Okla., drops a line to remind us of the WUFO-2 award sponsored by his hometown gang. Originated by W8LIM, now better known to 50-Mc stalwarts as VP7JX, the award is given for working five stations on 2 meters, if the stations are located in the counties of Bayfield, Ashland, or Iron, in Wisconsin, and Gogebic county in upper Michigan.

Anyone wanting Illinois can listen around 145.2 almost any midnight (CDT) for K9EID, who is running tests with a gallon of SSB and a 128-element J-Beam. Missouri is available from WØDQY, Smitty, in St. Louis, who has a nightly code wheel on 145.050. W4CSN, Paul, dispenses Kentucky from 145.2 with an SSB gallon. Other states available on 145.2 SSB include Missouri (WØNYF), Iowa (KØABY), Tenn. (K4CLE), and Indiana (W9POS). Our thanks to Joe, K9SGD, for this information; and if anyone is interested, Joe will soon be doing a column for us on VHF SSB.

In the western regions, big doings are planned for August 17 and 18 in Arizona, when the Phoenix VHF Club will put up both 6 and 2 meter stations atop South Mountain for scatter skeds with the Microwave Society of Long Beach and with any other stations who may be interested. The expedition leader is K7LPB; frequencies used are expected to be 50.100 and 144.100, with 1 kw. on Six into a 10-element beam and 150 watts on Two into an 8-over-8 J-Beam. Sked time wasn't set firmly as we went to press but we understand it will be 1200 to 1600 GMT Sunday morning; the Arizona group will call the first 5 minutes of every 15 and listen for the other 10. Thanks to K7JUE, Jerry, for the information.

220 mc. isn't such a dead band as it seemed to be 12 months ago, but activity still doesn't seriously rival that on 144. Only report received for this month came from K2SWI, George, who reported some nice DX from his Kings Park, Long Island, QTH. On June 17 he snagged W1BU, Medfield, Mass, and on the night of July 25 pulled down four more: W3HFY, Havertown, Pa., who was using SSB; W3UJG, Rockville, Md., a distance of 250 miles, also on SSB; K1JIX, Havard, Mass., 160 miles; and W1AJR, Middletown, R.I. This all happened between 0230 and 0355 GMT. George is using a homebrew 6360 rig and 12-element colinear 40 ft. up, and is looking for CW skeds into upper N.Y. state, Ohio, Virginia, Delaware, Vermont, Maine, and N. H. (copying, hey, Wayne?). His 48 elements should be at 70 feet by the time this sees print--and his closing remark was that he has been on 220 only since June 1, and in that time has gotten seven states!

432 has been picking up ever since the power limit was taken off, and we got reports on this band from W9JFP, W9OKB, and W5AJG. Vic, W9JFP, sent the sad news that his 50-foot antenna for 432 was broken in half by the wind, but a 30-foot replacement should be up by the time you read this. Height of the antenna will be a measly 130 feet. Vic reports no DX during the month, though he's been trying every time Two was open from his Cedarburg, Wisconsin, location.

Ken, W9OKB, had better luck to report. He holds regular skeds every Monday; at 0130 GMT with W8PT, 0200 with W9BTI, and 0230 with W9GAB, in Michigan, Wisconsin, and Wisconsin respectively. July 23 all three hit. Also on the skeds is K9IUF, in Indiana. Ken's location is Niles, Illinois.

Longest 432 report was from Leroy, W5AJG, who brings us up to date on Texas activity for the band. W5SWV, Denison, and Leroy hold regular skeds <u>every</u> morning at 1245 GMT (6:45 a.m. CST!). Sigs are always there, usually with fone quality.

According to Leroy, Houston sports four 432 stations: K5SDM/K5TUP on 432.113; W5FSC on 432.068; K5LLL on 432.053; and W5LDV on 432.004. W5SWV is on 432.003.

W5LUU in San Antonio is also on the band, at 432.025, and has been worked several times by Leroy. Also W5DMX, who is near Houston (frequency not given). Out-of-Texas stations Leroy mentioned include K9AAJ, on 432.108, who holds skeds with W5SWV each Wednesday and Thursday at 1245 GMT on 144 for possible change to 432 if conditions warrant, and W4HHK, who looks for north Texas each Saturday at 1345 GMT.

