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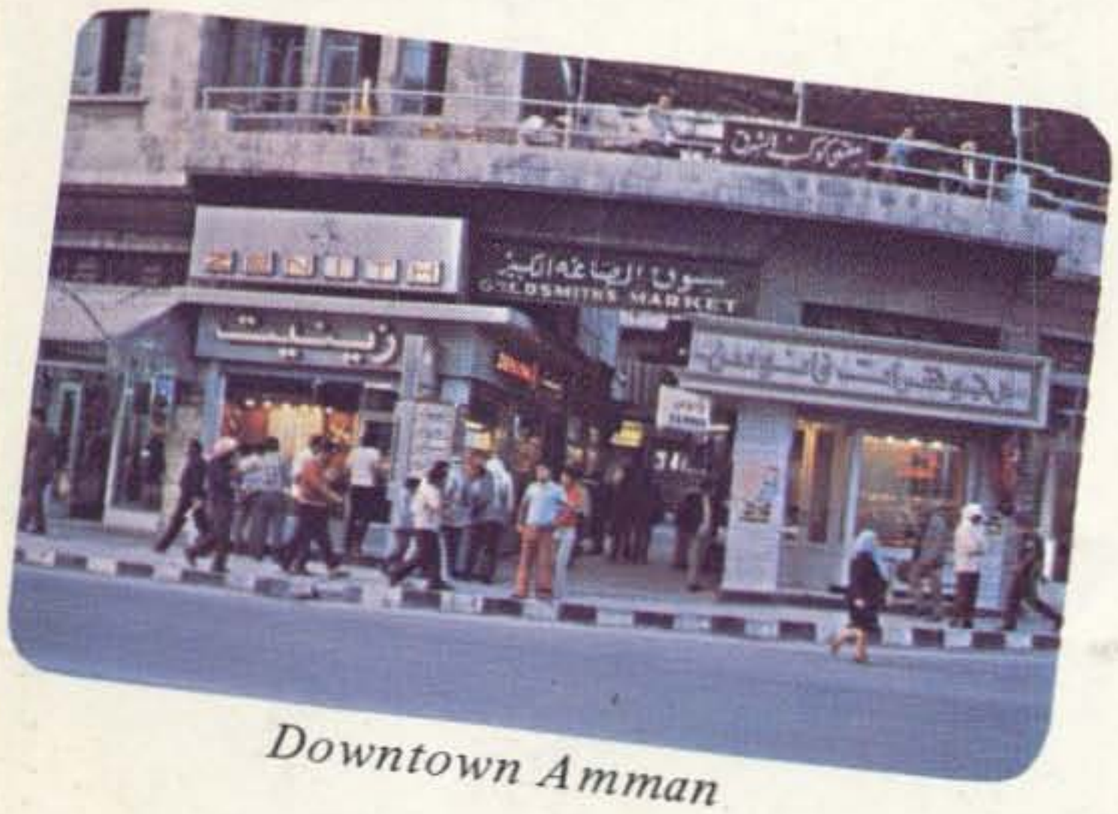
September 1973
26009
ACE

73 magazine
for radio amateurs

JORDAN



Downtown Amman

Pastry shop window

Hotel pools and cabanas

The desert of Jordan

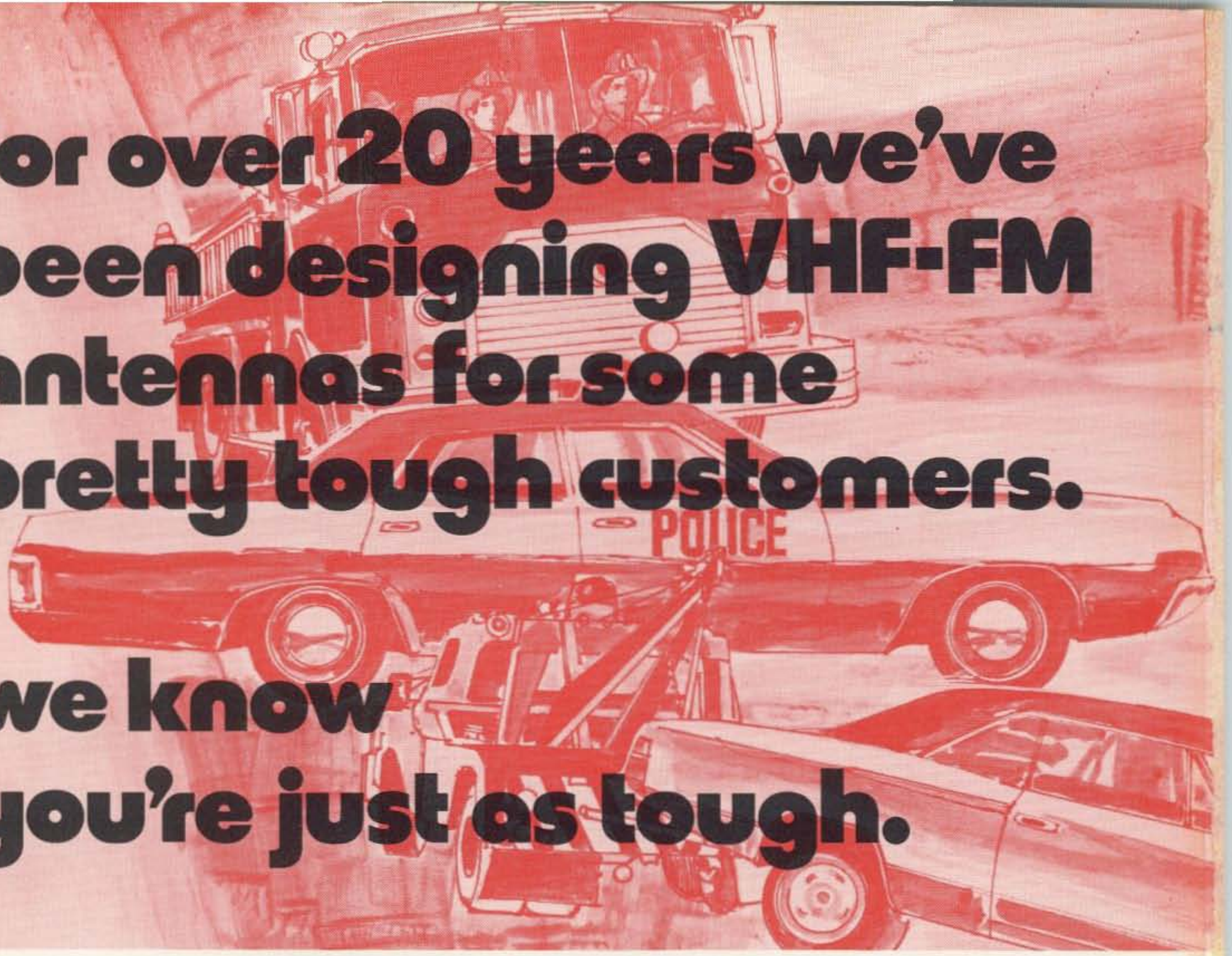
Amphitheater at Jarash

- Repeater Logic System
- Log-Periodic Antennas
- OSCAR 6 Discoveries
- 2 m Converter
- Phase Lock Loops

more . . .more . . . more . . .

Eating on Syria-Israel-Jordan border

for over 20 years we've been designing VHF-FM antennas for some pretty tough customers.



we know you're just as tough.

A product in the amateur market gets a reputation very quickly. It measures up to what you expect in engineering, performance and quality —or else. That's why A/S amateur antennas are built to the identical design and construction standards as their commercial counterparts. Standards that have made them specified for more police and public safety vehicle installations than all other brands combined.

HM-177
2 Meters
Features new high conductivity copper and nickel coated 17-7 PH stainless steel whip. Shunt fed coil encased in waterproof PVC jacket. All fittings chrome plated brass. Easy snap-in mounting. 3 dB gain.*

NEW! HM-223
1¼ Meters (220 MHz)
High performance ⅝ wavelength design for the new 220 MHz activity! Directly fed with low loss coil in new low-profile design. Spring and whip easily removable leaving only 1 3/16" high base for car wash clearance. 3 dB gain.*

HM-175
¾ Meters
Collinear design with truly hot performance! Base fittings have silver plated contacts. Can handle 100 watts. Whip and phasing coil assembly is a one piece molded design to resist vibration and moisture. 5 dB gain.*

HM-4
2 Meters
Tough, virtually indestructible antenna for hand-helds. Completely insulated. Base fitting matches Motorola HT, E. F. Johnson, and Standard portables.

HM-5
Same as above but for Drake and other packset portables with SO-239 fittings.

NEW ASCOM® TOWERS
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*Measured over a ¼ wavelength whip

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73 magazine
for radio amateurs

156 SEPTEMBER 1973

FEATURES

COVERS: A few of the hundreds of slides taken during the recent Jordan visit by our editor are on the covers. More exhaustive groups of slides will be shown at hamfests and conventions. Or, better yet, how about joining the 73 Journey to Jordan next March? That'll be a DXpedition you'll never forget!

73 Magazine is published monthly by 73, Inc., Peterborough, New Hampshire 03458. Subscription rates are $6 for one year; in North America and U.S. Zip Code areas overseas, $7 per year elsewhere. Three years, $14, and $16 overseas. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Printed at Menasha, Wisconsin 54942 U.S.A.

Phone: 603-924-3873. Microfilm edition of 73 available from University Microfilms, Ann Arbor, MI 48106. Magnetic tapes available from Science for the Blind, 332 Rock Hill Rd., Bala Cynwyd PA 19904.

Amateur Radio

SEPTEMBER MCMLXXIII — Monthly Ham

CLEGG BOOSTS 220 VIA REPEATER LEASING

A new 220 MHz repeater program has just been announced by Clegg, Lancaster, Pennsylvania, in an effort to bring vigorous 220 activity to radio amateurs from coast to coast.

A new Clegg repeater, valued at approximately $1,200.00, will now be leased to amateurs at special club rates of only $25.00 per month. The low monthly rental fee can be further reduced with club member purchases of the FM-21 transceiver, a 220 MHz FM unit.

The repeater is leased complete (except antennae and feed line) with features that include automatic identification, all solid-state construction, and built-in timers. It operates at 10 to 15 watts, uses a Phelps-Dodge duplexer, and has approximately .4 μV sensitivity. It includes an ac supply, local MIC, and metered signal strength.

All amateur radio clubs are invited to contact the Clegg Division if interested in getting their club into the repeater program. They may write Phil Theis K3TUF, Clegg Division, International Signal and Control Corporation, 3050 Hempland Road, Lancaster, Pennsylvania 17601, or telephone him at (717) 299-3671 for more information.

RECIPROCAL LICENSING IN ISRAEL

Every radio amateur who presents a valid license from his own country can receive an Israeli license. At the time of government examinations, he will be questioned in those specific areas where it is felt that the technical level in his own country is lower than in Israel. Decisions regarding the technical levels will be based upon a comparison of the syllabus from the amateur's own country to the syllabus in Israel. An amateur who does not pass the examination, or decides not to sit for it, will automatically be issued an Israeli license that is one grade lower than his original license. Examinations are currently held in Israel twice a year during the school vacations of the holidays Passover and Rosh Hashana (the Jewish New Year).

In the case of the U.S., Canada, UK, Austria and Costa Rica, special reciprocal licensing agreements exist. Amateurs from these countries may receive licenses during the period of their stay in Israel, and they are not required to sit for any examinations.

Amateurs who do not bring equipment can receive permission to operate every amateur station in Israel as second operators.

Further information, application forms for reciprocal licenses, may be obtained from: Ministry of Communications, Engineering Services, Postbox 29107, Tel-Aviv, Israel.

AC3- NEXT YEAR?

From The Camel Drivers Newsletter.

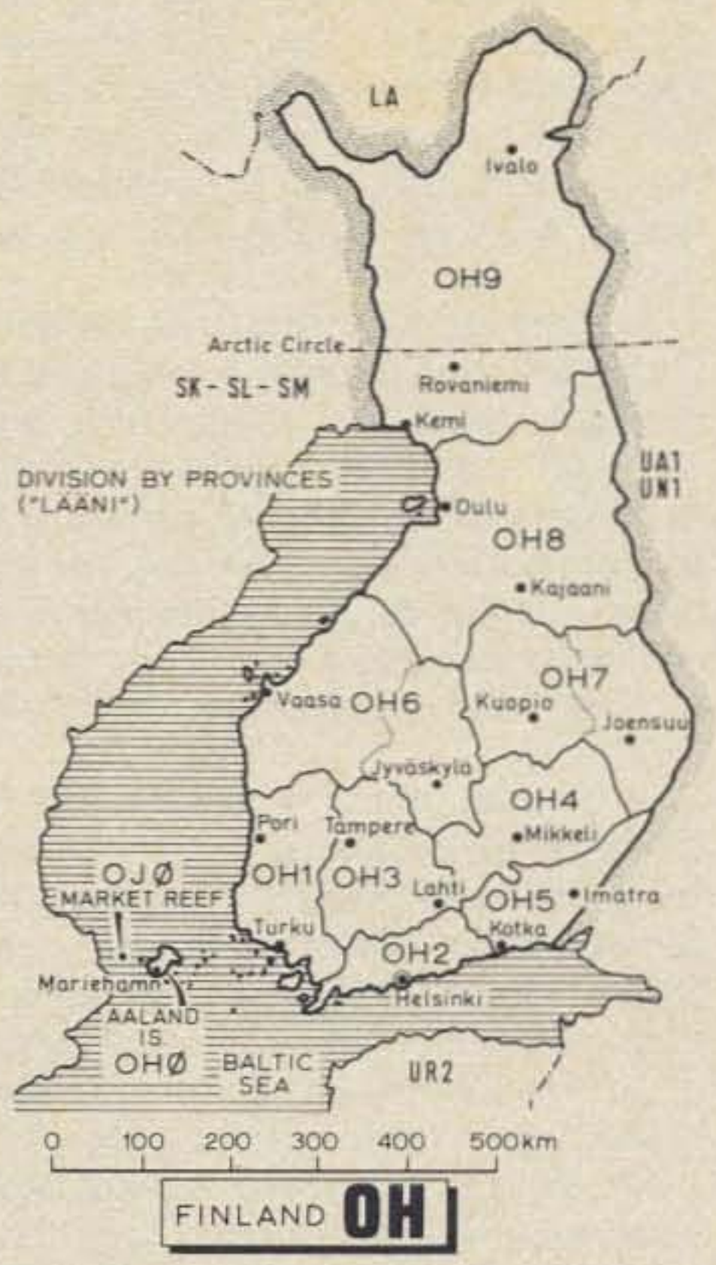
Arne 1AH relates his personal expedition to visit the Kingdom of Sikkim (north of northeast India and east of Nepal) where he had an invitation to set up a transmitting station with an AC3 call for the DX hounds early in April. Traveling in his own Volvo station wagon with his family, he took one day to reach Lahore, another to Delhi, and then two days to Gantok, the capitol of Sikkim. Sounds easy, but it wasn't! He'd applied to the Sikkim Government for permission to operate about six weeks before starting out, and tarried long enough in Delhi to make an application to operate through the Ministry of Foreign Affairs. Actually the second day's journey out of Delhi only got him to the Sikkim border, and he stayed in Siliguri, about 800 km from Delhi. Early the next morning, it was a three hour drive to Gantok, and he was pleasantly surprised to find many military trucks escorting him along, until he began to meet hundreds of demonstrators who weren't greeting him! His arrival in Gantok coincided with a downpour of monsoon rains, which helped break up the demonstrating throngs so he could locate the traveler's bungalow that had been arranged for him previously by a friend in Kabul. The first two days were spent in fruitless efforts to get operating, but there was so much turmoil it was hopeless. Then Indian troops arrived at the request of the government and some order was restored – at least he was able to see an Indian Political officer, who refused a permit to operate but cheerfully promised that if Arne came back "next year" all would be serene and he could operate then.

All was not lost however, as the next day Arne went to see a chap named Oberoi, a very close friend of the King. He spent the balance of his four days in Sikkim sightseeing, which was very worthwhile, as it is a beautiful country. There is no airport in Sikkim – all access is by road from India. Early in the morning Arne and his family started back for the Indian

News Pages

News of the World

border, and at Singtam, the last town in Sikkim, they ran into a roadblock at 7 a.m. – trees, rocks, and people. The leader wanted to know why Arne was going to India – if he was a friend of the King – complimented him on his car – and continued a long discussion before requiring the car and baggage to be opened for inspection. After all the ruckus of the past four days, this last straw unnerved Ula, Arne's XYL, and the tears started to flow (and yours would too, with about 20,000 demonstrators around the car with knives, sticks, and rocks), but the tears worked, and they were quickly cleared to proceed -- gratefully! The trip was interesting, and good pre-planning such as an extra fuel tank made the trip relatively comfortable. He did get stuck twice in the desert, but Scandinavian resourcefulness in using the rubber floor mat out of the car provided the traction needed! These expeditions are usually fun, but such a frustrating one as Arne's is better done when there isn't a political upheaval at the destination!



HAM OF THE YEAR - 1973

The Federation of Eastern Massachusetts Amateur Radio Associations are now requesting nominations for the "Ham of the Year" award for 1973. Only amateurs in the 1st call district are eligible and the amateur selected will be the top "good neighbor" among hams, the one who has performed an outstanding public service.

Anyone may nominate an amateur radio operator for the honor. Winner of the award will be chosen for the amateur activity which brings the greatest benefit to an individual or group and for the amount of ingenuity and personal sacrifice displayed in performing the service.

Nominating letters should include the candidate's name, address, call letters and a complete description of the service performed. Letters must be sent to the Chairman of the FEMARA Awards Committee, 28 Forest Ave., Swampscott, Mass. 01907.

The winner will be presented with a plaque and a cash award at the ARRL New England Convention, Dunfey's Hyannis, Cape Cod, on September 29, 1973.

CANADIAN RTTY NET

The canadian Amateur Radio Teletype Group has inaugurated a national RTTY traffic net and bulletin service.

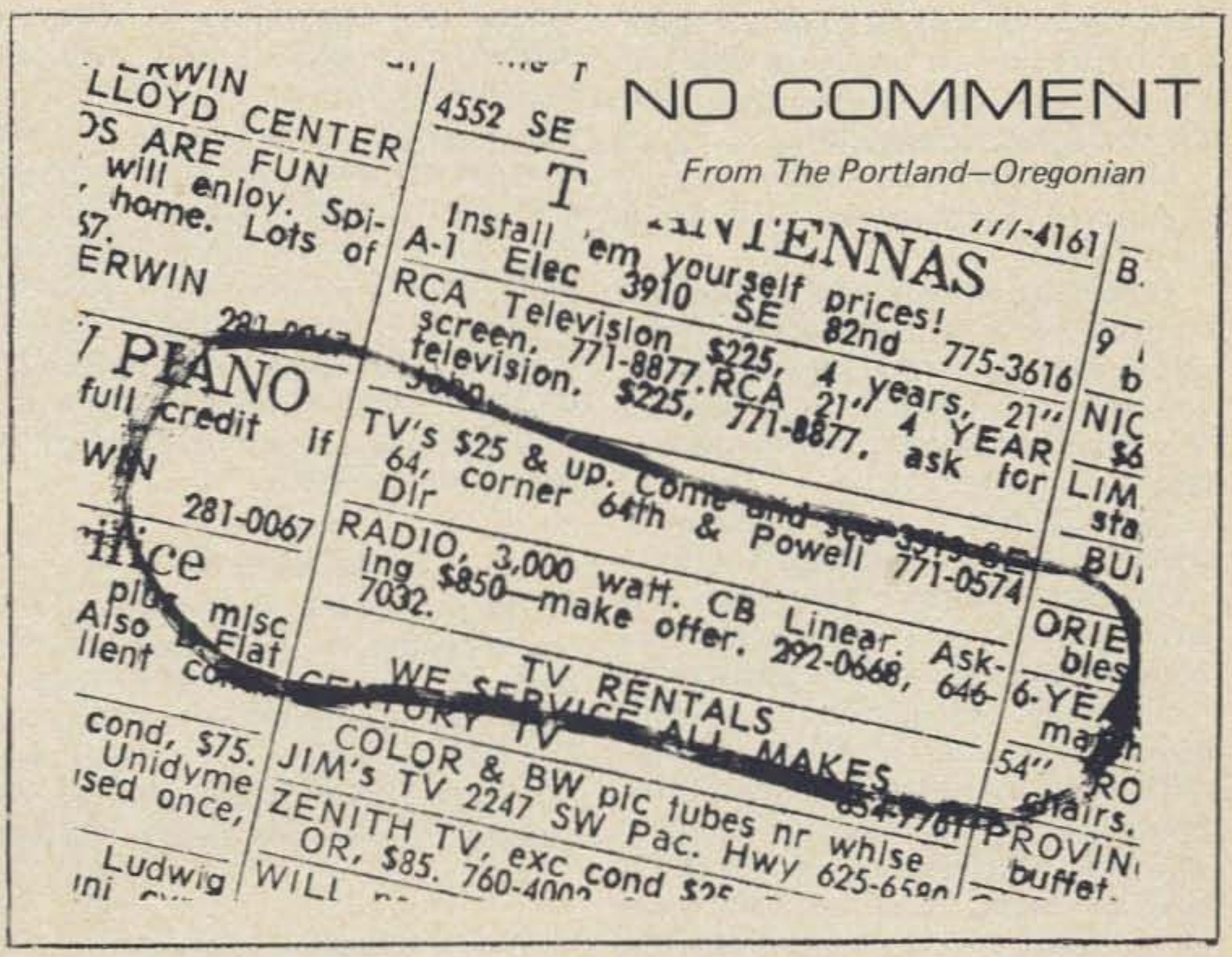
Operation is on 14.08 MHz every Sunday at 1930 GMT with VE5KE as net control station. .... CARF

SHORT WAVE...

SHORT CIRCUITS!

From The Short Wave Magazine, May, 1973.

From G2BVN's Region I News for April we get it that if and when amateur licenses are in general issue to Chinese nationals, the form of the call sign will be B followed by a letter denoting a geographical area, then a single digit and after that an A, or A with one or two suffix letters, e.g., a Chinese amateur station in the Shanghai area could be signing BH2A, or if from Hankow BJ1AB, while a Sinkiang AT-station might come up as, say, BU3ABC. There are 17 prefix letters allotted. So, when the bamboo curtain does go up (the chinks are already beginning to show) and amateur licenses become freely available, the Chinese call book will be quite a thing. Though at the moment of writing we have no further positive information, call signs heard or worked in the form shown here could well be genuine.



NEVER SAY DIE

...de W2NSD/1

EDITORIAL BY WAYNE GREEN

MORE ARGUMENT

The more I think about Walker and his constant accusations of appliance operation, the more irritated I get – the gall of that man – and the incredible myopia for someone in a position of responsibility and trust. Amateurs have had to sit through his arrogant calumnous vitriolic attacks at convention after convention – and the worst part is that they are totally without foundation.

Let's take a look at the facts of the situation. Okay, one fact is that in the golden days of yore, amateurs did indeed build their transmitters – no doubt about that – because there were none available to buy commercially. However, in those wonderful years that bring tears of nostalgia to the old timers, the great 30's, amateurs did not build their receivers. Hallicrafters, National, Bretting, and many others took care of that.

Before you join the aged in awe of the skill demonstrated in building those transmitters you'd better take a good look at the amateur radio magazines of the 30's and the transmitters they were building – you'll get a good laugh. One hundred watts was pretty high power then, and the most popular rigs being built were the QSL-40 jobs with a chassis the size of a QSL card and forty powerful CW watts input to a 6L6G. The "G" tube was better so you could see how red the plate was getting when you held the key down. Heady stuff.

Most Novices today build equipment that is far more complicated.

Please dig out any of the 30's ham magazines and see for yourself – then put it against a current issue of 73 and compare the construction projects – the number of pages of ads for parts – and the kits available.

Speaking of kits, which compnay in the ham field is the biggest – by a wide margin today? You know the answer is Heath – with somewhere between one half and one third of the ham market. Can you find an amateur anywhere (outside of those nostalgic old timers) who does not have some Heath gear around which he has built? The only difference is that the Heath gear of today is exceedingly more complicated than the transmitters our senior citizens were putting together forty years ago. You just try your hand at the Heath FM rig and see if you don't start to sweat. It's a nice rig, for sure, but you'll know you've had a workout by the time you get done.

Is there any real difference between taking a list of parts in a magazine to the radio store and going home with the bag – and sending to Heath for the bag? Well, you don't have to drill and punch out all those holes, for one thing – is that the thing that makes us appliance operators now – we dont't punch out tube socket holes anymore?

No, when Heath is selling kits to virtually every active ham – when there are more Heath transmitters on the air than Hallicrafters, National, Drake, Swan, SBE, etc., combined, then how can someone like Walker get up in front of us and point the finger of shame at us appliance operators?

Mr. Walker, for heaven's sakes open your eyes and take a good look! Get on the phone bands where 99% of the active amateurs are today and talk with them – find out what is happening – talk with the unwashed multitudes – come out of that Extra Class wasteland the FCC has created and get some grass roots data. The ham world is not Collins. Get on two meters and learn to talk with the fellows operating there – they are darned nice guys – and they are building some of the most sophisticated equipment around for repeater controls. Join in some of the slow scan activity on twenty and see for yourself what is really happening. Work some DX. You might even try six meters – there is a whole bunch of fellows on that band that you haven't ever met or talked with – and you'll find that they, like all the rest of us, have been building.

KC Update

The item in the July issue (page 94) regarding the shutting down of a KC repeater has brought mixed mail – some saying the report we received was without substance – others that the report will undoubtedly keep the repeater from ever being licensed.

(Continued on p. 84)

U.S. AMATEUR FREQUENCY ALLOCATIONS

	CW Only	Phone & CW
Extra Class	3.500– 3.775	3.775– 4.000
	7.000– 7.150	7.150– 7.300
	14.000–14.200	14.200–14.350
	21.000–21.250	21.250–21.450
	28.000–28.500	28.500–29.700
	50.000–50.100	50.100–54.000
Advanced Class	3.525– 3.775	3.800– 4.000
	7.025– 7.150	7.150– 7.300
	14.025–14.200	14.200–14.350
	21.025–21.250	21.270–21.450
	28.000–28.500	28.500–29.700
	50.000–50.100	50.100–54.000
General Class	3.525– 3.775	3.890– 4.000
	7.025– 7.150	7.225– 7.300
	14.025–14.200	14.275–14.350
	21.025–21.250	21.350–21.450
	28.000–28.500	28.500–29.700
		50.100–54.000
Novice Class	3.700– 3.750	
	7.100– 7.150	
	21.100–21.200	
	28.100–28.200	
Technician Class	50.100 – 54.000, 145.000–148.000, 220 MHz band and above.	

SSTV Frequencies

	Suggested
3.775– 3.890	3.845
7.150– 7.225	7.220
14.200–14.275	14.230
21.250–21.350	21.340
28.500–29.700	28.680
50.100–54.000	

LICENSE FEES

Initial License	$ 9
Renewal	$ 9
New Class	$ 9
Modification	$ 4
Special Call Sign	$25

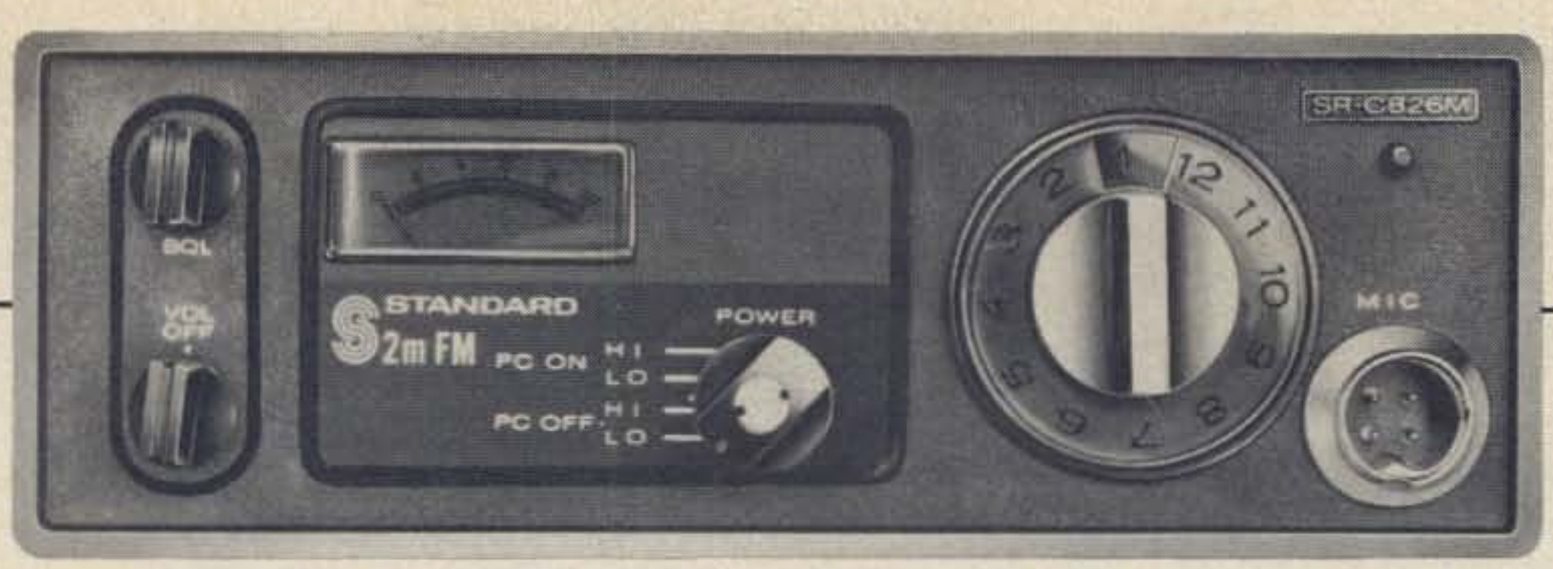
Use FCC Form 610 and mail with appropriate fee to:

Federal Communications Commission
Gettysburg PA 17325

RECIPROCAL LICENSING Between U.S. and: CE - CP - CT1 - CX - D - EI - F - G - HB9 - HC - HI - HK - HP - HR - LA - LX - OA - OH - PA - PY - SM - TG - TI - VE - VR2 - VU - YB - YN - YS - YV - ZL - ZP - 3A - 4X - 6Y - 8P - 9K - 9L - 9Y.

THIRD PARTY AGREEMENTS Between U.S. and: CE - CM - CO - CP - CX - EL - HC - HH - HI - HK - HR - JY - LU - OA - PY - TG - TI - VE - VO - XE - XP - YN - YS - YV - ZP - 4X - 4Z - 8R - 9Y. Also W/K/8P.

RESTRICTED COUNTRIES (don't work) are now down to only Vietnam(s) 3W8 and XV, with the exception of XV5AC being okay.



MAXIMIZE YOUR AMATEUR RADIO MONEY.

What new 2M FM gives me most for my money, performance vs. price? The answer's as clear as the superb reception you'll get on the new Standard 826MA, 10 watt, 2 meter FM transceiver. You'll find such outstanding features as 12 channels — with the four most popular ones included — and a RF output meter with selection of 10 watts or 0.8 watt for battery conservation. And of course, our "Astropoint" system that assures: top selectivity, great sensitivity, and rejection of unwanted signals on today's active 2M band. **Helical Resonators** & FET front end provide the performance needed for tomorrows crowded channels. Provision for **tone coded squelch** to activate modern repeaters. A radio that won't become obsolete. Occupies less than 200 cu. in. Weighs less than 5 lbs. It has all the same "Astropoints" as entire Amateur line.

NEW 22 CHANNEL BASE STATION

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Ultimate in a 2M FM Transceiver features:

- ☐ 22 channels
- ☐ AC & DC supplies Built In
- ☐ 10W (1, 3 & 10 selectable)
- ☐ Receiver offset tuning
- ☐ VOX
- ☐ Three Front Panel Meters
- ☐ Plus many more exciting features.

For detailed information on these; the complete Standard line and the name of your nearest dealer write:

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SSTV SCENE

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

A leading topic among Slow Scanners is scan conversion, or scan converter units. Here two basic techniques are possible. Digital IC circuits may be utilized to convert a TV signal into bits of information that are then "written" into an IC memory unit at one scan rate, and "read" out of the memory unit at another scan rate. Naturally, this "digitalized TV information" method can be designed to convert any desired scan rate – fast to slow, or slow to fast. K7YZZ, WØLMD, W6MXV and possibly some others are presently working on this type fast to Slow Scan converters, and the results I've seen have been very good.

The other method of scan conversion employs scan converter tubes. These are specially manufactured face-to-face "vidicons" sharing a common target (sketch in Fig. 1). One end acts like a CRT, projecting a picture on the storage target, while the other end independently scans this stored image, similar to conventional TV camera methods. Now we can feed a

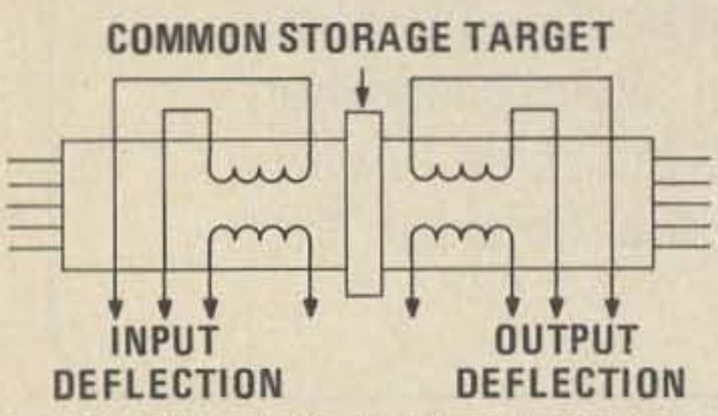

Fig. 1. A "face to face" vidicon for scan rate conversion.

picture of one scan rate in one "vidicon" (side) and output this at another scanning rate on the other side. W9NTP and SMØBUO are working on a converter like this as a joint project. Don displayed his Slow to Fast Scan converter this year at Dayton. The unit used a Thompson TME 1238 single gun storage vidicon (French made) and converted Slow Scan to Fast Scan. The picture was displayed on a regular TV. Results were good under the circumstances. Don threw (literally!) the unit together right before Dayton and didn't have time to work out a few bugs (noise in video). By now the unit is probably working perfectly.

J&R have been quite busy lately. Their gear now boasts optional oak wood cabinets or conventional Heath-style cabinets. No difference in price for either cabinet. Another change is the 8NP7 crt in the monitor. Since approximately 4½ inches square of the screen is used and the "bell" is aluminized, the pictures are fairly bright. In fact, the intensity can be high and "blooming" of whites is extremely low. (This clever idea might help some of you with adapters and scopes that use crt's without accelerators. Instead of using all 5 inches of the screen, lower the horizontal and vertical size pots to display only a 3 inch square picture . . . brighter, eh?) It's difficult to improve on circuitry like the 'mxv monitor, and it's good to see J&R hasn't made any radical changes here.

Their low light level camera does a superb job, even with average room light. Also, the automatic light compensation is nice when working with differently illuminated scenes. Very good definition is accomplished, probably due to the elaborate sampling method used. The camera also included ¼ frame scan, video inverter, built-in gray scale (flip and it's even in the middle of your picture . . . for proper light level calibration) and built-in power supply. Very nice gear.

Investigation is presently being conducted on replacements for the only electron tubes necessary in modern TV gear; the camera pickup tube and the cathode ray (picture) tube. One example is the recently introduced surface charge transistor (which may prove quite interesting in Slow Scan applications). This microminiature light-sensitive semiconductor device is being considered for use as solid state fast scan camera "tubes," using a computer-manufactured "string" of these to make up 252 lines, and scanning through this matrix with digital logic circuits. Slow Scan would be a natural here, since only a small 120 line matrix would be required, and conventional circuitry could be used (no sampling techniques or deflection yokes, either). Watch for more info on these sct's soon. Also, plasma panels (those ¼ million neon lamp panels) can be used to replace picture tubes in basically the same way. A Slow Scan monitor, interfaced with a plasma panel unit encoder, can scan through these lamps, thus reproducing the SSTV picture. WØLMD is presently investigating the plasma panel display concept.

How many of you DX operators would like to get in on the action of Slow Scan? Suppose a U.S. station made you a tape to transmit over your rig (of pictures, sketches, ID's, etc. you send him). Another Slow Scan station with a SSTV to Polaroid setup could take your "received off the air" tapes and send the confirmation photos back to you. You gain Slow Scan QSO's, others gain a new country on Slow Scan. This column can serve as a central point to get the idea going. If you can help make tapes or photos from a monitor, let me know. Likewise, interested DX stations let me know! I'll put you in touch and we will include a list of the groups in this column. Why don't you interested DX ops drop Wayne W2NSD/1 or me a letter explaining your rig, customs problems, postal procedure, etc., and let's see if we can't get you on SSTV.

We hope soon to have photos from VK5BS after his Fiji trip. (Maybe he can also convince them to try SSTV!) Incidentally, Australia's foremost SSTV group, the Eastern and Mountain Radio Club (John VK3LM, president) gathers Sundays at 0100 GMT on 14.230 kHz for their SSTV net.

Quite a few of the Slow Scan gang are presently setting up to copy pictures from our weather satellites. Facsimile communication is just interesting enough to catch Slow Scanners' fancy as a nice sideline. Basically, this consists of connecting a slightly modified fax machine (like those surplus desk fax units) to a receiver tuned to the satellite. The satellites operate around 136 MHz. A high gain directional antenna, like a helical, and pre-amp, finishes off the setup. Of course, there are problems, like Doppler shift, etc., (30 kHz bandwidth best) but one should still get fair results using a repeaked 2 meter rig, like maybe a TR-22. Info is still rather scarce on this, and some of the fellows working on it (WA7MOV, WØOQC, W7FEN and WB8DQT) may be too busy for much correspondence. Hopefully, by the time this appears in print, I will have copies of your info. (Plus a satellite monitor going myself!) If you're anxious for more info, drop me a note and SASE, and I'll try to help you.

K4TWJ

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA

FCC CRACKDOWN

The headline in the Van Nuys News of Tuesday, June 26, 1973, just about

LOOK INTO OUR CRYSTAL AND SEE BEYOND 2 METERS

The new 220 MHz Clegg FM-21 transceiver has a unique triple-duty crystal feature and offers you a chance to get away from to-day's 2 meter crowd. The FM-21 uses just 1 crystal in any channel. One crystal gives you a separate transmit and receive frequency plus automatic 1.6 MHz programming in the repeat mode. Our Crystal Saver Frequency Control is just one of the big pluses you get with the FM-21, another all-American made quality rig from Clegg. For the whole story, see your Clegg Dealer or call or write us now for detailed data sheet and escape from the 2 meter crowd.

Amateur Net $299.95

NOTICE
ALL NEW REPEATER LEASING PROGRAM AT SPECIAL LOW, LOW CLUB PRICE
CALL OR WRITE TODAY FOR DETAILS

CHECK THESE SPECIFICATIONS

GENERAL

POWER REQUIREMENTS: 12 to 14.8 VDC
Standby Current: 120 Ma.
Receive Current: 450 Ma.
Transmit Current: 1.5 Amps. Max.
FREQUENCY RANGE: 220 to 225 MHz
Power output down less than 2 db at 220 MHz
DIMENSIONS: 7" wide x 2¾" high x 9" deep.

RECEIVER

SENSITIVITY:
.25μV (Max.) for 12 db SINAD
SELECTIVITY: Adjacent channel (40 KHz) down 50 db
AUDIO POWER: 1.5 watts at 10% THD to internal or external speaker
SQUELCH: Noise actuated, adjustable threshold. .2 to 2μV min. range
MODULATION ACCEPTANCE: ±7 KHz
POWER OUTPUT: 8-10 watts (min.).
MODULATION: PRE-EMPHASIZED FM with deviation adjustable from 0 to 7 KHz. Adjustable speech clipping up to 10 db.

ISC Clegg DIVISION

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blew my mind. It read "U.S. Raids Radio Operators on Citizens Band in Valley." Mr. Jeffrey B. Young, who supervises the FCC special enforcement facility in Santa Ana, disclosed today that his agency had spent June 20 to 25 monitoring CB activity here in the valley, "raided" some 60 stations and had found that some forty of these were in violation of the rules. Mr. Young told the press that while no formal written notices have been issued at this time, violators have been verbally informed of their violations, and that formal written notices will be issued within a month. Most will be cited for failure to properly identify call sign, failure to observe the 5-minute time limitation on transmission, over-height antennas and of course running a bit over the power limit.

In case you are wondering what action the Commission can take in these cases here is the answer according to Mr. Young. Licensed violators face up to a $500 fine and revocation of their license. As to the unlicensed variety (about one-third of those caught fell into that category), they face action by both the Justice Department and the FBI, if the Commission chooses to turn the matter over to them. It is interesting to note that the crackdown is a direct result of complaints from the general public about excessive TVI problems and from legal users of CB who were sick and tired of the abuse they were suffering at the hands of the multitude of illegal operators. I was also gratified that Anne Hilker, author of the article in the newpaper, went to the trouble of explaining that it was Citizens Band operatiors, not hams, who were the source of the problem and subsequent investigation. She is to be commended for a good job of accurate reporting.

Many of us are equipped to track down "hidden transmitters" and still others own CB radios. Let the FCC know about violations in your area. According to Mr. Young, the crackdown out here is part of a nationwide effort to rid CB of those who would abuse the privilege. Hopefully in the near future "Monkey Man," "Fisherman," and their cronies will be part of the past.

220 Report

The Southern California Repeater Association held its meeting in Anaheim June 30th, and announced its proposed 200 band plan. Here is the way they have opted to go, as reported by Dave Glawson WA5CGR, with fills from Dick W6OLD, who covered the meeting while I was busy at the salt mines.

220.00 to 220.30 allocated to CW, AM, SSB, EME, DX.
220.30 to 222.00 allocated to remote control and aux-links for repeaters.
222.30 to 223.40 allocated to repeater inputs.
223.40 to 223.90 allocated to FM simplex.
223.90 to 225.00 allocated to repeater outputs.

Repeaters will use a 1.6 MHz split with an initital 40 kHz separation. However, it was also adopted that separation will be split to 20 kHz if there is a large demand for repeater channels. It is hoped that manufacturers will note this and design equipment that will work well, using the aforementioned 20 kHz separation.

Northern California

Up to this time, LW has concentrated on the area in and around Los Angeles. Now, through the efforts of Jerry Walker WA6LLX, LW can bring you some information on what's taking place up north. The following is an excerpt from a recent letter:

"Coordination is by the California Amateur Relay Council, Northern Section. The CARC is well thought of in the north and the coordination efforts are supported by member and non-member repeater groups alike. Location, power, expected coverage, possible mix frequencies and feelings of adjacent channel users are all considered before frequencies are recommended. The CARC North has a couple of things going for them in this effort. Northern California FM started out repeater-oriented as opposed to the south which began remote-base oriented, and repeater growth has been slow enough to allow a complex coordination effort to work.

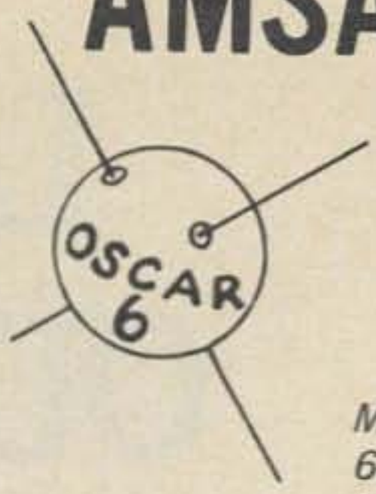
Twenty-four hour operation is practically non-existent. Most repeaters operate only when a licensed control point is available to monitor. This limits most operation from about 6 a.m. to midnight. Most 34–94 repeaters are 24-hour operations, serving as calling and traffic signals.

Repeaters I found particularly friendly are WB6TSO (22/82) St. Louis Obispo, WB6AAE (22/82) S.F.–Oakland, and WB6ZTA (34/97) Lake Berryessa, north of S.F. Bay. ZTA has exceptional coverage across the Sacramento Valley and into the Sierra along I-80. K6GWE will soon operate from the top of Mt. Tamalpias in Marin County and should do exceptionally well."

LW would like to hear from others in Northern California, so get out those typewriters and send me some info.

WA2HVK/6

AMSAT NEWS



Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Oscar 6 now has no less than five operating awards that are being offered for satellite work. They are in order of difficulty:
Satellite Communicators Club
WVE Satellite AWARD
Satellite DX Achievement Award
OSCAR 6 WAS (Worked All States)
GQ DX Award OSCAR Endorsement

Oscar 6 has been a great success in many fields and has contributed much in the way of space research. One of these new finds has been christened "INVERTED DOPPLER." More will be discussed about this subject later.

Marc Pressman WB4DRB, has developed a computerized AMSAT OSCAR 6 Communications Information Retrieval System which lists participating stations, states, and countries that use OSCAR 6. You are invited to send your lists to AMSAT so they can keep an up to date record of QSO's through OSCAR 6. Reports from stations in IARU Regions 1 and 3 are particularly needed.

AMSAT NETS

East Coast 75m AMSAT Net
Mondays 9:00 p.m. PDT (0300 Z Tuesday), 3850 kHz, Net Control, W6DMN or W6BGJ

International 20m AMSAT Net
Sunday 1800 Z, 14280 kHz, Net Control: W3ZM or others

International 15m AMSAT Net
Sundays 1900 Z, 21,280 kHz, Net Control: W3ZM or others

European 40m OSCAR 6 Net
Sundays 0930 Z, 7070 kHz

European 80m OSCAR 6 Net
After Passes on ON days, 3780 kHz

In addition, the frequencies 3855 kHz and 14,280 kHz are being used as general watch frequencies for satellite information after passes.

In the Washington area AMSAT traffic is handled via 2m FM on 146.85 MHz simplex and through the AMSAT repeater 146.25/146.85 MHz. Those interested in satellites in other parts of the country are urged to use these same frequency combinations where possible. If a repeater is already on 25/85, get on it. If not, try to set one up or use 146.85 simplex. This

way we can all communicate more easily among each other when traveling.

The regular operating schedule of OSCAR 6 is now as follows:

ON – Available for two-way contacts; 0000 Z - 2400 Z Thursdays, Saturdays and Mondays.

OFF – or if ON, not available for two-way contacts: 0000 Z - 2400 Z Fridays, Sundays, Tuesdays and Wednesdays.

ON – not available for two-way contacts for about three minutes approximately ten minutes after the first ascending node (N-S equatorial crossing) on each scheduled OFF day.

This operation is for the purpose of collecting telemetry data. Those copying telemetry data at any time are urged to send the *raw* numbers to: AMSAT Telemetry Data Dept., P. O. Box 27, Washington, D. C., 20044, USA.