SHF includes a whale of a lot of territory, but not too horribly much activity in the summertime. Only one report on the territory above 450 Mc came in this month, from W9OKB. Ken reports that he and W9MJT are working regularly over a 14-mile path using APX-6's about 1225 Mc; he says the path is line-of-sight all the way. In a future issue he will describe the antennas they are using.

LAST-MINUTE ITEMS:

As you can tell, it takes several nights to get all these reports typed up. During the days, more material keeps coming in. Rather than hold it for a month just to get it in its proper place band-wise, we'll put it all here at the tail of the column, as it comes in:

First of the last-minute items is a reminder that this year the Perseids meteor shower begins August 10 and lasts through the 20th; please airmail Perseids reports immediately and we will have a complete wrap-up of all accomplishments in our next issue.

KØDEL, in Aurora, S. Dak., reports some 6-meter openings on July 17, July 25, July 26, July 28, and August 2. States worked included Arizona, N. Y., and Georgia on the 17th; Tennessee on the 25th; W. Va. on the 26th (Utah heard); N. J. Conn., Montana, Oregon, Ohio, and Arkansas on the 28th (with Texas, Pa., Washington, and N. Y. heard); and Ohio on the 2d. The opening of the 28th was apparently double-hop, as Ed was hearing both sides of the QSO's between east-coast and the 7-area stations!

Kris, WA4GDC, sent a magnificently detailed report which disappeared under a stack of letters until after the 6-meter section was done! He reports working HI8XAG on July 15, on 50 Mc from Sebring, Fla., and again on the 21st. HI8XAG is in Santo Domingo.

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flat dish

CONTINUED FROM PAGE FIVE

Feeding of a single trough is no more difficult than the feed of a parabola; a single feedline is used. The screen is at ground potential, and with a little juggling you can use a 5/4 wavelength shorted stub to both support the driven element and feed the antenna; it might even double as a balun.

All Nuvistor 6 Meter Converter (2-6DS4) Cascode RF Amp (2-6CW4) Osc. and Mixer. Low cross-modulation, no neutralizing. A smooth operating unit of advanced design, low noise with high sensitivity proximity oscillator will accept any 3rd overtone xtal for any I.F. from BC to 20MC. Requires only 10MA at 100V for plus 30 DB gain.

"WA6YST—Very much satisfied" "K1TCU—FB." "WAØAIZ—Works great."

Circuit board wired and tested, less tubes and xtal ..$6.50PP
2 Meter model of above. 10MC & 50MC I.F. $7.50PP

The above units are now available mounted in a 3 x 4 x 5 aluminum case with antenna, output & power connectors mounted on rear of box. Cover lifts off for instant adjustment of unit. Green jewel pilot lite on front of case gives on-off indication. ADD $6.50

"Little Gem" 6 Meter Transmitter and Exciter Unit. Our most popular item. If you plan to get on 6 meters give this a try. If you are on 6 get one and have a ball. A highly efficient RF section. Unit uses low cost 8MC xtals and will give up to 3 watts into the antenna. Unit doubles in the final, requires no neutralizing, and has no danger of out of band operation. Uses one 6AU8 tube. Fully tuneable-variable capacitors-Built in antenna coupler. This unit can be used as a driver stage for linears and PA's to several hundred watts. Ideal for mobile rig. *"From W4BIR—Have worked 19 states with 'Little Gem' —remarkable performance."*

Circuit board wired and tested—$6.50. With 6AUB tube—$7.50

5 Watt Audio Board & Modulator for above. Xtal or carbon mike input. Uses 12AX7 & 6AQ5. Circuit board—$4.50. Set of tubes—$2.00.

The above units are available mounted in aluminum holders with all connectors—ADD $2.50

6 and 2 Meter Cascode Nuvistor Pre-Amps. S/N-3DB up to 20DB gain. Input & output fully tuneable with ceramic trimmers. Only 2½"x2". Fits anywhere. Ideal for communicators, HE-45, HQ-110 etc. Circuit board wired and tested—$4.00PP Also for citizen band 27MC.

The above unit is available mounted in 3x4x5 aluminum case with all connectors on rear. Front of case has green jewel on-off lite & 0-100 gain control. De-lux mount—ADD $6.50

GEM ELECTRONICS

P.O. BOX 203 **TREMONT CITY, OHIO**
PHONE — TERRA HAUTE 282 **URBANA, OHIO EXCHANGE**

Coming Events

SATURDAY, SEPTEMBER 7

14th Annual Gabfest of the Uniontown Amateur Radio Club, Uniontown, Pennsylvania. Club grounds on Old Pittsburgh Road, Uniontown. Hams from western Pennsylvania, West Virginia, and Ohio invited. Contact Joe Sofranko, 438 Braddock Avenue, Uniontown, for registration details.

SUNDAY, SEPTEMBER 8

15th Annual Hamfest of the South Jersey Radio Association. To be at Molia Farms, Malaga, N. J., starting at 11 a.m. Eastern time. 2,000 hams expected. Contact Dick Denber, K2OYW, or A. R. Klotzbach, W2FYS, for registration details.

ATTENTION HAMFEST PLANNERS!

Let us know about your plans at least 6 weeks before the event and we'll list it in this department; what's more, we may even donate a small prize or so to your loot chairman. And if possible, we might even try to have somebody show up to tell your gang all about the innumerable advantages of a subscription to both 6-Up and 73, not to mention ATV. Drop a line to K5JKX, Oklahoma City, for the full blast.

News

A lot of you seem to be interested in our deadlines; I hope it's because you want to send us the latest news from your QTH. Here's how it works: On the 7th of each month, I begin preparing the DX report; on the 11th, I finish things up and mail the package to Peterborough. On the 15th, the press rolls, and by the 18th you should be reading the book.

This means that news which arrives by the 7th finds itself in its proper department, but anything good which arrives by the 11th will probably get into the magazine.

Regarding articles, we need them. Payment is still (sob!) in prestige only--but we have hopes that the situation will change for the better, now that some advertisers are feeling bold. Articles can be sent at any time during the month. We also can use photos, and are interested in separate photos of good VHF installations. Same payment.

And please be kind to the advertisers--we could possibly survive without them, but we can be much bigger and better with them. Show your appreciation by parting with cash, and tell them you saw it in 6-Up no matter what! --K5JKX

UNBEATABLE!

That's the opinion of VHF'ers EVERYWHERE!

Clegg THOR 6 60 watt phone or CW transceiver for 6 meters. Built-in VFO, push-to-talk & keying relay. Receiver features nuvistorized front end crystal lattice filter. BFO for SSB and CW reception . . . price $349.95.

. . . and the best way to verify these opinions is right at your own receiver.

Listen across six or two. Pick out the best signals and you will find a piece of Clegg equipment behind them every time! Listen to the ham who's hearing and working the choice DX . . . the guy who's digging them out of the QRM and noise . . . he's probably using Clegg gear too!

A little more eavesdropping will provide the clincher. The enthusiastic, on the air endorsements by Clegg users (and those who wish they were) should convince the most skeptical. They all add up to the one word . . . "UNBEATABLE".

So . . . times a'wasting . . . see your dealer today. He's got a Clegg rig to match any pocket-book or any requirement.

MOBILE OPERATION

Now you can run a mobile "power house" using the new Clegg Model 418 transistorized 12V DC power supply/modulator unit to power your THOR 6 transceiver.

Visit your distributor today and see the famous Clegg family that is making VHF history.

ZEUS 6 & 2 meter transmitter 185 watts AM & CW . . . $695.00 amateur net

INTERCEPTOR 6 & 2 meter receiver . . . $473.00 amateur net

VENUS 6 SSB transceiver 185 watts PEP coming soon.

99'er six meter 8 watt transceiver . . . $159.95 amateur net

See your Distributor or write for information.