Modifications to this schedule will be made should it become necessary or if special operating situations make it desirable. Also, the operating schedule may be extended for DXpeditions and other worthy causes.

Word on schedule changes and other pertinent data can be obtained from any of the following sources:

AMSAT Nets, see above
AMSAT Hot-Line (301-654-1166)
W1AW Bulletins
AMSAT Bulletin Stations VE2BYG, KLHTV, W3TMZ and K7BBO. (These stations transmit on the Satellite on about 29,500 kHz on the reference orbits.) A reference orbit is the first orbit of each Greenwich day, the same orbit during which the satellite is turned ON briefly for telemetry recordings on OFF days.

ORBITAL INFORMATION

REV	DATE	TIME Z	LONGW
4012	Sept 1	o147.5	74.3
4024	Sept 2	0047.5	59.3
4037	Sept 3	0142.4	73.0
4049	Sept 4	0042.3	58.0
4062	Sept 5	0137.3	71.7
4074	Sept 6	0037.2	71.7
4087	Sept 7	0132.1	70.5
4112	Sept 9	0127.0	69.2
4124	Sept 10	0026.9	54.2
4137	Sept 11	0121.8	67.9
4149	Sept 12	0021.8	52.9
4162	Sept 13	0116.7	66.6
4174	Sept 14	0016.6	51.6
4187	Sept 15	0111.6	65.3
4199	Sept 16	0011.5	50.3
4212	Sept 17	0106.4	64.0
4224	Sept 18	0006.3	49.0
4237	Sept 19	0101.3	62.7
4249	Sept 20	0001.2	47.7
4262	Sept 21	0056.1	61.5
4275	Sept 22	0151.1	75.2
4287	Sept 23	0051.0	00.2
4300	Sept 24	0145.9	73.9
4325	Sept 26	0140.8	72.6
4337	Sept 27	0040.7	57.6
4350	Sept 28	0135.6	71.3
4362	Sept 29	0035.6	56.3
4375	Sept 30	0130.5	70.1

. . .WB8LBP

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

WB5CHN of Duncanville, Texas says the DX season started slowly from that area with the only "real DX" being KP4DKE and KP4AHQ. Things were not all bad for Jim, he did manage to work Mississippi for state #47 leaving only KH6, KL7 and Idaho for WAS. I heard Jim on the air since receiving his letter and found he was sporting a linear of the type in the July 1969 issue of 73. It sounded great here and brought the signal up about 12 db. . . Wayne WB9IHE writes from Fairview Heights, Illinois to say he worked two openings June 27th, one to Arizona (WA7RRT and W7LED) and another to the East coast. Wayne runs a TR-106 to stacked 3 element beams. . .you will find him around 50.4. . .WB9AYO, Bob, is a neighbor in Collinsville, Illinois. . .Bob is getting set up for 6 Meter CW and is interested in working some Aurora. If he is not careful K9YNN, W9EVD and WB9JGR from his area will beat him to the punch. . .WA2JQD is now WB4EQO and has worked 40 states in 3 weeks with the new call. . .WØNRI worked Vermont (WA1JEX) for state number 50. WB6NKO made the magic 50 too, working Maine (WA1EXN). Congratulations to both on accomplishing what to most of us is an impossible task. WA1EXN must hold the record for completing WAS for others. . .he will have some help in the future, W1YTW and WA1OJB have been active from Maine in the past weeks. . .W2IDZ was most amazed when I told him the "Lil Lulu" transmitter he designed 15 or so years ago was being sold in kit form by one of the big surplus houses. . .W4GDS mentioned hearing many South American commercial signals below 50 MHz but no sign of amateur activity . . .I had a nice crossmode QSO with Bruce WA2KJJ. He copied my SSB better, I copied his Clegg 99'er better on my AM transceiver. . .W1GAO says the Boston area had excellent double-hop openings during late June. Kevin worked W7FN, K6GHC and a host of others from Seattle to Southern California. . .WA5MZW (Bill) and WB5DKG (Ruth) were married June 23rd, WB5CTS and WB5DSH were groomsmen. . .passed along by Art WA1EXN who also mentions having worked 8P6EN July 8th and 21 days of Es during June. Art recently received an award, a photograph of which I hope to be able to publish next month. . .Forrest K4YPO says he worked 10 states in one evening with his New SBE SB-50, not bad for 10 Watts. . .Wally WA2BLM, who also signs WA1IWK and WB4MZN, is putting up 11 elements on a 47' boom and hopes to have it operational for the September Sweepstakes. . .this is from the Bridgeport, t, Vermont QTH. . .The rig is s Swan 250C. Those needing Vermont please take note.

Karl Braun, Bauvereinstrasse 41-45, D-8500 Nuernberg, Germany, manufacturers a 6 Meter converter, the model DGTC26, even though 50MHz is not allotted to the amateur service in Germany. With the almost total lack of converters "Made in USA" perhaps some readers would be interested in this unit. The DGTC26 measures 10 x 5 x 2.5cm and weighs about 70 grams. The input and output impedances are 50-75 Ohms and the i-F is 28-32 MHz. 12 V at 25 mA provide 25 dB gain at a noise figure of less than 3 dB. The circuit consists of two RCA 40673's (dual-gate MOSFET) as RF and mixer with a bipolar oscillator. Zener regulation is also provided. The price is DM 122 or about $38 at the exchange rate prevailing at the time of this writing.

Several columns ago reference was made to a letter received from Geoff Wilson-VK3AMK. Geoff explained the 6 Meter situation in VK land quite well and I still intend to publish this letter in a future column. The problem has been the Es season. So much has been happening of late that there simply has not been enough space to give this letter justice. When the Es dies a little we will run the whole letter. The same situation described above holds true for several other items. All will make good reading on a cold winter night.

WAØABI

I Q N L S I Y V J S N R U S M R

G R C C T Y R C K S N L

G S C N R T M C !

73 REPEATER ATLAS REGISTRATION

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

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

USEFUL RANGE (RADIUS)

EQUIPMENT

ANTENNAS & HEIGHT

☐ SPLIT SITE

☐ DIPLEXER

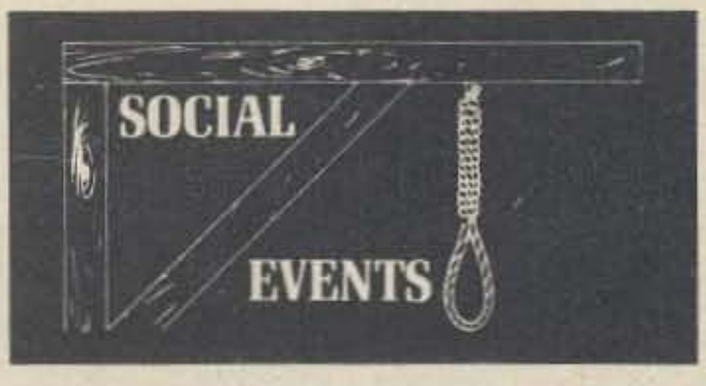
REPEATER GROUP/SPONSOR	TRUSTEE	ID–TYPE OR MFR.

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

DATE	SOURCE (NAME/CALL)	SPECIAL OR EMERGENCY FUNCTIONS

You're missing half of the ballgame if your name isn't on the program . . . KEEP THOSE UPDATES COMING!!

AZ	WR7ABH	TUCSON	146.28-146.88
CA	WR6AAA	CATALINA IS.	147.67-147.09
CA	WR6AAC/6	L. A.	146.37-146.97
CA	WR6AAD	OAKLAND	147.96-147.36
CA	WR6AAE	OAKLAND	146.22-146.82
CA	WR6AAB	L. A.	146.01-146.61
CA	WR6ABC	CLOSED	
CA	WR6ABD	SAN JOSE	146.04-146.64
CA	WR6ABE	MT. WILSON	147.435-146.40
CA	WR6ABJ	L. A.	146.07-146.67
CA	WR6ABM	OAKLAND	146.22-146.82
CA	WR6ABN	MT. LEE	147.84-147.24
CA	WR6ABQ	MT. DISAPPOINTMENT	147.87-147.27
CT	WR1AAE	LITCHFIELD	147.76-146.76
CT	WR1AAF	OXFORD	147.49-146.49
CT	WR1ABD	GROTON	146.07-146.67
CT	WR1ABE	BRIDGEPORT	146.295-146.895
CT	WR1ARM	AVON	146.28-146.88
CT	WR1ABT	NEW HAVEN	146.01-146.61
GA	WR4AAE	ATLANTA	146.22-146.82
GA	WR4ABC	ATLANTA	146.37-146.97
GA	WR4ABD	MABLETON	146.13-146.73
IA	WR0ABD	DUBUQUE	146.34-146.94
ID	WR7ABA	BOISE	146.28-146.88
IL	WR9AAA	JOLIET	146.28-146.88
IL	WR9AAD	MURPHYSBORO	146.25-146.85
IL	WR9ABB	HINSDALE PL 107.2	146.07-146.67
IL	WR9ABH	WESTERN SPRINGS	223.30-224.90
IN	WR9AAC	FT. WAYNE	146.28-146.88
KS	WR0ABB	WICHITA	146.22-146.82
KS	WR0ABK	WICHITA	146.34-146.94
KY	WR4ABO	MURRAY	146.34-146.94
MA	WR1AAA	MALOEN	146.31-146.91
MA	WR1AAC	SALEM	146.28-146.88
MA	WR1AAH	MARLBORO	146.01-146.61
MA	WR1ABB	FRAMINGHAM	147.75-147.15
MA	WR1ABG	WEBSTER	146.28-146.88
MA	WR1ABI	FALL RIVER	52.010-52.700
MA	WR1ABJ	WESTON	146.28-146.88
MA	WR1ABN	WALPOLE	147.49-147.09
MA	WR1ABP	BILLERICA	147.72-147.12
MD	WR3ABB	GREENBELT	146.28-146.88
MD	WR3ABC	CHEVERLY	146.01-146.61
MI	WR8AAA	MILFORD	146.19-146.79
MI	WR8ABI	KALAMAZOO T2100	146.34-146.94
MO	WR0ABH	ST. LOUIS	146.28-146.88
MO	WR0ABI	SAVANNAH	146.25-146.85
			146.10-146.85
NC	WR4AAA	SALISBURY	146.28-146.88
NC	WR4ABF	SHELBY	146.28-146.88
NC	WR4ABK	CHARLOTTE	146.16-146.76
NC	WR4ABL	GREENSBORO	146.16-146.76
NC	WR4ABP	GRIFTON	146.16-146.76
NC	WR4ABT	CHARLOTTE	146.28-146.88
NC	WR4ABX	LEXINGTON	146.31-146.91
NC	WR4ABY	HENDERSONVILLE	146.04-146.64
NC	WR4ACA	WINSTON-SALEM	146.04-146.64
NC	WR4ACF	RALEIGH	146.04-146.64
NH	WR1AAB	PETERBOROUGH	146.19-146.79
			222.34-223.94
			444.10-449.10
NH	WR1ABQ	DERRY	146.25-146.85
NH	WR1ABU	CONCORD	146.34-146.94
NJ	WR2ABM	WOODBRIDGE PL	146.22-146.82
NJ	WR2ABN	OAKLAND	146.10-146.70
NJ	WR2ABR	TOMS RIVER	146.31-146.91
NM	WR5ABG	LAS CRUCES	146.16-146.76
NY	WR2AAA	MANHATTAN	147.73-146.73
NY	WR2AAB	YONKERS	146.31-146.91
NY	WR2AAC	MANHATTAN	147.84-147.24
NY	WR2ABB	FISHKILL	146.37-146.97
NY	WR2ABE	PORT CHESTER	146.34-146.94
NY	WR2ABL	ELMIRA	146.10-146.70
NY	WR2ABQ	L. I.	147.63-147.03
NY	WR2ABS	BINGHAMTON	146.22-146.82
OH	WR8ABE	MIAMISBURG	146.22-146.82
OR	WR7ABE	PORTLAND	444.17-449.17
PA	WR3AAA	FREEDOM	146.25-146.85
PA	WR3ABD	RICHBORO	146.19-146.79
RI	WR1AAG	PROVIDENCE	146.10-146.70
SC	WR4ABM	LANCASTER	146.10-146.70
TN	WR4ACI	MANCHESTER	146.10-146.70
TX	WR5AAA	HOUSTON	146.28-146.88
TX	WR5ABB	SEGUIN	146.34-146.94
TX	WR5ABC	VICTORIA	146.16-146.76
UT	WR7AAA	CEDAR CITY	146.34-146.94
VA	WR4ABU	LYNCHBURG	146.01-146.61
WA	WR7ABC	RENTON	146.22-146.82
WI	WR9AAE	CEDARBURG T 2250	146.37-146.97
WV	WR8ABB	FAIRMONT	146.28-146.88
JORDAN			
JY	JY73	AMMAN	146.34-146.94



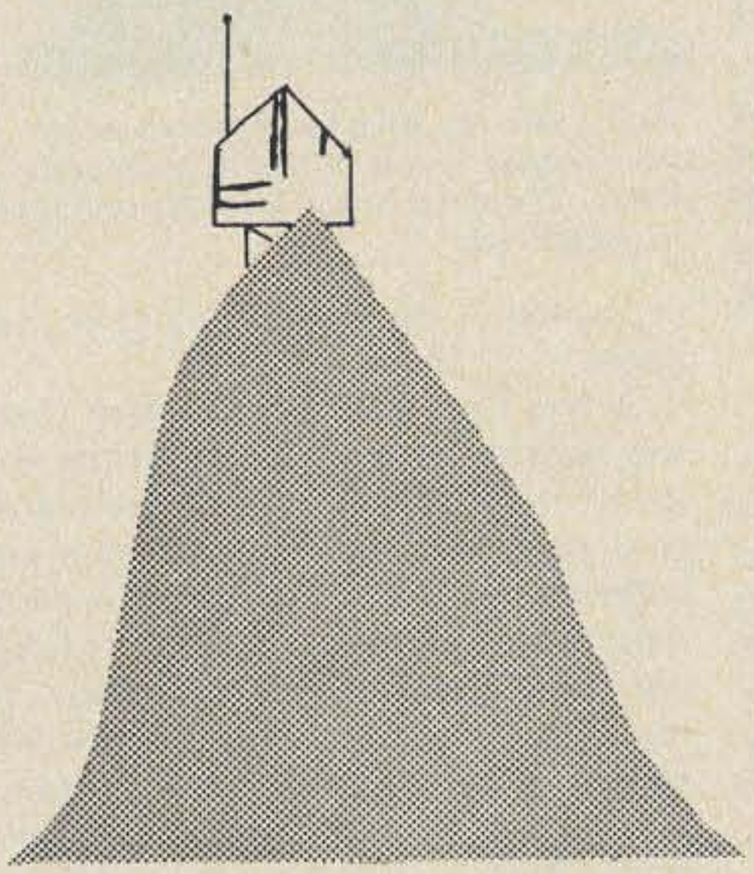
MARA AUCTION

The Massasoit Amateur Radio Association of Hanson, Mass. will hold its annual auction. The date will be September 15, 1973 at 7:30 PM. The location will be The American Legion Hall, Hanson, Mass. Talk in on 6m, 50.40 MHz. Talk in on 2m, 146.94 MHz. For further information contact: Albert Jones, WA1OEY, Parsonage Street, Apartment 10, Marshfield, Mass. 02050. (617) 834-7637.

(Continued on p. 95)

REPEATER OWNERS

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



REPEATER USERS

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

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Crystal Park, Chickasha, Oklahoma 73018

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TWX-910-830-6425

JORDAN

A Report by Wayne Green W2NSD/1 on his recent trip to the Hashemite Kingdom

Back in 1966 I made a trip around the world, speaking to as many officials of smaller countries as I could, emphasizing the importance of amateur radio to the development of their countries. I spoke to the Secretary General of the ITU on this and, though everyone agreed with the concept, not much of a concrete nature came from my talks.

It is no accident, I feel, that the technical development of nations is parallel to the number of amateurs in those countries. Technical development depends on communications – as does all government and business – and communications in turn depends on having the people to plan, install, operate and service the communications systems. It is odd, but without some sort of technical hobby to attract teenagers, the pattern is that virtually everyone goes through school thinking in terms of working as a clerk, or perhaps as a doctor, lawyer or accountant. The idea of technical careers never seems to occur to them.

Wayne with the Arab headdress (shamagh) at the entrance to part of the Crusader castle at Karak. The sun is bright, but it's not hot due to the altitude.

JY1Appears

Early in 1970 I began to get reports that His Majesty King Hussein was occasionally appearing on the air and getting clobbered by eager DXers who "needed" Jordan, even if it meant trampling a king to get it. I sent a cable to him offering to come over and work a few thousand frantic country hunters and hopefully take a bit of the pressure off. That was a magnanimous offer, wasn't it?

Much to my amazement I got a return cable saying yes. I quickly packed my toothbrush and got over to Amman as soon as I could – and found myself sitting at the royal ham station working a cacophony of DXers for several hours every day. I spent two weeks and had somewhat reduced the pressures by the time I had to get back to the magazine.

During this time I also took a few hours out to sit and talk with HM, as he is called. And, among other things, I brought up the Green manifesto of encouraging amateur radio in order to get teenagers interested in technical careers. HM seemed to like the idea and arranged a meeting of the top government officials involved and I explained it to them. Things looked good.

A few days after I left Jordan there was another attempt on HM's life and then came the hijacking of the planes to Jordan and the resultant civil war between the Jordanian army and the Palestinian guerrillas. Though I didn't see how HM could do much to impliment my ideas while all this was going on, I did sit down and write up a proposed set of amateur regulations for Jordan – printed up a hundred copies and sent them on over with my fingers crossed.

JY1 Calls

One day, after making a slow scan contact with Athens, I got a call from JY1. HM was coming to the States and would like to meet me. This was last year. Lin and I met HM in Washington and were invited to come to Jordan to see what had been done to follow up on the development of amateur radio there.

My trip to Navassa and other commitments kept me from dashing right over and we finally got together on an appropriate time for my visit this spring. With the trip set for June I was a bit concerned about the weather – afraid that it would be miserably hot and detract from our seeing the country. I consulted an almanac and was frankly surprised to find that we could expect virtually perfect weather – and climate. The high temperature was listed as 84°, the low as 62° and the average as 73°. What better possible portent could I ask? The almanac also promised 30 days of sun for June so I didn't need any umbrella or raincoat. I took them anyway.

Before leaving I managed a couple of contacts with JY9BB in Amman and I got the distinct impression that there would be no serious objections to my bringing along a two meter repeater and some HT's. I decided to take along a Standard repeater and began looking around for one. A&W Electronics had one on hand that had been used for a while with the WA1MHN group in Boston on 07-67. They retuned it to 34-94 for me and we picked it up for me to take to Jordan.

Standard, sensing the importance of having this repeater work right, got into gear and called up to ask that we not take the A&W unit, since they had not had an opportunity to tune it at the factory to 34-94, and to let them send one by air that was factory adjusted for the job.

As the time to depart neared I suddenly realized that I should take along some sort of personal gift for HM. What do you give the king who has everything? I think Lin finally came up with the idea of getting him a menu board and white letters for it to use with his slow scan station at the palace. I checked with JY9BB to make sure that HM didn't have one of these – and got the okay.

My fingers walked through the Yellow Pages until I found a company that makes menu boards and letters and I phoned in the order.

After many phone calls and urgings, everything came together and I was off to London on my way to Amman – with a suitcase full of repeater and transceivers in tow. I also had a big bunch of HEP IC's, courtesy of Motorola, to give to the amateurs of Jordan to help them with their building projects. I also threw in some bags of parts gleaned from the Peterborough Honeywell plant – end of the line parts when they finished some circuit board projects. I was more than a little concerned about

what British customs would say when they got a look at the mass of radio gear and parts.

My flight to London was without incident – Pan Am 747 – disappointing food. For some reason the American lines don't seem to be able to make it on food quality like most of the foreign airlines.

When I arrived in London I tried hard to get my radio suitcase transferred to Alia, the Royal Jordanian Airline, so I wouldn't have to take it through customs. No good – it seems you can't transfer luggage for flights leaving over six hours later – and mine was two days later. Sigh. So I headed for the baggage and customs end of the airport and the prospect of massive official complications.

Surprisingly enough my luggage was already going around on an endless track when I got to the customs area. I loaded it on a shopping cart and went through a door marked "nothing to declare." The next thing I knew I was out among the buses and throngs and my customs worries had turned out to be needless – like most worries.

While wheeling my cart around the airport trying to follow the damned arrows to the taxi stands I happened by chance to swing by the Pan Am bus and was sucked up into it and eventually deposited in downtown London a few blocks from my hotel destination. That saved me a bundle.

In most cities I immediately get in touch with the amateur radio society, but after an incredibly painful experience with Sylvia Margolis ten years ago – which person, though not a ham, became the official greeter for the RSGB – I have avoided contact with RS and have in general done everything in my power to avoid ever having to even visit London, much less take a group there. Pity, too, because I do have a lot of very good friends in London and I really should overcome this peevishness and look my friends up when I visit.

Lin and I did get around to see a couple of shows – Private Lives by Noel Coward and Habeas Corpus with Alec Guinness. Then it was off to Amman and the real trip. Lin likes London and tries to get over there whenever she can. She likes it probably as much as I dislike it.

We checked in early for the Alia flight to Amman. It goes twice a week and we were on the Sunday flight. There was a short delay before leaving while some VIP's arrived and filled up what was left of the first class compartment. Lin and I, as guests of HM, were travelling first class. We were a little worried since the captain of the plane had at first apologized that he had no room for us in first class since he was holding the space for guests of HM. I said we were guests of HM and that seemed to take care of it. But still I suspected there might be other more important guests. There were.

The other seats were taken by Princess Muna (HM's ex-wife), her mother and father, and her children, plus a couple of aides. We made an unscheduled stop at Geneva to pick up the Queen Mother – and then we were off again to Jordan. I'd like to tell you about all of the ham talk with PM (JY2), but the fact is that she either didn't remember me from three years ago or was too wrapped up in her own problems and we didn't get even to the nodding stage of meeting.

King Meets Plane

On my last visit to Jordan I arrived via Alia from Beirut and, as we taxied up to the terminal, the Jordanian beside me leaned over and said, "Look, there is our king, come to meet the plane." While this was a lot more than I ever expected, I was able to take it in my stride – and, fortunately, keep quiet – for when I sort of chucklingly asked who the king had come to meet, the answer was, "His sister is on this flight." I was met by an aide, given the VIP treatment, and put up in the Intercontinental Hotel as a guest of HM.

This time HM met my plane again – greeting his family. Once that was over Lin and I got off and met our official greeters – JY9BB, Blackie (W4TA) and his wife Martha, Hisham Ansari JY5HA, the head of the Royal Jordanian Radio Amateur Society, and other dignitaries. Hisham, who was to be in charge of us for the duration of our visit, was instantly likable and full of good humor.

It would be unfair not to mention the fantastic feeding job Alia did on the trip down from London – what a difference from the food on Pan Am! It started with a choice of salads and then cold hors d'oeuvres such as roast beef, turkey, potato salad, paté, apple salad, nut salad, orange and pineapple salad. It would have been easy to make a meal of these alone – you could take as much as you liked.

The main course came next as they wheeled another wagon load of food out – with the choice of duck a l'orange, veal marsala, lamb chops, veal chops, lobster gratiné, chicken, and a wide variety of vegetables, rice, etc. I chose the duck and was not displeased.

For dessert they sent around another wagon – take as much as you like – peach melba, chocolate layer cake, fresh strawberries with whipped cream, a delicate chocolate pudding with whipped cream blended in, cheese and fruit.

Since the Queen Mother and Princess Muna, as well as HM's children were on this trip, I suspected that they might have gone all out on the food. A later flight to Egypt without the VIPs sported just as varied a menu and just as well done, so apparently that is standard fare for Alia. It is food for a king.

The time in Amman is six hours later than Eastern Daylight Time, so Lin and I went to bed as early as we could to work on the time change. Eleven at night there is only 5 PM back home so the result was that I spent virtually the entire night tossing and turning, eyes wide as saucers. Along about 6 AM (midnight at home) my eyes finally closed in sleep. About 7 AM it was time to get up and get ready for a very busy day. The two meter rig came alive as JY9BB

Wayne JY8AA and JY1.

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The cabanas and swimming pools, part of the Jordan International Hotel.

called in on 94 direct to let me know that the tubes I'd brought him for his Gladding were both bad – and the repeater receiver didn't work. It was going to be a good day.

Lin and I yawned through breakfast in the Intercontinental Hotel coffeeshop – eating western style eggs – I must remember not to order sausage again – I'd forgotten about that – it is Vienna sausage and not exactly what I had in mind to go with breakfast eggs. As we finished up breakfast we found Hisham waiting for us with Blackie JY9BB and his wife Martha for a visit to Hussein Youth City and a mapping out of the details of our visit.

Blackie JY9BB and Prince Raad JY3HC.

At the Youth City we visited with Ibrahim Ayoub JY4IA, the top signal officer and an active ham – and we met Prince Raad JY5HC and tried out the station which he has in his office. We heard Raad on the air several times during the visit to Jordan and worked him a couple of times – so watch for him, he's very active.

From the Youth City we drove on up to the Jordan University and visited the club station there and met a few of the amateurs who were not involved in their final exams at the moment.

The station at the University JY6UJ consisted of a Collins KWM and the log showed not only a lot of activity from the station, but considerable good DX. Those fellows keep that rig going. There are 26 amateurs in the club, including 3 YL's! The shack is set up in its own separate building, which is excellent for the purpose and permits the members of the club a lot of freedom.

From the University we drove north of Amman a few miles to the ruins of Jarash. 30 miles. These were discovered in the 20's after having been covered by dust and sand for some 600 years. Jarash was one of the early Greek-Roman provincial cities and was in its peak in the first and second centuries AD.

We walked among the ancient columns, walking the same streets once busy with iron wheeled chariots – where there are two sets of Roman baths – a great oval forum – three theaters – thirteen churches – fountains – triumphal arches – even the remains of the street drainage system is still visible, complete with first century manhole covers.

Lunch was served in the Jarash resthouse. We had a dish called musakham – a broiled chicken dish that was finger-likkin' good, to coin a phrase. They take a young fryer, flatten it out and broil it on a thin loaf of Bedouin bread – with pine nuts and some sort of chili-type powder sprinkled all over it. Yum. The chicken fat seeps into the bread and the whole thing keeps you eating far beyond normal limits.

Lunch, we found, normally came on about 2 PM, and it was so huge that our appetite didn't return until along about midnight, if at all. Lunch usually included a nice tomato salad and the usual Arab dips – humus ba tahini, a delicious mixture of mashed sesame seeds and chick peas with olive oil and lemon juice – babaghanoush, a mixture of fried egg plant, olive oil and lemon – and some other varying dips, all good.

Not having slept much the night before I was pooped and glad to get back to the hotel after that big meal and get some sleep. On the way back we dropped Martha off at home and I made arrangements to come over later that evening to try and work home from JY9BB.

Since I'd missed getting a JY call on my previous visit, this seemed like a

The University of Jordan amateur radio club has 23 OM's and 3 YL's – here are JY5-UAA, UMS, UHH, UMM, UMR, UMN and UNM, standing outside the door of JY6UJ.

JY5UNM operating the KWM rig at JY6UJ club station.

good time to ask – and I found that, as I had recommended, tourists can get a two week license with the JY8 prefix. What would I like? Perhaps JY8WG? JY8NSD? I opted for JY8AA.

Back at the hotel a little later I was met by Karl Schulty WA2KBZ from New Jersey who was a Motorola technician operating out of Turkey. He was in town for a few days doing some work on Motorola gear for the Amman police. Karl wanted to get a visitor's license for JY since he would be there off and on for a year or so. I agreed to give his application to Hisham in the morning to speed it up. Karl for some odd reason didn't have

Hisham Ansari JY5HA, Secretary of the Royal Jordanian Radio Amateur Society.

an HT with him so I lent him one of mine. We talked back and forth with Blackie JY9BB, at his home, when he was mobile, and even when he was downtown visiting the palace.

If you're not into eating – particularly new and unusual foods, perhaps all my discussions of the foods of Jordan will bore you. To me visiting a new country is not only seeing all there is to see – meeting people and talking with them – but also finding out about the foods of the country. Oh, I've read the horror stories of goats eyes and things, but so far I've run into nothing but good and interesting foods. The big step is just to be willing to try anything.

On my last visit to Jordan I had dinner several times in a restaurant around the corner from the hotel. It wasn't a great restaurant, just a run of the mill Jordanian restaurant – but I was excited about it because it was

JY5KST JY5KAA JY5KMB JY5KAL JY5KSL

YL's at the girls' school in Karak.

Jordanian, while the hotel leaned toward European food – leaned heavily. I wanted Lin to see the Jordanian "salad" in particular so, after doing all we could to rebuild some fragments of an appetite, we headed for the restaurant, HT in hand, talking on 2m with Blackie and Karl.

The salad filled the table – perhaps a dozen dishes, or more. There were four or five dips, nice fresh pita (bread), and cucumbers, peppers, radishes, onions, tomatoes, etc. It was a meal in itself. We also ordered the roast chicken and chadwerma, little strips of roast lamb inside a slice of pita.

About half way through the salad it was obvious that we could never manage all that food so I picked up the HT and called Karl – who arrived about five minutes later, talked in over the HT, much to the amazement of the other diners.

My sched time to talk home neared so I left Lin and Karl to do what they could with the food and talked Blackie in to me for a lift to his house. By 2000 GMT the band was reasonably good and JY8AA managed to work W2NSD/1 with good signals both ways. The only news was that the FCC had finally released the 220 MHz CB docket. Big deal.

Though he had spent a good deal of the night typing up our itinerary, Hisham was at the hotel right on schedule at 8 AM for the second day's jaunt. Lin and I had caught up on our sleep a bit by this time and were better ready to face the antiquities. Martha joined us again this morning – she'd been in Jordan for several months, but had never had a chance to get to see the archeological sites for which the country is so famous, so she joined us on many of our trips and made up for lost time.

I brought Karl's license application and handed it to Hisham. He checked it over, asked what call Karl wanted – I suggested JY9KS – okay – so I picked up my HT and called JY9KS from JY8AA. There was a whoop on the other end.

Our goal this morning was Karak, about 73 miles south of Amman. There we first visited the girl's school where I took some pictures of the YL's present. Four of them went off and returned a few minutes later in their family heirloom costumes.

Hisham has been driving down to Karak once a week to give classes in amateur radio for the girl's and the boy's clubs there. When you consider that about 80% of the youngsters stick with the classes – 100 sessions of code and theory – to get their tickets, you have to admire their tenacity. I don't think many classes in the U.S. graduate that high a percentage of students.

From the girl's school we went to the boy's and found 19 licensed amateurs anxiously waiting to say hello and show us their station – and the log full of DX. Several of them are well on their way toward getting confirmations from one hundred countries.

On the way to Karak we stopped at a resthouse for a Pepsi where Lin and I bought schamaghs – the Bedouin head coverings. These were worth a lot to us when we went to see the ruins of the crusader castle on top of the mountain at Karak. It was a bright and warm day, but the wind was so high that it kept us from gettting uncomfortable – other than possibly worrying about being blown off the top of the mountain.

The main fortifications at Karak were built in 1136 and, like me, are in remarkably good shape, considering their age. The castle commands the surrounding territory for many miles, towering at 3400 feet over the valley below – with the Dead Sea off in the distance. What a place for a repeater or a relay station! I'll bet that they put a relay in there to connect Aqaba, some 130 miles further south, with Amman. It would be an ideal spot – and there are two active ham clubs there to keep things perking – and even join in the fun.

The huge subterranean vaulted rooms are in good shape and not easily forgotten.

The resthouse at Karak was clean, like the rest, and everyone was most courteous and helpful. It is a pleasure to visit ruins without being badgered by people trying to fleece you with fake antiquities, postcards, and other dodges to pry your dollars away from you. Instead of this hounding that you get in most countries, here we were helped at all times by the Tourist Police (their name for government guides) who are there to help you, not for tips. They take a keen interest in you and a pride in your enjoying your visit to their spot.

For lunch we had kebobs with fried potatoes – and the ever popular humis ba tahini and Arab bread. Kebobs are ground lamb, molded together like sausage shaped hamburgers and roasted on a spit, like a shishkabob. Good.

Back in Amman, late that afternoon, we stopped off for some pastry and coffee. Arab pastry, such as baklava, is fantastic. It is made with paper thin layers of pastry, layers of nuts or fruits, and drenched in honey. Those readers who have the Time-Life cookbooks can see a photo of the assortment available in Amman on page 16 of the Mideast Cookbook.

Four of the JY5's at Karak, decked out in local traditional costumes. Families often spend years making these intricately embroidered dresses.

Some of the licensed amateurs at the Karak Youth Center. Back row: JY5's KYA – KIN – KMM – KRM. Left to right, in front: JY5's KAQ – KAM – KKA – KHC – KMK – KKH – KAG – KMD – KXM – KNG. Many are well on the way to DXCC, though the club station is using just a dipole at present.

Back at the hotel I got in touch with JY9BB via 2m. Blackie had isolated the trouble with the repeater receiver – a joint came loose on the trip over – resoldered it, and the repeater seemed to be working, though not very well. We ascribed that to the makeshift antennas he had on it.

The hotel has a really first class restaurant up on the roof – one where the jet set dine and all that – so I invited Blackie and Martha over to have dinner with us there. But when we called for reservations we discovered that the restaurant was closed – a private party – so we went to the coffee shop restaurant and had nice, if strictly American, steak dinners with french fries.

Blackie wondered if I might want to go back to his place and work 20m for a couple hours. No. It was about 11 PM and definitely time to go to bed. I knew that Hisham, with car and driver, would be there waiting for us bright and early the next morning and that his schedule was a matter of honor. Hisham took pride in our sticking to that schedule.

Lin decided to sit out the next day's trip and try to catch up with her guitar practice. She has been going strong on learning classical guitar and it doesn't take much of a lapse in practice to slow down the process. The schedule we had been following left her with no time at all for practice. The Wednesday schedule included visits to two ham club stations, the Royal Signal School, and lunch at the Signal Officers mess. Lin is more into ruins and museums than ham clubs so this was a good day for her to miss.

Amman, with Jebel El Luweibida on the left. A photogenic city.

Blackie and Martha were interested in seeing the Signal School, so they were there at departure time as I struggled down with my bag full of cameras to greet Hisham – who was bright and cheery, as usual.

Our goal this morning was Zarka, a town a few miles to the east of Amman and our fist stop there was the Al Hussein Secondary Girls School where we were met by another bevy of very attractive girls. In all my years in amateur radio I've never seen so many beautiful YL amateurs together in one place. If the word gets around on this it could lead to a lot of visiting OMs. I'll leak the word.

Hisham has licensed 26 girls at the Al Hussein school so far and has quite a few more getting ready for their exam. The club station there uses an FTDx101 with a dipole – call JY6HS. The girls are really into QSL collecting and many have struck up friendships over the air. They all are enthusiastic about learning English better via amateur radio and the fondest wish of most of them is to someday have their own station.

Frankly, after talking with the girls and boys who are hamming over here, and finding out how impossible it is for them to get equipment, I am hoping that the readers of 73 will take a long serious look at their unused equipment and make it available for kids like these. Old receivers, old sideband or CW exciters, old rigs – all would be a Godsend to these enthusiastic people. I talked with King Hussein about this and arrangements have been made to take care of getting equipment from the U. S. to Jordan, tax free, shipping free – for ham clubs and amateurs in Jordan.

The next stop was the Royal Signal School where the army technicians are taught radio and electronics. This harkened me back to my days at the naval radio materiel school on

JY5HHB

JY5HFM

JY5HRM

JY5HMK

JY5HHH

JY5HDY

JY5HNI

JY5HJM

JY5HAD

JY5HBS

YL's at the Al Hussein school in Zarka. Almost half the girls who run the club station JY6HS are shown above.

Treasure Island in 1943 – hmmm, thirty years ago. They teach the basics of electronics as well as the working and servicing of all of the radio and signal equipment used by the army. This runs the gamut from sophisticated synthesized gear all the way back to things like that Russian Mark II tank transceiver that was selling surplus for $30 in 1946 – Gimbels ran a special on them, believe it or not. They were so useless that hams were never much interested, preferring them as boat anchors to rigs. Jordan is still using these gems.

Perhaps a word of explanation would clarify things at this time. Jordan is in a particularly difficult position – the country has virtually no natural resources. There is no oil, darned little water, no sources of generating power, and about 90% of the food has to be imported. The only thing exportable is phosphate and they shipped out about one million tons of that last year. The main income is from tourism – which may explain why Jordan has paid such detailed attention to making tourism perfect in every way they can think of.

It is surprising to see so much construction and long range plans under way in a country so recently devastated by civil war. The political situation appears to be stabilized for some time to come now and this has made it possible for the entire country to set its sights on building for the future.

There is no way to do justice to the complexities of the Israel-Jordan-Palestinian political problems in much less than a book – and the emotions involved make it rather non-productive to try to be even handed. I've had people give me hell for even showing slides of Jordan – and we've lost more than one advertiser – that's a fact. The pressures in Jordan have eased to the point of being unnoticeable since the Palestinian guerillas have been moved out of the country and up to Syria and Lebanon. It looks to me as if the tensions have eased substantially in the area.

Tensions in Syria and Egypt are kept high for internal political reasons in those countries, and while there is always the possibility that these countries may be able to precipitate trouble, it would appear that they will no longer be able to involve Jordan – at least for the forseeable future.

They have a particularly active ham club station in the signals school and the chief op, Shukri, using the call JY6RS, has well over 150 countries worked. Other particularly active ops at this club station are JY5's RAS, REM, RBM, RGM and RGT.

Shukri has over 150 countries operating the club station JY6RS at the Royal Signal School in Zarka, just east of Amman. Other ops at this station include JY5's REM, RAS, RGM, RGT and RBM.

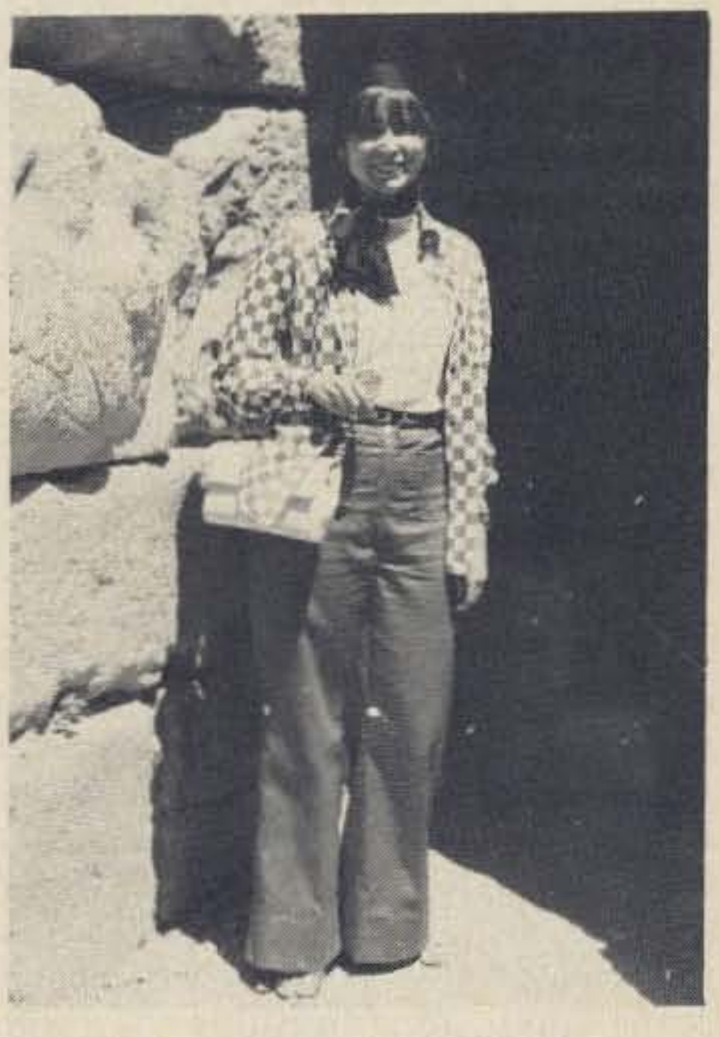
Operation at the club station was interrupted by word that lunch was ready. The main course was one of the best known Jordanian specialties, Mansaf. You may have read about it. This is not only incredibly delicious, but it is real fun to eat. It is served on a very large platter on a table and everyone stands around the table, eating with their right hand. Lefties have a problem. There is a huge mount of rice on top of very large slices of Bedouin bread – and then all around the rice are pieces of boiled lamb. A yoghert meat sauce is poured over the whole works – and each person is served a hot glass of this sauce.

The idea is to break off some lamb from a bone and then work a gob of rice around the lamb, all with one hand. When you get it into a ball you sort of flip it into your mouth, like a large marble. This calls for considerable dexterity and very careful aim when you flick. It is difficult to keep that left hand out of the action, although it is acceptable to use it for the glass of sauce. The sauce, by the way, tasted very much like one that I make to go with chicken – a sour cream and white wine mixture, with some onions.

I found my hand getting gooier and gooier, with rice sticking all over it. It was difficult to make rice balls with that soggy stuff which tended more to ooze between the fingers than gather into the required lumps. The lack of practice didn't spoil the fun or the taste one bit – and I'm looking forward to getting expert at mansaffing.

You eat mansaf with your right hand, standing up. Boiled lamb with a huge pile of rice and the most delicious sauce you ever tasted. It takes practice to eat with one hand.

Why the right hand for eating? Well, ahem, just a bit of Arab protocol hanging fire from the old desert days before the invention of toilet paper when the right hand was used for greeting and eating, and the left hand for – err – other things. Perhaps you can imagine what a serious problem thieves had once their right hand had been hacked off – they could no longer eat in company.



Lin, XYL of Wayne JY8AA.

Lin was sorry to miss the mansaf feast, but not all that disappointed to miss the ham clubs, the signal school, and that sort of thing. She managed about six hours of guitar practice, so she was a lot happier.

We had a long trip ahead of us the next morning so we rendezvoused early and got away from the hotel by 7 AM. Our goal was Aqaba, a small town on the gulf of Aqaba, a branch of the Red Sea, 210 miles to the south. On the way we would visit the ancient city of Petra, 170 miles south.

Over a period of five hundred years the Nabataean Arabs lived in Petra and carved it out of the stone mountains. This was a strong city about 300 BC, being on the caravan route from Mecca and other places to the south of the way to the Mediterranean. Rome conquered it in 106 AD and added the usual theater – also carved out of the rock – and a columned street, temples and such.

The crusaders built a fort there in the 12th century, but changing trade routes cut the income from this

source and the city gradually was deserted. Petra was lost to the world until accidentally discovered by a Swiss explorer in 1812.

We arrived at Petra about 11 AM and, after a cold drink of Pepsi at the beautiful resthouse – much of it cut out of the limestone mountain – we put on our Arab headdresses and mounted our Arabian horses for the ride through the city. Lin led the way – I followed next, balancing my camera case on the saddle and snapping pictures with this lens and then that as we rode through the siq – the very long winding defile between rock cliffs that tower 300 feet or more on both sides for perhaps a mile or more. Hisham, ever game for anything, kept up the rear on his horse.

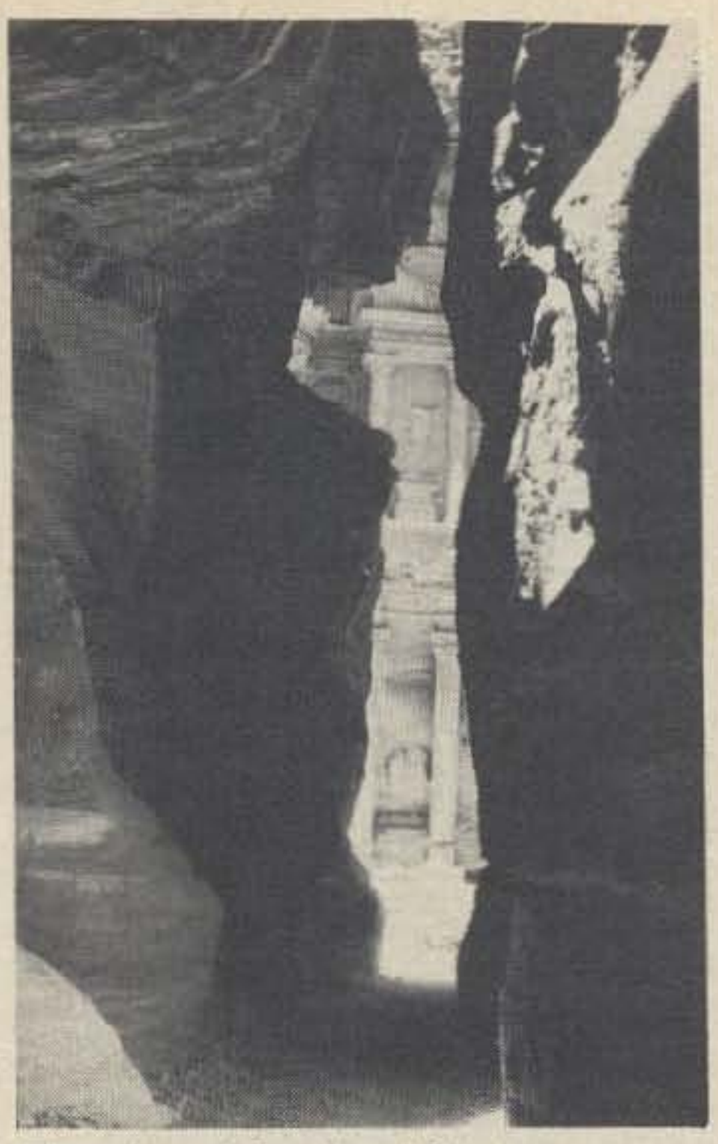
It was fascinating to see how that Petrans had carved troughs for water on both sides of the defile, permitting water to run its length. The ride through the devile was cool – the temperature was perhaps in the low 80's – but once in the sun I appreciated the shamagh on my head, even though I had to struggle a bit with it now and then when my camera straps would wrench it awry.

The first glimpse of the city is through the defile when the treasurey suddenly comes into view – shining pale red in the sun – a fantastic building carved right out of the stone mountain. That set my cameras to snapping so fast I could hardly keep up with them – black and white for the magazine – color for maybe a cover and for hamfests – and bragging. Wide angle, telephoto – I was whipping cameras around, jumping here and there – hold still.

Since seeing that city I decided that no description is really possible and the only honest alternative is to get every possible reader I can to go there and see it personally. The cliffs of the city are busy with patiently carved homes – complete with stairs cut into the face of the cliff and even water aquaducts leading to a great many of them. How about homes with running water in them 2000 years ago! And, being carved out of the mountains, they are cool even in the hottest weather.