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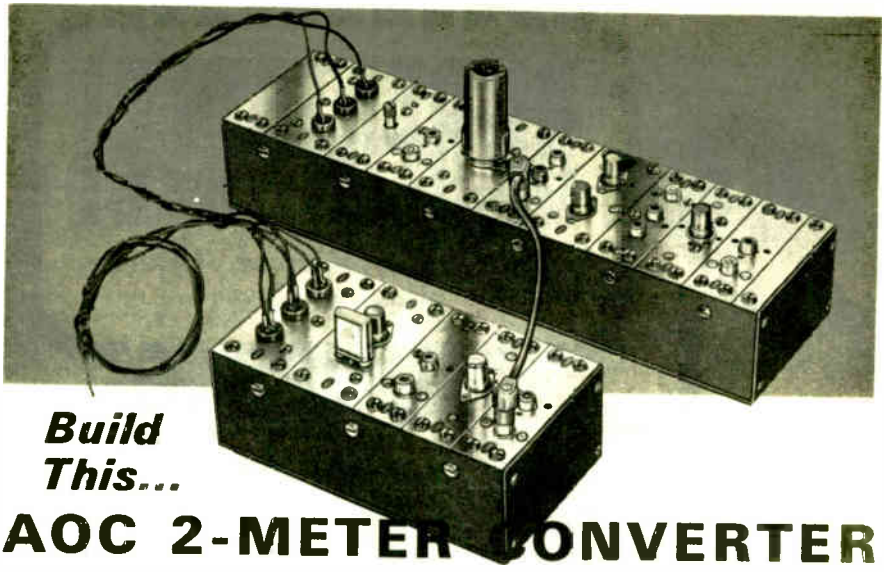
RT. 53, MT. TABOR, N. J.
TELEPHONE 627-6800



Build This...

AOC 2-METER CONVERTER

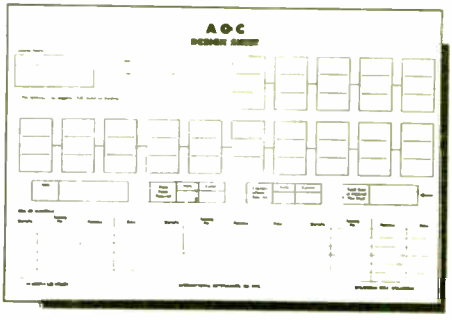
A COMPLETE KIT USING INTERNATIONAL PREWIRED AOC UNITS

- **2 RF STAGES**
- **3 DB NOISE FIGURE**

Everything that you need for building a 2-meter converter with International Add-On-Circuits. Simple step-by-step instructions show you how to assemble the factory prewired units. Now . . . packaged in kit form for easy construction!

The converter kit includes input circuit, nuvistor grounded grid preamplifier, nuvistor/cascode preamplifier, innerstage coupling coil, mixer, IF output coil, oscillator tuning coil, oscillator, power connectors; hookup wire, special molded cables, hardware, and cases. **Specify IF desired when ordering.**

In addition . . . the AOC units in your converter are designed so that each circuit may be removed for modification or change. At a later date . . . the same circuits may be used to construct other electronic equipment. You never discard an Add-On-Circuit because of obsolescence.



AOC units may be used to build receivers, transmitters, or other gear. For complete details of available AOC units write International today!

2-Meter Converter, Complete.....$59.50

BUILD WITH INTERNATIONAL **AOC** AND YOUR EQUIPMENT WILL NEVER BE OBSOLETE

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WALKIE-TALKIE!

6 meter, 150 mw., 4 channel, transistorized transmitter with AM modulator. Complete with transistors and 50.5 mc. crystal. Requires only 12 volts at approx. 35 ma. Ideal for walkie-talkie or get 10 to 15 mile range with a beam.

Only $14.95 ppd. while they last.

6 METER CONVERTER WITH NUVISTOR PRE-AMP

Unbeatable performance at an unbeatable price. Only $10.00 ppd. Complete with 6U8A, 6CW4 tubes and choice of 36 mc. crystal for 14-18 mc. output or 49.4 mc. crystal for broadcast band output. Fully assembled, tested and guaranteed. Sensitivity 1 microvolt. Noise figure 2.5 db.

TNS NOISE SILENCER

Reg. $14.98 now only $6.00 ppd. while supply lasts. New, guaranteed, and complete with 6AL6, 12AX7, squelch control, and mounting brackets. Don't miss out. Order today.

CONVERTER SALE

New model series 300 with 3 VHF transistors, crystal, and more than 30 high quality parts. Carefully assembled and tested. Measures only 3" x 2½" x 2". Low noise and better than 1 microvolt sensitivity. Made in USA and guaranteed. Available in the following models for 12 volts DC:

Model	Input mc	Output mc.	Price
300-A	26.965-27.255	1.0-1.255	$8.50 ppd.
300-B	50-51	6-1.6	$8.50 ppd.
300-C	50-54	14-18	$8.50 ppd.
300-D	144-148	50-54	$10.50 ppd.

Supply limited at these low prices—order now.

All above converters are supplied with Motorola type connectors. For two 50-239 connectors instead, add 75c. N.Y.C. residents add 4% sales tax.