An archeological expedition was hard at work in the area, digging away. More pictures. And they have an interesting museum in some of the caves up on the side of a mountain which you get to by going up the ancient carved stairs. The theater, a newer addition, about 200 AD, seats some 3000. It goes on and on.

There is a resthouse right in the center of the old city of Petra where they can put up about 70 people for the night, if desired. Some of the



First view of the city of Petra as you come on horseback through the long defile.

rooms are in the ancient caves, so that might be an experience – particularly for someone sensitive to the occult.

But we were on our way to Aqaba, so we finished our drinks, pictures and took one last remembering look as we swung back on our horses for the trip back up through the long defile.

Late in the afternoon we arrived at Aqaba. A lot could be said about the beauty of driving through the desert on the way – in some areas vast sections were planted – wheat, I think – though how anything could grow here is a mystery to me. There is no rain at all in June or July – and perhaps a couple of days in August at best. The rain comes in the winter – and perhaps there is enough to stick and keep working through the summer.

We passed the area where Lawrence of Arabia was filmed – and succeeding vistas of incredible beauty. We paused at a reathouse on a mountaintop for cold drinks – pictures – and whatever. What a fantastic spot for a repeater.

The gulf of Aqaba is a gorgeous blue color, with the small city of Aqaba on the left and the Israel city of Eilat on the right, only a few meters away. This is Jordan's only seaport – and it is certainly out of the way, with the Suez Canal closed. Syria and Iraq have their borders closed, which means that goods shipped in to Jordan must either come by air or around Africa and up the Red Sea – one hell of a long trip.

While I realize the frustrations and resentment of the Palestinians against Israel, this situation, which helps to prevent some sort of agreement on a corridor through Israel to the Mediterranian, is excessively costly to Jordan. The high costs of importing things slows down the growth of the country by forcing people to pay too high a price for things – and slows down growth also by making it extremely difficult to export anything.

We checked into one of the two first class resort hotels and had a late lunch. Karl, who had driven down the day before to work on some police equipment, called in on 94 and came over for a visit. Two meters sure does help to make travel enjoyable.

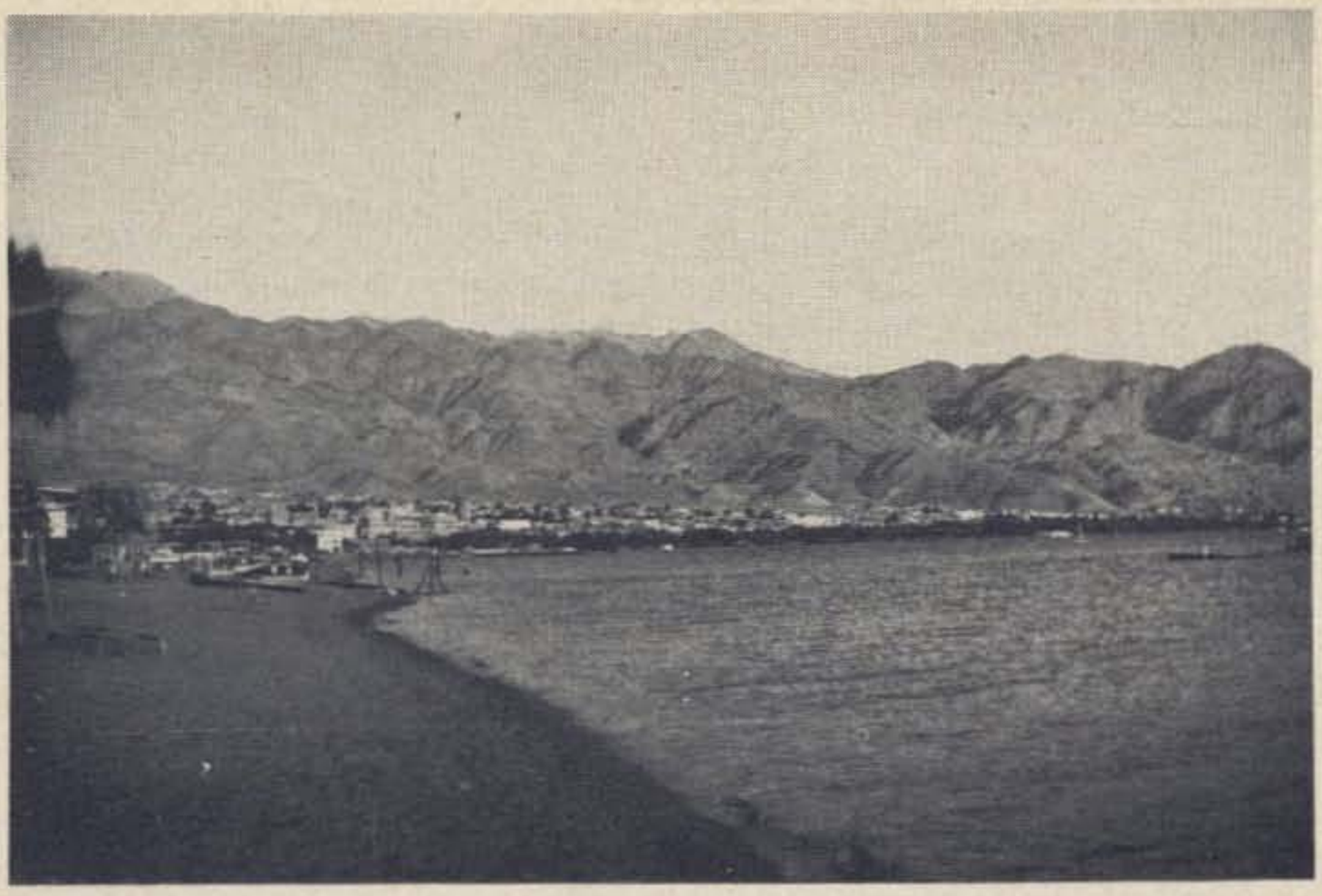
Later Lin and I put on our suits and went for a swim in the Red Sea. As we were swimming King Hussein circled overhead in his small plane – he was down for the weekend to visit with his family.

Even though the water of the gulf keeps things cooler than they would be otherwise, we appreciated the air conditioning of the hotel for sleeping.

The next morning, after one more dip in the Red Sea – and a good breakfast with bacon and eggs – plus a Jordanian breakfast for Hisham which, while good, didn't seem as satisfying as the old favorite. I like the goat cheese and the humus spread – Lin digs the olives – but after years of orange juice and eggs – etc.

I dozed off during much of the long drive back up through the desert, not coming full awake until we reached Madaba, just 20 miles from Amman. Here we stopped for some cold drinks and then went off to see as many of the mosaics for which the area is famous as possible. We drove up to Mt. Nebo, not far away, and visited the spot where Moses viewed the promised land. We could see across the end of the Dead Sea into Palestine

The Treasury at Petra, carved out of the rose-colored rock of the mountain. Inside are a large room and two smaller rooms. Carved out around 300 BC.



The beach at Aqaba is lovely – and look at those mountains – what a spot for a repeater! There are first class resort hotels here on the Riviera of Jordan. This is Jordan's only seaport. The Gulf of Aqaba is part of the Red Sea and they have skin diving, water skiing and great swimming.

and Jerusalem. Quite a bit of work has been done on this site to preserve and repair extensive mosaics laid down at different times, from about 300 BC until the Byzantine times. This work is painstaking and fascinating to see.

The most famous mosaic of all is in this town – a mosaic map of Palestine in the 6th century. The map shows Eqypt and Palestine with a detailed representation of Jerusalem as it was in the days of Justinian. This is the *only* map existant of the period. White blocks on black lines depict roads. Ancient monestaries in the desert are shown.

We saw some recently discovered mosaics – some which had not even been uncovered as yet – and we learned that there are many more awaiting discovery as the locations of old churches are found.

A Bedouin tent outside of the Madaba resthouse was our lunch stop. We lounged on cushions on the Persian rugs which covered the ground as we waited for lunch to be served. There was the ritual round of Bedouin coffee and then we were into a delicious musakhan – chicken broiled on Bedouin bread with spices and pine nuts over it. There just has to be some way to get you over here to see this and taste it! It isn't fair for me to enjoy something this much without sharing it with everyone.

In Madaba you can see a great many ancient mosaics such as this one which has just been recently discovered and has not yet been cleaned of the dirt covering it. The swastica is a very old good luck sign.

That night I got on the air again as JY8AA and found that although most ops had worked JY by now, I was the first JY8 they'd heard and the prefix hunters were vigorously at it – interspersed with Italian stations, who appear to attack anything that moves. It is fun being rare DX like that – a lot of fun. I worked stations all over Europe – with the pileups toppling over on me now and then. Then the U. S. came in and a contact with the home station where I found that things were going as usual – an office party had replaced work for the day at 73.

On our sixth day in Jordan we first drove to the television studios and explored them. Having worked in television in both engineering and direction, this was familiar territory for me. They are just converting to color and are greatly expanding their operation. I talked a bit with the director of the station and was impressed with his grasp of the economic and political situation – I guess I keep expecting to run into emotionally biased people and am constantly surprised to find level heads. Delusions are bad enough with average citizens, but are a serious liability in top level jobs.

The next stop was the broadcasting studios – radio is still an important force in the Mideast, what with Egypt pouring out propaganda and venom against Israel, Jordan, and any other country that frustrates the political aspirations of Sadat. Ditto Syria and Iraq. Much against its will, Jordan finds that it has to try and keep up with the propaganda barrage by setting up ever more powerful transmitters.

The Jordanian ploy is to provide honest and unbiased news – to try and provide a calming influence between the shrill cries of their neighbors and the extremists. It is unfortunate that no one gets much in the way of followers in this way – the followers seem to go off after the more emotional "leaders."

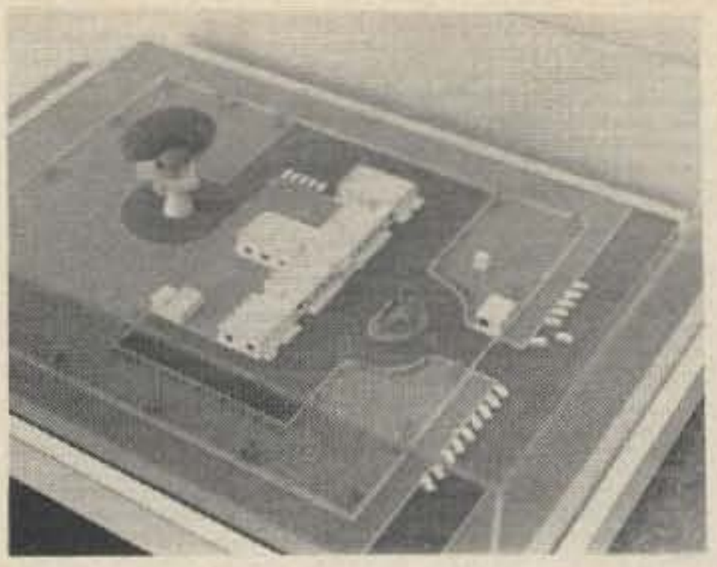
The director of the radio system explained that he regretted very much that there seemed to be no alternative to setting up two 1.2 megawatt broadcast transmitters – a $12 million investment. Plus about $1.5 million a year in operating cost for them. Jordan has a great need for this money for other developments – but without some counter to the propaganda, there might not be a Jordan. I'll tell you this, I'm sure that if anyone anywhere can come up with some other good solution to this problem, they will find willing ears. Keep in mind that inexpensive transistor radios have made radio a very important communications medium in low income countries.

JY5MAM, one of the principle operators at the Madaba club station in the Youth Center, JY6MC.

Our next stop was the earth satellite ground station, a few miles north of Amman. They pick up the signals there and relay them via passive reflectors into town. Passive reflectors, if you're not sure, are those big billboard size things you see here and there on mountain tops.

This satellite station is how I was able to rather quickly make a phone call to Amman from New Hampshire – and have a call that was clear and loud. Not very many countries are hooked into the satellite system as yet, so the result is that you can call the U. S. from Jordan a lot easier than you can call into the next country.

The big dish is run by a computer and was put in by Nippon Electric. The emergency power supply consists of a couple of big diesel generators – with batteries to take the load during the few seconds it takes to get the



Model of the earth satellite station which permits Jordan to have excellent phone and television service via the 100 foot dish. The station is a few miles north of Amman.

generators going. From the big dish we Drove back to Amman and the Al Hussein Youth City – a complex of parks – playing fields – auditorium – swimming pools – and an athletic field with a huge grandstand. Here we toured the immense place and ended up with a luncheon served in the restaurant. Most of the active JY4 and JY9 amateurs were there for this occasion of state, with Prince Raad JY5HC being the host.

Food again. We started with the Bedouin coffee maneuver and then were presented with jumbo shrimps on a skewer – about eight of them. This, with the normal Jordanian salad and dips in the middle of the table, was enough to fill anyone. The shrimps were huge and delicious. Just as Lin and I managed to finish them off, in came the main course. The shrimp had merely been the usual English fish course – served before the main meal.

The main course was a veal steak with pate (something like liverwurst) – and the desert was something new for me – rose flavored ice cream. Yep, rose. Good too. Y'hear that Baskin Robbins? Why are you trying to waste our digestions on bubblegum ice cream when you could get going on rose and who knows what other flower flavors?

I got in another evening of 20m operating while Lin worked on her guitar practice. I stuck it out this time until the wee hours, working into South America, Japan, and just about everywhere in the world. JY8 is not as rare as it was.

The next morning we had set aside for getting the two meter repeater going. Blackie had it working fairly well at his house – the job now was to get it set up somewhere high to serve the whole city. Hisham, Blackie and I, with an army driver, loaded the repeater into a car and headed off out of town. Hey, what happened to the idea of putting the repeater on the hill overlooking the city? Hisham explained that the mosque we wanted to use couldn't be entered today since this was Sunday and we would have to try it somewhere else.

The somewhere else was about ten miles out of town to the north. It was a nice location on top of a hill with a beautiful tower – 200 foot or more high. With misgivings I watched while a couple of army men zipped up the tower and set up the receiving antenna. I have to admit that I have never set up a repeater with greater ease. We then set up the transmitting antenna about 100 feet lower than the receiving antenna and I turned on the repeater. No troubles apparent.

We kerchunked our hand units a couple times and then Blackie drove off in his car in one direction while Hisham and I took off in the opposite direction, around a formidable mountain. The repeater disappeared almost as soon as we went around the mountain. Hmm – I expected some problems, but nothing as bad as that! We turned around and drove back, picking up the repeater again when within a couple miles of it. We would never be able to use that from Amman which was ten miles away.

Grumbling, I had them take down the antennas and pack up the repeater so we could take it to Amman and put it up on the biggest hill overlooking the city. There was a passive reflector site not far from the top of this mountain, so we headed there. No towers at this site, just a couple of those billboards, so getting antenna separation for the repeater was going to be a challenge.

At first we put the repeater on the ground under one of the reflectors and snapped one gutter-clip antenna to the top of the reflector and another to the bottom. Even with only about 20 feet of spacing I couldn't detect any desensitization – that was odd. We kerchunked again and drove off in opposite directions again. Within blocks I found I had lost the repeater. Something is very wrong. Could the problem be desense? Or what? Blackie and I pondered the situation:

Hisham and I returned to the hotel, on the other side of town. Here I made a test with Blackie and found that while I was coming through 9-plus on 94 direct to his HT, I wasn't making it on 34 through the repeater receiver. Okay, now we know! Let's take a look at that receiver board and see if the antenna wire is broken off or shorted. Blackie opened it up and removed a little piece of solder – and we had a beautiful working repeater! A little chip across the antenna input was all it took – there still was enough zoop to work with nearby rigs, but weak signals couldn't make it.

I could work into the repeater even from inside the elevator of the hotel and it wasn't long before I'd had contacts with Karl – Major Zaza JY3BZ, the personal aide to HM, – Prince Raad and others. I'd brought along three hand units plus a TR-22 and they were all in use.

That afternoon word came that HM had me on his schedule for a visit. I'd been waiting for this, so I put on a tie and jacket, grabbed up my list of ideas and impressions, and we all headed for the palace. I almost forgot to bring along the menu board which I had gotten for HM – and some New Hampshire candy.

Major Zaza greeted us – Blackie – Hisham – Lin and me, and showed us into the reception room. Soon HM joined us, with Prince Hassan, his brother. I started talking.

Hisham, who has an eye for these things, timed it at one hour and fifty minutes. I covered a lot of items – some of possible interest – some already in the works – some probably not too practical.

I was impressed by the possibilities of a vast canyon, miles long, called Wadi Mujib. During the rainy season it is obvious that a lot of water runs down this wadi and off into the Dead Sea. It looked to me as if it would be possible to make a dam on the downward side of this wadi and thus collect the water that would normally run into the sea. This water could be pumped up to the top of the wadi and fed by gravity to irrigate the surrounding desert. I had suggested this to several people, only to be argued that it couldn't be done. HM assured me that they are working on it and that it will indeed be done. Not all my ideas are practical – even when they are as grandiose as that.

The road through Wadi Mujib was exciting – it wound down one side of the canyon walls, hairpin turning back and forth – then across a bridge on the bottom over the dry riverbed – and hairpins back up the other side – I'll bet that goes up 4000 feet on either side! Along the way we passed road markers put there by the Romans almost 2000 years ago – still at their job.

After I finished expounding on my ideas we all went up to the third floor to the hamshack – in a little alcove just off the roof. I set up the menu board and made a couple slow scan television contacts with VU2's, one as JY1 and the other as JY8AA, while HM looked on. Queen Alia, HM's new bride, came up and greeted us – she is lovely – beautiful! Lin had to remind me that it would be prudent if I were to take some pictures of HM at this time. I was so wrapped up in the slow scan contacts I almost forgot about everything else.

It was time to let HM get a crack at the slow scan so we all trooped back

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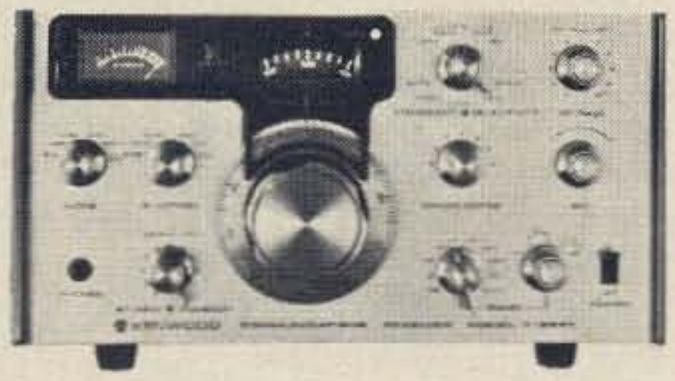

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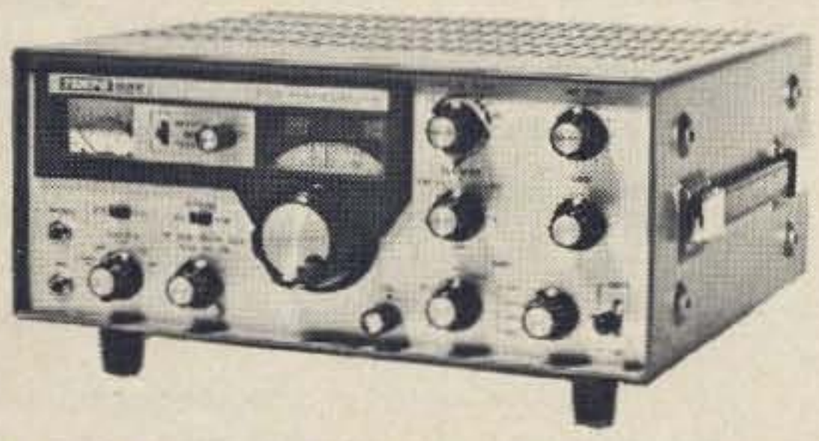

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downstairs and bid HM and Queen Alia goodbye.

That evening I again held forth on 20m – getting in as many slow scan contacts as I could via my tape recorder. Most of the SSTV group were too busy making local contacts to even listen for me, so I made far fewer than I hoped for. Time after time Italian stations would come on channel and fire up with endless slow scan pictures – sending for ten or fifteen minutes at a time until I had to move off channel and try to get away from them that way. Few of them could apparently understand one single word of English so my sobbing pleas to just send one or two pictures and let me work some more stations went completely unheeded.

With the exception of the slow scan frustrations, DXing was first rate and my log sheets filled up rapidly – the main problem being to get the calls of the multitudes calling. I had my best luck when I asked for stations with a one in their calls – then a two – etc., with the ever present difficulty of the large numbers of I's who apparently had no knowledge of English, and were not about to cooperate in anything I had in mind – "the QTH here is Civitavecchia, I spella for you twice, C – Canada. . . " etc.

Monday, my last day in Jordan, had us scheduled for a visit to the Royal Scientific Society – then a drive up to the very northern border of Jordan to visit the youth club in Irbid (and the ham club station there), with lunch at the Al Hemma hot springs on the Syrian-Israel border to Jordan. Blackie and Martha came with us to the Scientific Society where we were joined by Col. Ayoub JY4IA and shown around by Elie Baghdady, the president of the Society.

The scientific equipment in the labs was impressive and must be most helpful to students wanting to go into advanced studies. Even more impressive were the preproduction models for a high band walkie-talkie which they are working on with the

Brigadier General Ayoub JY4IA, Wayne JY8AA/W2NSD and Hisham Ansari JY5HA, secretary of the RJRAS.

idea of possible commercial development. The physical construction was the most sturdy that I've seen – and the unit is designed for ultra-simple servicing – a coin being the only tool needed for taking it apart and changing the plug-in modules.

They are also hard at work on an optical scanner that would read the writing on a page and convert it into digital information. This has many applications in communications – in computers – record keeping. With work like this going on, no wonder they are so enthusiastic about the amateur radio program throughout the top level of the government. They'll need every technically interested person they can get if they are going to start manufacturing transceivers and computer equipment. I don't think I'm exaggerating when I say that I think that plans like this would have been totally impossible just three years ago.

Our interest in the work at the Royal Scientific Society put us behind on Hisham's schedule for the first time in a week. We didn't have much time to oblige the television crew that was there doing a film of us for the news that night – though we later heard that it came out well and was most interesting. Martha, Lin, Hisham and I piled into one of HM's new Volvo's and our driver headed north – past the satellite tracking station – past Jarash – and 73 miles to Irbid.

The first stop was the ham club at the youth center there, JY5IC. There were only a few ops present, but we talked for a while and I snapped some pictures to show back home. From there we drove up to a point overlooking the borders of Syria and Israel – with a fine view of the Sea of Galilee. We went through a few of the ruins here – spotting some mosaics that would soon be uncovered on the site of an old christian church circa perhaps about 400 AD.

Much of Jordan is on a plain about 3000 feet above sea level – which accounts for its relatively cool climate – the altitude does make a profound difference. As soon as we wound our way down from the plain to the hot springs at Al Hemma, much closer to sea level, we found ourselves in a hot climate with tropical trees growing all around.

The hot springs are very helpful for many illnesses and we saw people being brought to the baths on stretchers for healing. This is a popular type of healing in Europe, too.

Our lunch was served by the large swimming pool – starting again with the strong, sour Bedouin coffee – the ritual where you have to give the cup a little wiggle as you return it if you are going to ward off a refill. Then came the big salad – and platter after platter of small beef steaks and chicken – a belt-busting feast. Fresh apricots, cucumbers and plums came for desert.

On the way back I dozed off a bit, getting rested for the farewell reception coming that evening at the Royal Automobile Club.

Many of the top men of the country were at the reception and I had a chance to talk with quite a few of them. The most important piece of news came from Ali Ghandour of Alia, the Royal Jordanian Airline – and that was about the coming flights from New York by Alia, starting in November. He explained that there would be a special group rate for a

JY5IBM

JY5IAT

JY5IMH and JY5IBR

Operators at the club station at Irbid, a city near the northern border of Jordan. The club station is located in the Youth Center of Irbid. Nearby there are many newly discovered ruins which are being uncovered.

one week visit in Jordan – only $340 round trip! The first class fare is about $1500 – the special tourist 14-day rate is about $800 – and that was the cheapest I'd found so far.

Remember that Jordan is almost twice as far as London from New York. It's almost 6000 miles.

In addition to the special fare, Alia has arranged for special rates at the Jordan Intercontinental Hotel – a truly first class hotel. This means that the total cost of a visit to Jordan for a week would run about $600. On that basis it would seem prudent to start thinking in terms of organizing a 73 tour of Jordan for, say, next spring. In addition to seeing some of the most remarkable antiquities, eating exciting new foods, and probably meeting one of the key men in the world today: King Hussein.

If this has piqued your imagination, you might consider that I understand that there will be a first rate DX ham station set up in the hotel – plus that 34-94 repeater in Amman – you'll bring a hand unit with you, won't you? – and, for frosting on the cake: a ham rig on the plane to be used during the flight over and back!!! That's a three exclamation pointer if there ever was one.

The next day Lin and I packed and got on the morning flight to Cairo via Alia Airlines. On the way to the airport HM called me via the repeater and thanked me for taking the time to come over and see the country and give them my ideas on development. I don't know how much value my ideas have for Jordan, but I do know that the visit was a priceless treasure for my memory.

Security measures are strict and I found guards on the plane making sure there was no funny business. That was nice.

The food was just as first class on this short trip to Cairo as on the one down from London. They sure pull out all stops on serving excellent food.

A short while later we got off the plane in Cairo where it was hot – very hot. The hassles started almost immediately. They demanded that everyone change $80 each in U. S. money into Egyptian currency before they would let us out of the entry room. And we had to list all of the money of any kind that we had along – this list to be compared to our declaration upon leaving to make sure that we don't indulge in buying Egyptian Pounds at the low black market rates.

Once free of that hassle – imagine them insisting on us spending $80 each for a two day stay – we started out towards the taxis and our first real brush with the constant attempts at

JY8AA, JY4IA, JY9BB, JY9GR and XYL, JY9FOV.

fleecing that became a part of this visit to Egypt. Having been there before I asked the first taxi driver who rushed up – followed by the pack – if he had a meter – oh yes indeed – okay we want to go to the Nile Hilton – our bags were grabbed up and put into a car trunk – where is the meter? – suddenly ,the taxi driver knew no English – how much for the trip I asked him – his English was barely discernable now as I decyphered two pounds from the long explanation he was giving. Hmmm – that's not bad – about $3.50 – and it is a long trip. Just to be sure I turned to another taxi and asked him how much it would cost to the Hilton – oh, less than one pound – okay, take the bags out and into this cab with a meter – the metered fare came to 73 piasters (by coincidence), so I gave the driver a pound (100 piasters).

There are an incredible number of very poor people in Egypt so they have worked out a system – like one man takes each of your bags when they are carried anywhere – this gets a little more in tips. Merely nearing the door of the hotel on your way out brings a swarm of "guides" who will take you anywhere and show you anything – for a very nice price. They are so persistant that eventually it keeps you from even wanting to leave your hotel room. You can't shake them – and if you do get away, within a block more have spotted you and zeroed in. They expect a no from you and seem to count on wearing you down by persistance.

Though I tried many dodges, the only one that seemed to have any possibilities of working was where I would turn on the nearest con artist and demand 10 piasters from him in exchange for taking his picture – which I promised I would show all over the U. S. – explaining that he might become a famous movie star – Omar Sharif – etc. That backed 'em off.

The Pyramids

By shrewd bargaining I was able to engage a guide with a car for the whole day to see the antiquities at only about five times what I should have paid. We drove to Memphis and saw the big statue they have there – lying down – with a small sphynx outside. We went to visit some of the tombs – riding across the desert on donkeys. We rode camels at the site of the sphynx and major pyramids – as well as some Arabian horses.

The desert sun was too much for Lin, who had forgotten to bring her Jordanian schamagh, so we returned to the hotel early. Food poisoning from the dinner in the Hilton that night capped the day for her and we had to call a doctor the next morning.

Once I'd met the doctor, who was very nice, I realized that I'd seen him in the hotel quite a bit, with his sheaf of room call slips in one hand. That restaurant must keep him busy.

Lin had to stay in bed that whole day – and eat very little. The next morning she was able to get out a bit, but was still weak – and her enthusiasm for the remainder of the trip had evaporated. We were scheduled to spend a couple days in Damascus where we would see Rasheed YK1AA, a couple of days in Rome, Paris, and then back to New Hampshire. The next flight back was TWA the following morning so we changed our tickets and sent cables to Rasheed and 73 about the change.

The Cairo airport the next morning was another Chinese fire drill – with hands out for tips at every turn – one man per bag from the hotel to the taxi – from the taxi to the customs lines – from there to the passport area – from there to the baggage check in. Did I say lines? Pileups is more accurate. No one in charge – little information available from anyone on what to do, where to go. And just to cap the situation, I was groggy and sick, having managed to get food poisoning at dinner at the Hilton the night before.

Everything that happened in Egypt made me appreciate Jordan the more. The people are different – the climate is different – and, most of all, the whole government attitude is completely different. Every minute in Egypt made me appreciate Jordan more.

We arrived home that night – tired – dizzy from the ravages of King Tut's Revenge – and the fast time change.

After the royal red carpet treatment in Jordan, it was difficult to get back and settle into being just a face in the crowd.

...W2NSD/JY8AA

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JY2	Muna Al Hussein	"	2101
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JY5HAD	Abeer Mahmoud	"	
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JY5HMN	Marry Nima	"	
JY5HMQ	Misbah Qurashi	"	
JY5HMS	Majida Sayyad	"	
JY5HNB	Najat Badri	"	
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JY5ICN	Walid Jiries	"	
JY5ICO	Fakhri Baker	"	
JY5ICP	Bassem Atia	"	
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JY5KAC	Amal Mawajdeh	"	36
JY5KAD	Amneh Sawadha	"	36
JY5KAG	Eiman Haddaddin	"	30
JY5KAH	Ahmad Al Masri	"	30
JY5KAI	Alia Mawajdeh	"	36
JY5KAJ	Akram Jamil	"	30
JY5KAK	Afaf Majali	"	36
JY5KAL	Intisar Majdi	"	36
JY5KAM	Adnan Khayat	"	30
JY5KAN	Aisha Mahadeen	"	36
JY5KAQ	Albert Qssous	"	30
JY5KAT	Amjad Madaita	"	30
JY5KAW	Abdull Wahab Madadha	"	30
JY5KBC	Bashar Halasa	"	30
JY5KBD	Bassam Dmour	"	30
JY5KFG	Vera Hadadeen	"	36
JY5KFM	Fatima Shamaileh	"	36
JY5KFZ	Fayez Zheimat	"	30
JY5KGA	Ghada Adhash	"	36
JY5KGO	Gharam Amareen	"	36
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JY5KJJ	Jamal Jamil	"	30
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JY5KJR	Jawhara Rida	"	36
JY5KJS	Jamal Sawalha	"	30
JY5KKA	Kifah Momani	"	36
JY5KKB	Khalida Salem	"	36
JY5KKC	Khadra Madadha	"	30
JY5KKH	Khaled Halasa	"	30
JY5KKK	Khaled Khreis	"	30
JY5KKI	Khitam Mowafi	"	36
JY5KKM	Khitma Madadha	"	36
JY5KM	Khasrouf Abdulla	Amman	
JY5KMA	Maysoun Madadha	Karak	36
JY5KMB	Marry Bqaein	"	36
JY5KMC	Marry Durzi	"	36
JY5KMD	Mohamad Dmour	"	30
JY5KMA	Marwan Hadaddeen	"	30
JY5KMI	Mikhled Ibrahim	"	30
JY5KMK	Mohamad Karoki	"	30
JY5KMM	Mansour Majali	"	30
JY5KNG	Nasser Gabari	"	30
JY5KRM	Radwan Mohamad	"	30
JY5KSA	Samieha Madadha	"	36
JY5KSJ	Shadia Jamil	"	36
JY5KSL	Samar Lafi	"	36
JY5KSM	Samir Ayed	"	30
JY5KSN	Salma Madadha	"	36
JY5KSR	Samih Rahaifeh	"	30
JY5KSS	Samah Samih	"	36
JY5KST	Samah Lafi	"	36
JY5KYA	Yousef Rmamin	"	30
JY5KZH	Khazar Halasa	"	30
JY5KZN	Zein Majali	Karak	36
JY5MAA	Awad Ababseh	Madaba	
JY5MAF	Ahmad Faiad	"	
JY5MAI	Azmi Anwar	"	
JY5MBH	Bassem Halasa	"	
JY5MCC	Chibli Salem	"	
JY5MGM	Ghassan Michel	"	
JYMHD	Haitham Dabaeen	"	
JY5MHF	Haidar Farah	"	
JY5MHM	Husam Masannat	"	
JY5MHQ	Husam Qsous	"	
JY5MIH	Ihsan Hamarneh	"	
JY5MIW	Ibrahim Wahsh	"	
JY5MKH	Kholoud Hamarneh	"	
JY5MMS	Michel Sahouri	"	
JY5MMT	Marwan Twal	"	
JY5MNC	Nawaf Shawabkeh	"	
JY5MRM	Rajai Matalga	"	
JY5MSM	Samir Marzoug	"	
JY5MSO	Saleh Oran	"	
JY5MSQ	Soheil Qunsul	"	
JY5MT	Mrawed Altel	Amman	
JY5RAC	Akram Abou Shaar	"	
JY5RAH	Ahmad Hasant	"	
JY5RAS	Ahmad Suleimann	"	
JY5RBM	Bader Mustafa	"	
JY5RDH	Daifulla Hamdan	"	
JY5REM	Eid Mazahreh	Zarqa	
JY5RFK	Fahmi Khalaf	"	
JY5RGM	Grayed Mujali	"	
JY5RGT	Ghazi Twaise	"	
JY5RIK	Issam Kawar	"	
JY5RIS	Ibrahim Sodah	Amman	
JY5RMA	Mohomad Armouti	"	
JY5RS	Shukri Antoon	Zarqa	
JY5RST	Samih Talab	Amman	
JY5RUA	Yousef Suleiman	"	
JY5SA	Saleh Atiyat	"	
JY5UAA	Abdull Jalil Musa	"	13016
JY5UAH	Ahmad Haroon	"	"
JY5UAK	Ahmad Khateeb	"	"
JY5UAN	Abdull Munem Nweerar	"	"
JY5UAT	Ahlam Taher	"	"
JY5UFA	Fawzi Ali	"	"
JY5UHH	Husam Hashem	"	"
JY5UKS	Khawla Suleiman	"	"
JY5UMA	Mohamad Mahmoud	"	"
JY5UMD	Mahmoud Issa	"	"
JY5UMH	Mohamad Harbi	"	"
JY5UMI	Mahmoud Rifai	"	"
JY5UMM	Muner Mansour	"	"
JY5UMN	Mahmoud Nugrush	"	"
JY5UMR	Mahamad Radi	"	"
JY5UMS	Mahmoud Said	"	"
JY5UMY	Mohamad Younes	"	"
JY5UNM	Naef Mohmoud	"	"
JY5UTB	Taiseer Belbaise	"	"
JY5UTH	Taha Hussein	"	"
JY3ZH	Zeidan Hussein	"	"
JY5ZS	Zuhair Shaer	"	"

CLUB STATIONS

Call	Club	Location	P.O.B.
JY6AC	The Royal Automobile Club	Amman	
JY6AS	The Arab Revolution School	Zarka	
JY6FC	King's Faisal College	Amman	
JY6GC	Aqaba (OM) Youth Center	Aqaba	
JY6HC	Al Hussein Youth City	Amman	
JY6HS	Al Hussein Secondary School	Zarka	32
JY6IC	Irbid (OM) Youth Center	Irbid	
JY6KG	Al Karak (OM) Youth Center	Alkarak	30
JY6KW	Al Karak (YL) Youth Center	Alkarak	36
JY6MC	Madaba (OM) Youth Center	Madaba	
JY6RS	Royal Signals Officers Club	Zarka	
JY6UJ	University of Jordan	Amman	13016
JY6ZZ	Royal Jordanian Radio Amateur Society	Amman	2353

Joseph M. Steim WA1OMS
125 Freeman Parkway
Providence RI 02906

IC REPEATER LOGIC SYSTEM

Switch repeater functions in a proper, controlled sequence with this solid-state control unit.

Reliability is the prime consideration in repeater control logic. Malfunctions in control logic can usually be traced to an electro-mechanical device such as a relay or motor. Quite simply, if a control logic system does not contain any electro-mechanical devices, there aren't any that can malfunction.

This article will describe a totally solid-state logic system using relays in only the COR and B+ line feeding the transmitter. I should mention that this article will provide sufficient information to duplicate the logic system described herein, but will leave details of interfacing it to existing equipment and the like to the builder. I assume that anyone building a repeater has quite an adequate level of technical competence.

Having been influenced by common practice in repeater design in the New England area, the design has been made to conform to the following set of criteria:

1. A 3-minute time-out function which never resets until both the COR resumes an idle state and the repeater carrier leaves the air.

2. A squelch tail length of about 3/4 seconds.

3. A solid-state identifier which initiates only upon departure of a signal from the receiver. This system is differentiated from those which allow the ID to operate during someone's transmission. Identification during transmission is undesirable because it either interferes drastically with the speaker or it necessitates reducing the ID to such a low level that the repeater call becomes nearly illegible. Identification occurs at intervals of 2.5 minutes, and only during

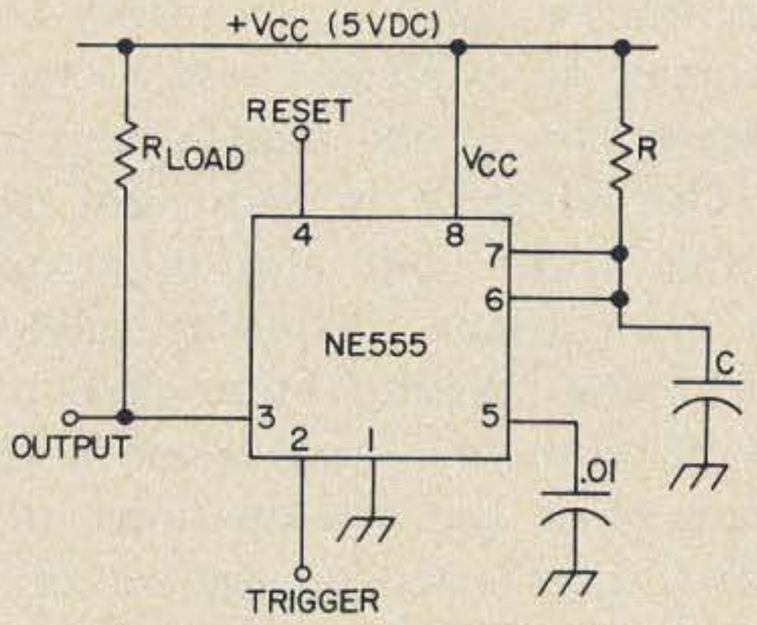


Fig. 1. General connnection diagram of NE555.

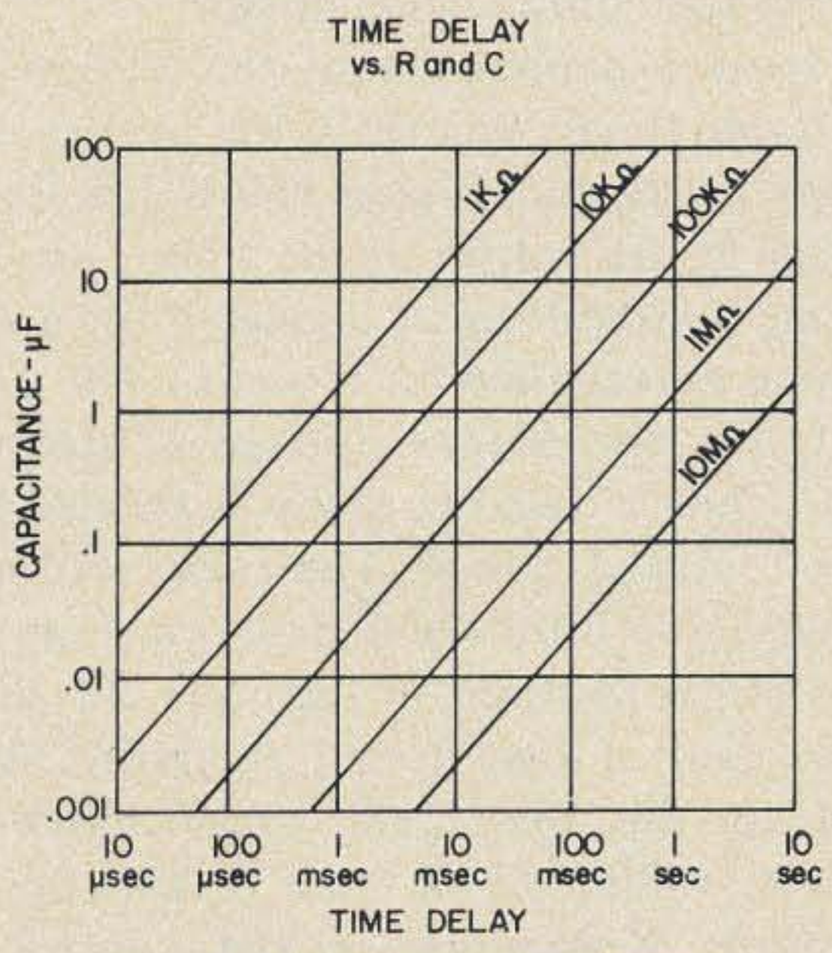


Fig. 2. Time delay nomogram.

periods of use; i.e. the repeater never turns itself on to identify.

4. A timer which holds the transmitter on for an especially long tail during identification so the ID may be allowed to complete itself before the transmitter leaves the air.

5. A slight 3/4 second delay between departure of a signal from the receiver and initiation of the ID. This delay will compensate for the rather long transition times from transmit to receive in some new solid-state rigs. It permits someone who has immediately stopped transmitting to hear the ID without missing the first few characters as a result of long transition time.

6. Operation at reasonable current requirements from a single 5V dc supply for both logic and ID.

7. Ability to interface without major modification to existing repeaters using relay logic.

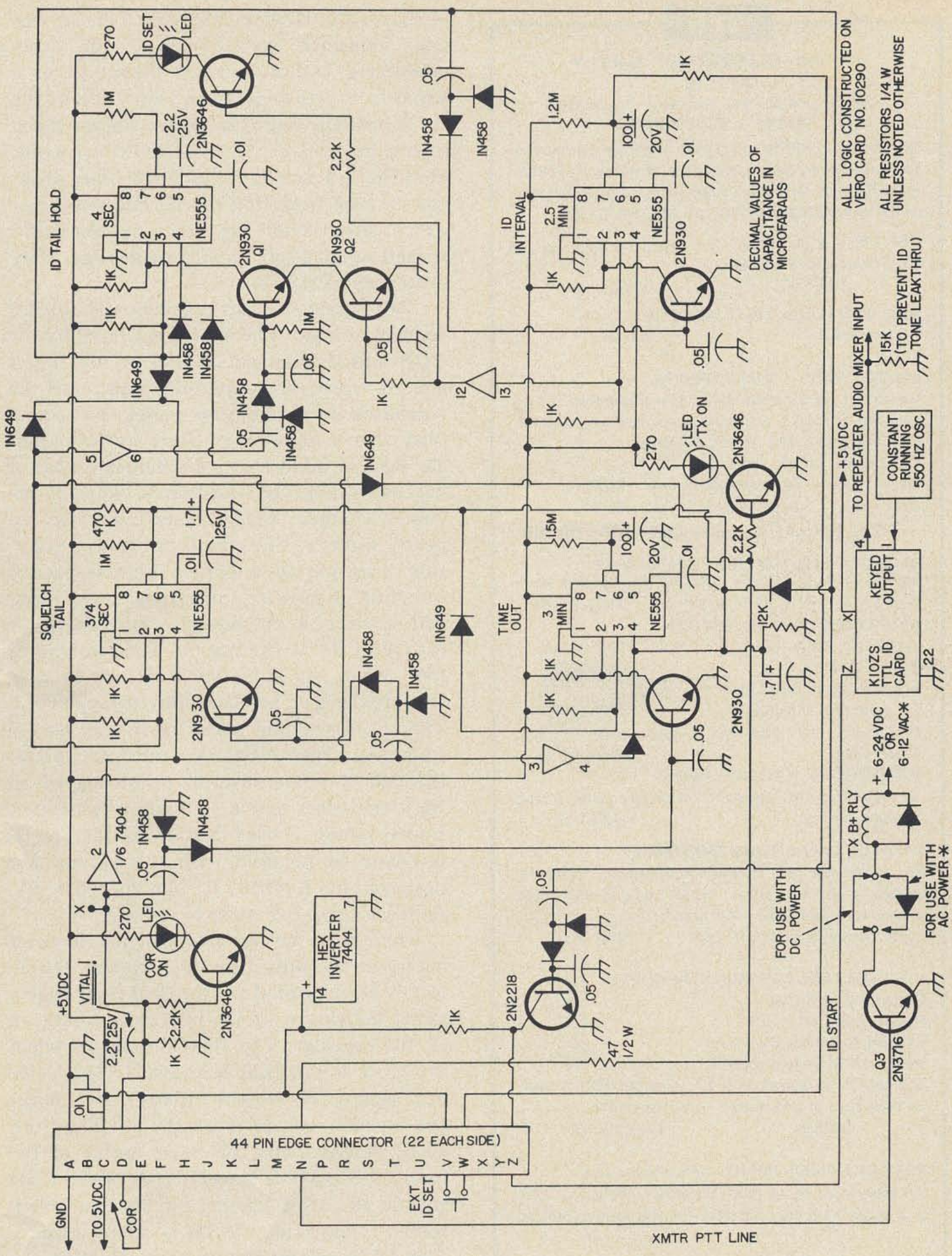
The control logic design centers around an IC which has been recently introduced by Signetics, the NE555. Although it is available in two package styles, the DIP, designated by the V suffix, is probably the most convenient, since all the rest of the IC's in the design are in the dual-inline configuration. The NE555V is useful not only as a resettable timer, but also in a variety of other applications, including monostables, astables, and missing pulse detectors. For those of you who wish a more thorough description of the machinations of the IC, Signetics offer a seven page set of application notes. I will, however, present a description here of the way in which the NE555V is used in the control logic design.

Figure 1 depicts use of the NE555V as a resettable timer. Whenever the voltage on the trigger input, pin 2, goes below 1/3 Vcc, the voltage at the output of the timer, pin 3, will assume a condition of logical 1 for a period of time determined by R and C. The timer is reset, i.e. the output voltage is brought to zero, when a negative pulse is applied to the reset terminal, pin 4. The timer will not be retriggerable until the logical 0 voltage at the reset pin is restored to logical 1. In all cases in the control logic design, the NE555V's are used in the resettable timer mode. The correct values of R and C for the time constants designated in the control logic design are given. However, depending upon the particular builder's tastes, these values may be altered according to the nomogram shown in Fig. 2.