VANGUARD ELECTRONIC LABS Dept. H-9
190-48—99th Ave. Hollis 23, N. Y.

WRETCHED K2PMM

BADGES

One of the big problems at hamfests and club meetings is to have everyone plainly enough marked with their first name and call. All sorts of stickers and pieces of cardboard have been tried, plus little cards which can be typed up and stuck in holders . . . all have the same problem: they are hard to read from any distance.

The best answers to date are these engraved laminated plastic name badges which can be read by Cousin Weakeyes from seventeen paces. You are in luck. We've arranged to make these darbs available at a real low price, all personally engraved. The badges are 3" x ¾" and come complete with a pin and safety lock. Please give your first name, call and specify whether you want the badge to be bright red with white letters or jet black with white letters.

$1.00 each.

Order from
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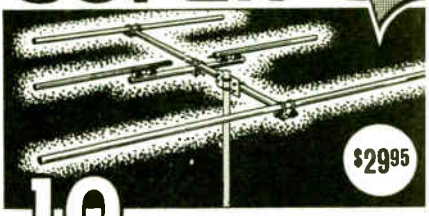
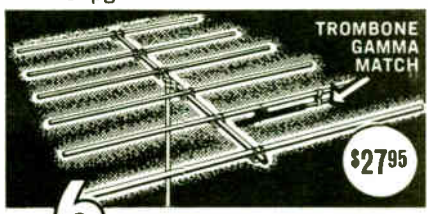
new from SUPER Q



10 METER BEAM

- One Inch Elements for Low Q and Wider Frequency Range
- 12 Foot Boom for Wide Spacing
- Dipole Driven Element, 52 Ohm Feed
- Forward DB Gain 9.2 Front-To-Back 28 DB
- All Tempered Aluminum—Driven Element Assembled. Shpg. wt. 20 lbs.



6 METER BEAM

- Gamma Match for 52 Ohm Feed
- Resonate Frequency 50.4 Meg.
- Forward Gain 11.2 DB Front-To-Back Ratio 25 DB
- Boom Length: 15 Ft., 1¼ Inch Dia.
- 1" Dia. Elements for Low "Q", Wide Range
- Tempered Preassembled Aluminum Elements, Easy Installation. Shpg. wt. 20 lbs.

MONEY BACK GUARANTEE

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3363 Verner, Kent, Ohio

☐ 10 Meter Beam @ $29.95 | Shpd. Exp. Collect Only
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"Are you the POLY-COMM 6 TRANSCEIVER too?"

Do you have a dual nuvistor rf amplifier?

Do you have a MINILOAD VFO with an adjustable differential capacitor?

Do you have an ultra sensitive squelch and noise limiter and illuminated S meter?

But I have a microphone and mounting bracket included in my price.

I sell for $329.50 and there is no extra charge for C.D. units.

We make a pretty good team in any ham shack.

See you on the dealer's shelf, you rascal you!

"No I'm the POLY-COMM 2 TRANSCEIVER (that's T-W-O)!"

Of course . . . and I've got the same unparalleled sensitivity as you. (.1μv at 6 db S N)

Sure do . . . and it maintains virtually zero drift under any and all adverse conditions.

Yes, and I even have 17 tubes and 10 diodes.

So do I and I have 3 more nuvistors to really take advantage of low noise on two meters.

I sell for $349.50 even though I have more tubes, and no extra charge for C.D. units

The best ! ! ! and don't forget the D.C. supply is built-in for mobile.

I'll be there and I'm not a rascal.

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Write for free descriptive brochure.

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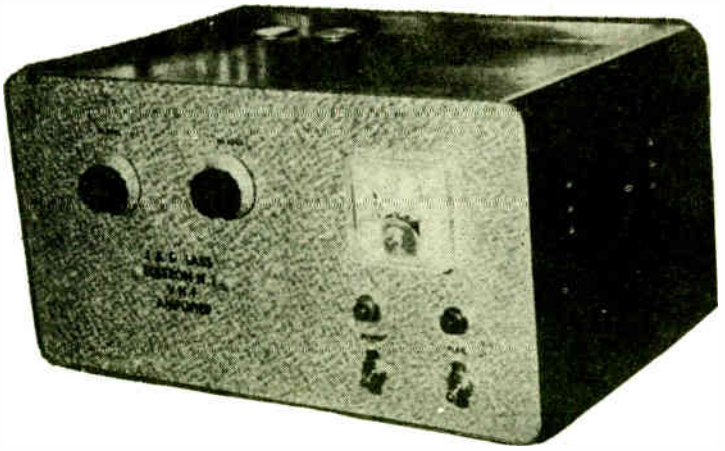

Mono-band Units
10 watts drive required

Model 500 500 watts SSB and CW, 250 watts AM, 1 4X150 final, built-in silicon power supply and blower. **Price only $149.95**

Model 1000 1000 watts SSB and CW, 500 watts AM, 2 4X150 finals, built-in silicon power supply and blower. **Price only $199.95**

All units housed as above picture. Size 7" high x 15" wide x 9" deep. Please specify band when ordering.

J & D LABS P. O. Box 266 Eatontown, New Jersey Area 201 222-1605

73 parts kits

In the interests of making home construction simpler for those readers with anemic junk boxes 73 has gathered together the parts required for building our less complicated projects. These kits are as complete as we can make them, containing good quality parts. Except where the chassis or case is integral to a unit we do not supply it. We will mention when we do supply a case or chassis. We do supply tubes, sockets, condensers, resistors, transformers, connectors, etc. The kits are kept in stock to the best of our ability, though sometimes the distributors who supply us delay us a bit.

TWO METER PREAMPLIFIER. Uses two 6CW4 nuvistors in a grounded grid input circuit (March '63 p8) and one 6CW4 nuvistor grounded grid output. Complete with power supply. Uses 50 volts on the plates for extraordinary noise figure. Full scale drilling template supplied.
W9DUT-1 ..... $18.50

QRP TRANSMITTER. Have fun with this little one half watt CW rig on 40 meters. Uses any 40M surplus crystal. Kit supplies 1S4 tube and socket, condensers, resistors, coil, rf choke, terminal trip, etc. Runs from flashlight battery for filament and portable radio 67½ volt B-battery. See March '63 p22.
W1MEL $6.00

15-20 METER NUVISTOR PREAMPLIFIER. Need more hop on these bands? This simple to build preamp will bring up those signals. This is particularly good for inexpensive and surplus receivers. See April '63 page 40.
W6SFM-1 ..... $4.00

TRANSISTOR POWER SUPPLY. Voltage regulater adjustable power supply for running transistor equipment. Takes the strain off those transistor batteries. Great for the test bench. See April '63 page 8. Uses five transistors, one zener, cute little (expensive) meter, etc. Will deliver up to 100 ma continuously, voltage from 0.35 to 15.0.
W1ISI $25.00

TRANSISTOR TRANSCEIVER. One of the most popular kits we've ever assembled is this six meter miniscule transistorized transceiver. Really works. Hundreds built. See page 8 in the May '63 issue. Five transistors.
K3NHI $25.00

CW MONITOR. Connects right across your key and gives you a tone for monitoring your bug. Page 44, June '63.
WA2WFW $4.25

TWOER MODIFICATION. Increase your selectivity considerably by installing a new triode 7587 nuvistor stage. This is our best selling kit to date. Everything you need for the modification is included. See June '63 page 56.
K6JCN $6.50

SIX METER CONVERTER, DELUXE. 6EW6 low noise front end, 6U8 oscillator and mixer. Output is 10.7 mc (easy to change to suit your needs). This is a tunable converter with fixed frequency output, not the usual converter that requires you to tune the receiver. This helps considerably on eliminating interference from nearby high power stations. See page 8, July '63.
W6DUT-2 ..... $20.00

TUNING EYE KIT. This kit enables you to install a dual tuning eye in any transmitter to indicate the tuning of two or more stages. It works far better than a meter or even meter switching. See page 22, July '63.
K6GKU $7.50

NOISE GENERATOR. Invaluable test instrument for tuning up rf stages, converters, etc. voltage regulated by a zener diode. Kit includes even the battery and mini-box.
K9ONT $5.00

73 News. Published monthly, editor VE3DQX. Keeps you up-to-date on current ham events. In valuable to club officials for discussions at club meetings. Good source material for club bulletins. 1.00/year.