Circuit Description

The three-minute time-out timer commences its timing cycle immediately upon receipt of a signal in the receiver. The output of this timer feeds the B+ relay driver transistor, Q3, through a simple 3 input diode OR gate (see Fig. 3). When the signal leaves the receiver, the 3/4 second squelch tail timer is triggered, raising its output to logical 1, and holding the transmitter on until its timing cycle is completed. In the meantime, the three-minute time-out timer has been prevented from resetting by a second 3 input diode OR gate connected to its reset terminal. The reset voltage at pin 4 of the time-out timer is held at logical 1 until the repeater carrier leaves the air.

Until this point we have considered operation of the logic divorced from the timer which controls the interval between identification and the timer which provides an extra-long tail to allow the ID to complete itself without interruption. Now let us see how these timers work. Consider a situation where the repeater has been idle for some time. The 2.5 minute ID interval timer has its output at logical 0 since its timing cycle has been completed. After passing through the phase inverter associated with pins 13 and 12 on the 7404, this voltage is converted to logical 1, enabling one input, namely Q2, of the discrete transistor AND gate consisting of Q1 and Q2. A signal appears on the repeater input, starting the time-out timer. Then the signal leaves, and the squelch tail timer starts. The negative-going pulse arising from the squelch tail timer returning to logical 0 is changed to a positive-going pulse by passing through the phase inverter associated with pins 5 and 6 of the 7404. This positive-going pulse is applied to the second input, Q1, of the AND gate, Q1 and Q2. Since the first input of the AND gate has already been enabled by the ID interval timer, the ID tail hold timer commences its timing cycle. Along with keeping the transmitter on, at the beginning of its 4 second timing cycle the ID tail hold



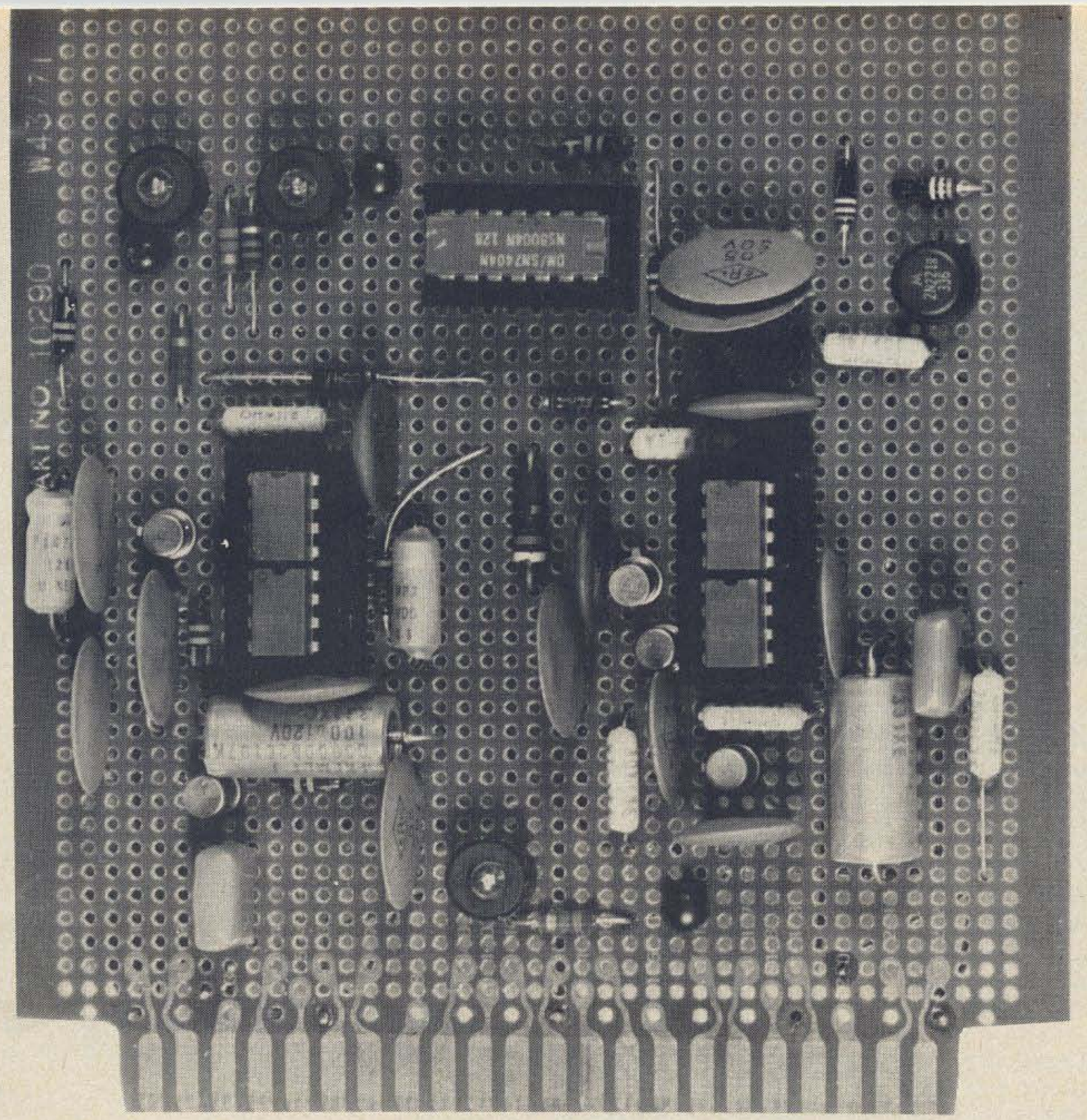
ALL LOGIC MUST BE OPERATED WITH VERY WELL REGULATED 5V SUPPLY
ALL CARDS SHOULD BE SHIELDED AND BYPASSED TO KEEP RF OUT

Fig. 3. Schematic of complete logic system.

timer sends an initiate pulse to the ID and retriggers the ID interval timer. Finally, one must consider the source of the delay mentioned earlier between departure of a signal from the receiver and initiation of the ID. Recall the timing sequence when a signal leaves the receiver. First the COR drops out, then the 3/4 second squelch tail timer drops out, in turn triggering the ID tail hold timer which then starts the ID. The same 3/4 second squelch tail timer provides the delay in starting of the ID.

This design is an example of pulsed sequential logic. The signals delivered by the COR and the output circuits of the timers are of constant amplitude, and must be converted to momentary pulses. To accomplish this, a one-shot of some sort is required. Bear in mind that a discharged capacitor has essentially zero resistance. When it becomes charged, the resistance increases to nearly infinity. The circuit in Fig. 4 employs this principle in a simple diode-capacitor one-shot. A positive-going signal at the input will deliver a momentary positive pulse through CR1 at the output. The one-shot is reset when the input signal returns to zero, thus discharging the capacitor through CR2. This positive-going pulse is of no use in triggering the NE555V until it passes through a phase inverter consisting of an NPN transistor and a 1K pullup resistor. A similar circuit is used to start the ID. The ID intended to be used with this system was designed by K1OZS. It, like the NE555V, requires a negative pulse to initiate.

There are several convenience features incorporated into the logic system. Three LED's are mounted on the card to provide a visual indication of the operating condition of the repeater. The first illuminates when the COR is on, thus acknowledging receipt of a signal. The second LED is on whenever the repeater carrier is on the air. The third LED, and perhaps the most useful of the three, shows when the Q2 input of the AND gate in the ID triggering circuit is enabled. Hence it indicates the ID is set to operate. This LED will extinguish when the ID starts, demonstrating that the ID is no longer set. It will reilluminate in 2.5 minutes, when the ID interval timer has completed its timing cycle. A provision is included for externally reset-



Photograph of completed logic card. This photo was taken before the half-volume was added. With edge connectors at bottom, the ID set LED appears in the foreground. Upper left LED is COR on. Remaining LED is transmitter on.

ting the ID interval timer so that the entire ID sequence, including the ID tail hold timer which keeps the transmitter on during identification, can be controlled manually. Similar additions, such as ability to manually time out the repeater, may be added, but are left to the constructor's judgment.

Construction

The entire logic system, exclusive of the ID, which occupies another card, fits in somewhat less than 3/4 of a standard size Vector card. Vero also makes a card suitable for this; its part number is 10290. Both cards are designed to mate with a 44 pin edge connector. Layout is straightforward, as can be seen in the photograph. Since each NE555V is an 8 pin DIP, two of them fit nicely in a single 16 pin DIP socket. The details of construction are left to the builder. I prefer not to bother with pins to mount components. The photograph should provide more than adequate ideas for construction. The ambitious among you may want to lay out a PC pattern.

Miscellany

As with any design involving high speed pulsed logic, rf can be a problem. The TTL series 7404 as well as the NE555V are, however, remarkably noise immune. Despite their noise immunity, additional precautions should be taken to avoid possible difficulties. All bypass capacitors shown in the diagram are the absolute minimum number for successful operation, but if you are plagued by rf don't hesitate to experiment with .01's anywhere in the circuit. They can't

Heathkit® 2-Meter FM gear is here!

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179.95*

HW-202 shown above with Tone Burst Encoder installed.

All solid-state design • Can be completely aligned without instruments • 36-channel capability *— independent push-button selection of 6 transmit and 6 receive crystals* ***• 10-Watts Minimum Output*** *— designed to operate into even an infinite VSWR without failure* ***• Optional Tone Burst Encoder*** *— mounts inside, gives front-panel selection of four presettable tones*

The Heathkit HW-202 compares with the best wired amateur 2M/FM rigs. Plus it has: 36-channel capability via independent selection of 6 transmit and 6 receive crystals. Solid-state circuitry with complete built-in alignment procedures using only the manual and the front-panel meter allow operation over a 1 MHz segment from 143.9 to 148.3 MHz. Removable front-panel bezel permits installation of the new Heathkit HWA-202-2 Tone Burst Encoder.

10-15 watts transmission into an infinite VSWR — indefinitely, with no failure! The HW-202 needs no automatic shut-down — it continues to generate a signal regardless of antenna condition. Transmitter deviation is fully adjustable from 0 to 7.5 kHz, with instantaneous deviation limiting. Harmonic output is greater than −45 dB from carrier. The push-to-talk ceramic microphone supplied has an audio response tailored to the HW-202.

Excellent reception — 0.5 uV or less produces 12 dB Sinad, or 15 dB quieting. Output at the built-in speaker is typically 2 watts at less than 3% total harmonic distortion. The receiver circuitry utilizes diode-protected dual-gate MOSFETS in the front end; an IC IF that completely limits with less than a 10 uV signal; dual conversion, 10.7 MHz and 455 kHz via a 4-pole monolithic 10.7 MHz crystal filter. Image response is −55 dB or better. Spurious response is −75 dB or better.

The Heathkit HW-202 comes with two crystals used in initial set-up and alignment, give you simplex operation on 146.94. Kit includes microphone, quick-connecting cable for 12-volt hook-up, heavy duty alligator clips for use with a temporary battery, antenna coax jack, gimbal bracket, and mobile mount that lets you remove the radio from the car by unscrewing two thumbscrews. The HWA-202-2 Tone Burst Encoder provides four presettable pushbuttons for instant repeater access. Fixed station operation is as easy as adding the HWA-202-1 AC Power Supply. The HA-202 2-Meter Amplifier puts out 40 watts for 10 watts in, and externally it's a perfect mate for your HW-202.

Kit HW-202, 11 lbs., mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. . . **24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. . . **29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95***

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5μv or less. **Squelch threshold:** 3 μv or less. **Audio output:** 2 W at less than 10% total harmonic distortion (THD). **Operating frequency stability:** Better than ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious rejection:** Greater than 60 dB. **IF rejection:** Greater than 75 dB. **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequency:** 455 kHz (adjustable). **Receiver bandwidth:** 22 kHz nominal. **De-emphasis:** −6 dB per octave from 300 to 3000 Hz nominal. **Modulation acceptance:** 7.5 kHz minimum. **TRANSMITTER — Power output:** 10 watts minimum. **Spurious output:** Below −45 dB from carrier. **Stability:** Better than ±.0015%. **Oscillator frequency:** 6 MHz, approximately. **Multiplier factor:** X 24. **Modulation:** Phase, adjustable 0-7.5 kHz, with instantaneous limiting. **Duty cycle:** 100% with ∞ VSWR. **High VSWR shutdown:** None. **GENERAL — Speaker impedance:** 4 ohms. **Operating frequency range:** 143.9 to 148.3 MHz. **Current consumption: Receiver** (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. **Operating temperature range:** −10° to 122° F (−30° to + 50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VDC nominal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD=$\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

...and here!

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FM copy on the fringe... 69.95*

40 watts nominal out for 10 watts in — *requires only 12 VDC supply.*

Fully automatic operation — *with any 2-meter exciter delivering 5-15 watts drive.*

Solid-state design — *all components mount on single board for fast, easy assembly.*

If you're regularly working from a fringe area, the new Heathkit HA-202 can boost your mobile output to 40 watts (nominal), while pulling a meager 7 amps from your car's 12-volt battery.

Install it anywhere...in the trunk, under the hood or dashboard. Use it with any 2-meter exciter delivering 5-15 watts drive. Features fully automatic operation. An internal relay automatically switches the antenna from transmit to receiver mode when you release the mike button.

All solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink, permitting high VSWR loads. Tuned input-output circuits offer low spurious output to cover the 1.5 MHz segment of the 2-meter band without periodic readjustment. All components mount on a single printed circuit board for easy, 4-hour assembly. Manual shows exact alignment procedures using either a VOM or VTVM. And installation is just as simple.

Kit includes transceiver connecting cable, antenna connector. Operates from any 12 VDC system — additional power supplies are not required. Add HA-202 power to your mobile 2-meter rig, and boom out of the fringe. **Kit HA-202,** 4 lbs.

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3″ H x 4¼″ W x 5½″ D.

...and here!

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Perfect tune-up tool for your 2-meter gear. Tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity. **Kit HM-2102,** 4 lbs.

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO-239. **Dimensions:** 5¼″ W, 5⅛″ H and 6½″ D, assembled as one unit.
*Using a 50 Ω noninductive load.

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do any harm. All cards containing logic, i.e. control logic and ID, should be completely shielded in a metal enclosure. Leads interconnecting the logic to other parts of the repeater should pass through the enclosure walls only through feed-through capacitors. Leads should also contain small chokes of about 10 μH mounted as close as possible to, or perhaps right on, the logic card. The 2.2 μF capacitor mounted across the COR contacts is absolutely essential to eliminate problems induced by contact bounce in the relay. With these precautions, the logic will perform perfectly.

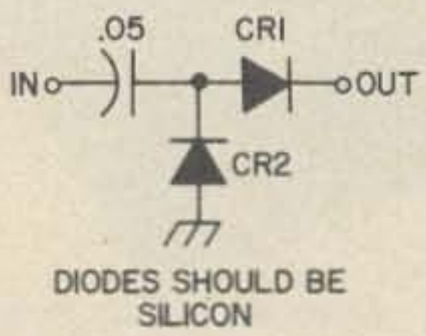


Fig. 4. Diode–capacitor one-shot.

Transistor and diode part numbers referred to on the schematic are not critical. Replacements should have similar characteristics to those which were suggested.

The capacitors used in the timing circuits, designated by C in Fig. 1, should be tantalum or Mylar for stability. Most others may be disc ceramic.

As pointed out earlier, the identifier mentioned throughout the article was designed by K1OZS. The triggering circuit used in the logic system will work with the K1OZS ID, but may require modification to work with other identifiers. Details of this modification are again left to the constructor, since design characteristics will vary for different ID's. The output circuit of the K1OZS ID uses a small picoreed relay, which can quite easily be made to key the output of a constant running audio oscillator. The small size of the picoreed relay causes a certain amount of capacitive leakthrough, which results in a trace of ID oscillator voltage appearing on the repeater carrier at all times. This condition is completely cured by placing a 15K resistor in shunt to ground with the line going to the repeater audio mixer from the ID. Systems using low impedance audio mixers may not experience the problem at all since the input impedance of the audio system is already low enough to eliminate capacitive leakthrough difficulties. Alternatively, what is known as a half-volume circuit may be used to do away with the problem. This circuit reduces the ID level by about 3 dB when a signal appears in the receiver so that someone who accidentally starts transmitting over the ID will not be obscured by it. As an added benefit, its shunt impedance is also low enough to eliminate capacitive leakthrough problems. Such a circuit appears in Fig. 5. These few components would easily fit in a small portion of the unused space on the control logic card. There would still even be room for putting a Twin-T network audio oscillator for the ID.

The output of the logic system provides positive 3V for the relay driver transistor, more than sufficient to saturate it. The relay driver transistor suggested, a 2N3716, is capable of switching up to about 30V at several amps, positive only with respect to ground. The schematic shows an option for operation of the B+ relay coil from ac. It is necessary only to insert a diode, properly polarized, in series with the relay coil.

Again, those of you who are ambitious may want to replace the electro-mechanical COR by a solid-state Schmitt trigger, using perhaps a TTL series 7400. In addition, Delco now offers transistors suitable for controlling low to moderate transmitter plate voltages and capable of operation at 700–800V dc. Possibilities suggest a totally solid-state repeater logic system. Imagine a repeater that is completely silent! I had originally displaced thoughts of a completely solid-state system, since one of my objec-

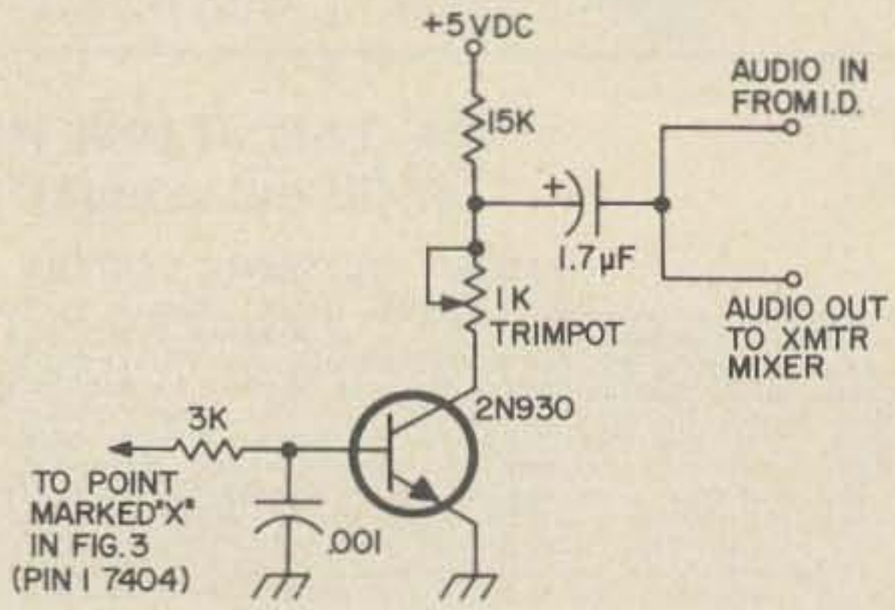


Fig. 5. Half-volume circuit.

tives was to enable the design to be interfaced with existing repeaters using relay logic. The objective has been maintained. A repeater using relay logic can have the logic system described in this article installed in it in a matter of minutes, because the old COR and B+ relay are used. Yet for new repeaters there is no such restriction. The nature of the design permits it to be integrated into a totally solid-state system.

The logic system and ID should be operated from a well-regulated and filtered 5V dc power supply which is free from transient noise spikes and other extraneous outputs. A Thyrector diode across the primary of the power transformer should eliminate unwanted noise resulting from power line pickup. The voltage from the power supply must be constant or the ID speed will change. Such a supply is not difficult to construct. Suitable designs appear in *The Radio Amateur's Handbook*, many hobby circuits manuals, and magazine articles. Several surplus electronics houses offer complete 5V supplies intended specifically for use with TTL logic. The power supply for the logic should be capable of at least one amp.

Testing the completed circuit consists of plugging it in, turning it on, and seeing if it works. Chanes are that if it doesn't pass the smoke test, you'll never be able to tell visually, since it contains no high voltage or high current components to be visibly damaged by a malfunction. Malfunctions will be traceable to either a faulty component or a wiring error. The design has proven itself inherently flawless over several months of 24-hour service. The operation of the system is described in detail earlier. When you take it upon yourself to start this project you should, as with any other, be prepared to repair the finished product if it doesn't work. This article is not intended to be a troubleshooting manual.

At maximum, there are only two adjustments to be made to the system. The speed of the ID should not be permitted to exceed the 20 wpm legal limit. If the half-volume circuit is included, its 1K trimpot should be manipulated so that the ID level is reduced by about 3 dB when the COR is active, i.e. when a signal is present in the receiver.

Conclusion

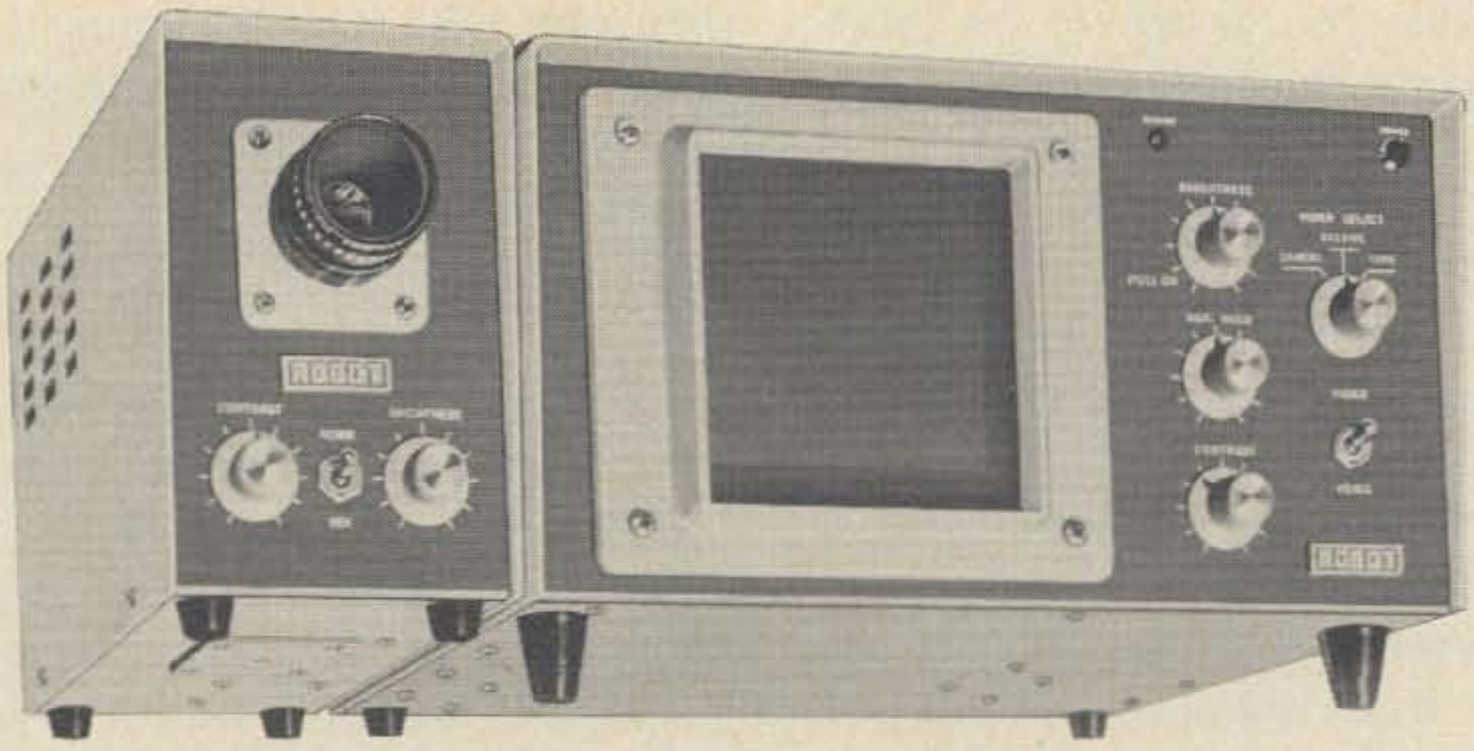
With this system replacing relay logic, you can bid farewell to sticking relays, timers which either don't work at all or don't reset, and scratchy code wheel identifiers.

The system lends itself to interfacing with a TTL sequential tone decoder for remote control purposes. I am currently perfecting a circuit which can be added to the logic system without modifying it, to allow for complete remote control of the repeater. It employs another Signetics IC, the NE567. Almost any other remote control system, using either relays or solid-state logic, may be interfaced with this logic design. Anyone starting construction on a new repeater should explore the solid-state COR discussed earlier.

I am confident anyone using this design will be pleased with its operation and rewarded with trouble-free operation for building it.

Acknowledgements go to K1ABR, K1BCT, K1OZS and W1OAV.

...WA1OMS



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MONO - BAND LOG - PERIODIC ANTENNAS PART II

Last month the theory and design of single band Log-Periodics was discussed and element lengths were presented for five-element L-Ps for the HF bands 80–10m. This month we will conclude the article with the method of construction, erection and tune-up of these antennas.

Construction

Figure 3 illustrates the homemade 1.5 x 7.5 cm Lucite center insulators. These support and space the two-wire center feed line which feeds the elements and separates or positions the five elements. These can also be used as end insulators for elements 2, 3 and 4. Egg-type insulators are used for elements 1 and 5 as will be mentioned later.

W4ITS has been experimenting with L-Ps lately and suggests that pieces of ½ in. (std) plastic water pipe serve well for insulators and are less expensive and easier to construct.

Figure 4 illustrates the completed mono-band L-P supported between four masts, showing the method of using two nylon catenary side lines for supporting the elements. This sketch is shown looking down on the complete system.

My lastest Log-Periodics are constructed entirely of aluminum wire which is used to reduce weight and cost. This is No.15 aluminum electric fence wire which can be purchased at Sears and is much less expensive than any copper antenna wire. The use of aluminum wire is important for weight reduction of my L-Ps since they are all supported by high trees. If masts were used, No.14 or 7/22 copper antenna wire could be used; however it is quite a bit more expensive.

Assembly

First cut and drill the Lucite per Fig. 3. Three of the center insulators (4-holes) and six of the end insulators (2-end holes) will be required for elements 2,3 and 4.

Next cut two wires slightly longer than the overall length given in the table last month for the two-wire center parallel feed line. Thread the three center insulators on one end of the two wires (close spaced holes).

Select two trees, posts or other rigid supports separated by a meter or two greater than the final length of the feed line. These

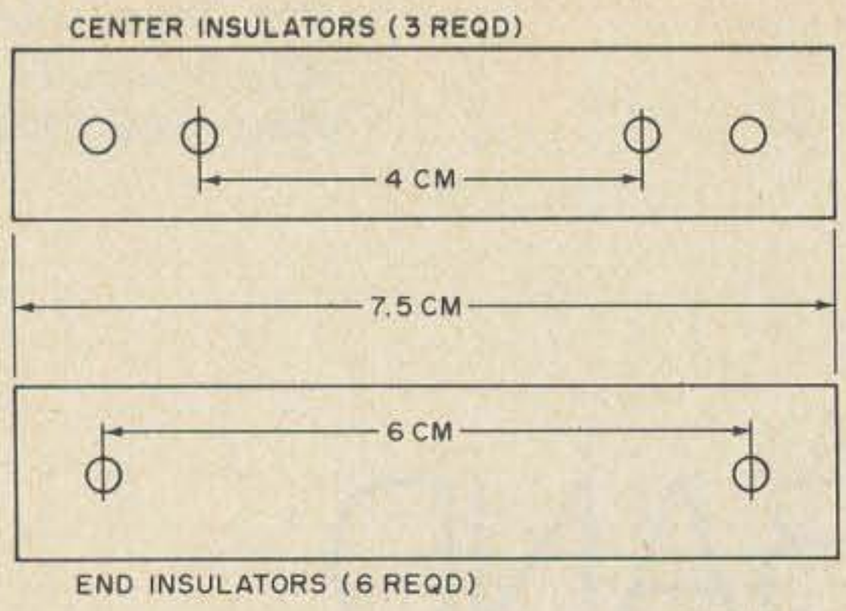


Fig. 3. The centered end insulators are made of Lucite approximately 6 mm thick. All holes are made with a No. 29 drill.

should be at least 1.5 meters above ground between which the two-wire center feeder can be strung and pulled tight.

With the two-wire feed line secured to and made tight between the two supports, mark a starting point (about 30 cm from one of the end supports). This can be indicated by a piece of plastic tape or masking tape secured to each of the two parallel wires (or a quick-drying paint smear can be used). This will be the starting point or the location of the No.1 rear (longest) element. Note: An egg-type insulator will be used as the center insulator for the rear element 1 and the forward element 5. Lucite is not suited for these two end elements as there is more strain on these than elements 2,3 and 4.

Starting at the marked point which will be the center connection for element 1, measure along the parallel feeders with a steel tape to obtain the first spacing distance (S1) between elements 1 and 2. Now slide a Lucite center insulator to this point. The other two insulators must be forward of the element 2 center insulator. Using a short length of No.18 or 16 tinned copper hook-up wire, secure the Lucite center insulator or spacer to the two parallel feeders as illustrated in Fig. 5. Make certain the Lucite spacer is square or at right angles to the feeder and that the tension is equal on both wires. After the first spacer is secure, proceed to the next.

Measure the second spacing distance (S2) which will be the distance between element 2 and 3. Slide the second Lucite spacer into position and secure, being sure the third spacer is forward of the second.

Now measure S3 and secure the third spacer, then measure S4 or the last spacing between E4 and E5 and mark with tape or paint. This will be the location for the egg center insulator for the short forward element 5 and also the feed point.

Measure a length of antenna wire for the longest rear element 1. Since this is in effect a doublet, the length on either side will be one-half the length given in the table. Allow sufficient length on both ends for securing to the center and the end insulators.

The two-wire center feeder line will be attached across the center (egg) insulator of element 1. The feeder can be spaced or fanned out to about 8 cm at the center which will give greater spacing. This gives better mechanical stability to the two parallel feeders and there will be less possibility of these two wires becoming twisted or shorted in a wind. The lower bands, 40 or 80m L-Ps, may require one or two extra Lucite spacers to reduce the possibility of shorting in a high wind. A spacer every 2 meters may be necessary. These will generally not be required after element 2 or 3. None should be required for 10, 15 or 20m L-Ps.

Next, measure the two wires for element 2. As this element will be transposed at the Lucite center insulator, leave at least 30 cm extra on the center ends, beyond where they are secured to the end holes. This extra length or "dress" will allow for the transposition below the Lucite insulator.

Measure and cut element 3. This element is non-transposed at the center.

Measure and cut element 4. This will be transposed as per element 2.

Measure and cut the shortest forward element 5. This is non-transposed and also uses an egg center insulator as used for element 1.

The two-wire parallel center feeder can now be removed from the two end supports and for the moment can be laid on the ground. We now have the center feeder spaced by the three Lucite insulators for elements 2,3 and 4, and it is ready to be connected across the two egg insulators at elements 1 and 5. The two-wire feeder should be 30 or 40 cm longer at each end (beyond the rear and forward marked

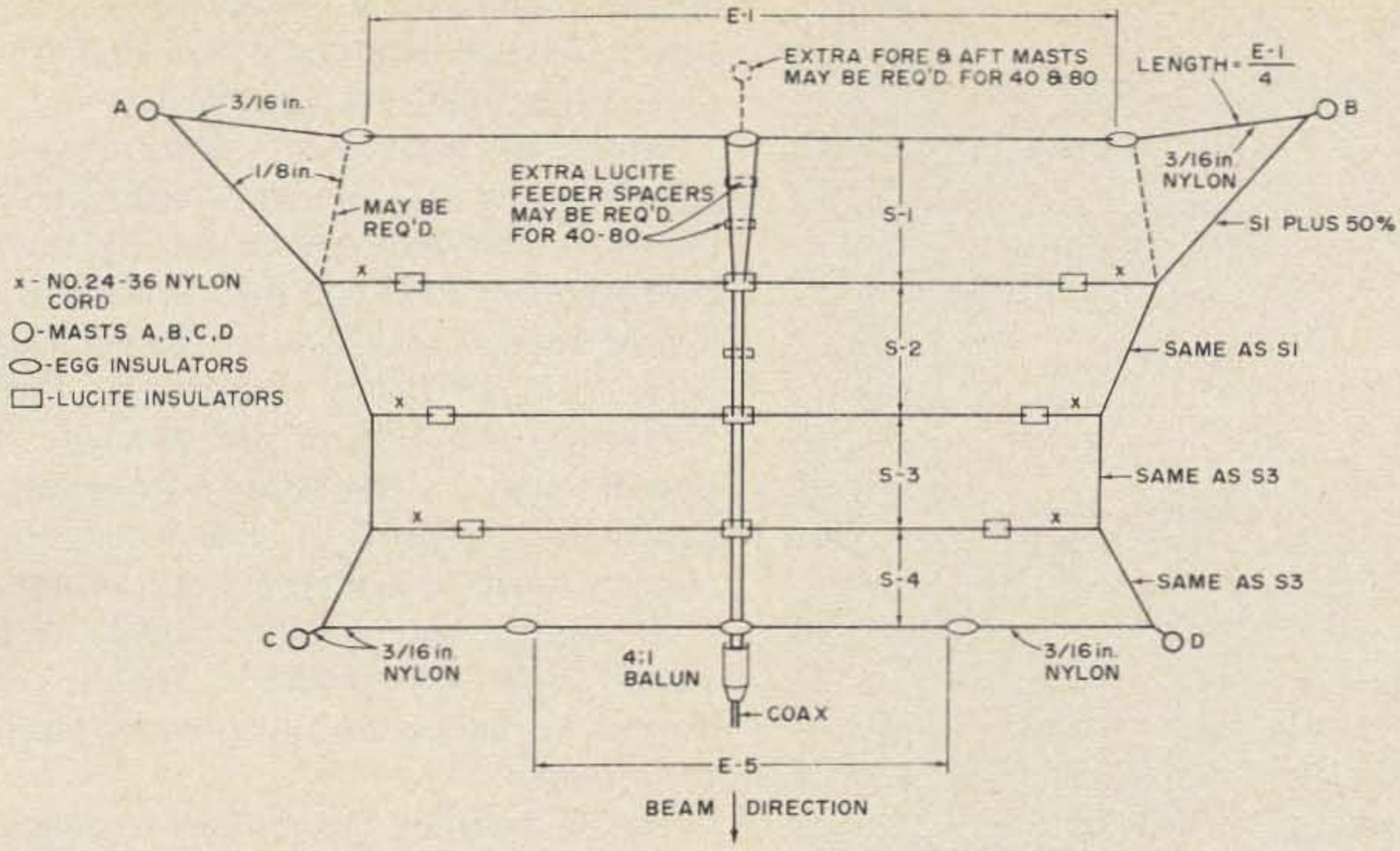


Fig. 4. Basic layout of the L-P antenna once the insulators and supporting ends have been attached.

points). These extra lengths leave sufficient length for wrapping to the center of elements 1 and 5. After wrapping, the extra length is cut off. We now have the center feeder connected to the five elements.

Regarding transposition of every other element, note that the odd elements 1, 3 and 5 are *non-transposed* while even elements 2 and 4 are *transposed.*

We are now ready to assemble the entire antenna. It is assumed that the four masts, trees or other supports to which this beam is to be suspended and aimed in the desired direction have been selected or erected.

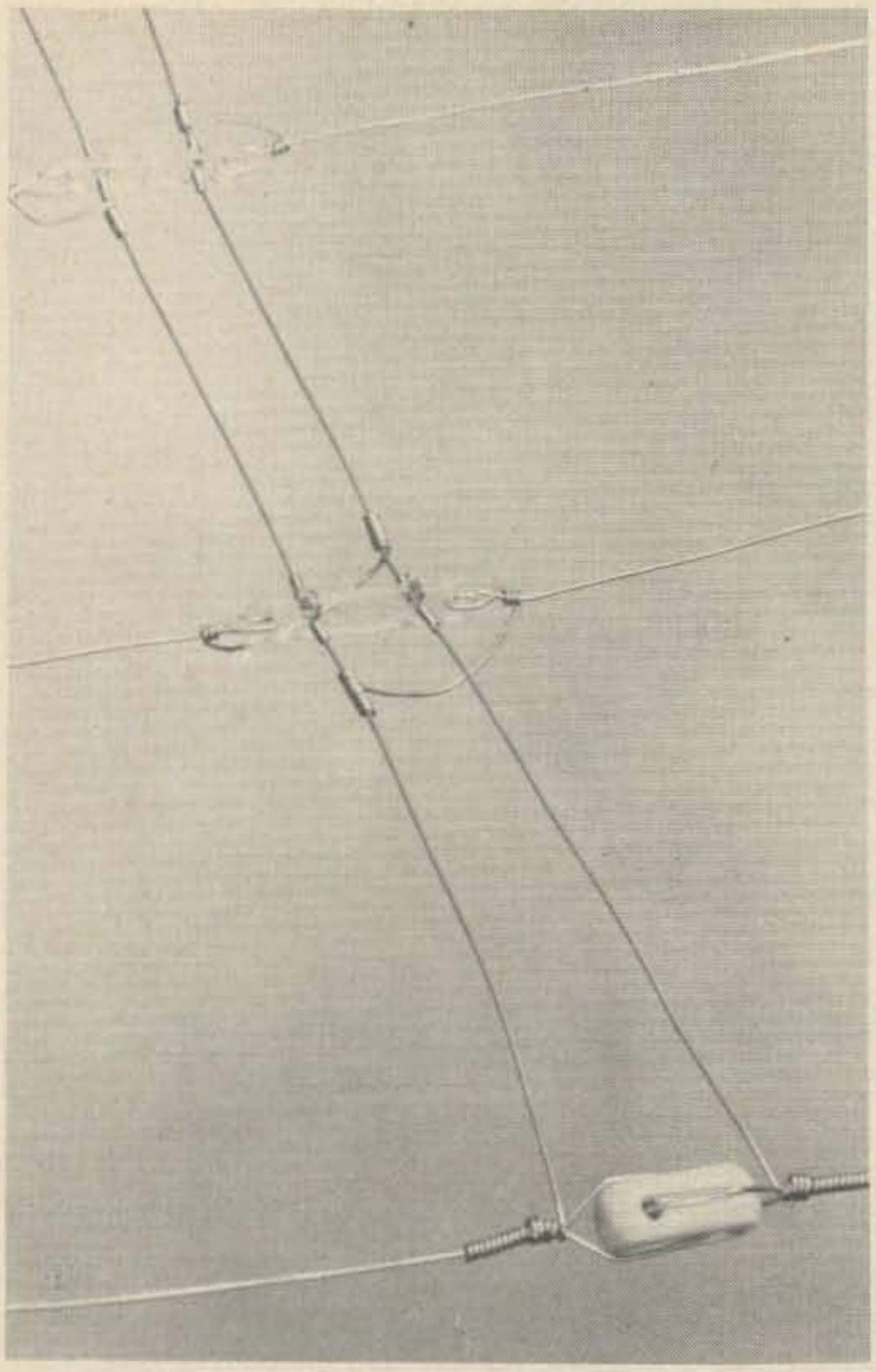
The entire antenna will first be temporarily assembled between the four masts at a height of approximately 2 meters. This height is suggested as the system can be stretched at the low height between the four masts to clear the ground and can still be reached for making the connections between the elements and the center feed line. If the beam is to be for 80m it may be necessary to assemble it approximately 3 meters off the ground, using a stepladder.

With the five elements and the two-wire center feeder laying on the ground in the desired aiming direction, string the two catenary side lines (A-C and B-D) fore and aft between the supports.

Next add the end insulators to the five elements and to these tie on the nylon support cords. Egg-end insulators are used for the rear and forward elements 1 and 5; Lucite end insulators for elements 2, 3 and 4.

Stretch element 1 between supports A and B and element 5 between C and D. Now, by having the two side catenary lines stretched between the masts (line 1 between A and C; line 2 between B and D) at a working height, it is fairly easy to adjust the tension between the elements and the side lines so they (catenary side lines) will take on the proper shape illustrated in Fig. 4. While making these adjustments, it is suggested that the nylon cords between elements 2, 3 and 4 end insulators and the catenary lines be tied to the catenaries with an easily untied knot, as it may be necessary to adjust these several times for proper weight and tension distribution so the side lines will take on proper shape. This is the only "cut and try" procedure required for assembling this type L-P.

Care should be taken at this point to keep the elements parallel with each other, i.e., the end separation between the elements should be equal to their center spacing distances, S-1, S-2, etc. There will be some



This is a mock-up showing three elements to illustrate proper connections to the forward or aft egg center insulators (non-transposed). The following element using the Lucite center insulator is transposed and the third insulator is non-transposed. These mock-up elements were only spaced 25 cm so the three types of center connections to the feed line could be illustrated in a single photo.

sag to elements 2, 3 and 4 unless their supporting cords to the catenaries are very tight. Some sag in these elements seems to have little if any effect on the antenna's performance. It is probably better to have some sag than to put too much strain on the end cords and in turn the side lines. Allow some "give" to reduce possibility of damage during an ice storm.

There will also be some fore-and-aft sag to the center feeder due to the weight of the two-wires and the center insulators (especially if copper wire is used). The amount of feeder sag will also depend on how tight the rear and forward elements can be tightened between their supports, as they support the weight of the center feeder. If copper is used for the center feeder, it may be necessary to also have two additional fore-and-aft supports, especially for 40 or 80.

After all mechanical adjustments have been made at a convenient height, it should "hang" or be stretched in exactly the same configuration it should have when raised. If it now appears satisfactory, the element end cords can be firmly secured to the side catenaries. After these are secured with a non-slip knot, a few wraps of masking tape should be applied to either side of the element cords to keep them in position.

If copper wire has been used, all joints should now be soldered. The 4:1 balun should be added to the forward short-end feed point.

Before hoisting the antenna to position, it is suggested that an swr check be run. Connect a short length of coax to the balun and read the swr across the band every 100 kHz.

Even though the antenna is only 2–3 meters above ground, the swr readings taken at this height will not be too far off from one taken after the antenna is raised to maximum height. This procedure would probably not be accurate for a yagi or other narrow band, high Q beam, as there would be too much ground effect. An L-P, being a low Q broad band antenna, seems to be less affected. It is suggested that the swr readings be recorded for comparison with the final swr test which should be run after the antenna is raised to its final location.

Another interesting test while the antenna is at a workable height it to excite it with sufficient power to get an rf indication at the element ends, using a small neon bulb or a "sniffer" to check the voltage distribution on the elements and center feeder.

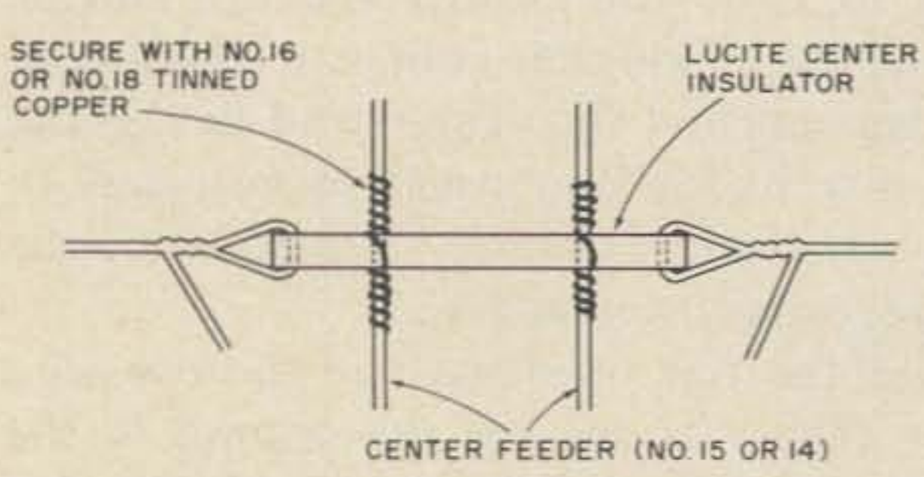


Fig. 5. Method of securing the center insulators to the center feeders.

Rf will be practically nil on the rear element 1 (reflector). The second element will be quite "hot", as it should be, and rf will generally diminish on the three forward elements. At the high end of the band, 3 may become the "active" element and 2 the reflector. This simple voltage distribution test is especially interesting on a long 12–17 element L-P for 20-15-10 when testing on each of the three bands.

If the low elevation swr is less than 1.5:1 and relatively flat across the band, the coax to be used can be connected and the beam raised into place for on-the-air tests.

Some have inquired as to how these L-Ps stand up under icing conditions and during high winds. Although all of my L-Ps, including those for 20-15 and 10 are suspended by high pines and cedars, I have had no problems to date. The first L-P installed in 1970 is still up. It and several others have been through three heavy ice storms. Although they sagged almost to the ground from ice buildup, none broke. The nylon line used for their support evidently has enough "give" under the load to prevent snapping. As soon as the ice melted, they returned to their normal height. The only antenna I have lost here during an ice storm was an 80m doublet – but so far, no L-Ps. They have also been through several high winds successfully.

There have also been inquiries as to whether the mono-band L-P can be designed for a higher gain than 10 dB. The gain of a Log-Periodic is determined by several variables as were outlined by Reference 5. Of these the α angle (½ the apex angle), the "boom length" and the number of elements, are important factors. The smaller the apex angle, the longer the boom length and more elements (up to a point) gives greater gain.

Some of the large fixed commercial and military hf Log-Periodics give gains up to 14 dB. One manufacturer produces a modified type L-P only 60 meters in length which has an advertised gain of 17 dB.

Working with these variables is more complex and lengthy than can be presented here. Without a programmed computer, the designing of an L-P by the formulas can become quite involved. I have, however,

worked out a graphic design method for L-Ps which requires absolutely no math except for simple division. By using this method, any 3 to 30 MHz, VHF or UHF L-P can be designed on paper in less than an hour, where several days were required before. My largest 17-element 20-15-10m L-P, which is 30 meters in length, giving 12 to 13 dB gain, was generated by the graphic method.

I am now assembling an experimental "Long-John" mono-band L-P for 20 which will have seven or nine elements and should give 15 dB gain. If this gain is realized, I plan to add a second identical L-P to give two side-by-side (co-linear) in phase beams to obtain an additional 3 dB or a total of 18 dB. I have tried this previously with a temporary dual L-P and was able to get the additional 3 dB gain by phasing. If this works out over a test period, I will be glad to pass on the information.