Ham-RTTY. This is the most complet book on the subject. Written for the beginning TT'er as well as the expert. More complete and authoriative than books at twice the price. Pictures and descriptions of all popular machines, where to get them, how much, etc. $2.00

Index to Surplus—W4WKM. This is a complete list of every article ever published on the conversion of surplus equipment. Gives a brief rundown on the article and source. $1.50

Ham-TV—WØKYQ. Covers the basics of ham-TV, complete with how to get on the air for under $50. Not the usual theory manual, but a how-to-do-it book. $3.00

Surplus TV Schematics. You can save a lot of building time in TV if you take advantage of the real bargains available in surplus. This book gives the circuit diagrams and info on the popularly available surplus TV gear. $1.00

AN/ARC-2 Conversion. This transceiver sells in the surplus market for from $40 to $50 and is easily converted into a fine little ham transceiver. Covers 29 mc (160-80-75-40 meters). This booklet gives you the complete schematic and detailed conversion instructions. $1.00

AN/VRC-2 Conversion. Completely different from the ARC-2. This book gives you complete instructions on converting the inexpensive VRC surplus gear into a six meter wide band FM transceiver. There are probably over a thousand stations now operating on 52.525 mc around the country. Join the crowd. Fun. $1.00

Order from
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Radio Bookshop

SPECIAL SPECIAL SPECIAL

Rodio Hondbook, 15th Edition, written by Bill Orr W6SAI, over 800 pages. Covers every phase of amateur radio from the very basics right up through the construction of just about everything you could want in ham gear. Originally published at $8.50. Superceded by the new 16th edition which is the same except for new construction projects and selling for $9.50 (see number 11). Special, until the last few copies are gone, only $5.95!

5—ANTENNAS—Kraus (W8JK). The most complete book on antennas in print, but largely design and theory, complete with math. $12.00

11—16TH EDITION RADIO HANDBOOK—by Bill Orr W6SAI. This fantastic book is loaded with the most understandable theory course now available in our hobby plus dozens of great construction projects. This is the best ham handbook in print by a wide margin. Easily worth twice the price. $9.50

13—REFERENCE DATA FOR RADIO ENGINEERS. Tables, formulas, graphs. You will find this reference book on the desk of almost every electronic engineer in the country. Published by International Telephone and Telegraph. $6.00

21—VHF HANDBOOK—Johnson (W6QKI). Types of VHF propogation, VHF circuitry, component limitations, antenna design and construction, test equipment. Very thorough book and one that should be in every VHF shack. $2.95

22—BEAM ANTENNA HANDBOOK—Orr (W6SAI). Basics, theory and construction of beams, transmission lines, matching devices, and test equipment. Almost all ham stations need a beam of some sort . . . here is the only source of basic info to help you decide what beam to build or buy, to install it, how to tune it. $2.70

23—NOVICE & TECHNICIAN HANDBOOK—Staner (W6TNS). Sugar coated theory: receivers, transmitters, power supplies, antennas; simple construction of a complete station, converting surplus equipment. How to get a ham license and build a station. $2.85

27—QUAD ANTENNAS—Orr (W6SAI). Theory, design, construction, and operation of cubical quads. Build-it yourself info, Feed systems, tuning. $2.85

28—TELEVISION INTERFERENCE—Rand (W1DBM). This is the authoritative book on the subject of getting TVI out of your rigs and the neighbors sets. $1.75

32—RCA RADIOTRON DESIGNERS HANDBOOK—1500 pages of design notes on every possible type of circuit. Fabulous. Every design engineer needs this one. $7.50

36—CALL LETTER LICENSE PLATE—Regulation size license plate. Please give your call and the color of letters and background. $3.00

37—101 WAYS TO USE YOUR HAM TEST EQUIPMENT—Middleton. Grid-dip meters, antenna impedance meters, oscilloscopes, bridges, simple noise generators, and reflected power meters are covered. Tells how to chase trouble out of ham gear. 168 pages. $2.50

52—HOW TO READ SCHEMATIC DIAGRAMS—Marks. Components & Diagrams; electrical, electronic, ac, dc, audio, rf, TV. Starts with individual circuits and carriers through complete equipments. $3.50

53—BASIC ELECTRONIC TEST PROCEDURES—Turner. This book covers just about every possible type of electronic test equipment and explains in detail how to use it for every purpose. Testing: audio equipment, receivers, transmitters, transistors, photocels, distortion, tubes, power . . . etc. $9.75

55—TRANSISTOR CIRCUIT HANDBOOK—Simple, easy to understand explanation of transistor circuits. Dozens of interesting applications. $4.95

63—GE TRANSISTOR MANUAL—6th edition. This is one of the best buys around: 22 chapters, 440 pages, diagrams by the gross, data, facts, charts, etc. If you don't have this one you just aren't up to date. only $2.00

80—SURPLUS RADIO CONVERSION MANUAL VOLUME NO. 1 (second edition). This book gives circuit diagrams, photos of most equipment, and rather good and complete conversion instructions for the following: BC-221, BC-342, BC-312, BC-348, BC-412, BC-645, BC-946B, SCR-274N 453A series receivers conversion to 10 meter receivers, SCR-274N 457A series transmitters (conversion to VFO)SCR-522 (BC-624 and BC-625 conversion to 2 meters), TBY to 10 and 6 meters, PE-103A, BC-1068A/1161A receiver to 2 meters, Surplus tube index, cross index of A/N tubes vs. commercial types, TV & FM channels. $3.00

81—SURPLUS RADIO CONVERSION MANUAL VOLUME NO. II. Original and conversion circuit diagrams, plus photos of most equipments and full conversion discussion of the following: BC-454/ARC-5 receivers to 10 meters, AN/APS-13 xmtr/rcvr to 420 mc, BC-457/ARC-5 xmtrs to 10 meters, Selenium rectifier power units, ARC-5 power and to include 10 meters, Coil data-

simplified VHF, CO-9/TBW, BC-357, TA-12B, AN/ART-13 to ac winding charts, AVT-112A, AM-26/AIC, LM frequency meter, rotators, power chart, ARB diagram. $3.00

82—SURPLUS RADIO CONVERSION MANUAL VOLUME NO. III—Original and conversion diagrams, plus some photo of these: 701A, AN/APN-1, AN/CRC-7, AN/URC-4, CBY-29125, 50083, 50141, 52208, 52232, 52302-09, FT-ARA, BC-442, 453-455, 456-459, BC-696, 950, 1066, 1253, 241A for xtal filter, MBF (COL-43065), MD-7/ARC-5, R-9/APN-4, R23-R-28/ARC-5, RAT, RAV, RM-52 (53), Rt-19/ARC-4, SCR-274N, SCR-522, T-15/ARC-5 to T-23/ARC-5, LM, ART-13, BC-312, 342, 348, 191, 375. Schematics of APT-5, ASB-5, BC-659, 1335A ARP-2, APA10, APT-2. $3.00

83—THE SURPLUS HANDBOOK, VOLUME 1—Receivers and Transmitters. This book consists entirely of circuit diagrams of surplus equipment and photos of the gear. One of the first things you really have to have to even start considering a conversion of surplus equipment is a good circuit diagram. Tihs book has the following: APN-1, APS-13, ARB, ARC-4, ARC-5, ARN-5 VHF, ARN-5, ARR-2. ASB-7, BC-222, -312, -314, -342, -344, -348, -603, -611, -624 (SCR-522), BC-652, -654, -659, -669, -683, -728, -745, -764, -799, -794, BC-923, 1000, -1004, -1066, -1206, -1306, -1335, BC-AR-231, CRC-7, DAK-3, GF11, Mark 11, MN-26, RAK-5, RAL-5, RAX, Super Pro, TBY, TCS, Resistar Code, Capacitar Color Code, JAN/VT tube index. $3.00

66—DESIGN MANUAL FOR TRANSISTOR CIRCUITS BY CARROLL. Tested transistor circuits for design engineers. Interesting reading too. $9.50

ALP-1—GENERAL CLASS LICENSE HANDBOOK—by Pyle W7OE. A complete guide including typical questions and answers, to help you prepare for the FCC Technician, Conditional or General amateur radio exam. A good writer is quite a help in this sort of thing. $2.50

AMA-1—AMATEUR RADIO ANTENNA HANDBOOK—by Hooton W6TYH. Basic theory, construction and tuning of all the well known and effective ham antennas. Good stuff on feed lines and towers too. $2.50

AMP-1—TROUBLESHOOTING AMATEUR RADIO EQUIPMENT—by Pyle W7OE. A guide for all hams who want to keep their gear on the air by themselves. Includes complete schematics of many popular ham transmitters and receivers. $2.50

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