. . .W4AEO

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If you've added a tunable oscillator to your 2m FM rig, the next step is

Bill Hoisington K1CLL
Farover Farm
Peterborough NH 03458

CALIBRATING YOUR TUNABLE 2 METER RECEIVER WITH SURPLUS CRYSTALS

This article describes the use of either old or new crystals in the 8 MHz band, such as from Gonsets or similar, for calibration purposes. An infinite attenuator is also described as a bonus for signals from .1V down to .1 μV, and even .001 μV if you think your receiver can pick that up. This is good for both sensitivity and low noise tests. You can also borrow crystals from a buddy to help calibrate your dial. Looking back into the Gonset portion of my junk box, I found some 8 MHz rocks that did the job, and multiplied them into the 2 meter band from 144 to 147.819, so the 2 meter FM band was easy to find.

Now, a crystal oscillator in the 8 MHz band is easy. Or is it? Sure, they've been around since before World War II, but just wait until you try it. There are pitfalls waiting for you such as high-power spurious and drop-outs with some crystals because – while they can be made to oscillate well – you have to change the circuit slightly, and that's no good for a general purpose calibration-signal generator-attenuator.

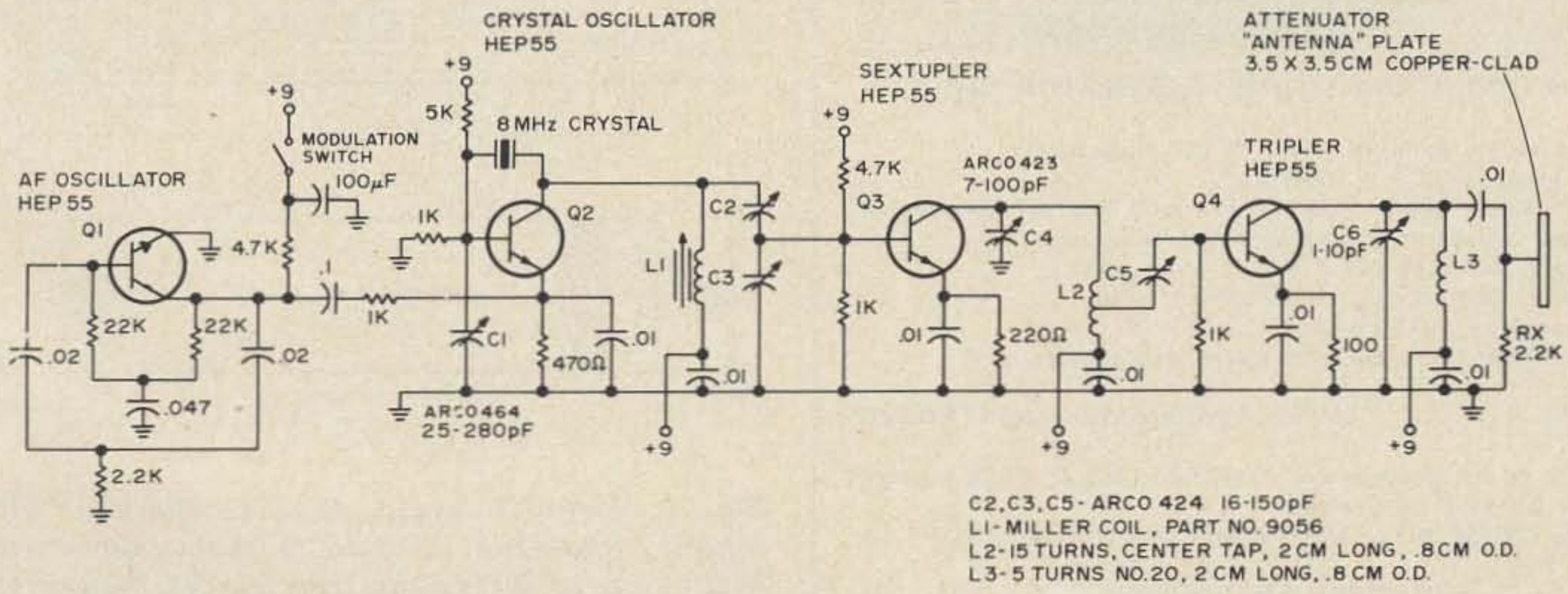


Fig. 1. Schematic of the receiver calibrator for the 2m band. L1 – Miller coil, part no. 9056; L2 – 15 turns, center tap, 2 cm long, .8 cm O.D.; L3 – 5 turns, no. 20, 3 cm long, .8 cm O.D.

It took me a good two days, 12 or 13 hours per day, to get this one running smoothly with most of the old crystals, and a smooth-running job is always a must with me. Here's hoping my experience will save you some time.

I first tried my favorite VHF circuit for the oscillator, which turned out to be much too lively. So back to the old "No-coil" Pierce I went, and after plenty of tries, the circuit shown in Fig. 1 was the result. It is very reliable and easy to tune up. It was built on a narrow plank for insertion into my trusty old Infinite Attenuator, a piece of waveguide 60 cm long by 11.8 cm wide and 7 cm high, which has a metal cap and jack on one end, as in Fig. 2. An insulated pick-up plate inside the waveguide attached to J1 allows you to connect your receiver cable to the receiver, *et voila*, signals from 100,000 μV down to 1/10, 1/100, or even less!

I included an af oscillator, which helps to identify the signal, and although this is not absolutely necessary when you use the infinite attenuator, at times it can be very useful. A money saver is a piece of rectangular cross section aluminum rain-gutter down lead (Fig. 2). This can be used instead of the waveguide, which not everybody can scrounge.

Special Notes

There is a certain amount of balance in tuning up an oscillator of this kind between

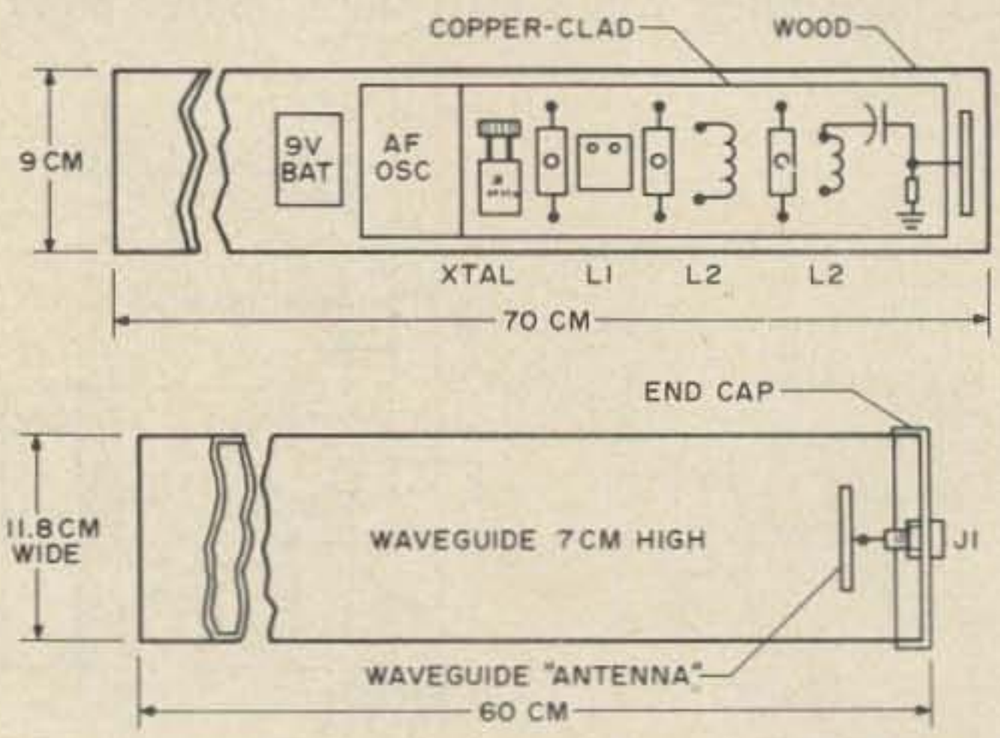


Fig. 2. Pictorial layout of the calibrator and infinite attenuator. Aluminum rain-gutter down lead of similar dimensions may be used in place of the waveguide.

the emitter resistor and the collector tuning, because of the variable capacitance effect of almost all transistors. Also, don't expect every crystal to work just the same way. They don't! I have one that could not be made to play along with the others. Make sure, with a tuned diode receiver, that you are on 8 MHz (very important). Most "dippers" when used in the diode mode and link coupled to the oscillator will do a good job for you. Do not use a high-sensitivity receiver for this purpose. You have to have at least one piece of test equipment on your bench for this sort of work, and that is a signal generator. A $40 one will do. This will enable you to calibrate diode receivers, etc. I have these things here from 50 kHz to X band, 10 GHz, and they are very handy when you need them. After checking the frequency of the crystal oscillator, I put in an untuned diode across the circuit of the output on 144 to 148 MHz. With this you can watch the rf output, and listen to it, without having to tune again. But always watch that frequency! When multiplying by large numbers, even tripling, it is very easy to slip into the next harmonic, and then see what happens if you don't realize it.

AF Oscillator

Referring to Fig. 1, and starting with the af oscillator, you see the familiar Twin-Tee job, which oscillates near 400 Hz with the values shown. All you want is some tone on the signal in order to identify it. You can connect it in almost anywhere on the crystal oscillator. It works fine on the emitter, so that is where it stayed. For more modulation, connect it to the base, possibly through an rf choke. A switch in the 9V line should be used to cut off the modulation. Do not try to simply disconnect the oscillator while it is running, as some modulation will sneak in through the battery's internal resistance. You could use a 100 μF capacitor across the +9V, but it is not really needed. The easiest way to disconnect the af oscillator is to just turn it off.

Crystal Oscillator

The final circuit is a combination of a Pierce, with the crystal between base and collector, but it also has a tuned collector coil which helps a lot, and a large capacitor to ground from base. This is a great help in maintaining the proper phase between the collector and the base, which is at times very important. The base should not be left floating, phase-wise, in many types of circuits. Always check this out. The oscillator is sure-fire for 8 MHz rocks. L1 is tuned mainly by C2, with C3 matching into the base of Q3 the sextupler. Always do the larger part of your multiplication in the *first* stage, when you do have a choice, as with Fx6 and Fx3. This is because practically all active devices are less active the higher you go in frequency, so put the largest multiplier first, making L2 and C4 resonant on 48 MHz. Be sure it is on 48, not on 40 or 56! You will find that C2 and C3 match well into Q3. C4 tunes L2, and C6 is a good match into Q4. If the bottom half of L2 gives you trouble on 147 (spurious oscillations on 147) use the two-capacitor connections shown for the input of Q3. I didn't find much trouble here, so C5 did the job.

Tripler

Another HEP 55 still works well on 147, so the tripler Q4 is easy to work with and tune up. No plus voltage was needed on its base, there being sufficient drive from Q3 on 48 MHz. Also, of course, be sure it's on 147, or wherever your crystal multiplies up to in the two meter band. L3 and C6 tune to 147 with the antenna plate attached. To check for good output power, say 5 to 10 mW, couple into a tuned diode detector from L3 with a 1 to 12 pF capacitor into an output cable from a tap one turn up from the cold end of L3, plus a ground connection for the cable sheath.

Conclusion

You will find the crystal signal generator to be very useful for a lot of tests and the attenuator will allow you to make very interesting sensitivity and noise tests. When you back this unit down into that waveguide, you *cannot* pull in that signal! The attenuator is also very "repeatable" which makes calibration easy and important.

...K1CLL

Elliott Kanter W9KXJ
3242 W. Hollywood Avenue
Chicago IL 60659

PLL IC APPLICATIONS FOR HAMS

The single most exciting development of the mid-70's, at least as far as ham radio is concerned, will probably be remembered as the Phase Locked Loop (PLL). These remarkable circuits have applications galore. In fact the only real limit to their versatility is your own imagination and initiative. This article will outline several interesting applications with the emphasis on practical use rather than theory; where possible, exact component values will be given. For those desiring details as to the "why's" (heavy-theory), a bibliography follows the text.

General Considerations

The integrated circuits described are available in transistor-like packages, eight-fourteen-or sixteen pin dual-inline-packages and occasionally in sixteen pin flat paks. Their cost in single lots is generally less than $5 each. Cross-referencing or substitution of other than Signetics Corporation's IC's is usually not possible. The PLL, to my best information, is of a proprietary nature to the Signetics Corporation and not readily available from other sources.

The easily procured "Circuit-Zaps" allow rapid construction of a variety of circuits. A socket-type mounting arrangement is suggested for the IC to allow for its use in other circuits. For hams who have not worked with or used IC's before, a few precautions are in order: First, lead length should be kept as short and direct as possible. Second, do not neglect to use bypass capacitors to avoid unwanted instability and oscillation. Third, use only a small tip, low wattage iron for connections. Last, unused inputs should be grounded for best operation.

PLL Receiver

The NE561B integrated circuit together with a handful of inexpensive components produces a novel receiver usable from 1 Hz to 15 MHz. The frequency range provides for applications from the sub-broadcast band (e.g., WWV @ 60 kHz, marine and weather broadcasts) to the ham bands from 160–20 meters. If you can visualize a few components, an antenna band switch arrangement and audio-output stage, a truly miniature all-band WWB or CHU time receiver is possible, spanning the frequencies of 60 kHz through 10 MHz. On the more practical and realistic side, a simple receiver can be put together for about $10 for a particular ham band, a nice gift for that would-be-Novice you know. After all, who wouldn't rather hear live code than listen to tapes? Other

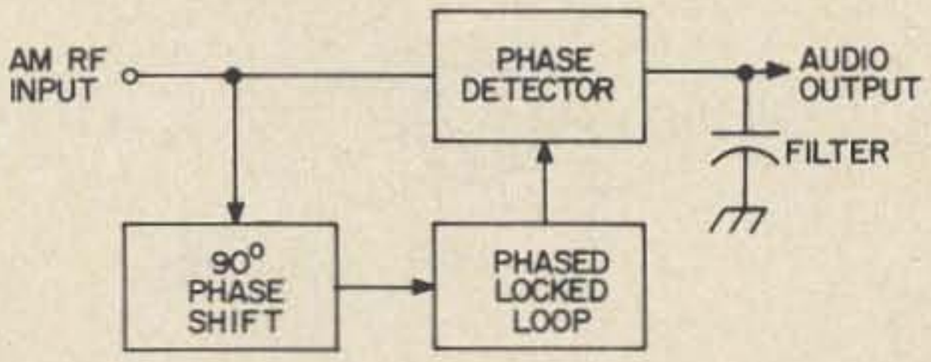


Fig. 1. Block diagram PLL AM receiver.

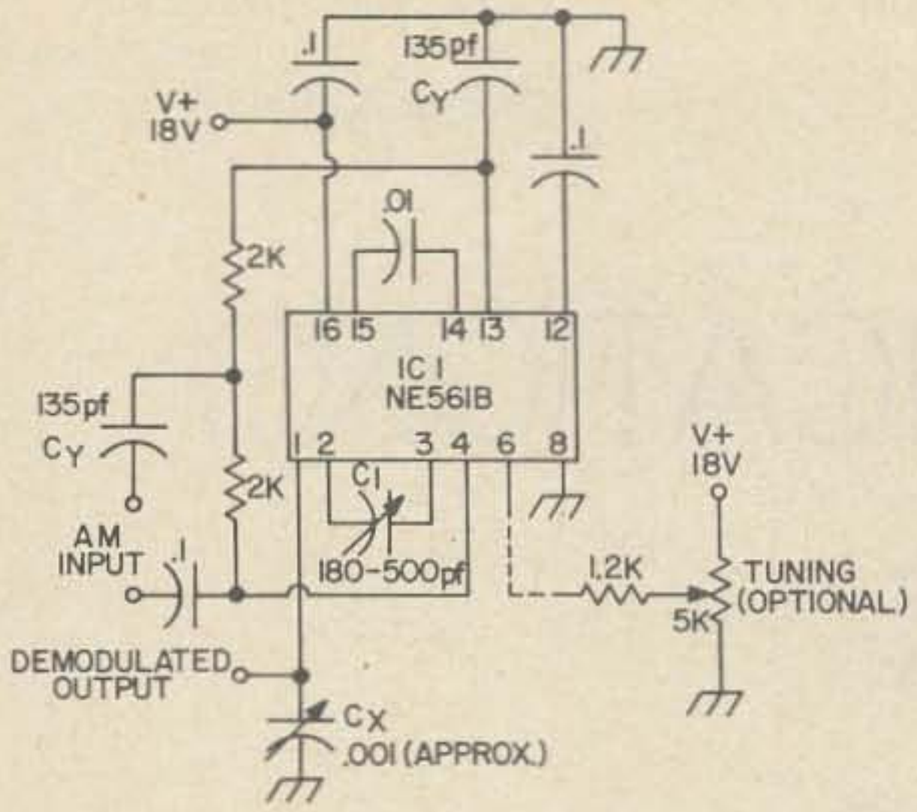
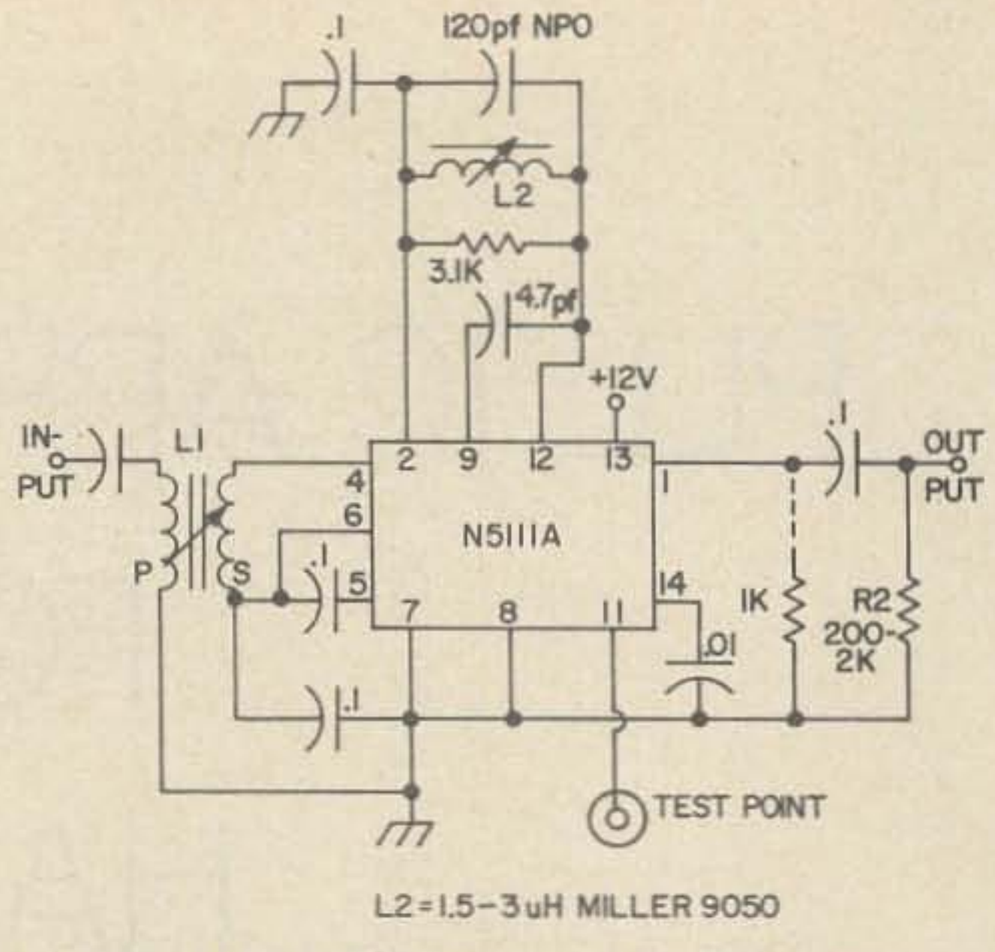


Fig. 2. Typical PLL AM receiver for the broadcast band. For other frequencies (1 Hz–15 MHz), Cy = (fhi – flo)/(fhi x flo). C1 = 300 pF/f(MHz).



L2=1.5–3uH MILLER 9050

Fig. 4. IC FM detector. 10.7 MHz output.

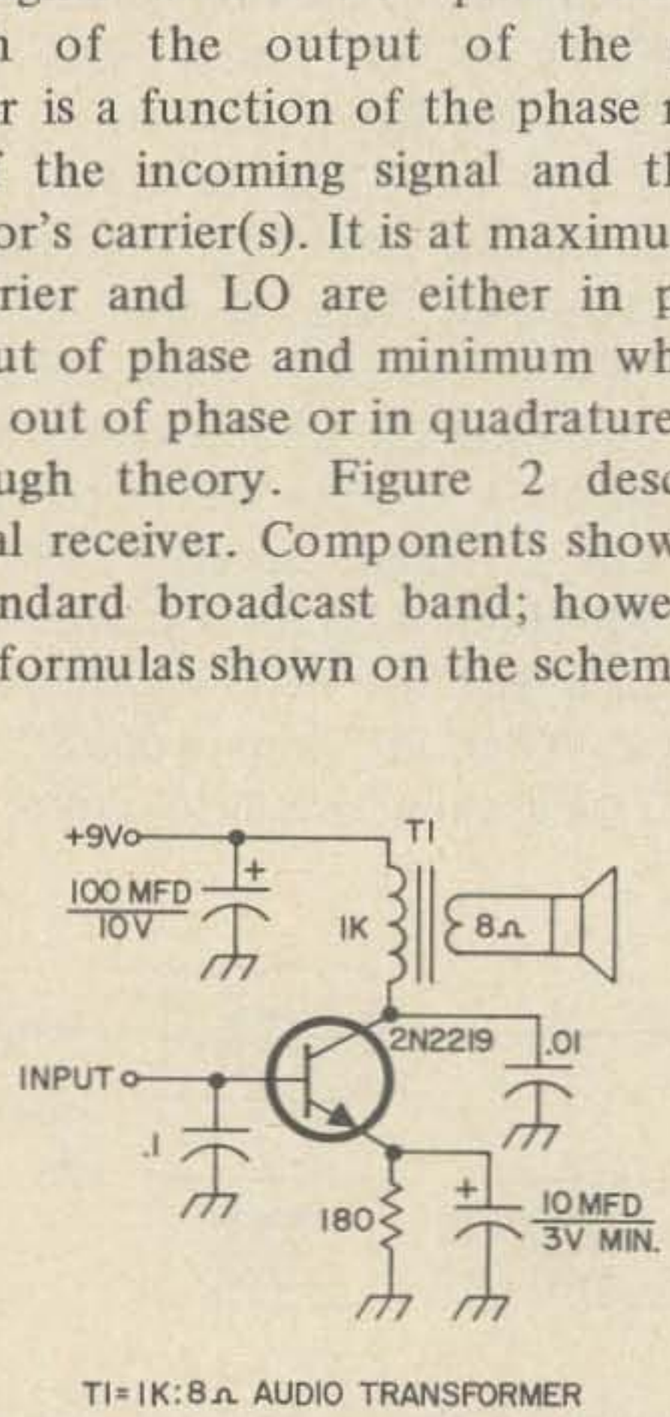
applications include tunable i-f strips for converters and FM demodulators without tuned circuits.

Figure 1 is the block diagram of the PLL receiver. The phase locked loop is locked to the signal carrier frequency and its voltage controlled oscillator (VCO) output is used to provide the local oscillator signal for the product detector, or for use as a synchronous demodulator. The PLL locks to the input signal with a 90° phase error. The strength of the output of the product detector is a function of the phase relationship of the incoming signal and the local oscillator's carrier(s). It is at maximum when the carrier and LO are either in phase or 180° out of phase and minimum when they are 90° out of phase or in quadrature.

Enough theory. Figure 2 describes a practical receiver. Components shown cover the standard broadcast band; however, the simple formulas shown on the schematic will enable you to calculate changes to allow operation from 1Hz to 15 MHz. Although the circuit is primarily designed for AM use, varying Cx will introduce sufficient change to allow CW/SSB reception. A tuned rf stage may be required together with a good antenna and ground. The voltage requirements can be met by connecting two 9V batteries in series. The PLL requires a maximum of 12 mA, with 10 mA being typical. The audio amplifier shown in Fig. 3 will be more than adequate for the PLL receiver.

FM Detector/i-f

While the N5111A shown in Fig. 4 is not a PLL, its relatively simple requirements as to discrete components and modest 12V power requirements will no doubt find their way into many receiver applications requiring a detector/i-f at 10.7 MHz. The input frequency range of the 5111 spans 5 kHz to



T1=1K:8Ω AUDIO TRANSFORMER

Fig. 3. Audio amplifier for use with PLL receiver.

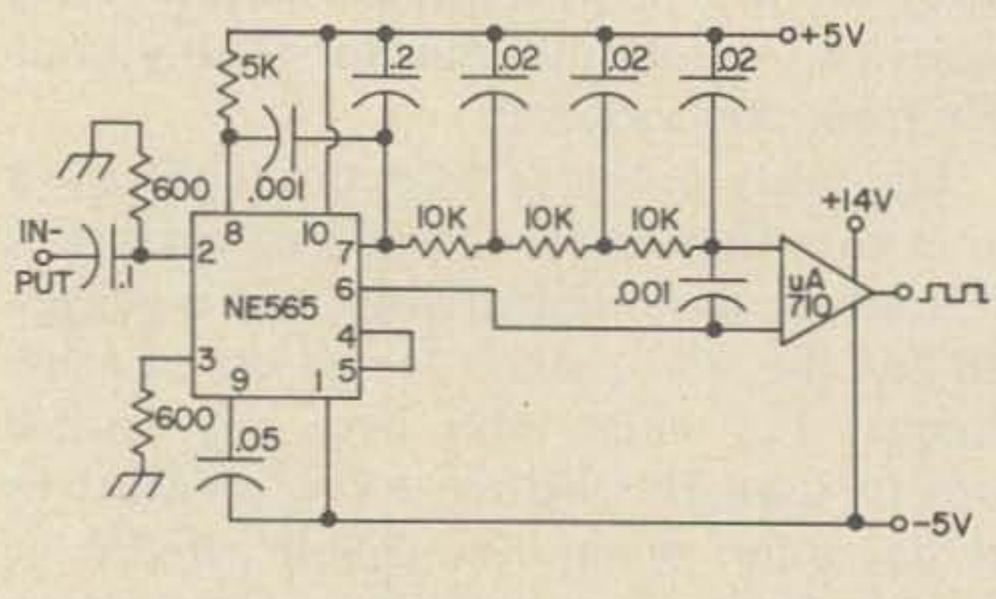


Fig. 5. Typical PLL FSK decoder (1070/1270 Hz).

50 MHz, making it a suitable detector/i-f for a number of converters, receivers, etc. Suitable applications for this IC include automatic control systems, receivers and servo amplifiers. There is no reason why a simple receiver cannot be built to monitor FM repeaters on the 10 meter band, or for the SWL a Lo-band monitor for commercial frequencies. Again, the applications are limited only by your imagination.

RTTY/FSK

Teletype and frequency shift keying is a natural application for the PLL. Figure 5 shows a two IC FSK decoder using the NE565 (PLL) and the UA710 differential voltage comparator. The dual voltage supply can probably be met with batteries as the NE565 will function with from 5 to 20 volts. The 565 is a general purpose PLL designed for applications at frequencies below 1 MHz. The circuit and component values are for decoding FSK signals of 1070/1270 Hz. As the FSK signal appears at the input, the loop locks to the input frequency, tracking it between the two frequencies with a corresponding shift (dc) at the output.

Single Burst Tone Generator

Again we are dealing with an IC which is not a true PLL. Instead, the NE566 is described as a function generator. The IC is a voltage-controlled oscillator exhibiting exceptional stability and linearity with buffered outputs of square and triangular waves. Frequency is determined by the external resistor R1 and capacitor C1 and the voltage applied to the control terminal (approximately .75 Vcc). Operation is possible with voltages from about 9–24V with typical current requirements of 7 mA. The value of R1 should be somewhere between 2K and 20 KΩ. Frequency adjustment over a 10 to 1 range is possible with the same capacitor. Typical applications include tone generators, frequency shift keyers, FM demodulators, clock generators and of course function generators.

The circuit shown in Fig. 6 is that of a single burst tone generator which produces a signal for a duration of one-half second (0.5 sec) after activiation of the power supply.

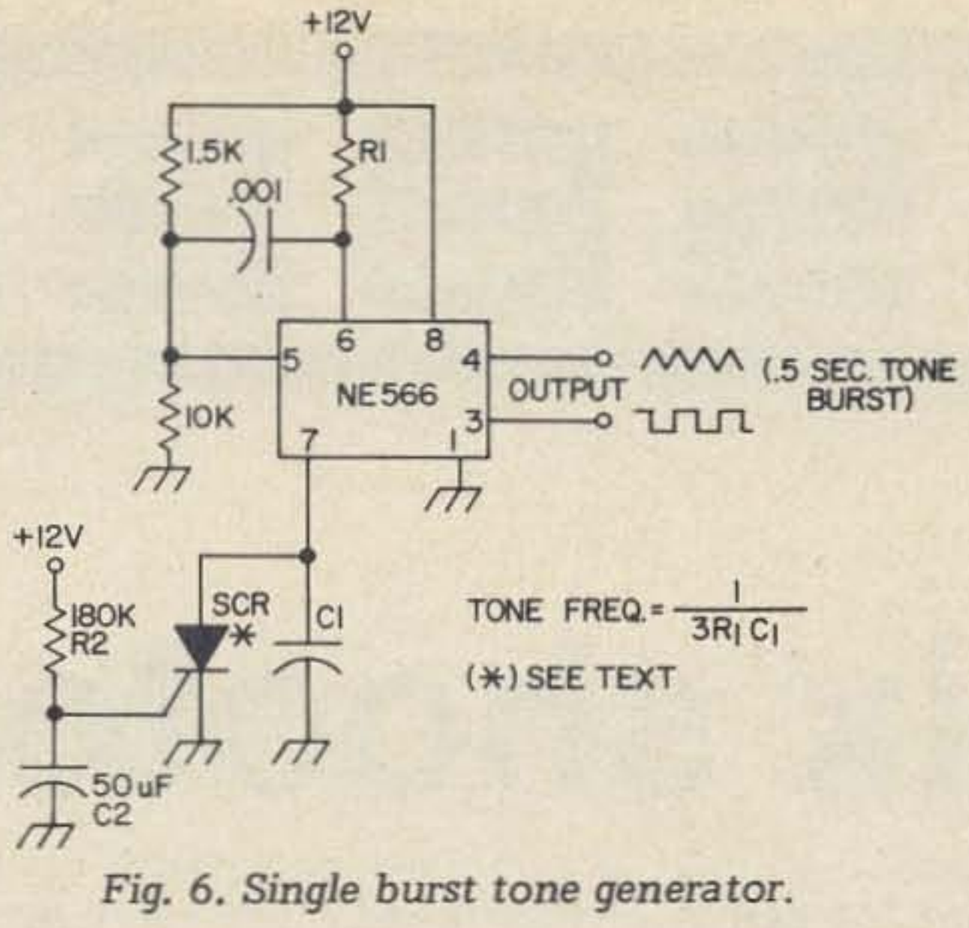


Fig. 6. Single burst tone generator.

The frequency of the tone is selected by the formula:

$$\text{Tone} = \frac{1}{3\ R1C1}$$

with the value of R1 being between 2K–20 KΩ. The SCR must be capable of triggering at a level of 70 μA as this is the maximum current available. Should you desire to increase the current, you can reduce the value of R2 while increasing the value of C2 to keep the same .5 sec. time constant.

This simple circuit can be readily adapted and built into existing FM transceivers as a subaudible tone generator to access repeaters. By varying R1 with C1 constant a "universal" tone burst generator can be built to enable the traveling ham to access any repeaters he might happen across on vacation, etc. In addition the modest 12V at 7 mA can be supplied by even a battery-portable transceiver with no trouble at all. The SCR can be replaced by a NPN transistor and the tone switched on and off at will at the base terminal of the transistor.

We have tried to present a number of useful applications for the PLL IC. These are but a few of the many uses to which they can be adapted in ham radio, and if nothing else this article is food for thought. Considering the modest cost and power requirements, shouldn't you invest about $10 and get some today?

...W9KXJ

Bibliography

Linear PLL Applications Book and *Linear IC Vol. 1*, both available from Signetics Corp., 811 E. Arques Ave., Sunnyvale CA 94086.

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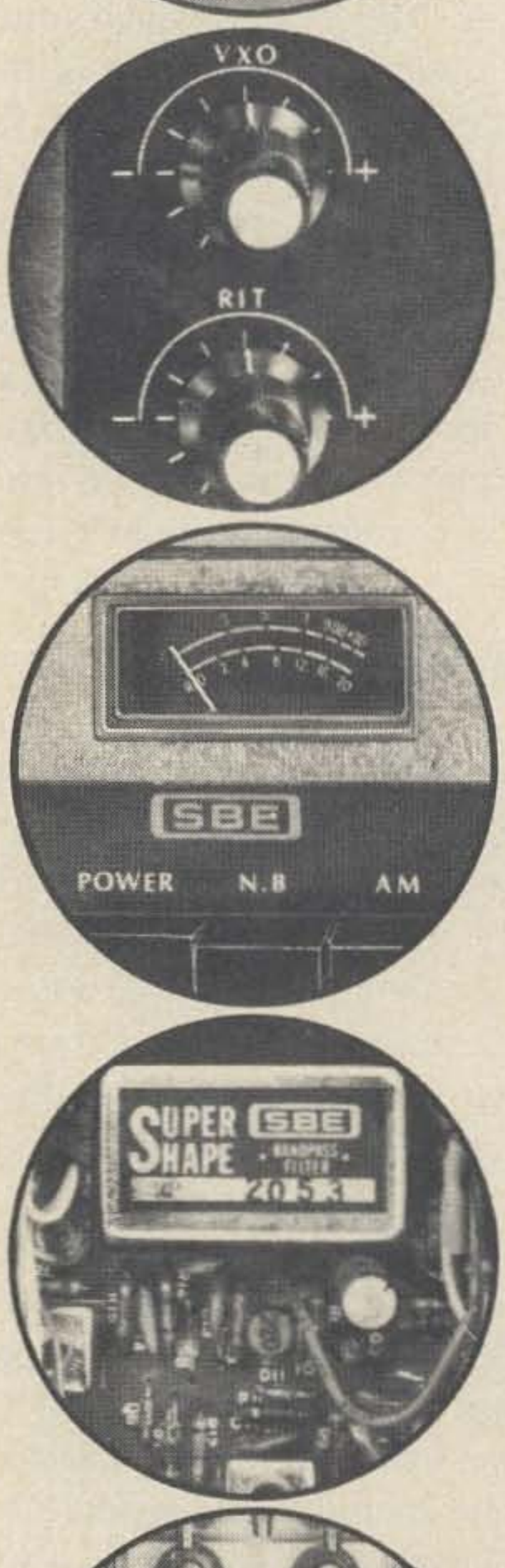

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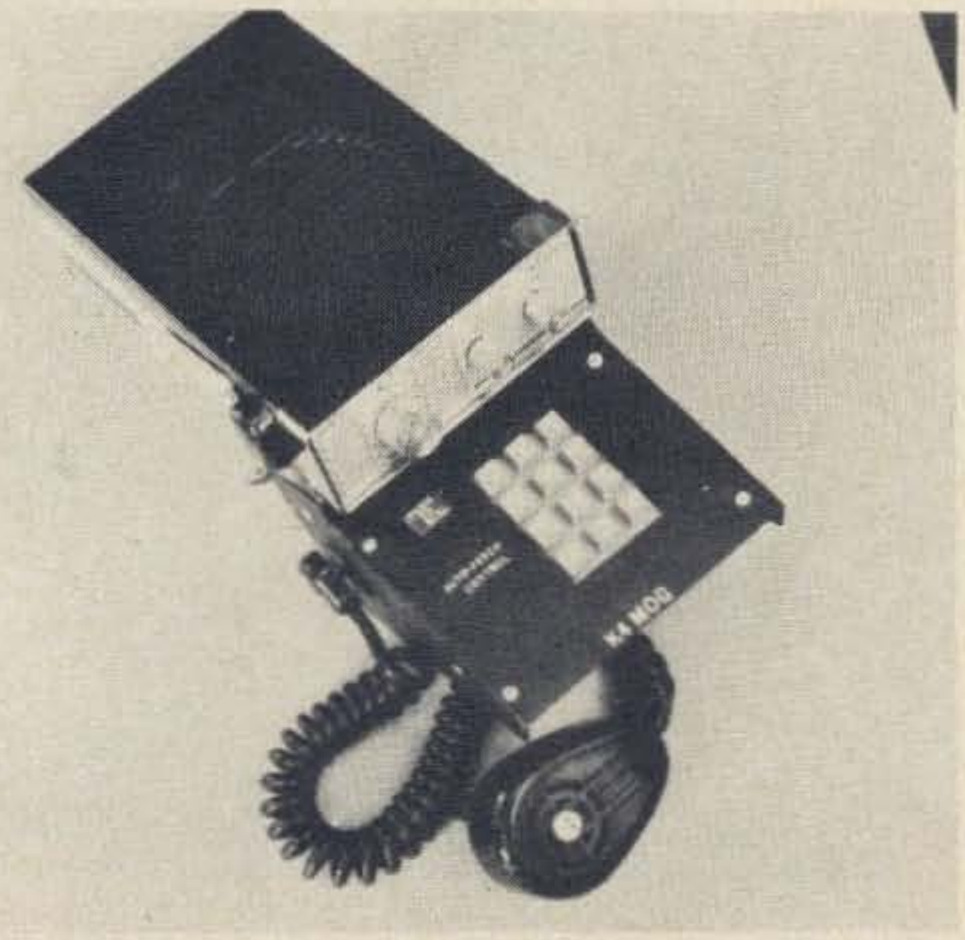
THE PATCH PAD

A circuit that allows auto-patch access and dial-up with one finger ease and convenience

Almost every major city in the United States has at least one 2 meter repeater that has auto-patch access capability. While the majority of telephone calls that go through these repeaters are generally of the social nature, there are cases where lives have been saved by the quick reporting of accidents by "Good Samaritan" hams with 2 meter auto patch capability. In Atlanta several months ago, when a million gallon fuel tank exploded setting several homes on fire and threatening others over a radius of a mile, the auto patch proved its value.



The "Patch Pad" shown assembled and attached to the transceiver.

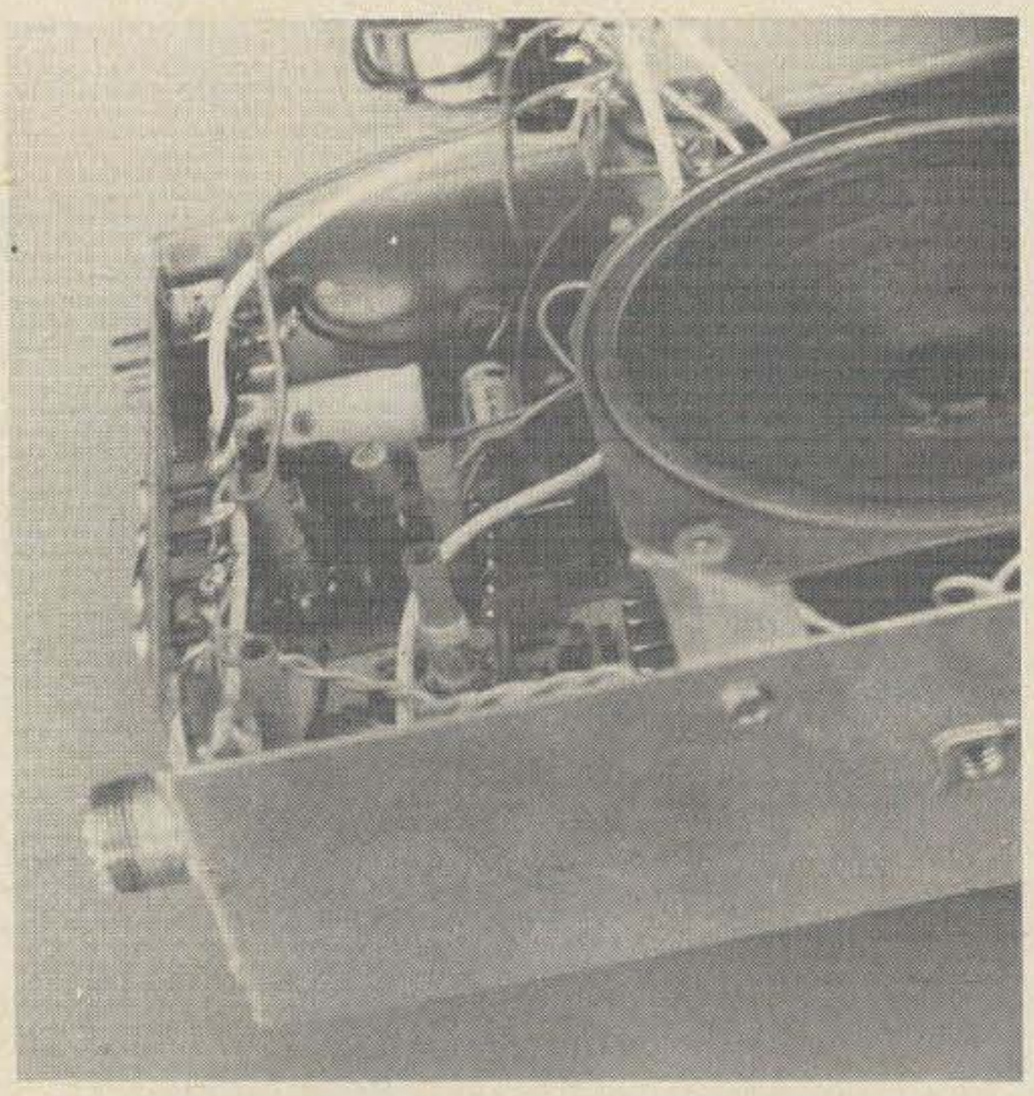
Members of the Atlanta Radio Club provided 80% of all emergency telephone communications out of the area through the club's auto-patch facility for 12 hours until the telephone company could run additional circuits to the operational command center. While the auto-patch system will never entirely replace the need for point-to-point communications networks during emergencies, it is fast becoming a standard tool in civil defense and related community service activities, and every amateur with 2 meter FM capability should have the ability to access the auto-patch in his area during an emergency.

Is It Hard to Add a Touch-Tone Pad to an Existing FM Transceiver?

There is no problem adding a touch-tone pad to any transceiver, as long as certain rules are followed. Ideally, when the pad is being used, the microphone should be

switched out of the circuit, even though the pad shunts the relatively high impedance of most crystal and dynamic microphones with a very low impedance. In most cases, this shunt is low enough to reduce the noise pickup from the microphone to a low level during the dial cycle.

However, in order to insure a pure noise free tone output it is a good idea to switch the transceiver input between the microphone and the pad during pad activation periods. In addition, it is important that the audio level out of the pad be set independently from the microphone level control. Most pads' output will be in the neighborhood of 3V peak to peak. If some provision is not made to control the output level of the pad, the microphone pre-amp will be overloaded and the tone input waveform to the modulator will be severely distorted. In some cases, the over-drive problem may cause the modulator circuit to over-deviate the transmitter out of the pass band of the repeater receiver. To overcome these problems, a separate audio level control is mandatory. Unfortunately, the addition of a level control can lead to an additional problem with frequency stability. If the low output impedance of the pad is not properly matched to the output circuit, comprised of a potentiometer and a dc blocking capacitor, minor frequency shifts can occur in the



Switched B+ is brought directly off of the change-over relay contacts and brought to an external tie point on the transceiver.

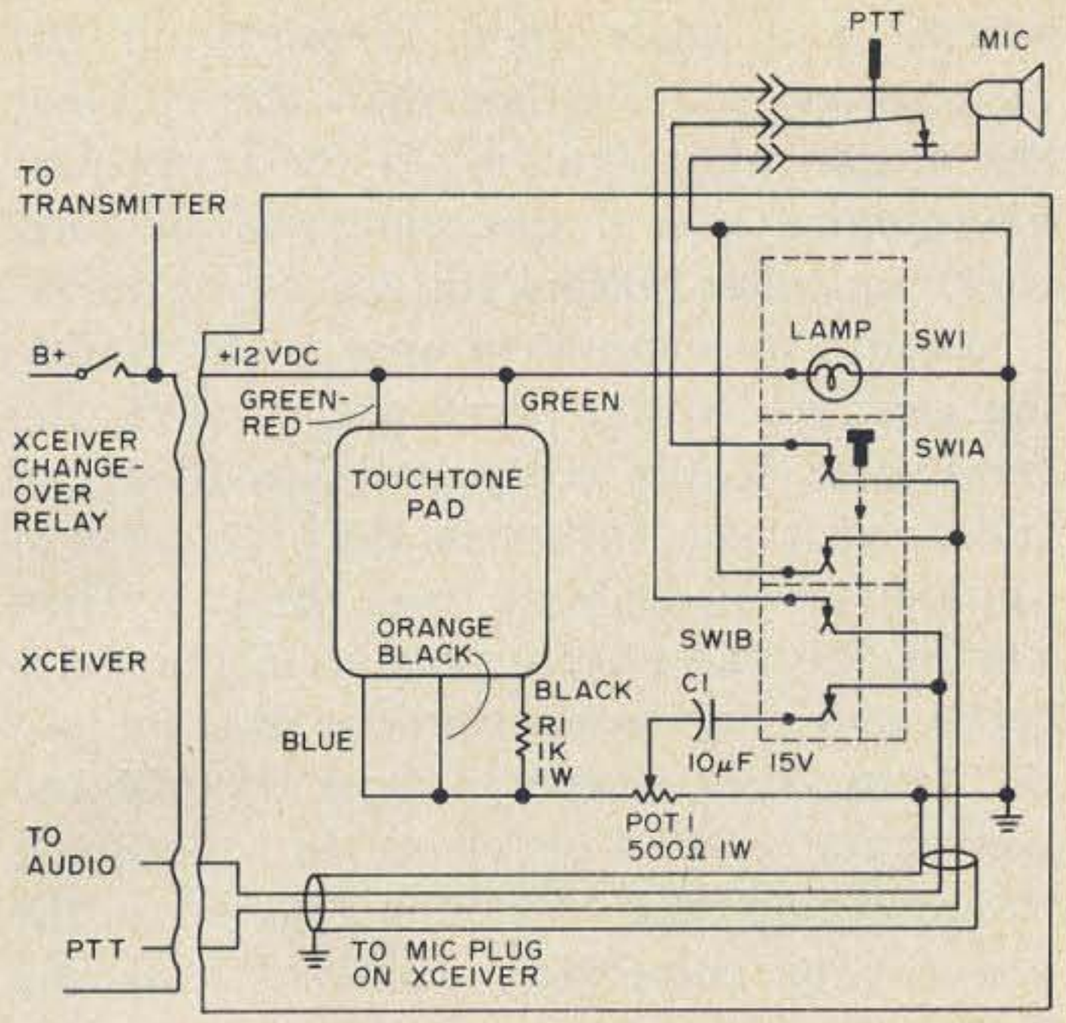


Fig. 1. Diagram of the 'optimized' TT pad schematic.

output frequency. Depending on the severity of the mis-match, under worse case conditions, the tone generator's output frequency can be pulled out of the pass band of the telephone company's switching equipment.

Therefore, it is most important that impedance relationships be kept within tolerance in any design using a touch-tone pad. Also, some provision must be made to control the amount of time required for the output to stabilize at the proper frequency and pre-set amplitude level. This period can range from a few milliseconds to several hundred, depending on the pre-set level of the internal bias that is controlled by external circuitry.

The final consideration in designing associated circuitry associated with a touch pad system is related to user ease. The design should be primarily optimized for operator convenience. One finger operation during the entire dial sequence is highly desirable. In addition, it is nice to know if and when the pad has been accidentally activated, possibly to the extent of turning on the transmitter. (This has happened during mobile operation more than once to even the best operators.) This problem can be avoided with the addition of a visual indicator such as a pilot light, during the time that the pad is activated. In short, the more care that is taken in designing associated pad circuitry, the better the results and the fewer misdialed numbers that will occur.

The 'Patch Pad' design meets most of these requirements and the associated circuitry can be built in one or two evenings depending on the physical design of the housing for the switch and touch-tone pad.

Construction of the "Patch Pad"

There are several makes of touch-tone pad configurations and they may differ between manufacturers. However, most of the color coding is standardized to the extent that the color combinations shown in Fig. 1 should be accurate regardless of manufacturer. Therefore, the internal circuitry of various pads is unimportant for the scope of this project. The same holds true for the transceiver modifications.

The only important consideration to remember when tying to the transmitter B+ is that it is 12V dc and negative ground. Most of the small solid state transceivers meet this specification. Those who use tubes in the final amplifier usually have a solid state driver stage that is fed from the switched 12V dc line, and tying into this switched source is no real problem.

Circuit Description

The circuit shown in Fig. 1 is generally self-explanatory, except for the operation of the circuit. SW1 is a "lock-on" type switch (Arrow-Hart 83504) with a pilot light assembly (83-500-70) and two contact blocks (83-500-30) that form in effect a pair of double pole double throw switches.

When the switch lens assembly is depressed, it locks into the down position. This actuates a plunger that causes SW1 A. to short the push-to-talk line to ground. This turns on the transmitter, which applies 12V dc, through the change-over relay to the transmitter board and simultaneously to the touch-tone pad and pilot light assembly in the switch. This voltage supplies the pad operating voltage and the pilot light in the switch alerts the user that the transmitter is on.

The plunger also activates SW1 B. This action transfers the audio input of the transceiver from the microphone to the pad, direct, assuring no extraneous noise will be mixed with the tones.

Potentiometer, Pot. 1 determines the

Quick disconnect of the "patch Pad" can be accomplished in a few minutes if mated plugs and tie strip connections are used.

level of the audio out of the pad, and Capacitor C1 blocks the dc voltage across Pot. 1, from the input of the transceiver.

The 1K resistor, R1, serves as an external bias control element. This value was found to be adequate to insure that the tones will rise to the proper frequency and amplitude within several milliseconds.

Installation

After wiring the components as shown in Fig. 1., locate a source of switched +12V dc when the transceiver is in the transmit position. In the HR2 series transceiver, this voltage can be taken directly from the transmitter section of the change-over relay. This should be the case with most other solid state transceivers. If possible, bring this voltage out through a tie point on the transceiver for quick disconnect convenience. Again, in the case of the HR2, one of the spare lugs on the rear can be used for this purpose, allowing the pad assembly to be quickly removed during crystal adjustments or final tuning procedures.

Once the switched 12V B+ has been located and the tie point in the transceiver wired, attention can be turned to the audio portion of the circuit. A female microphone jack that mates with the male microphone plug should be mounted on the touch-tone case in some convenient location. The audio and push-to-talk pins are wired as shown in Fig. 1. The output circuit is wired according to Fig. 1, paying attention to the fact that the microphone and push-to-talk circuits are wired to a male plug identical to the microphone plug. Other than the fact that the output plug wouldn't fit the transceiver microphone jack if this were not the case, there are other reasons for this arrangement.

Should some problem arise in the switching circuitry in the tone pad cabinet, the transceiver is not completely disabled. All that is necessary to bypass the problem is to unplug the microphone from the pad. Then unplug the pad output plug from the transceiver and plug the microphone directly into the transceiver, thus bypassing the pad and pad circuit related problems. In addition, if the matching plug scheme is adhered to, the pad can be completely removed from the transceiver in a matter of a few minutes if it is necessary, all without going into the transceiver each time to unsolder connections.

Setup Procedure

Before the pad circuit can be used on the air, the output level must be adjusted to a level not to exceed that of the microphone that is used with the transceiver. Otherwise, distortion of the sine wave will result when the microphone pre-amp is overdriven in the transceiver by the pad circuit. Plug the microphone into its mated plug on the pad assembly. Connect an oscilloscope to the pad output and whistle into the microphone with SW1 in the up position (Pad Off.) Note the peak value of the resulting output. Depress SW1 and then hold any digit on the keyboard. Note the level of the pad output. If the pad output is much higher or lower than the microphone output, adjust Pot. 1 until the pad's output is the same as the output of the microphone during the "whistle test."

After this checkout procedure has been accomplished, you are ready to go. All that remains is to find out the rules for the use of the local auto-patch circuit. Now you are ready to join the ranks of those hams who already enjoy the convenience of the world at their fingertips.

. . .K4MOG

Acknowledgement

I especially want to thank Jack Berry W4PME for his help in supplying me with data on the optimization of circuitry for the touch-tone pad.

Hans Weber WA6QYU/DJØDQ
Dammerstock Str. 44
75 Karlsruhe-Rüppurr
West Germany

S-METER FOR AN HW-7

A simple modification that is a welcomed addition to the popular Heath QRP rig.

After assembling an HW-7 and finding the Heath rig quite nice, I wondered about an S-meter. To add one, remove the only screw holding the front panel to the back-up plate and increase the hole size. A miniature 1 pole switch (SPDT) can be inserted easily, and that takes care of the main mechanical work. The diagram shows a simple meter amplifier and rectifier. It was soldered together on a terminal board. Although it is comparatively frequency independent, this system uses the audio-beat as a signal so the volume control must be set in a fixed position. We took the audio directly from the IC output terminal into the circuit's input.

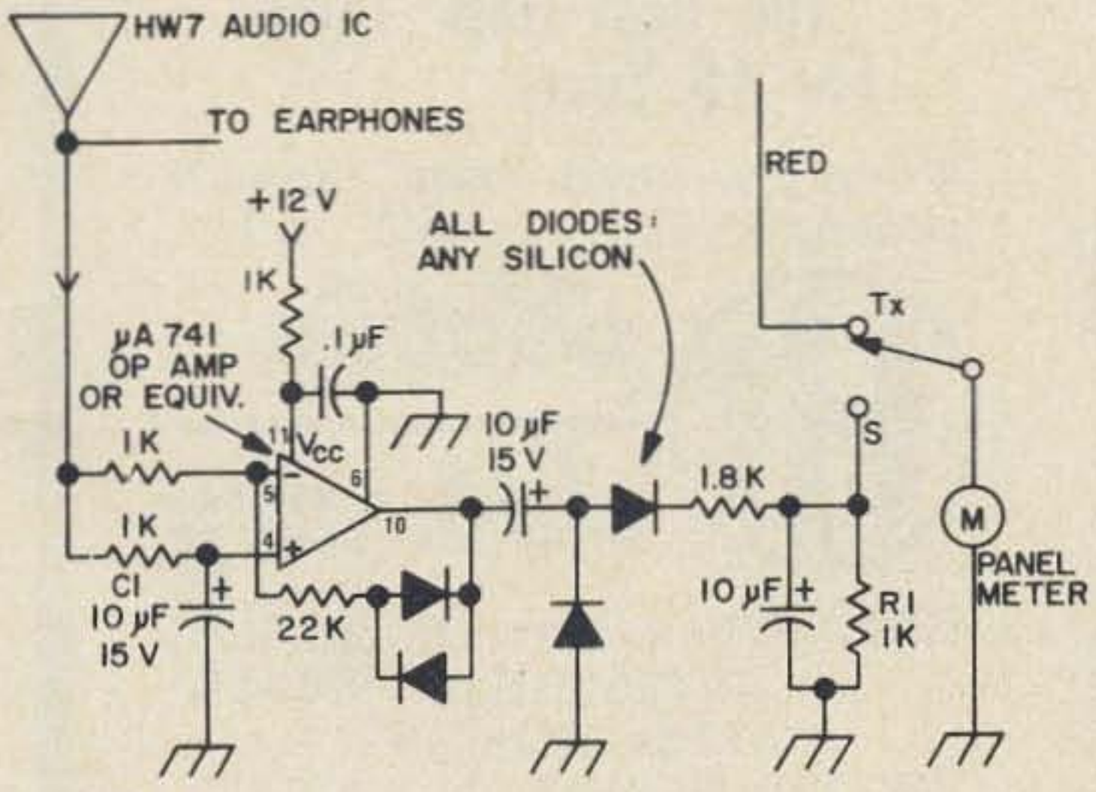


Fig. 1. Schematic of the HW-7 S-meter. R_1 should be determined by the operator's usual gain setting and a "loud station." It can vary between 680Ω and 4.7K.

The audio signal for the IC is fed to both input terminals via the 1K resistors. C_1 eliminates audio for the non-inverting input, but allows the dc bias to reach this input. The same bias voltage will arrive at the inverting input. Due to the common mode rejection of the amplifier, any dc bias on the input side will be ignored. The differential ac voltage, (audio signal) however, will appear across the inputs. The IC will amplify the signal in a non-linear manner, thanks to the feedback circuit and the back-to-back diodes. From there it is only a matter of rectifying the amplified audio, filtering it and using the derived dc to drive the meter. The switch is used to choose between S-meter and output-meter operation.

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Reprinted from the AMSAT Newsletter
Vol. V

INVERTED DOPPLER ?

Interesting things are happening with OSCAR 6.

The flight of OSCAR 6 has been a tremendous success; it has challenged the imagination and ingenuity of countless individuals by presenting the opportunity to devise and test new modes and methods of VHF communications, simple yet extremely reliable telemetry systems, accurate ranging systems utilizing commonly available equipment, new methods and findings in the area of propagation research, as well as countless other benefits.

It is this last subject, propagation, which we will address in some depth, concerning a UHF propagation anomaly first discovered while observing the 435.1 MHz telemetry beacon aboard OSCAR 6. For lack of a more descriptive term, we have chosen to christen the anomaly *"Inverted Doppler."*

Under normal circumstances, if one plots received frequency versus time for one satellite pass, a curve similar to the one depicted in Fig. 1 by the solid line will result. With only minor variations, this curve is representative of that which is predicted by the "Doppler Effect" theory. The apparent shift in frequency is due to the change in the satellite's velocity relative to the observer on Earth. Although many factors influence the *amount* of apparent frequency shift (such as tropospheric and ionospheric effects, variations in electron density and the plasma surrounding the satellite itself), all these combined effects will normally create a shift of only 40 Hz or so at a frequency of 400 MHz according to theory. Therefore, the effect may be practically stated in a slightly simplified form as follows:

As the satellite approaches the observer, its velocity is *added* to the velocity of propagation of the radio signal, creating an apparent *upward* frequency shift on the order of 8 kHz *above* the true (transmitted) frequency at 435 MHz. The amount of upward shift gradually but steadily decreases until the instant when the satellite is nearest the observer, or "TCA" (Time of Closest Approach). Its velocity relative to the observer is then zero, and at that instant the

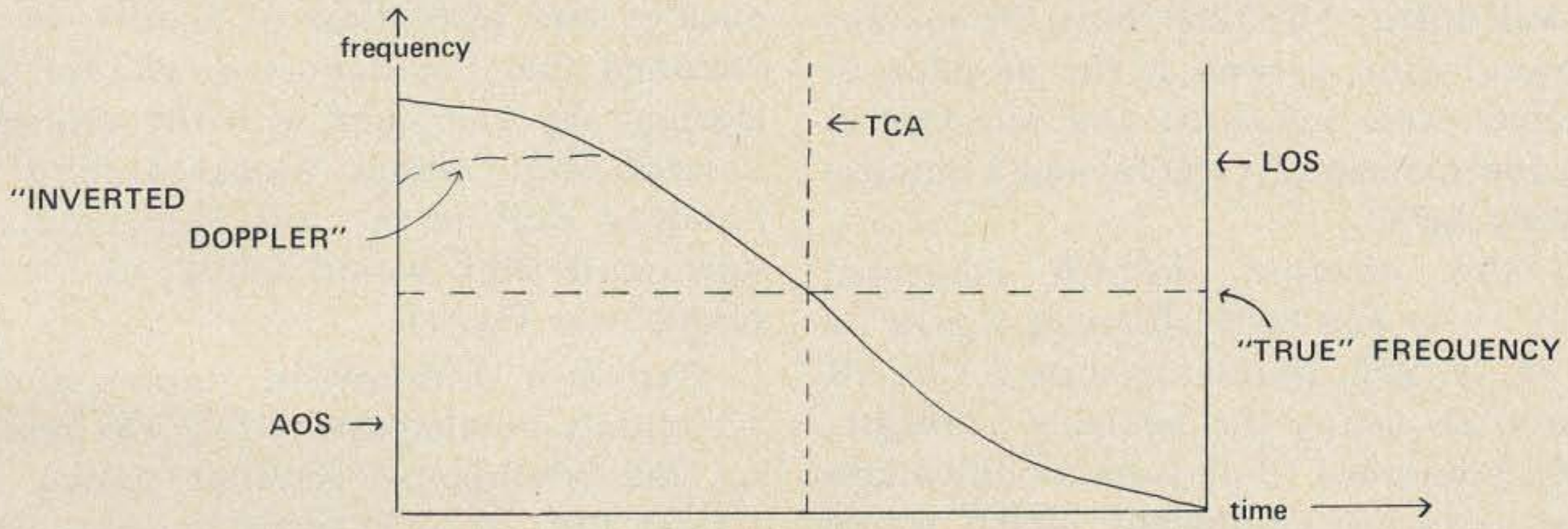


Fig.1 A representation of the effect predicted by the Doppler theory.

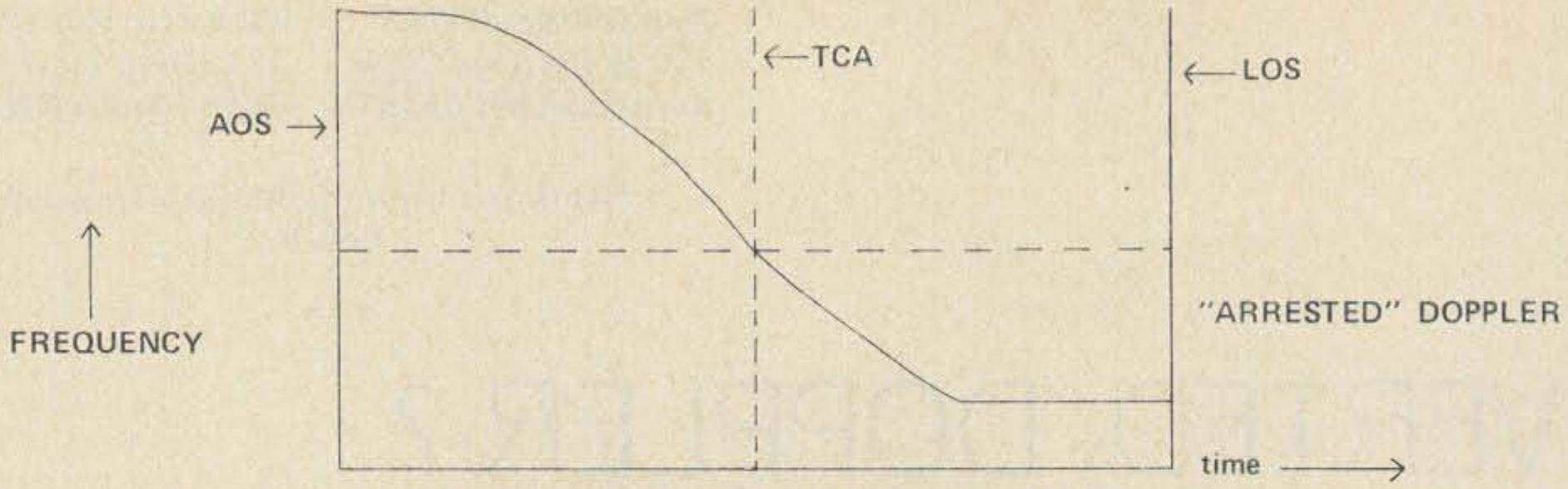


Fig. 2. The expected arrested Doppler effect.

observed frequency is the same as that transmitted from the satellite; i.e., no frequency shift, either up or down.

As the satellite *recedes* from the observer, its velocity is *subtracted* from the velocity of propagation, resulting in a total apparent *downward* frequency shift of approximately 8 kHz, for a shift during one orbital pass of ±8 kHz, or 16 kHz total.

This normal effect had been noted on all previous OSCAR satellites. However, on October 24, 1972, WØLER noted an unusual occurrence immediately following AOS (acquisition of signal) on Orbit 118. Instead of the normal downward frequency shift, the signal was *climbing* in frequency at a rapid rate. The climbing effect was gradually decreased, stopped, and then was followed by normal Doppler shift for the duration of the pass. Since no one else in the Minneapolis area was tracking the 435 MHz beacon at that time, WØLER was unable to verify the observation and assumed the strange behavior to be caused by drift in his receiving system. A thorough equipment check revealed no malfunctioning components, however. Subsequent orbits occurring later that evening exhibited only normal Doppler characteristics.

The following evening, the same upward shift was noted! This time, both the *amount* of upward shift, as well as the *duration* of the effect were measured and recorded as being approximately +450 Hz and 7 minutes following AOS.

At this juncture, WØLER contacted WØMJF, who had been observing signals on the 146/29 MHz translator aboard OSCAR 6. After discussing the anomaly at length, WØMJS proceeded to perform modifications to his receiving equipment which would allow reception of the 435 MHz beacon.

With two tracking stations now in operation, the rate of data collection was greatly increased, and with the stations on a north-south line only 25 miles apart, it was readily verified that both stations observed exactly the same phenomena.

After approximately three weeks of tracking and data analysis, it became evident that the Inverted Doppler anomaly was roughly confined to an equatorial crossing between 60°W and 90°W longitude. Due to the painfully slow eastward precession of the orbits, it was not possible to closely define the exact boundaries of the effect at this time.

Further analysis revealed that the duration of the effect was related to equatorial crossing time and showed an average duration of approximately 7.5 minutes past equatorial crossing on the *northbound nighttime* passes of OSCAR 6.

Our attention was then turned to the *southbound daytime* orbits passing over the same area in which the effect had been noted on the northbound passes. We anticipated that we would see an "Arrested Doppler" effect on the southbound passes; i.e., we expected the Doppler curve would be perfectly normal from AOS through TCA, but as the satellite approached the equator and LOS (Loss of Signal), we had reasoned that the normal *downward* shift, algebraically combined with the anomalous *upward* shift would probably cause the *observed* shift to be zero; i.e., the normal downward shift would appear to be "arrested" (see Fig. 2).

Extensive investigation proved fruitless. Absolutely no abnormal effect was observed on the southbound daytime passes, even though they crossed exactly the same area as the nighttime passes had.

Continued investigation of the nighttime passes resulted in further refinement of the available data. The effect was found to encompass an area between 50°W and 105°W longitude as observed from our location in Minneapolis (45°N, 93°W). The magnitude of the upward shift varied from 20 Hz to 550 Hz, with the greatest majority of measurements falling in the range of 200–500 Hz. Duration of the effect past equatorial crossing averaged 7.43 minutes, with 91% of the readings falling within the range of 6–9 minutes.

Due to operational procedures designed to conserve battery power, OSCAR's 435 MHz beacon was not run continuously, leaving several gaps in our data. We then turned to reception of signals from the NOAA-2 Weather Satellite operating on 137.5 MHz in order to speed up data collection. (NOAA-2 was launched by the same vehicle which carried OSCAR 6; therefore, both satellites were in an essentially identical orbit.)

Results were negative on 137.5 MHz. Several concurrent tests were conducted by tracking OSCAR 6 on 435 MHz and NOAA-2 on 137.5 MHz. Even though the two satellites were only 20 minutes apart, with practically identical equatorial crossings, no Inverted Doppler was noted on NOAA-2's signal, even when it had been observed only 20 minutes earlier on 435 MHz.

These new findings led to the suspicison that the upward frequency shift might be caused by oscillator drift in the OSCAR transmitter, probably resulting from thermal effects associated with the satellite's passing from sunlight into the Earth's shadow.

Two other stations who had been tracking the 435 MHz beacon were then contacted; Ted Mathewson W4FJ, Richmond VA, and Dick Allen W5SXD, Houston TX. Neither station was able to detect the anomaly that was being observed at our more northerly location. One possible explanation is that the anomalous effect may occur near TCA for these stations, at which point it would be most difficult to detect.

When the 435 MHz beacon's output power dropped drastically on orbit 1081 (1/10/1973), we immediately built equipment for the 400 MHz satellite band. After a week of construction and testing, we commenced tracking operations on 400 MHz. We soon discovered that most of the satellites in that band are only turned on for short periods in order to retrieve stored data and then immediately shut down, yielding no data useful for our purposes.

Finally, after many fruitless hours involved in tuning, tracking, calculating of orbits, etc., we experienced success on January 30, 1973. Inverted Doppler was observed on a satellite named Copernicus, operating on approximately 400.562 MHz. Spurred on by this new evidence, and assisted by many other amateurs who suggested possible frequencies, satellites, and orbital parameters, we finally located a group of five satellites which were in continuous operation and in a near circular orbit inclined only ±2° off the poles. These satellites are a part of the Navy's "NavSat" (Navigational Satellite) System, transmitting on 149.988 and 399.968 MHz simultaneously, by multiplying a common frequency source at 49.996 MHz times 3 and 8. One important difference between these satellites and OSCAR 6 is their orbits' relation to solar time. At the time we commenced tracking the NavSats, their northbound pass occurred in the *daytime*; southbound at *night*; exactly the opposite of OSCAR 6!

The "Arrested Doppler" was indeed observed on the *southbound nighttime* passes, occurring almost exactly as predicted earlier! The normal downward shift merely tapers off and ceases, followed by several minutes of absolutely stable, steady signal until LOS! Absoluately no abnormal behavior was observed on *northbound daytime* passes.

Now came the task of refining our measurements of the orbital period of the five satellites. Accurate calculations concerning the time of equatorial crossing also had to be generated from sequential TCA observations.

Finally, all the necessary data was collected and a new set of computer listings containing orbital predictions was rapidly prepared by Hank (WØRLI) Oredson. As the fates would have it, the effect ceased abruptly on the next day, February 5, 1973!

As of May 5, 1973, the effect has not been observed again at this location.

Since that time, we have continued the research by reviewing any material even remotely associated with possible causes of the Inverted Doppler effect. One very promising item which recently came to light is contained in Part 2 of an article by Dr. Roger Harrison VK2ZTB of the Ionospheric Prediction Services Division of the Commonwealth Bureau of Meteorology in Darlinghurst, Australia. The article was printed in the February 1973 issue of the *VHF Communicator*, and is entitled "VHF Trans-Equatorial Propagation."

There appears to be several possible correlations between the Inverted Doppler effect and an effect mentioned by Dr. Harrison, called "Evening," or "Class II" TEP (TransEquatorial Propagation). In the article Dr. Harrison mentions that Class II TEP "shows a maximum occurrence between 2000 and 2300 LMT (Local Mean Time) with a pronounced peak for different seasons and particular paths." (OSCAR 6's northbound equatorial crossings occurred at approximately 2049 LMT.) He further states that maximum Class II TEP occurs during December and January from North and South America. The magnitude of the Doppler shift observed in connection with Class II TEP is definitely in the right ballpark. Further, VK2ZTB says that "Class II TEP is dependent on many factors (season, sunspots, geomagnetic latitude, etc.) that seem to have no bearing on true scatter mode propagation." He also offers the possibility that "Class II TEP is probably supported in some way by field guided ionization; *the closer a ray can be launched to tangency with the magnetic field, the more favorable are its characteristics; i.e., higher frequencies will be supported.*" This last statement may well hold valuable clues concerning the Inverted Doppler anomaly!

At this point it would seem beneficial to summarize some of the findings concerning the anomaly:

1. Inverted Doppler is apparently a nighttime effect.
2. Inverted Doppler is apparently a seasonal effect, perhaps centered on the Winter Solstice.
3. Inverted Doppler seems to be frequency selective, since its effect was never observed at 137.5 MHz.
4. Inverted Doppler effect apparently ceases when the satellite reaches the vicinity of 23.24°N latitude (average) computed from the satellite's velocity and the average duration of the effect. (The Tropic of Cancer is located at 23.5°N latitude.)
5. The apparent eastern boundary (from Minneapolis) at 50°W longitude is explained by the fact that orbits crossing the equator further east than this point would have been more than 7.5 minutes north of the equator before we acquired the signal. This explanation does not, however, satisfy the western cutoff at 105°W, since we should still receive some part of the first 7.5 minutes past equatorial crossing out to approximately 123°W.
6. There may be a possible correlation between *maximum* shift magnitude and *minimum* "A-Index" as shown in Solar Geophysical Reports. More data is necessary to confirm this theory.

Our investigation continues, utilizing data gathered by research satellites such as ARIEL I (NASA SP-119), giving us profiles of electron, ion, and magnetic effects in the area of interest. No conclusions have been reached; however, theories abound. We welcome any offer of assistance in the effort, since several questions still must be answered:

Do observers further east or west, but located near 45°N latitude observe the effect?

How far south is the effect detectable?

On what dates does the effect commence and terminate?

Is it somehow related to Class II TEP, and are *both* effects related to the "A-Index" and Solar conditions?

Could VHF/UHF communications via this mode be possible over vast distances?

The list of questions is endless. We solicit reports from any stations which were involved in tracking the 435 MHz beacon on OSCAR 6, be they positive or negative. All reports will assist in pinning down the area of the effect, and will be most welcome.

. . . WØMJS & WØLER

Stirling M. Olberg W1SNN
19 Loretta Road
Waltham MA 02154

THE L'EGGS INJECTOR ANTENNA

The need for a very rugged self-supporting vertical antenna that could survive the rigors of ice storms and other winter excesses was recently required by W1SNN.

Research applied to radiators available from area vendors revealed a large complement of antennas, many of which were well constructed but not suitable for winter due to the excess appendages required for matching.

References were appraised which led to the following: A vertical antenna which offers thé smallest possible profile, and therefore low wind loading, is best in ice storms. Antennas using radials and external tuning apparatus are to be regarded as potential ice collectors.

The insulators used must offer a large smooth area, preferably round or egg shaped. This feature reduces ice packing, provides a good run-off for rain and precludes collection of dirt particles.

An impedance transformer to insure a very close match to the load value of the radiator should be a part of the antenna.

A look at antennas used in the commercial, land mobile and public safety services revealed a hard look had been already taken in the areas described . . . many conclusions led to a skirted antenna. This antenna is not new to amateurs, but in the past has not been popular because of its very narrow band response and its construction problems.

The coaxial skirted antenna acts like a half wave antenna in free space by using a skirt to form the bottom half of the dipole. The skirt also serves another purpose; it acts as a choke which isolates the antenna from its supporting metal mast.

The formation of the skirt does not change the current distribution on the upper half of the dipole. The inside of the skirt becomes a short circuited quarter wave line forming a high impedance at the base of the skirt. If we move along the outer conductor to the next quarter wave point, below the first skirt, we could install a second skirt or

for that matter a series of them could be added at each quarter wave section. This antenna would become a coaxial collinear array. Of course, some additional gain would be recognized, but now we deviate from simplicity of construction for a small gain improvement.

The large diameter to length ratio of the skirt produces an end effect which requires the exterior length of the skirt to be reduced; however, the interior length is increased to its proper electrical one quarter wave length by a dielectric slug. The slug now serves as a skirt insulator and insures concentricity. Also, a small length of tubing telescoped within the skirt can be added to adjust the antenna to exact length.

A section of self-supporting coax is a part of the antenna which serves a twofold purpose. It provides a transmission line for the antenna proper and is the mechanical support for the entire radiating system. It is easily constructed from copper water pipe.

There are two important dimensions; the inside diameter of the outer conductor and the outside diameter of the inner conductor are calculated from the equation as follows:

$$Z_o = 276 \log \frac{b}{a}$$

Where: Z_o = characteristic impedance
b = center to center distance between conductors
a = radius of conductor (in the same units as b)

The calculation reveals ½ in. water pipe with a center conductor of ¼ in. diameter has the correct ratio of diameter required for a 50Ω coaxial line.

Refer to the table for components needed to construct 59 or 70Ω antennas for four popular frequencies used for repeaters and general FM work.

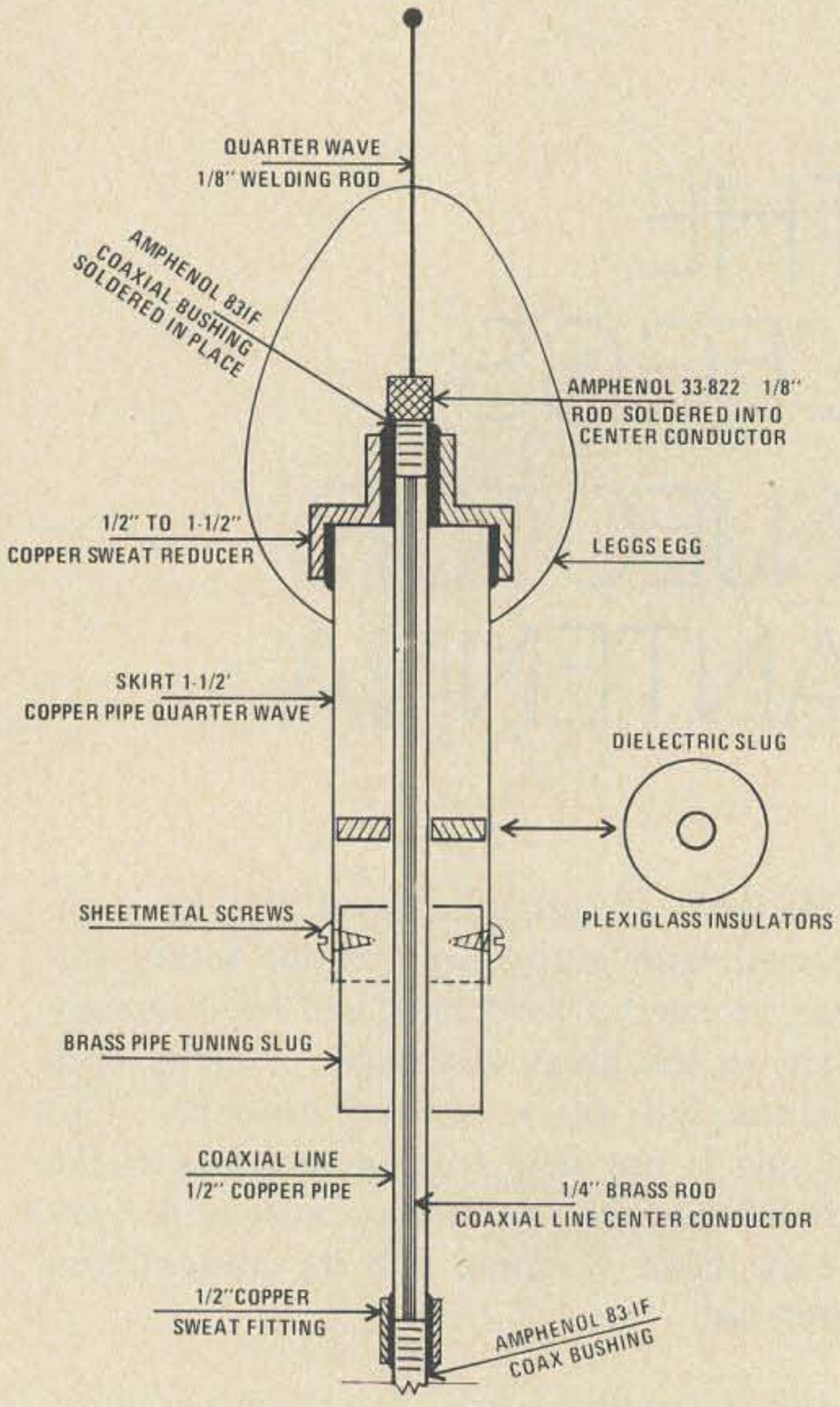


Fig. 1. Cross section view of the construction details for the Leggs Injector Antenna.

PARTS LIST

1 – 36" length of ½ in. water pipe
1 – 36" length ¼ in. diameter brass rod
1 – 17" length 1½ in. copper water pipe
1 – ½ in. to 1½ in. reducer copper sweat fitting
1 – ½ in. sweat coupling
2 – UG363 - 1U bulkhead bushing Amperol #83-I-F
1 – Jan 49190 teflon loaded Amphenal #33-822
1 – 1½ in. "P" trap extender pipe (brass)
4 – #6 sheet metal screws
1 – Leggs (panty hose container)
1 – 4" square ½ in. thick plexiglass
1 – 1/8 in. brass brazing rod 36"

Dipole and Skirt Dimensions

	Skirt Length	Skirt Diam.	Dipole Length	Dipole Diam.
50 MHz	50"	1½"	52"	1/4"
146 MHz	17"	1½"	18.1"	1/8"
220 MHz	10.5"	1¼"	11"	1/8"
440 MHz	5"	1"	6"	1/8"

Coaxial Line Dimensions

	50Ω	75Ω
Outer conductor	½"	½"
Inner conductor	¼"	3/32"

A graph describing the bandwidth plot showing the VSWR range of a two meter antenna is included (Fig. 2) to give some idea of the useful bandwidth of this antenna.

To construct a two meter version, start the assembly by inserting the ½ in. water

pipe into the ½ in. to 1½ in. reducer, half way through the small opening. Mount a coaxial feed-through bushing just above the water pipe as shown in the cross section drawing . . . very carefully solder both pieces into place. Next cut a piece of ¼ in. brass rod to a length of 35 in. and file each end back ½ in. to be 3/16 in. in diameter so that it will slide into a coaxial bushing with a firm grip. Insert one end into a coaxial bushing; then slide the other end into the ½ in. water pipe and into the previously soldered coaxial bushing. Then solder the second bushing into the previously soldered coaxial bushing. Solder a ½ in. sweat coupling to the opposite end of the ½ in. water pipe; place the second coaxial bushing into this sweat fitting engaging at the same time the remaining end of the coax center conductor; sweat solder this bushing into place.

Next slide a 1.7 in. length of 1½ in. diameter copper pipe over the ½ in. pipe into the reducer and solder to the reducer socket. Make sure the two pipes are concentric.

With a scribing divider mark two dielectric slugs on the 4 in. piece of ¼ in. thick plexiglass; cut them out with a coping saw and sand the edges smooth. Slide both pieces over the end of the ½ in. pipe up into the 1½ in. pipe used as a skirt, push them up 4 in. Slide a piece of trap extruder brass tubing into the end of the skirt. This tubing has a very thin wall and will slide into the skirt firmly.

Cut a piece of brass brazing rod to a length of 18.4 in, Solder the opposite end of the 1/8 diameter rod into an Amphenol

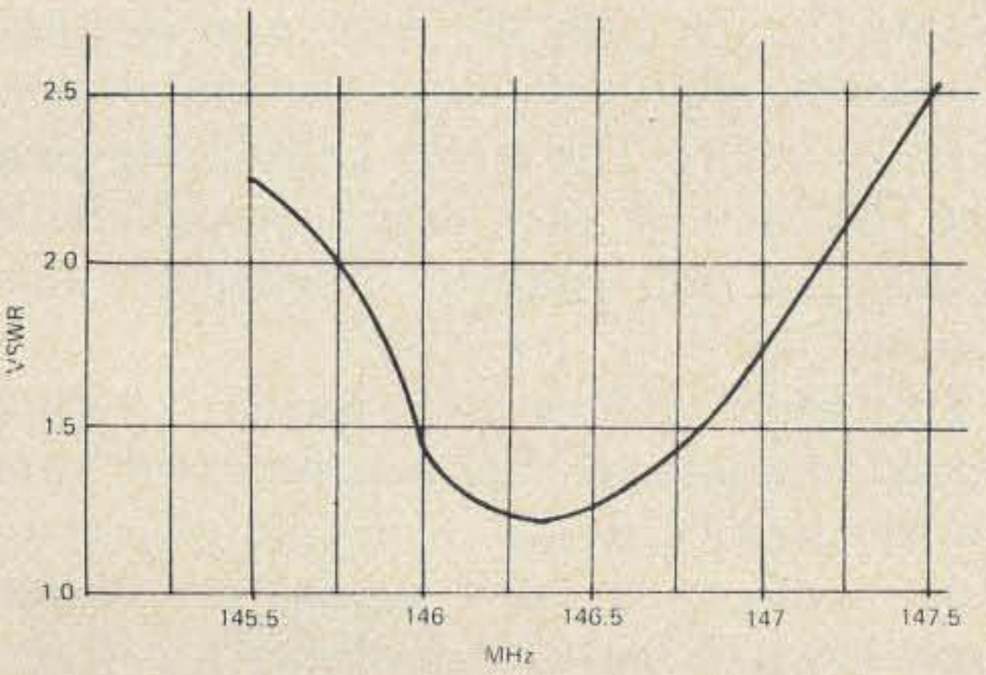


Fig. 2. Graph showing VSWR versus frequency for the antenna.

33-822 teflon loaded connector, push the rod down into the male pin and make sure the solder sweats to the whole pin and rod connection. Insert the connector into the coaxial bushing which is at the junction of the skirt and the coaxial line.

Now for the XYL pleasing touch! Go to the nearest L'eggs Boutique® and pick up a pair of panty hose (L'eggs). . . be sure you get the right color and be darned sure of the size if you want to continue your career in ham radio! This product comes in a white plastic egg-shaped container. Remove the product and give them to the XYL . . . but keep the egg.

Cut a 1½ in. hole around the center of the large end of the eggshell and slip it over the skirt. Slide it up so it butts against the ½ to 1½ in. reducer rim. Punch a 1/8 hole into the opposite end of the egg and slide this section over the 1/8 dipole rod. Now mate the two halves of the L'eggs egg and you have a cool insulator which will stand all of the ice problems as well as dirt. A touch of epoxy cement at the rod entry and some more at the egg joint and you have completed an antenna which is as tough as any available.

Next feed in some rf through your favorite VSWR indicator, adjust the brass telescope section of the skirt for the lowest VSWR. Secure the brass section with three sheet metal screws or solder it so it won't move.

Now all that is left to do is to securely mount the antenna to your mast. Stainless steel or galvanized dip hardware should be used. I found a pair of Sears #13K19842 fence hinge supports provided an excellent mount. Simply push the ½ in. coax section through the pintle openings and space them six inches apart. The clamp ends fasten to a mast and they are then drawn up tight with a galvanized bolt and nut supplied for this purpose.

This small antenna looks like a converted hypodermic injector and gets its name from that appearance. It has withstood winds up to 65 mph so far, and several ice storms which would have demolished a lesser antenna.

. . .W1SNN

Clifford Klinert WB6BIH
520 Division Street
National City, CA 92050

A TWO METER CONVERTER

For the amateur beginning serious work on VHF.

This article describes a "second generation" FET converter using an IGFET rf amplifier. The MFE 3007 can provide superior noise figure and cross modulation characteristics with very low cost in amateur applications. The performance characteristics are not particularly needed or sought at two meters because the ambient ignition and powerline noise in this area always masks any receiver noise, but the cross modulation characteristics are desirable for in-band duplex and for checking the purity of strong signals without having the receiver generate more spurious signals than the transmitter. Lastly, and most serendipitious, is the fact that the extremely low internal feedback capacitance of the MFE 3007 almost eliminates the instability and oscillation problems that befell JFET and bipolar transistor amplifiers. This makes this converter an excellent first project for the VHF builder starting serious work with receivers.

The Circuit

The circuit of Fig. 1 starts with the popular overtone crystal oscillator circuit using a 2N5182. Almost any VHF silicon transistor will work in this circuit, but the 2N5182 works quite well, and the price is pleasant. The crystal is a 43.333 MHz overtone cut. The oscillator tank coil, L8, is coupled with a 9 pF capacitor to the base of a class A tripler, another 2N5182. The 130 MHz signal from the tripler tank coil, L9, is injected into the gate of the mixer through the 5 pF capacitor. The input frequency of the mixer, 144 MHz, minus the 130 MHz injection frequency, gives a 14 MHz output frequency that can be used with amateur band or general coverage receivers. Other local oscillator and output i-f frequencies can be used, of course. The rf amplifier employs a single MFE 3007 in the common source configuration. No neutralizing is used. One gate is used for bias and the other is used for the signal input. Three tuned circuits are used in the input to provide added selectivity against images from other VHF services. The output from the rf amplifier is inductively coupled to the mixer by L4.

Construction and Alignment

As with most projects, the converter should be built and tested a stage at a time, starting with the oscillator. The pictures show an earlier version with two stages of rf amplification, the first of which was simply removed and replaced with L1 and L2. The base material is double clad printed circuit that is quite light, strong, and easy to work with. The shielding used is quite minimal, and probably is unnecessary. Any layout with reasonably short leads and logical placement can be used. The components are merely soldered to each other, or whatever is handy, insuring minimal stray coupling. Each variable capacitor used with L1, L2, and L3 is a piston type trimmer, but other types can be used with the same capacitance range. This arrangement, however, provides a handy mechanical way to anchor the "hot" end of each coil. Other tuned circuits are slug tuned.

Construction and alignment should proceed quite simply, but the signal at L9 may be hard to get. When problems develop, just

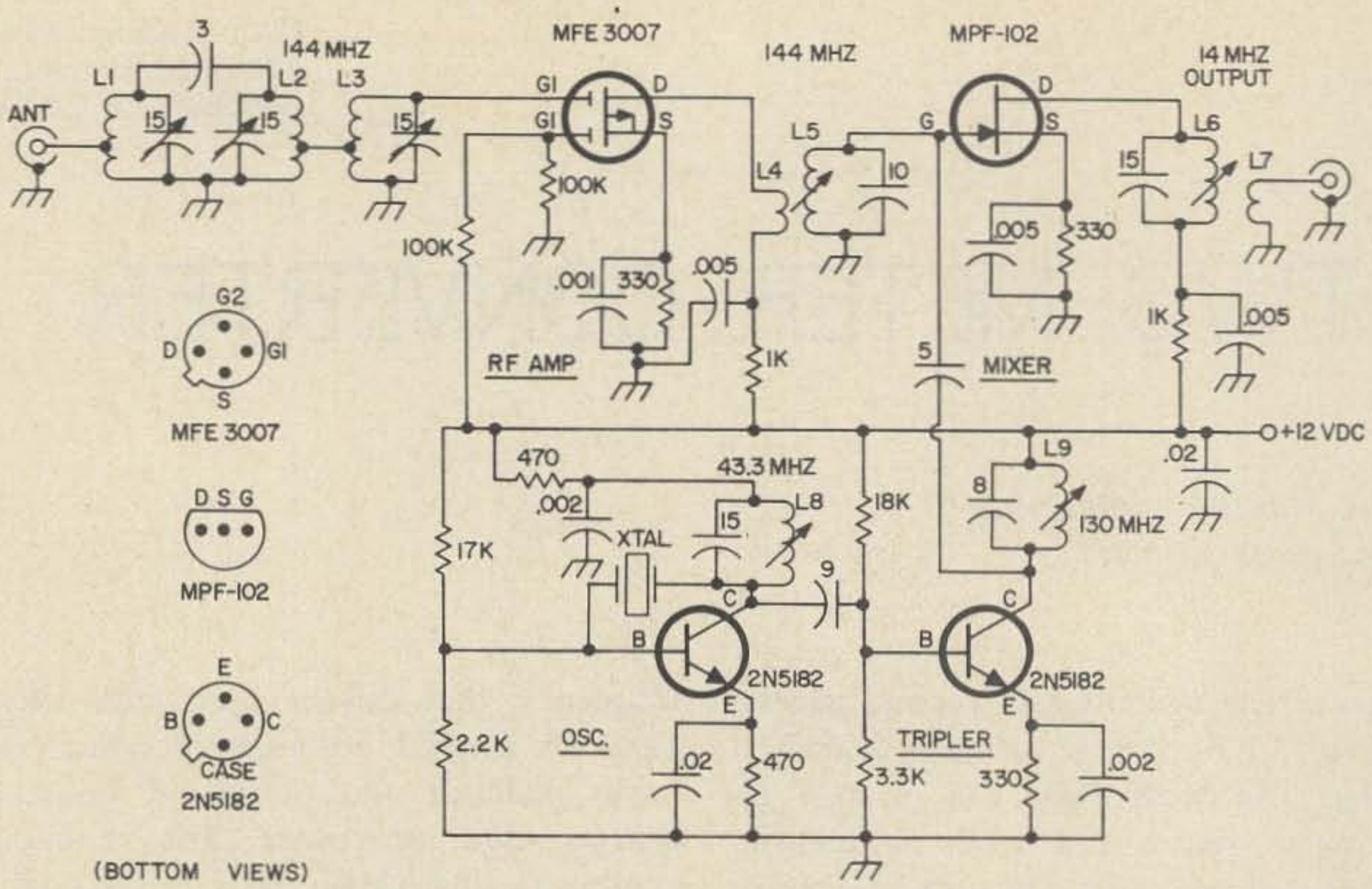
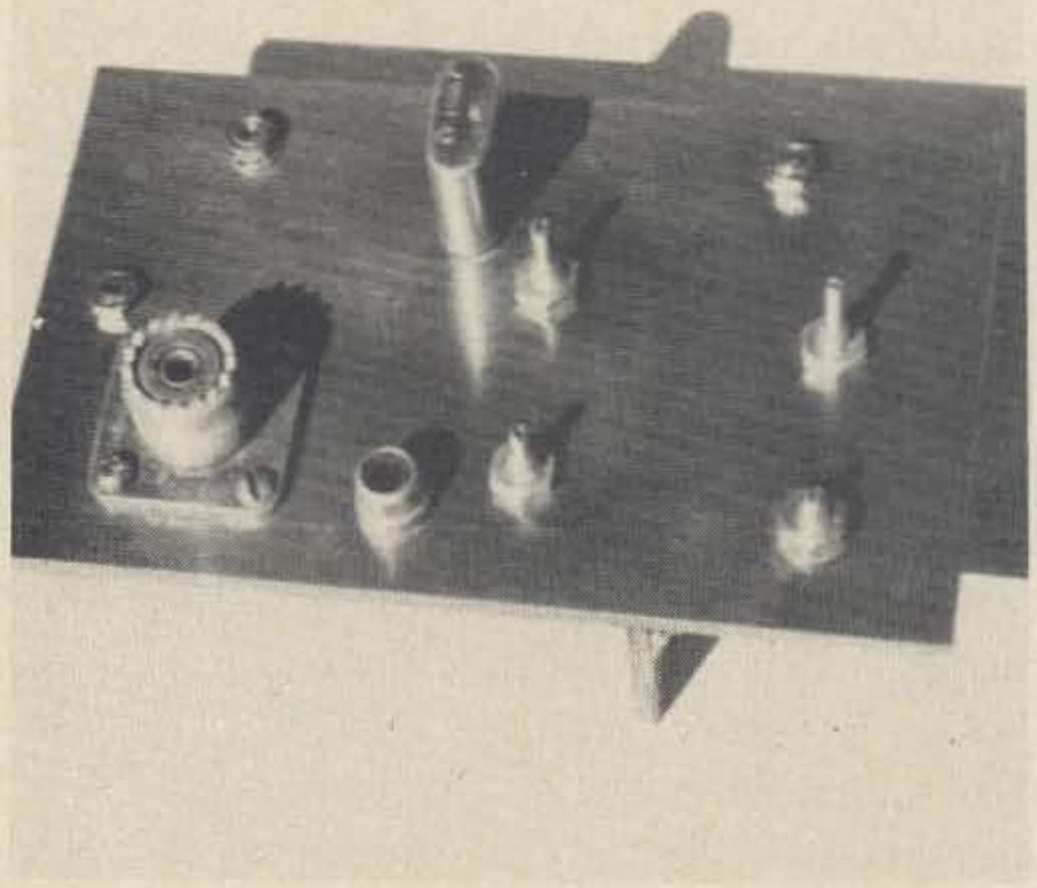
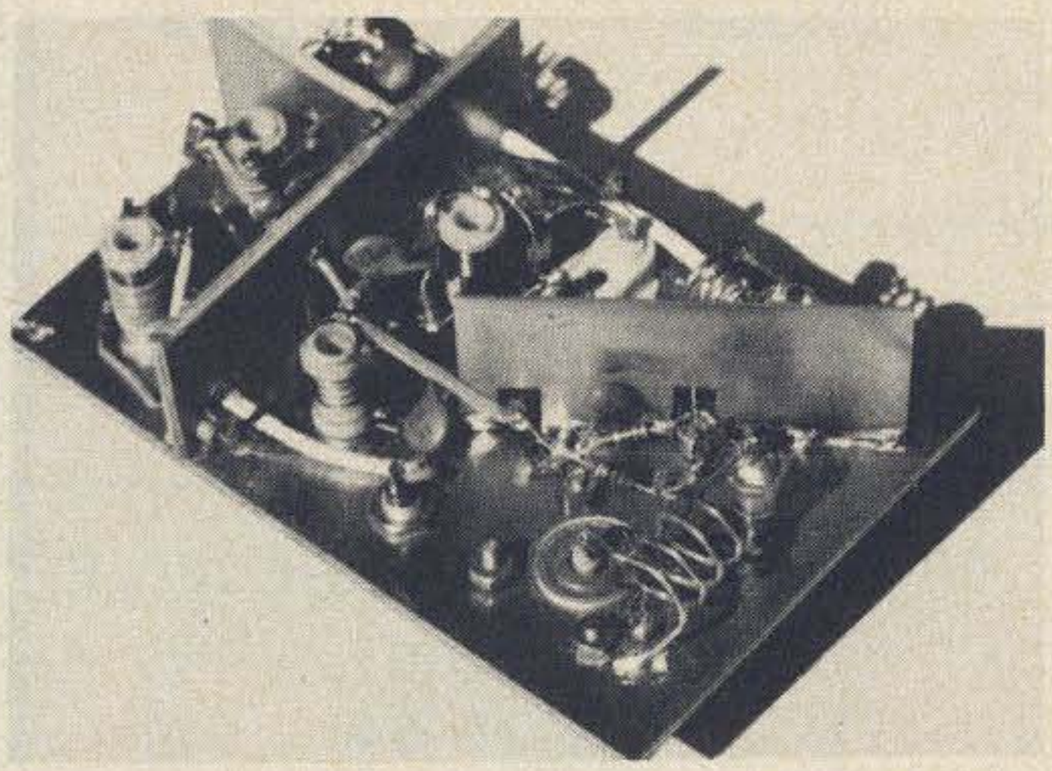


Fig. 1. Schematic of the 2m converter. L1, L2 and L3 – 5 turns No. 18, 0.7 cm diameter airwound, about 2 cm long, tap at one turn, adjust to resonate at 144 MHz. L4 – 3 turns hookup wire on L5. L5 – 3 turns No. 20, 0.7 cm diameter slug tuned, 1.3 cm long, resonate at 144 MHz. L6 – 30 turns No. 30, 0.7 cm diameter slug tuned, resonate at 14 MHz. L7 – 6 turns hookup wire on L6. L8 – 10 turns No. 24, 0.7 cm diameter slug tuned, resonate at 43 MHz. L9 – 4 turns No. 24, 0.7 cm diameter slug tuned, resonate at 130 MHz.

tune the grid dip meter to the proper frequency and set its pick up coil near the tuned circuit. Tune the circuit until a dip is observed on the meter in the oscillating mode. Then switch to the absorption wavemeter position, and the signal will be there. If a defective transistor is suspected, use a VOM in the RESISTANCE TIMES ONE position to check the two junctions in the two bipolar transistors. Higher voltages in some VOMs can destroy transistor junctions, resulting in all transistors tested being bad. I know of no similar simple test for FETs. If you know how the leads on bipolar transistors are arranged at the base, the 2N5182 may teach you that you don't. After the 130 MHz output from the tripler is obtained and peaked, small as it may be, and the other tuned circuits are dipped on frequency, final alignment can be done with a signal generator. Final tuning in most cases must usually be done with an antenna and remote signal. Most inexpensive signal generators have enough leakage that all of the signal will not go only through the input tuned circuits, and tuning them will only show a good peak on a remote signal that is coupled through the input connector. No trouble should be encountered in alignment, the rf stage only took a couple of hours to get working, and no oscillation or instability was detected. Some care should be taken when handling the MFE 3007, however. The transistors are sold with the leads clipped together with an



Double-sided copper-clad board is used for the chassis and shield sections. Definitely easier to work with than aluminum!



The coax connector serves for the 2 meter input and the phono jack for 14 MHz output. The slug tuned coils, clockwise from the crystal, are L8, L5, L6 and L9.

eyelet to prevent static charges from destroying the junction. The leads can be tied together with a short piece of small wire while handling and soldering. It also helps to ground yourself and all objects that will be used in the installation. The soldering iron or gun should be unplugged and grounded while soldering, there may be leakage between the hot side of the power line and the tip of soldering iron.

These general comments and procedures can be taken lightly for what they are worth to each individual reader. The purpose of most articles is to provide information and ideas that the reader may not have been exposed to, rather than specific and rigorous step by step instruction.

Conclusion

The converter has been quite successful in all cases with the only possible exception being damage to the MFE 3007. Some changes may be made to optimize the rf amplifier. The higher the gate bias voltage, the higher the gain and poorer the noise figure. The gate voltage could be lowered and the 1K drain return resistor could be made smaller or replaced by a choke to raise the drain voltage. However, the results have been good without further changes. Also, agc can be applied to the biased gate. Considering cost of the transistors, and ease of alignment, this was a better than average project.

. . .WB6BIH

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1379 Forest Glad Road
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VERSATILE IC KEYER

An inexpensive and easy-to-build unit that features Relay and Solid State output.

This article describes a keyer circuit which utilizes IC's throughout. It is a compact unit, cheap to build, gives an accurate 1:3 dot-dash ratio at any keying speed and features self-completing characters. It could be easily battery powered if so desired.

The unit can be built for about $12 including the cabinet, transformer and IC's if the parts are purchased surplus.

Overall Circuit

Three DTL *nand* gates (TTL is also suitable) function as a variable frequency oscillator which produces a square wave. This signal is fed to a 'one-shot' for pulse shaping. The pulse signal serves as clock signal for the dot generator JK flip-flop.

The dot and dash generator consits of 2 JK flip-flops, 2 diodes and one *nand* gate. The diodes provide memory functions and the gate does the necessary gating to provide a high and low output. This high and low signal controls a transistor switch and a reed relay for transmitter keying.

The circuitry requires a regulated 5V dc at 60–80 mA.

A circuit for a monitor tone generator is also shown.

Circuit Function

Variable Oscillator

Nand gates 1, 2 and 3 function as a variable frequency oscillator. Capacitor C1 and resistors R1, R2 determine the oscillation frequency. With the values shown, 10 μF and 1270Ω, the oscillation frequency is

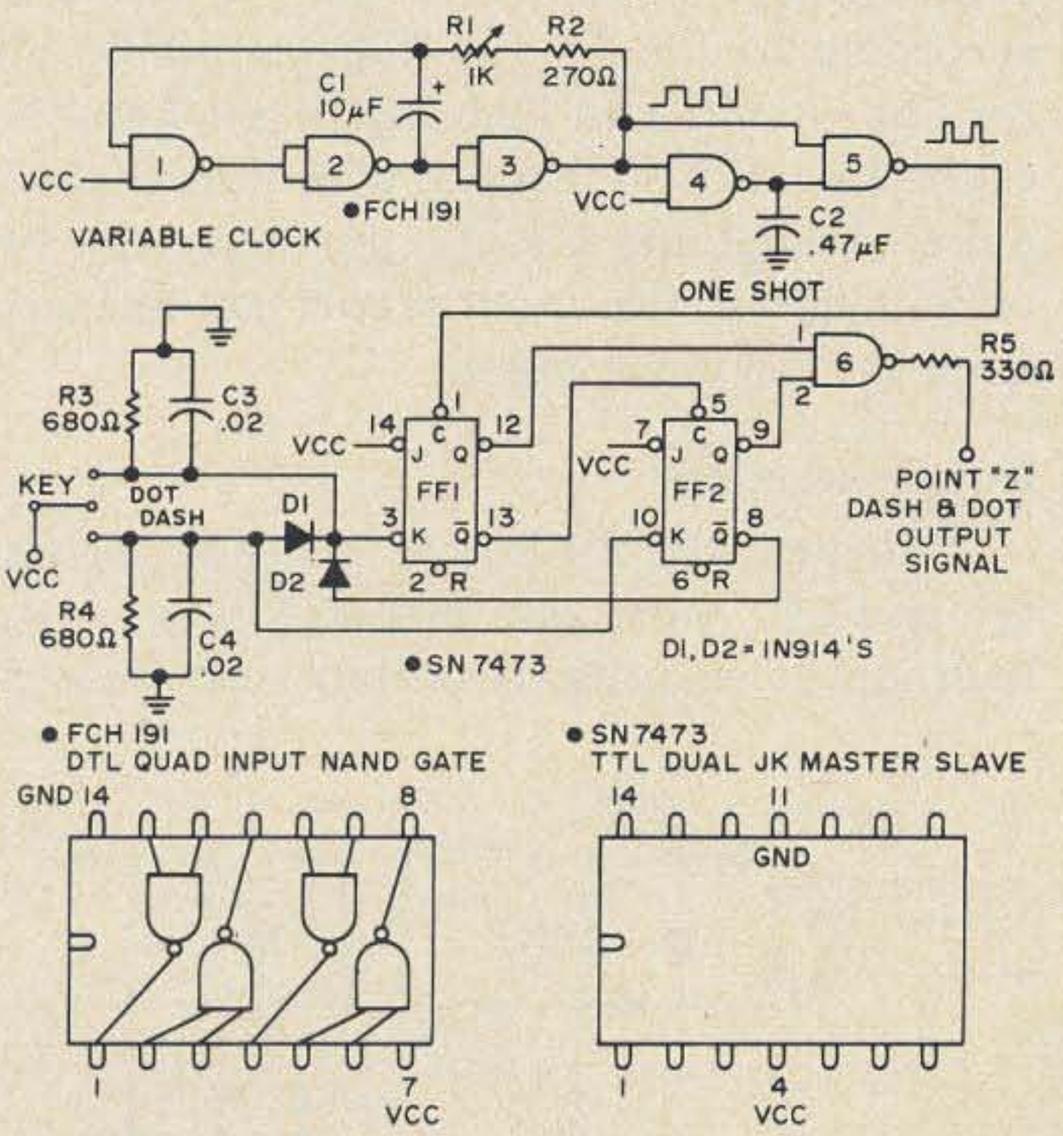


Fig. 1. Schematic.

adjustable from about 150 to 1500 Hz. This is equivalent to roughly 4 to 40 words of code speed per minute. Any value capacitor (0 pF to 1000 μF) can be used to obtain any ridiculous oscillation frequency as long as the total resistance of R1 and R2 do not exceed 1500Ω.

One input of gate 1 and gate 4 is tied directly to VCC (+5V) to minimize loading of the oscillator and to maintain a square wave.

'One-Shot'

Nand gates 4 and 5 serve as a 'one-shot.' The approximately square-wave signal of the oscillator is reshaped to a sharp-edged narrow pulse which is ideal for clocking the JK flip-flop. Capacitor C2 determines the pulse width of the output signal.

JK Flip-Flop Operation

Flip-flops 1 and 2 are SN7473 TTL JK masterslave flip-flops. Together with diodes D1 and D2, and *nand* gate 6 they provide the necessary circuitry for dot and dash generation. A fixed 1:3 dot to dash ratio results at any keying speed. The JK FF's function as follows: at the positive edge of a clock pulse the FF loads the J and K input information to its slave flip-flop. At the negative edge of the clock pulse it executes according to the JK flip-flop truthtable. As for our circuit, two high inputs (at J and K) cause the FF to toggle with every clock pulse. A high and a low input make the FF only toggle if the input status had changed from the last clock pulse.

Dot Generation

Unkeyed, the FF's have a steady high at Q1 and Q2. *Nand* gate 6 therefore gets two high inputs, causing its output to be low. If the keyer is moved to the dot position, input K1 goes high, Q1 goes low and $\overline{Q}1$ goes high at the first occurring clock pulse from our 'one-shot.' Thus, one input to gate 6 goes low causing the output of gate 6 to go high. When the second clock pulse occurs at FF1, there may be two input alternatives: K1 may be low if the key was released or may be high because the key is still held in the dot position. In either case FF1 will toggle, resetting Q1 high and therefore restoring the gate 6 input high again. Gate 6 output returns to low. At the third clock pulse, another character cycle may begin. If we look at FF2 during this operation, we see that $\overline{Q}1$ gave a clock pulse to FF2. But since there was no input status change at K2 during this time period, FF2 did not toggle.

As the key is moved to the dash position, K2 goes high, and, through diode D1, K1 goes high also. At the first occurring clock pulse to FF1, FF1 immediately gets busy with a dot generation, while FF2 can't do anything because it lacks a clock pulse at the time. As the second clock pulse occurs at FF1, FF1 toggles again and gives the desired negative clock pulse edge to FF2. Since FF2 loaded the input information 'high' at the positive slope of that clock pulse already, it executes a toggle, regardless if the key was released from the dash position in the meantime or not.

Thus, after FF1 provided the first third of a dash (a dot), FF2 toggles now and provides the second third of a dash by holding the other input of gate 6 low. During this operation $\overline{Q}2$ went high and supplies K1 with an artificial high through diode D2. As FF1 receives the third clock pulse it registers K1 high and goes through another dot generation cycle. This time, both Q1 and Q2 are low, and the output of gate 6 stays high again.

Now clock pulse 4 comes up at FF1 and causes FF1 to toggle either because the K1 input went low (an input status change) or because the operator pushed for another character already (both inputs high). As for FF2, it receives the negative edge of a clock pulse from FF1 $\overline{Q}1$. Again, FF2 will toggle regardless of whether K2 is low (input status change) or high (both inputs high). The Q

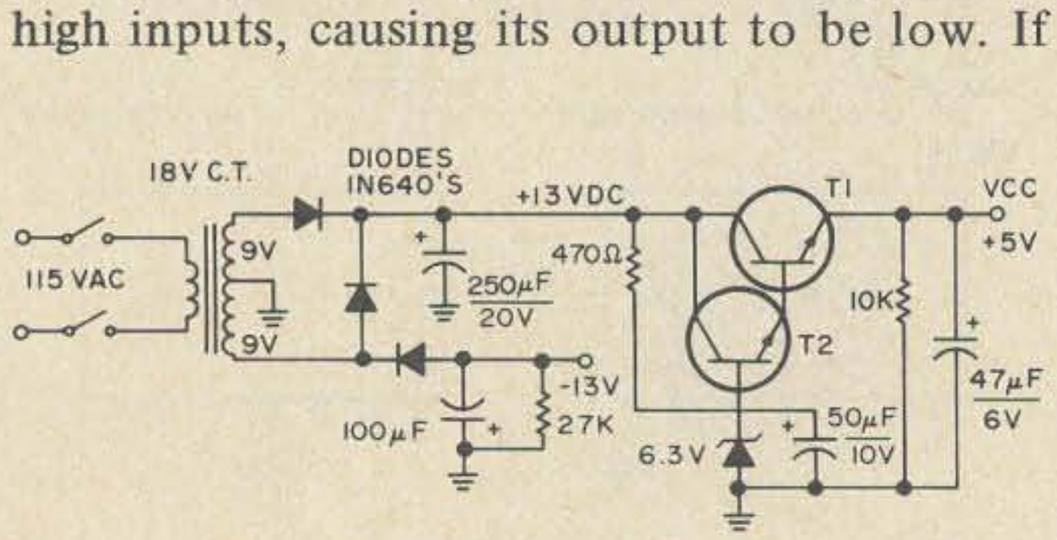


Fig. 2. Power supply. T1-2N1893, T2-2N2925.

outputs of both FF's will therefore be high in this timing cycle and cause a low gate 6 output. Another character may begin at the fifth clock pulse to FF1.

Relay Driver or Output Switch

The output of gate 6 is not suitable for keying a transmitter as is. It must be amplified to operate a relay or to control a power transistor switch. Figures 1A and 1B show two alternative circuits. In Fig. 1A, transistor T1 switches a relay whenever the gate 6 output goes high. A fast relay such as a reed type must be used. This relay should not take its power from the VCC +5V for the logic circuit, but be supplied with about 12V dc from before the 5V regulator. In Fig. 1B, the circuit I built into my keyer uses two transistors, one low power NPN type and one 60V 500 mA PNP. When gate 6 output goes high, the collector voltage at T1 drops to 1.2V and changes the bias voltage to T2. T2 bias goes negative and the PNP transistor conducts. Resistor R8 is critical in respect to the negative supply voltage and should be 1000Ω per volt. The collector of the PNP switches my HW-100 transceiver directly, and probably many other transmitters can be keyed this way, free of any relay clicks.

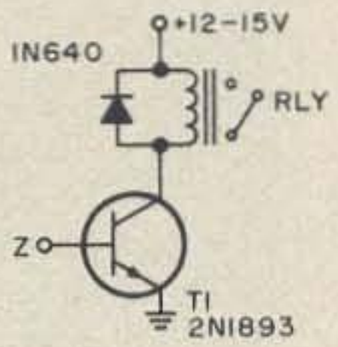


Fig. 3A. Relay driver.

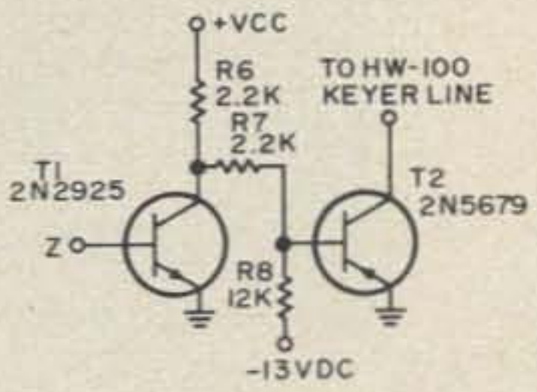


Fig. 3B. Solid-state switch/HW-100.

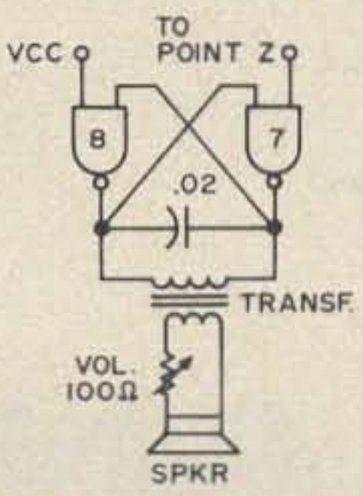


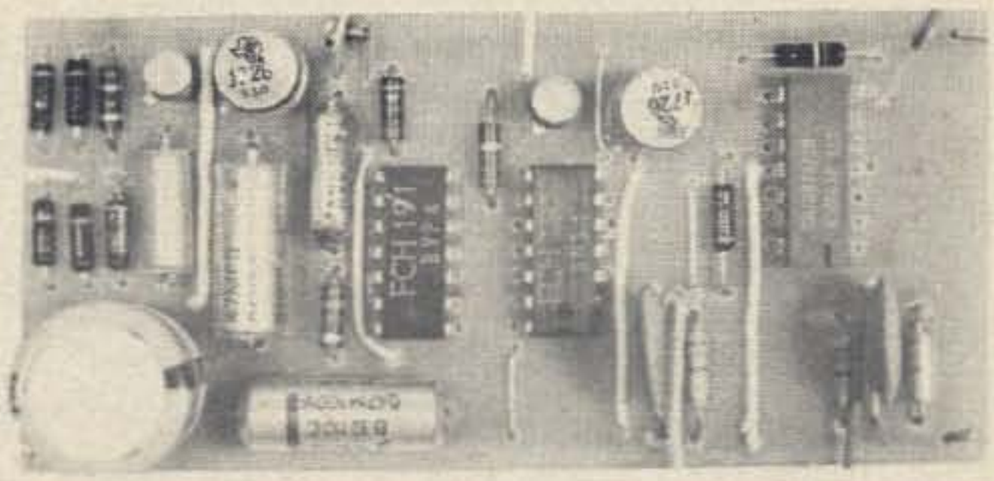
Fig. 3C. Tone monitor.

Tone Monitor

In this circuit, two of your *nand* gates remain unused. They can be wired to make a multivibrator tone generator (Fig. 1C). The oscillation of this tone oscillator is controlled by a 'high' or 'low' at the output of gate 6/ input of gate 7. A low power minispeaker with matching transformer or a 600Ω headphone capsule can be used as speaker device. The tone pitch can be lowered by adding a capacitor in parallel to the speaker inducuctance (.02 μF). If a 600Ω headphone capsule is used, no additional space is required on the circuit board. Otherwise a transformer would have to be accommodated somehow.

Summary

This unit was built onto my homebrew paddle mount and mounted in a 8 x 12 x 8 cm cabinet. The bottom was weighted with a steel plate.



I like the keyer because of its compactness and state of the art. The photograph shows the circuit board with the power supply on the right side (except transformer) and the other circuitry spread over the rest of the 10 x 5 cm board. The keyer works nicely and I enjoy CW more than before.

. . .VE3GSP

References:
73, March '67.
Radio Amateur's Handbook.

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MEASURE ANTENNA IMPEDANCE WITH YOUR SWR BRIDGE

So far, the great majority of antenna impedance bridges that we have found in construction articles are devices that function only with a low power rf source. The run-of-the-mill impedance bridge is designed to operate with a grid dipper as the source of rf excitation. Operation with tube type dippers is generally intended as the transistor dippers produce an rf level that is too low for excitation of this bridge type.

The conventional antenna bridge cannot be left in the transmission line continually as excessive rf energy would soon destroy the device. This means that each time measurement of antenna impedance is desired, the transmission line must be opened and the bridge inserted and grid dip excitation applied. Grid dippers are not necessarily the most accurate rf source for a specific frequency in an amateur band . . . therefore the station receiver must monitor the dipper output for any bridge accuracy. A low power bridge will not often present the true operating impedance of the antenna . . . especially antennas with parasitic elements. A bridge that operates under full transmitter power will present a much more accurate picture of your antenna system at a specific frequency.

Inspiration for the "In Line" full power bridge came from information concerning the standard swr bridge. Just about every amateur has in his possession some sort of swr bridge and the great majority are of the type illustrated in Fig. 1. This bridge consists of a section of transmission line near which are placed two inductors. These inductors are actually two bridges along with their associated diodes and resistors. One of the bridges reads forward power and the other reflected power. The resistors (Rx) at the end of the inductors L1 and L2 are critical for accurate bridge null (balance) and therefore must be the proper value for the specific transmission line used. For the

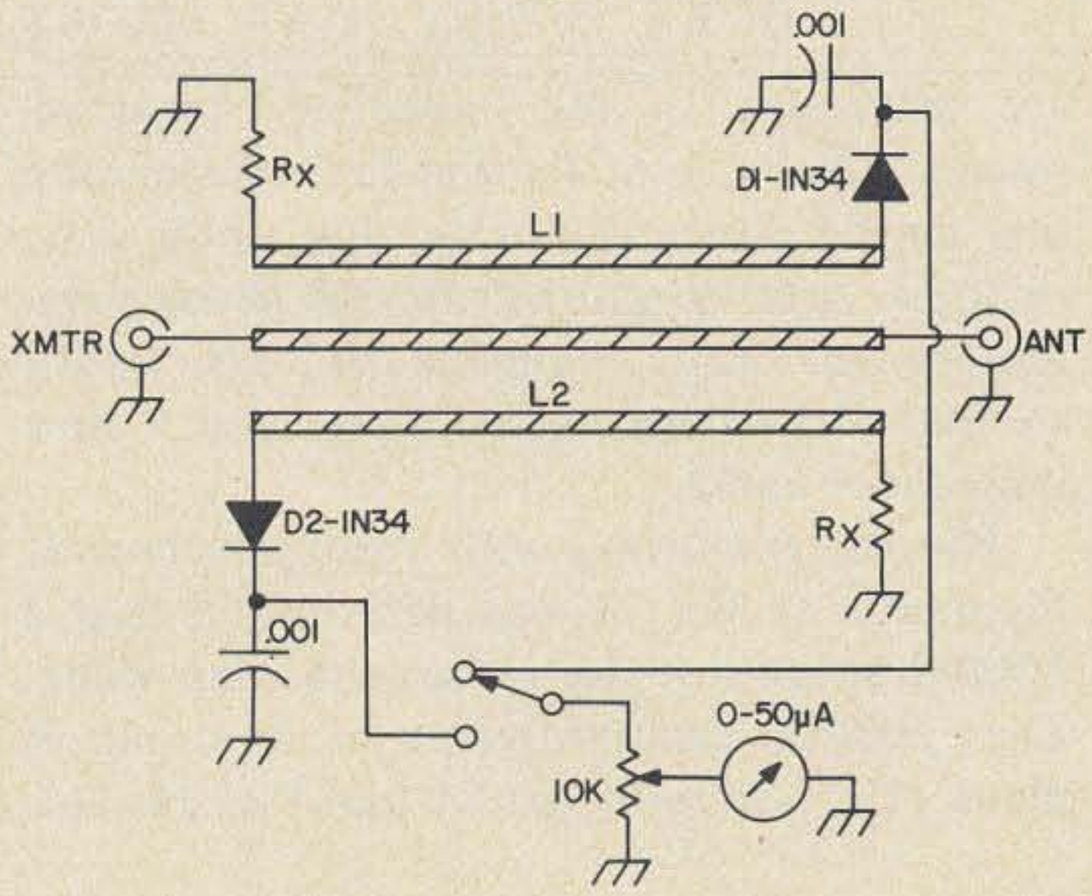

Fig. 1. Conventional swr bridge.

average swr bridge the value for Rx is 100Ω for 75Ω line and 150Ω for 50Ω transmission line. Considering that resistor Rx is critical for the impedance of the line in use, varying the value of Rx and devising a system of calibration for Rx would enable us to determine the impedance of a line when a null is achieved on the bridge meter.

The "reflected" inductor which is L1 in Fig. 1 is the portion of the bridge circuit we

are interested in for impedance measurements. The value of Rx and the transmission line must balance the bridge for a null to be realized. Any variation from the above parameters will mean changing the value of Rx so that the bridge again balances at a new impedance value.

By experimenting with various values of resistance at Rx, it was determined that a 1000Ω potentiometer represents a fair value. The 1000Ω potentiometer is inserted in place of Rx on inductor L1 (see Fig. 2). This is the inductor with the diode pickup located toward the load or antenna end of the swr bridge.

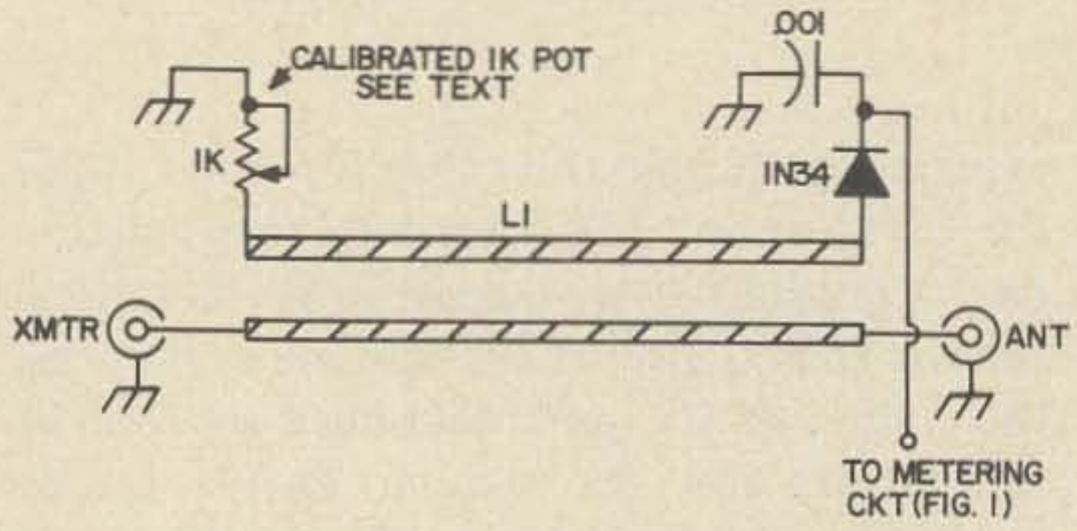

Fig. 2. The modified bridge leads to 1K pot should be as short as possible and shell (case) of pot grounded.

Make sure that all leads to the 1000Ω potentiometer are short and that the metal case (shell) of the potentiometer is well grounded. Excessive lead length or inductance will create inaccuracy of the device. The position of the potentiometer will be determined by the physical layout of your particular swr bridge. It must be set at a point where the shaft can be extended through the front panel of your swr bridge. Allowance must also be made for a dial or other indicating device which can be calibrated in ohms (impedance) on the front panel. It might even be desirable to mount your entire present bridge in another larger case so that all functions can be accommodated.

Calibration of this in-line bridge was the major problem. An ordinary grid dip meter will not provide sufficient excitation for readings. With full power applied, especially a kilowatt, it becomes difficult to find resistive dummy loads of various values to

calibrate the bridge. Even with 100W of rf, proper resistive load values are not common.

The solution to the calibration problem came to us in the form of an (ouch!) CB transmitter. A CB transmitter is fortunate if it is able to put out 3W of rf and at the same time is well within the frequency range of an swr bridge. The most important fact is that a CB transmitter will provide adequate excitation for calibration of the bridge with ordinary 5W 5% carbon (garden variety) resistors. For calibration, a good assortment of these resistors is necessary. Use values such as 5, 27, 47, 75, 100, 150, 220 and 470Ω. Intermediate values can be then interpolated on your scale. The calibration procedure is simple . . . first borrow your neighbor's CB, then attach the 5W resistors across the antenna coax connector of the bridge and excitation of the CB transmitter is applied to the remaining connector on the bridge. The bridge sensitivity should be set for a middle scale reading of the meter and the 1000Ω potentiometer is varied until you reach a null on the meter. Mark the value of the calibration resistors on the potentiometer scale (dial). Do this for all of the available resistors and your bridge will be in fair calibration.

At this point we should mention that this system does not measure reactive components in the antenna system. If your antenna is reactive, either inductive or capacitive, the meter will present a shallow, poorly defined null at the operating frequency. A sharp, well defined null will indicate a purely resistive impedance.

When using the bridge in its former function as an swr bridge, set the resistance dial to the value of your transmission line. When measuring impedance, vary the dial for maximum dip on the meter and read the resistance (impedance) directly.

As a final point, it is wise to insert the swr/impedance bridge at a half-wave or an even multiple of a half-wavelength from your antenna. At half-wave points from the antenna, the antenna impedance is repeated. This will enable your measurements to be much more accurate. When determing half-wavelength points, take into consideration the velocity factor of your particular coax.

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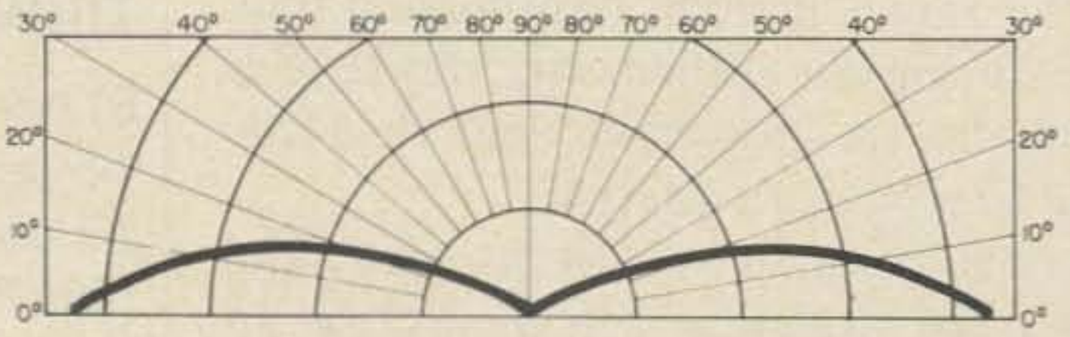

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POTENTIOMETERS

A second look at uses for an old Component.

I am a homebrew nut. My junkbox runneth over. Wading through that mound of resistors, capacitors, and defunct transistors, not a second passes before I come across a potentiometer.

Pots galore! But what can I use them for? While looking over some commercial gear, I got a few ideas. Here they are.

Figures 1 through 4 show diagrams for voltage-controlling/polarity-shifting devices. They use different methods to achieve a similar effect. Don't confuse them with the common voltage *divider* that you find in any receiver's volume control circuit. Sure, voltage dividers provide a means for varying the amplitude of the voltage, but they can't reverse its polarity. That's where polarity shifters come in. To get an idea of how they work, take a look at Fig. 1. When the wiper of R1 is at point *A* positive nine volts appear at the output. As the wiper is brought nearer point *B* this positive voltage decreases. At point *B* the output voltage is zero. When the wiper passes *B* a negative voltage appears at the output. Finally, it reaches *C*, and –9V is found at the output. Simple enough?

I've found many uses for this type of circuit. Imagine being able to switch your class of bias on experimental transistor amplifiers with the turn of a pot. If you design it right, you can turn a voltage amplifier into a power amplifier and vice versa with "volume control" ease.

As I've said, all of the circuits in Figs. 1–3 do basically the same thing. It's just that they go about it in a different way. Each has its own good and bad points. For example, the circuit of Fig. 1 has the disadvantage of having its output voltage vary greatly with variations in load resistance. The circuit shown in Fig. 2 has a slightly more stable output voltage. It uses two resistors in a bridge circuit. The resistors should be of equal value. Their total series resistance should equal that of the pot. As shown in Fig. 3, two similar pots may be connected in a Wheatstone bridge configuration to achieve the same result.

Remember, in all of these circuits, when the pots are set to center position, the voltage output is zero. When you swing

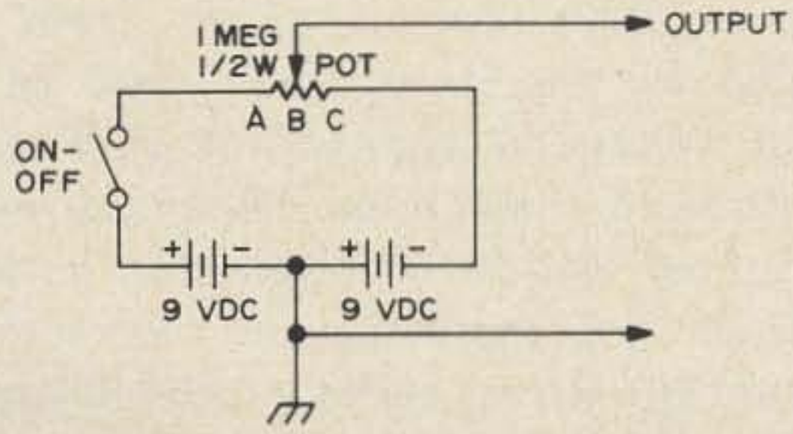

Fig. 1.

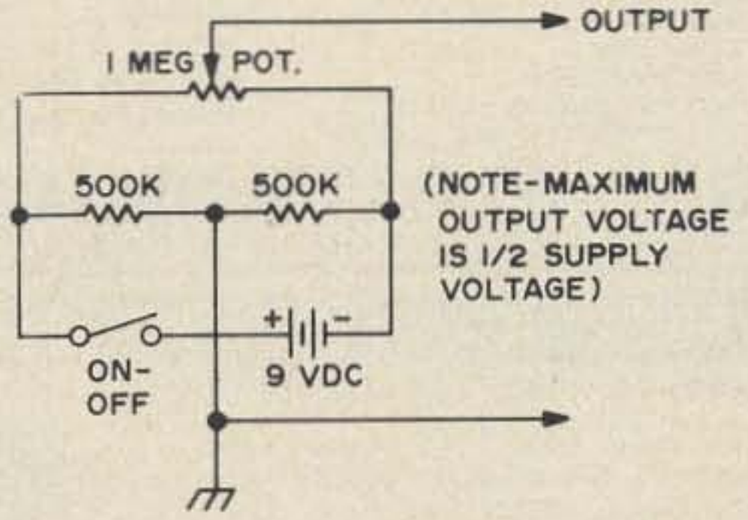

Fig. 2.

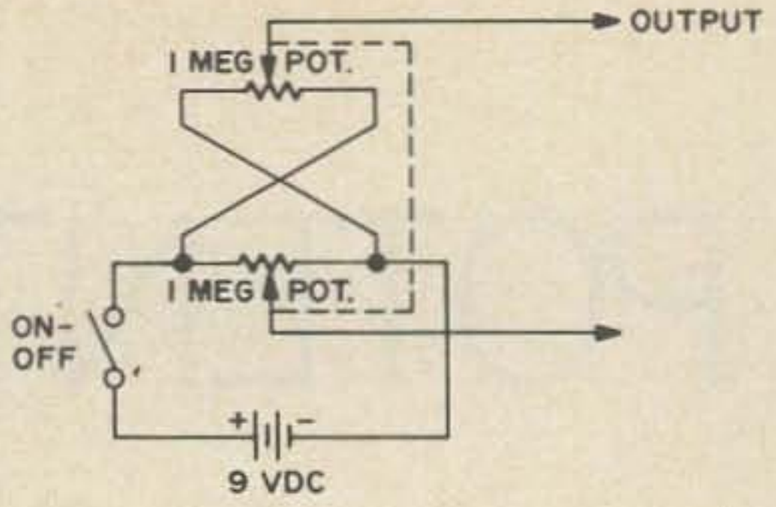

Fig. 3.

past center, the voltage *reverses* its polarity, so don't power a transistor circuit that might be damaged by this. You should also note that linear pots make the best voltage controls. Tapered pots vary the voltage unevenly, and put the "zero-volts" position far off center.

The values shown are typical and have been tested. They should be changed to suit your particular needs. Keep in mind that $P = I^2R$. Don't draw too much current unless your pots have a high enough wattage rating.

I have found it very convenient to test small diodes with these circuits. Just put a milliammeter in series with the diode and place this across the output voltage of any of the aforementioned circuits. Now swing the pot over its range and measure the diode's reverse current. This technique may also be used to check the junctions in transistors.

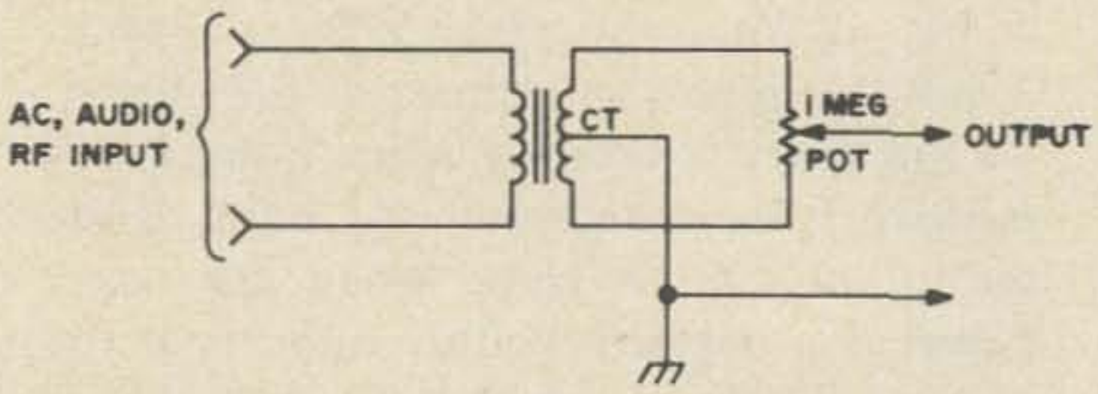

Fig. 4

The circuit shown in Fig. 4 is found in most oscilloscopes to obtain Lissajous patterns. As the pot is swept from one extreme to the other, the *phase* of the output voltage is changed as well as the amplitude of the voltage. The phase will be determined by how far off center the wiper is placed. The input may be connected to standard 60 Hz ac, audio – or rf if you use a suitable transformer.

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AN IMPROVED METHOD TO PRUNE ANTENNAS

For anyone who desires to install a new antenna, there is always the problem as to how long to make it. At best, the formulas in handbooks are an approximation and the resonant frequency of the antenna will be modified by surrounding objects, the propagation factor of the antenna, and capacitive end effects. Usually these approximations are adequate but we frequently find ourselves pruning the antenna for the best swr at the desired operating frequency. This is a method that will assist pruning the antenna and avoiding innumerable climbs to the roof or cutting the antenna too short.

Compute the antenna length for the low end of the band (146.9 F, where F is the frequency in MHz). The length will be in meters.

Install the antenna and plot the reflected power or swr across the band (Curve A). I used a reflectometer type of swr meter.

Draw a straight line along the slope of the swr curve until it crosses the bottom of the graph (Curve B). This intersection represents the actual resonant frequency of the antenna (Fr).

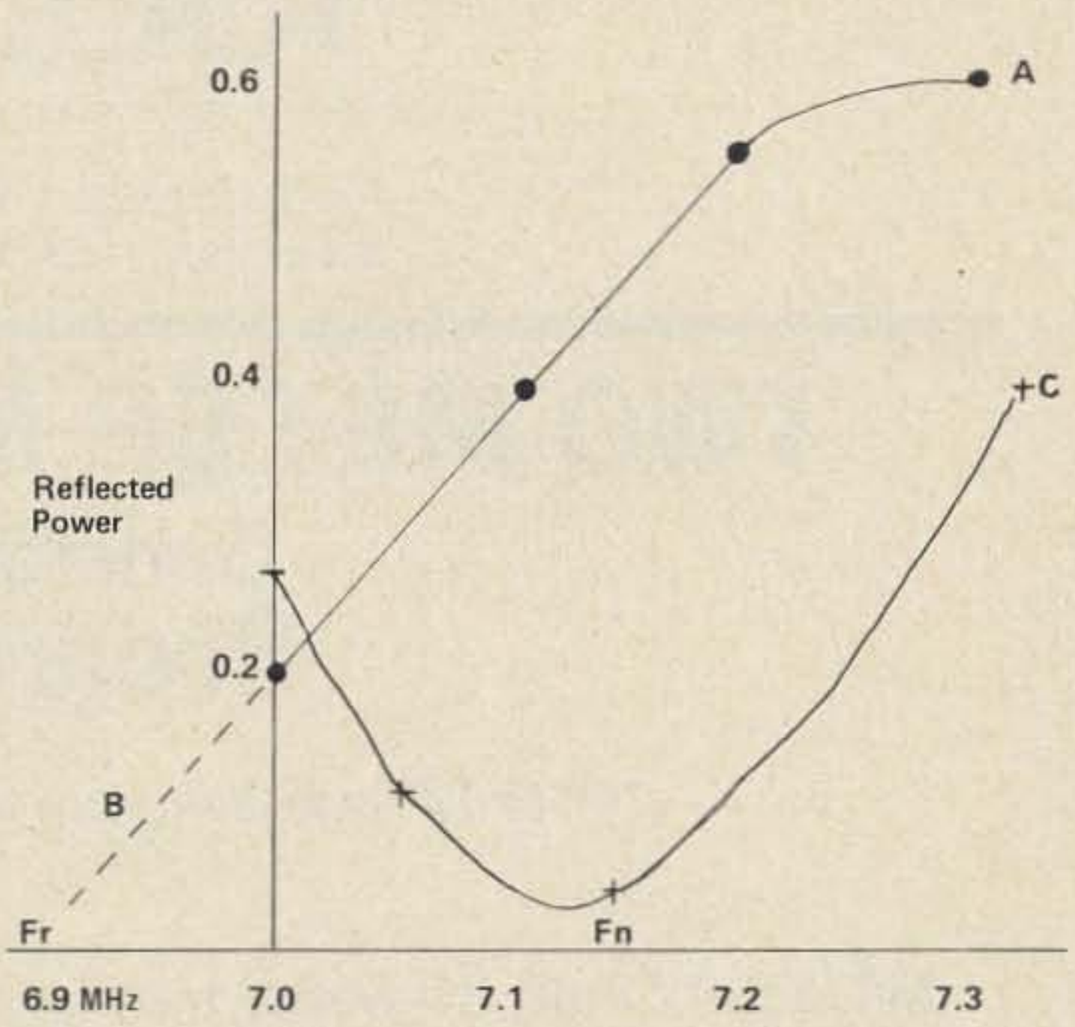
Calculate Fd = Fn - Fr where Fn is the desired resonant frequency of the antenna in MHz.

Calculate the amount the antenna needs to be shortened in meters (Ld).

$$Ld = \frac{146.9 \times Fd}{Fr^2}$$

Make a new swr curve after shortening the antenna by this amount (Curve C). If the resonant frequency is not correct, repeat the procedure.

I used this method on a new 40 meter dipole and I had to prune it twice, which is



$$\text{Antenna length} = \frac{146.9}{F} = \frac{146.0}{7.0} = 20.98 \text{ meters}$$

$$Fd = Fn - Fr = 7.15 - 6.90 = 0.25 \text{ MHz}$$

$$Ld = \frac{146.9 \times Fd}{Fr^2} = \frac{146.9 \times 0.25}{6.9^2} = .77 \text{ meters}$$

especially nice if one is working by himself. The constant 146.9 is the same as given in the ARRL Handbook corrrected for a 98% velocity factor and expressed metrically. This method can be used with any type of antenna if the appropriate constant is used, whether it be a dipole, ¼ whip, or a director.

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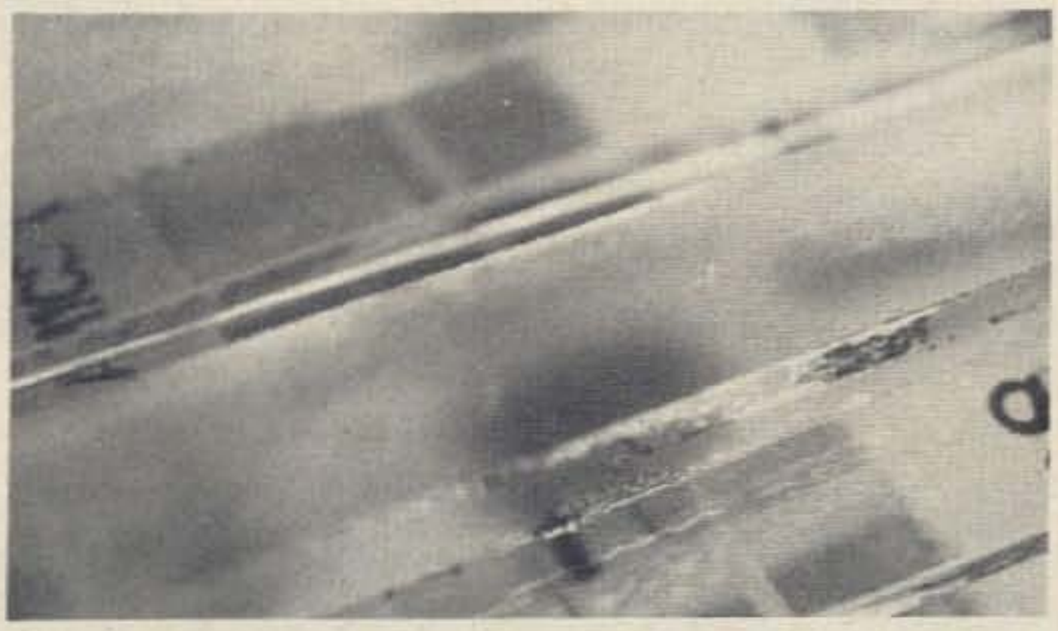
MA/E33

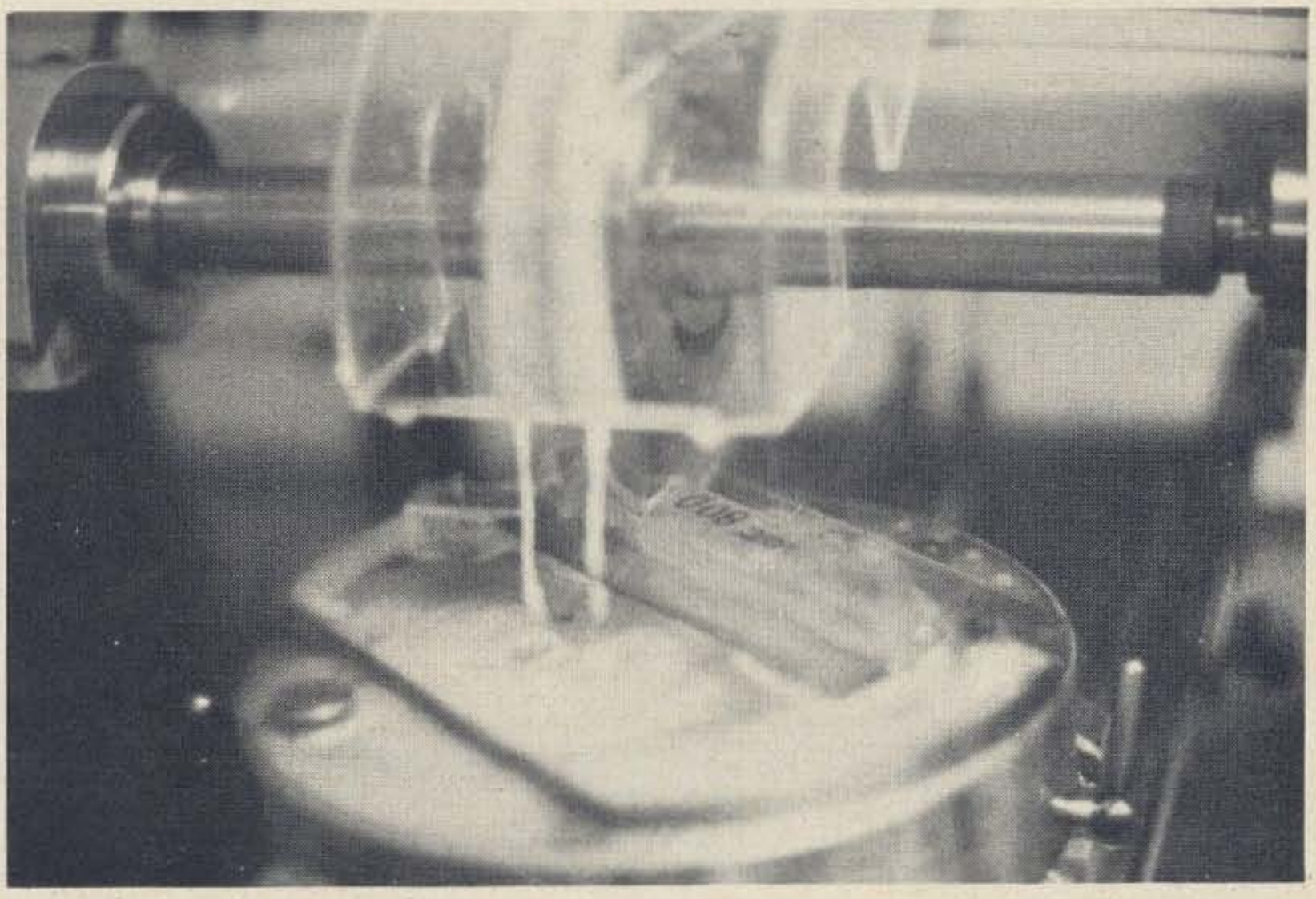
A VISIT TO SENTRY

Picture Story by Wayne Green W2NSD/1

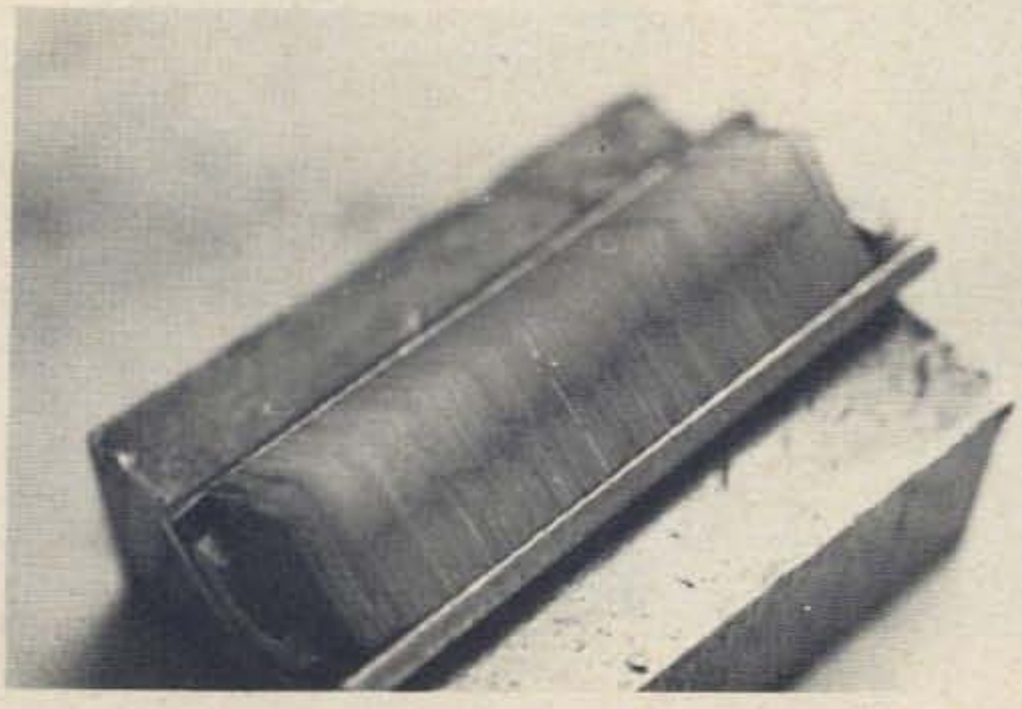
While down in Oklahoma giving a talk to the Oklahoma University radio club, I made a short side trip to Shawnee to stop in and see the crystal making at Sentry. It was most impressive. Sentry is one of the pioneers of crystals for wristwatches and they are into that process extensively. I tried to follow through the process whereby our FM crystals are manufactured.



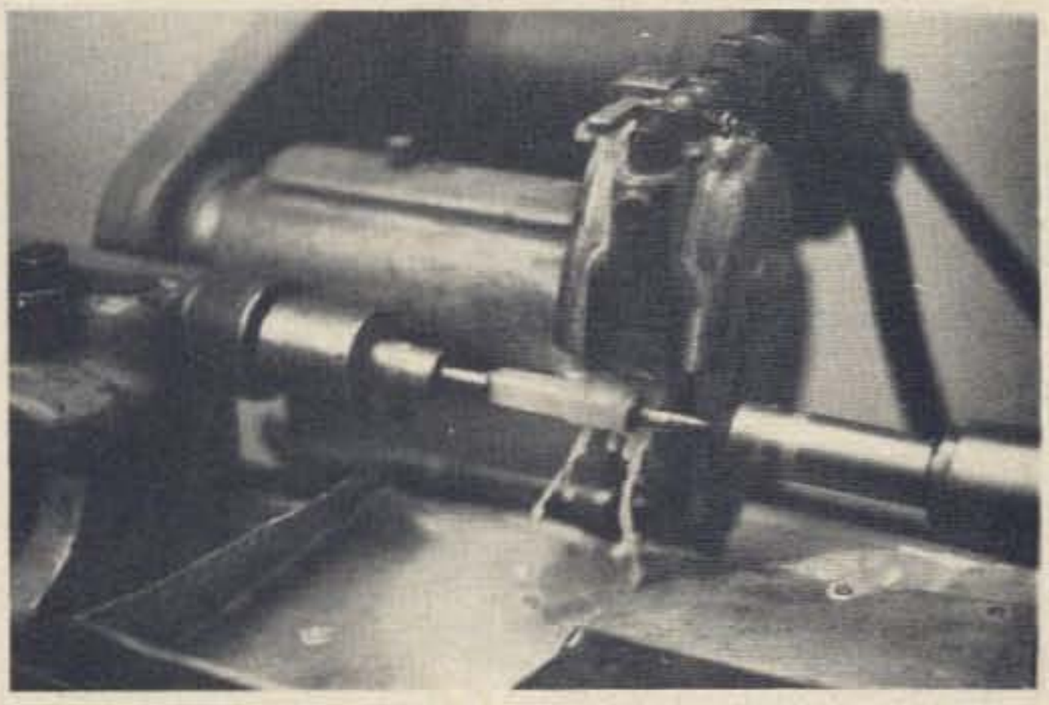
The long bars of quartz crystal are difficult to photograph — they look a lot like bars of ice.



The first step is to cut the quartz into thin slices at an angle to the bar. Here we see the slices being made by a saw. Quartz is difficult to cut and they have to run a lot of coolant on the saw to keep it from getting too hot.



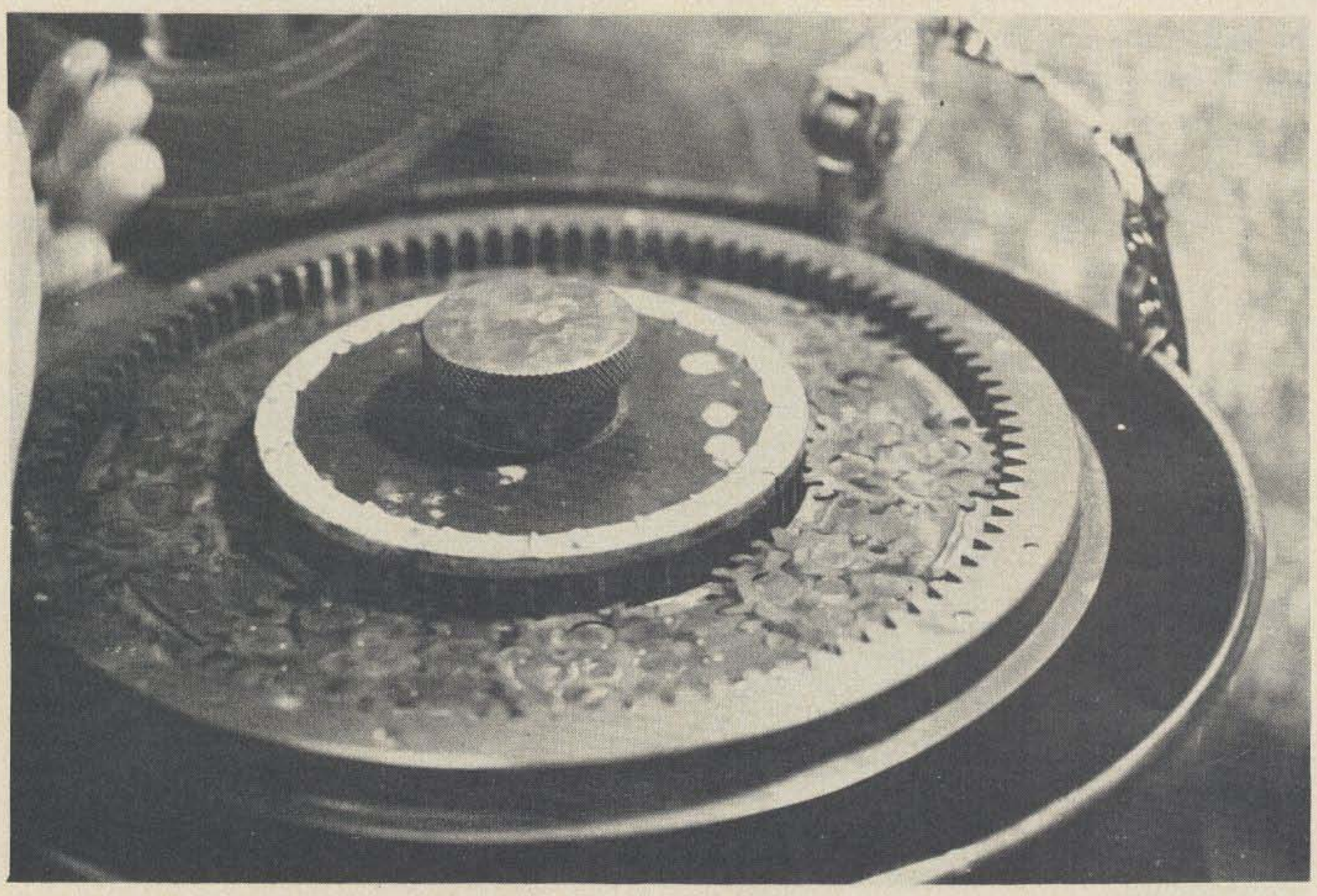
The slices of quartz are put together and clamped for rounding.



A lathe rounds the slices.

Some of the round slices are not absolutely perfect and they are removed at this time in the process.

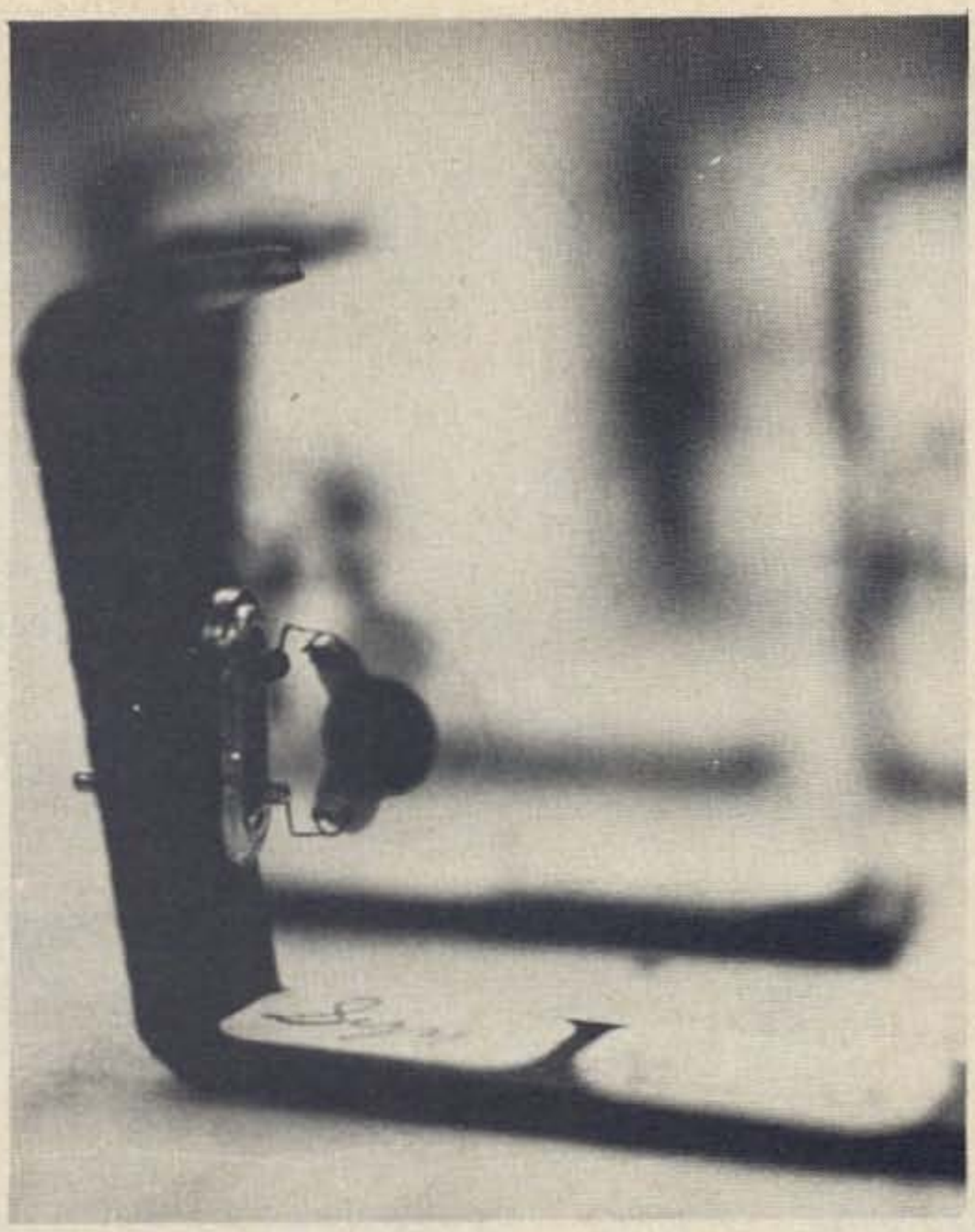
The round crystal blanks are put in this rough grinder a dozen at a time and a grinding sludge is squirted as they are ground down.



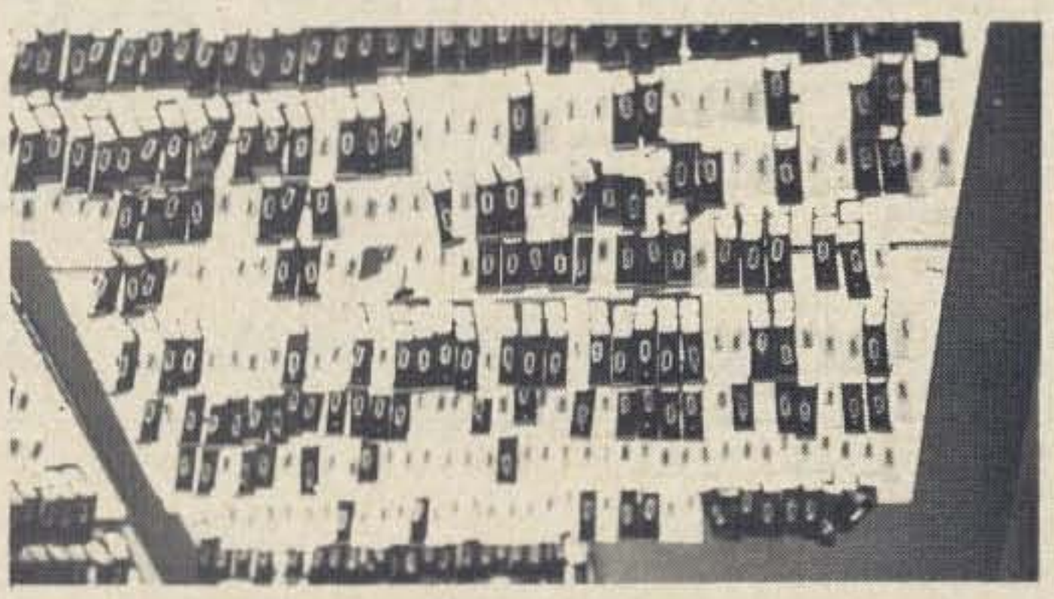
Thirty-six crystal blanks go into this final grinder for lapping close to the desired frequency. The crystals are in an oscillator circuit so the operator of the grinder can keep track of their frequency. No two are on exactly the same frequency so the operator swings the knob of an old HQ-129 back and forth, listening to the multitude of oscillations as they move on up the band with grinding.

The 129 is at the right and the grinder in the middle — note weights on the crystals to help them grind in.

The crystal blanks are put together with electrodes for gold plating.

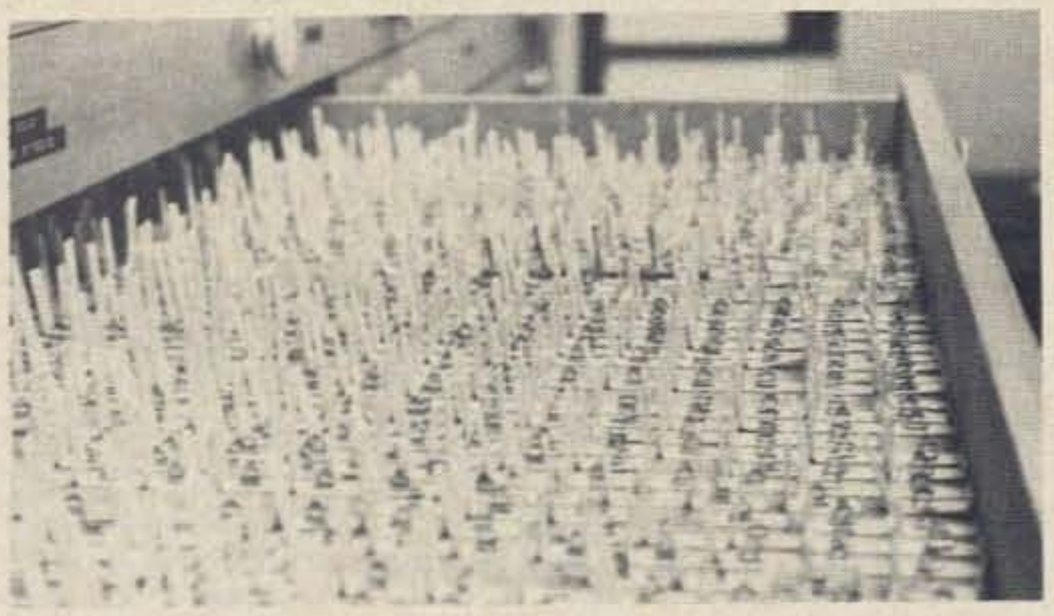


Finished crystal in work holder getting ready for the case to be soldered on. The crystals are kept on file in this shape, ready to be zeroed in on the ordered frequency and then put in their cases.



Here are a few hundred crystals ready for finishing

Talk about a gilt complex! This contraption puts gold on the crystals.



Sentry has thousands upon thousands of crystals ready for the final process, just awaiting your order. They have them by the drawers full.

. . .W2NSD/1

(W2NSD/1 continued from p. 4)

Now we wonder where truth doth lie – and who doth lie? Public savants - - er, servants, don't like a lot of light on themselves, so when someone from the FCC does something unfair to amateurs it is important to bring it out into the light and not try in fear to cover up.

Sex Sells!

It takes months before the figures are in from all of the newsstands around the world, but at last we have the details on how well or poorly our February sex cover did as compared to other issues. We had a bikini clad girl on the February issue and an exciting tower photo on the April issue. February sold 6.8% better on the newsstands than April!.

Big deal? You bet it is – that's over $1000 out of our pockets. It appears that occasional flings at female type covers may drop out a few Baptist ministers and Boy Scout leaders, but it does get more readers – and that means we can put out a little bigger magazine.

How about it you camera bug amateurs, can you come up with some relatively tasteful sexy pictures for our covers – with an amateur radio theme? We work best from 2 ¼" x 2 ¼" or 4" x 5" transparencies.

CURIOUS FCC CONCEPT

A recent talk by Johnny Johnston brought out an odd concept that apparently has taken root in the amateur division thinking – and that is that all petitions for rule changes should be viewed from the aspect of their applicability to the basic reasons for amateur radio as expressed in the regulations. The five are: providing emergency communications – contributing to the advancement of the radio art – advancing skills in the communication and technical phases of the art – expanding the reservoir of trained operators, technicians and electronic experts – enhancing international good will.

While it seems as though we should be able to enter petitions on any matter that is of importance to us, even though it might not bear directly on one of the five purposes of the "service," it would be prudent to keep in mind that this is the way the pendulum has swung for the time being and try to tie in your petitions for change to one or more of these purposes. Apparently this will help them move through the morass in Washington.

WRITING CONGRESS

A call from WN4YRB brought out the idea that many amateurs would like to write to their congressmen, but are stopped because they don't know how.

That's reasonable. How do you address your senator? How do you find out who he is if you don't know?

(Continued on p. 108)

FCC RULES AND REGULATIONS, PART 97 (IV)

CONTENTS THIS MONTH

Subpart C—Technical Standards

Continuing from last month the complete text of the FCC Rules & Regulations pertaining to the Amateur Radio Service.

SUBPART C—TECHNICAL STANDARDS

§ 97.61 Authorized frequencies and emissions.

(a) Following are the frequency bands and associated emissions available to amateur radio stations, other than repeater stations, subject to the limitations stated in paragraph (b) of this section, §§ 97.65, 97.109, and 97.110.

Frequency band	Emissions	Limitations (see paragraph (b))
kHz		
1800-2000	A1, A3	1, 2
3500-4000	A1	
3500-3775	F1	
3775-3890	A5, F5	
3775-4000	A3, F3	4
7000-7300	A1	3, 4
7000-7150	F1	3, 4
7075-7100	A3, F3	10
7150-7225	A5, F5	3, 4
7150-7300	A3, F3	3, 4
14000-14350	A1	
14000-14200	F1	
14200-14275	A5, F5	
14200-14350	A3, F3	
MHz		
21.000-21.450	A1	
21.000-21.250	F1	
21.250-21.350	A5, F5	
21.250-21.450	A3, F3	
28.000-29.700	A1	
28.000-28.500	F1	
28.500-29.700	A3, F3, A5, F5	
50.0-54.0	A1	
50.1-54.0	A2, A3, A4, A5, F1, F2, F3, F5	
50.0-54.0	AØ	
144-148	A1	
144-148	AØ, A2, A3, A4, A5, FØ, F1, F2, F3, F5	
220-225	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5.	5, 6
420-450	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5.	5, 7
1215-1300	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5.	5
2300-2450	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5, P.	5, 8
3300-3500	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5, P.	5
5650-5925	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5, P.	5, 9
10000-10500	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5.	5
21000-22000	AØ, A1, A2, A3, A4, A5, FØ, F5, F2, F3, F4, F5, P.	
Above 40000	AØ, A1, A2, A3, A4, A5, FØ, F1, F2, F3, F4, F5, P.	

(b) Limitations:

(1) The use of frequencies in this band is on a shared basis with the LORAN–A radionavigation system and is subject to cancellation or revision, in whole or in part, by order of the Commission, without hearing, whenever the Commission shall determine such action is necessary in view of the priority of the LORAN–A radionavigation system. The use of these frequencies by amateur stations shall not cause harmful interference to LORAN–A system. If an amateur station causes such interference, operation on the frequencies involved must cease if so directed by the Commission.

(2) Operation shall be limited to: (Next page).

(3) Where, in adjacent regions or subregions, a band of frequencies is allocated to different services of the same category, the basic principle is the equality of right to operate. Accordingly, the stations of each service in one region or subregion must operate so as not to cause harmful interference to services in the other regions or subregions (No. 117, the Radio Regulations, Geneva, 1959).

(4) 3900–4000 kHz and 7100–7300 kHz are not available in the following U.S. possessions: Baker, Canton, Enderbury, Guam, Howland, Jarvis, Palmyra, American Samoa, and Wake Islands.

(5) Amateur stations shall not cause interference to the Government radiolocation service.

(6) Not available in those portions of Texas and New Mexico bounded by latitude 33°24′ N., and 31°53′ N., and longitude 105°40′ W. and 106°40′ W. between the hours 0500 and 1800 local time, Monday through Friday, except to stations authorized to operate in an organized civil defense network when civil defense emergencies exist or when arrangements have been made with the Commission Engineer in Charge at Dallas, Tex., and the Area Frequency Coordinator at White Sands, N. Mex., for drills at specific dates and times.

(7) In the following areas the d.c. plate input power to the final transmitter stage shall not exceed 50 watts,

(2) Operation shall be limited to:

Area	Maximum DC plate input power in watts							
	1800-1825 kHz	1825-1850 kHz	1850-1875 kHz	1875-1900 kHz	1900-1925 kHz	1925-1950 kHz	1950-1975 kHz	1975-2000 kHz
	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night	Day/Night
Alabama	500/100	100/25	0	0	0	0	100/25	500/100
Alaska	1000/200	500/100	500/100	100/25	0	0	0	0
Arizona	1000/200	500/100	500/100	0	0	0	0	0
Arkansas	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
California	1000/200	500/100	500/100	100/25	0	0	0	0
Colorado	1000/200	500/100	200/50	0	0	0	0	200/50
Connecticut	500/100	100/25	0	0	0	0	0	0
Delaware	500/100	100/25	0	0	0	0	0	100/25
District of Columbia	500/100	100/25	0	0	0	0	0	100/25
Florida	500/100	100/25	0	0	0	0	100/25	500/100
Georgia	500/100	100/25	0	0	0	0	0	200/50
Hawaii	0	0	0	0	200/50	100/25	100/25	500/100
Idaho	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Illinois	1000/200	500/100	100/25	0	0	0	0	200/50
Indiana	1000/200	500/100	100/25	0	0	0	0	200/50
Iowa	1000/200	500/100	200/50	0	0	100/25	100/25	500/100
Kansas	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Kentucky	1000/200	500/100	100/25	0	0	0	0	200/50
Louisiana	500/100	100/25	0	0	0	0	100/25	500/100
Maine	500/100	100/25	0	0	0	0	0	0
Maryland	500/100	100/25	0	0	0	0	0	100/25
Massachusetts	500/100	100/25	0	0	0	0	0	0
Michigan	1000/200	500/100	100/25	0	0	0	0	100/25
Minnesota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Mississippi	500/100	100/25	0	0	0	0	100/25	500/100
Missouri	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Montana	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Nebraska	1000/200	500/100	200/50	0	0	100/25	100/25	500/100
Nevada	1000/200	500/100	500/100	100/25	0	0	0	0
New Hampshire	500/100	100/25	0	0	0	0	0	0
New Jersey	500/100	100/25	0	0	0	0	0	0
New Mexico	1000/200	500/100	100/25	0	0	100/25	500/100	1000/200
New York	500/100	100/25	0	0	0	0	0	0
North Carolina	500/100	100/25	0	0	0	0	0	100/25
North Dakota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Ohio	1000/200	500/100	100/25	0	0	0	0	100/25
Oklahoma	1000/200	500/100	100/25	0	0	100/25	100/25	500/100
Oregon	1000/200	500/100	500/100	100/25	0	0	0	0
Pennsylvania	500/100	100/25	0	0	0	0	0	0
Rhode Island	500/100	100/25	0	0	0	0	0	0
South Carolina	500/100	100/25	0	0	0	0	0	200/50
South Dakota	1000/200	500/100	500/100	100/25	100/25	100/25	100/25	500/100
Tennessee	1000/200	500/100	100/25	0	0	0	0	200/50
Texas	500/100	100/25	0	0	0	0	0	200/50
Utah	1000/200	500/100	500/100	100/25	100/25	0	0	100/25
Vermont	500/100	100/25	0	0	0	0	0	0
Virginia	500/100	100/25	0	0	0	0	0	100/25
Washington	1000/200	500/100	500/100	100/25	0	0	0	0
West Virginia	1000/200	500/100	100/25	0	0	0	0	100/25
Wisconsin	1000/200	500/100	200/50	0	0	0	0	200/50
Wyoming	1000/200	500/100	500/100	100/25	100/25	0	0	200/50
Puerto Rico	500/100	100/25	0	0	0	0	0	200/50
Virgin Islands	500/100	100/25	0	0	0	0	0	200/50
Swan Island	500/100	100/25	0	0	0	0	100/25	500/100
Serrana Bank	500/100	100/25	0	0	0	0	100/25	500/100
Roncador Key	500/100	100/25	0	0	0	0	100/25	500/100
Navassa Island	500/100	100/25	0	0	0	0	0	200/50
Baker, Canton, Enderbury, Howland	100/25	0	0	100/25	100/25	0	0	100/25
Guam, Johnston, Midway	0	0	0	0	100/25	0	0	100/25
American Samoa	200/50	0	0	200/50	200/50	0	0	200/50
Wake	100/25	0	0	100/25	0	0	0	0
Palmyra, Jarvis	0	0	0	0	200/50	0	0	200/50

except when authorized by the appropriate Commission Engineer in Charge and the appropriate Military Area Frequency Coordinator.

(i) Those portions of Texas and New Mexico bounded by latitude 33°24′ N., 31°53′ N., and longitude 105°40′ W. and 106°40′ W.

(ii) The State of Florida, including the Key West area and the areas enclosed within circles of 200-mile radius centered at 28°21′ N., 80°43′ W. and 30°30′ N., 86°30′ W.

(iii) The State of Arizona.

(iv) Those portions of California and Nevada south of latitude 37°10′ N. and the area within a 200-mile radius of 34°09′ N., 119°11′ W.

(8) No protection in the band 2400–2450 MHz is afforded from interference due to the operation of industrial, scientific, and medical devices on 2450 MHz.

(9) No protection in the band 5725–5875 is afforded from interference due to the operation of industrial, scientific, and medical devices on 5800 MHz.

(10) The use of A3 and F3 in this band is limited to amateur radio stations located outside Region 2.

(c) The following transmitting frequency bands and the associated emission authorized in paragraph (a) of this section are available for repeater stations, including both input (receiving) and output (transmitting):

Frequency Band (MHz)

52.0–54.0
146.0–148.0
222.0–225.0
442.0–450.0
any amateur frequency above 1215 MHz.

The frequency band 29.5–29.7 MHz may be authorized upon a special showing of need for repeater station operation in this band for intracommunity amateur radio communications.

[*§ 97.61(a) intro. amended and (c) added new eff. 10–17–72; and Table in (a) amended and (b)(10) added new eff. 11–22–72; VI(72)–1*]

§ 97.63 Individual frequency not specified.

Transmissions by an amateur station may be on any frequency within any authorized amateur band. Sideband frequencies resulting from keying or modulating a carrier wave shall be confined within the authorized amateur band.

§ 97.65 Emission limitations.

(a) Type AØ emission, where not specifically designated in the bands listed in § 97.61, may be used for short periods of time when required for authorized remote control purposes or for experimental purposes. However, these limitations do not apply where type AØ emission is specifically designated.

(b) Whenever code practice, in accordance with § 97.91(d), is conducted in bands authorized for A3 emission, tone modulation of the radiotelephone transmitter may be utilized when interspersed with appropriate voice instructions.

(c) On frequencies below 29.0 MHz and between 50.1 and 52.5 MHz, the bandwidth of an F3 emission (frequency or phase modulation) shall not exceed that of an A3 emission having the same audio characteristics; and the purity and stability of emissions shall comply with the requirements of § 97.73.

(d) On frequencies below 50 MHz, the bandwidth of A5 and F5 emissions shall not exceed that of an A3 single sideband emission.

(e) On frequencies between 50 MHz and 225 MHz, single sideband or double sideband A5 emission may be used and the bandwidth shall not exceed that of an A3 single sideband or double sideband signal respectively. The bandwidth of F5 emission shall not exceed that of an A3 single sideband emission.

(f) Below 225 MHz, A3 and A5 emissions may be used simultaneously on the same carrier frequency provided the total bandwidth does not exceed that of an A3 double sideband emission.
(T.S. VI(72)-1)

§ 97.67 Maximum authorized power.

(a) Except for power restrictions as set forth in § 97.61, each amateur transmitter may be operated with a power input not exceeding 1 kilowatt to the plate circuit of the final amplifier stage of an amplifier-oscillator transmitter or to the plate circuit of an oscillator transmitter. An amateur transmitter operating with a power input exceeding 900 watts to the plate circuit shall provide means for accurately measuring the plate power input to the vacuum tube or tubes supplying power to the antenna.

(b) Notwithstanding the provisions of paragraph (a) of this section, amateur stations shall use the minimum amount of transmitter power necessary to carry out the desired communications.

(c) Within the limitations of paragraphs (a) and (b) of this section, the effective radiated power of a repeater station shall not exceed that specified for the antenna height above average terrain in the following table:

Antenna height above average terrain	Maximum effective radiated power for frequency bands above:			
	52 MHz	146 MHz	442 MHz	1215 MHz
Below 50 feet	100 watts	800 watts	Paragraphs (a) and (b).	
50 to 99 feet	100 watts	400 watts	do	
100 to 499 feet	50 watts	400 watts	800 watts	Paragraphs (a) and (b).
500 to 999 feet	25 watts	200 watts	800 watts	Do.
Above 1,000 feet	25 watts	100 watts	400 watts	Do.

[§ 97.67 intro. text designated as (a), and (b) & (c) added new eff. 10-17-72; VI(72)-1]

§ 97.69 Radio teleprinter transmissions.

The following special conditions shall be observed during the transmission of radio teleprinter signals on authorized frequencies by amateur stations:

(a) A single channel five-unit (start-stop) teleprinter code shall be used which shall correspond to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar) but special signals may be employed for the remote control of receiving printers,

or for other purposes, in "figures" positions not utilized for numerals. In general, this code shall conform as nearly as possible to the teleprinter code or codes in common commercial usage in the United States.

(b) The normal transmitting speed of the radio teleprinter signal keying equipment shall be adjusted as closely as possible to one of the standard teleprinter speeds, namely, 60 (45 bauds), 67 (50 bauds), 75 (56.25 bauds) or 100 (75 bauds) words per minute, and in any event, within the range of ±5 words per minute of the selected standard speed.

(c) When frequency shift keying (type F1 emission) is utilized, the deviation in frequency from the mark signal to space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(d) When audio frequency shift keying (type A2 or type F2 emission) is utilized, the highest fundamental modulating audio frequency shall not exceed 3000 hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 hertz.

§ 97.71 Transmitter power supply.

The licensee of an amateur station using frequencies below 144 megahertz shall use adequately filtered direct-current plate power supply for the transmitting equipment to minimize modulation from this source.

§ 97.73 Purity and stability of emissions.

Spurious radiation from an amateur station being operated with a carrier frequency below 144 megahertz shall be reduced or eliminated in accordance with good engineering practice. This spurious radiation shall not be of sufficient intensity to cause interference in receiving equipment of good engineering design including adequate selectivity characteristics, which is tuned to a frequency or frequencies outside the frequency band of emission normally required for the type of emission being employed by the amateur station. In the case of A3 emission, the amateur transmitter shall not be modulated to the extent that interfering spurious radiation occurs, and in no case shall the emitted carrier wave be amplitude-modulated in excess of 100 percent. Means shall be employed to insure that the transmitter is not modulated in excess of its modulation capability for proper technical operation. For the purposes of this section a spurious radiation is any radiation from a transmitter which is outside the frequency band of emission normal for the type of transmission employed, including any component whose frequency is an integral multiple or submultiple of the carrier frequency (harmonics and subharmonics), spurious modulation products, key clicks, and other transient effects, and parasitic oscillations. When using amplitude modulation on frequencies below 144 megahertz, simultaneous frequency modulation is not permitted and when using frequency modulation on frequencies below 144 megahertz simultaneous amplitude modulation is not permitted. The frequency of the emitted carrier wave shall be as constant as the state of the art permits.

§ 97.75 Frequency measurement and regular check.

The licensee of an amateur station shall provide for measurement of the emitted carrier frequency or frequencies and shall establish procedure for making such measurement regularly. The measurement of the emitted carrier frequency or frequencies shall be made by means independent of the means used to control the radio frequency or frequencies generated by the transmitting apparatus and shall be of sufficient accuracy to assure operation within the amateur frequency band used.

(To be continued next month)

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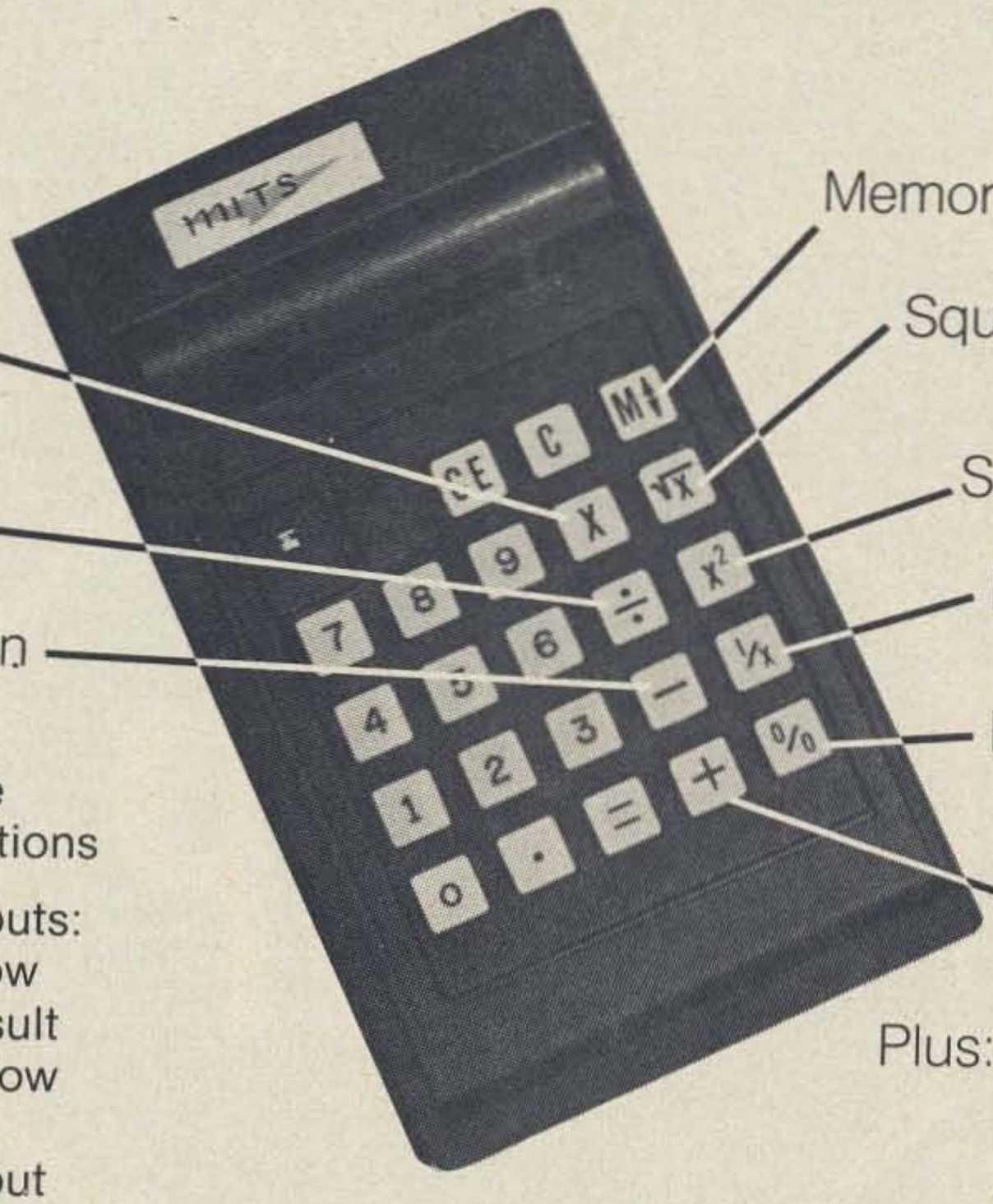

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73-9

Gay E. Milius, Jr. W4NJF
1416 Rutland Drive
Virginia Beach VA 23454

THE QSL MANAGER . . .

. . . is he behind the two-year time-lapse between working that rare DX station and finally receiving your card? A hard working QSL Manager tells his side of the story.

DXing is one half making the contact, and the other half getting the QSL to confirm the contact. Much has been said about how to QSL so as to entice a DX station to send a QSL. Nevertheless, the DXer should also know how to QSL to the QSL Manager. The latter sees many cards with many errors, and he is in a position to explain how to QSL properly and get better and speedier results.

Being a QSL Manager, I have discovered many DXers do not use Greenwich mean time and do not set their clocks by WWV, while the DX stations, as a rule, are quite careful of the time they use in their logs. This accounts for great discrepancies between QSL time and log time. Many beginning DXers continue to use their local time, while all worldwide DXers use GMT. Thus, more confusion ensues because the QSL Manager cannot stop to translate local time to GMT; at the same time it leads to incorrect dates, which in turn leads to no QSL from the QSL Manager. In an active DX log, one day may cover many pages. Obviously, when faced with a huge pile of QSL's, the Manager cannot stop to go through page after page, searching for an entry which might or might not be there.

Using GMT obliges one to remember that in the EST zone, the new day starts at 7:00 p.m. – ESDT zone, it starts at 8:00 p.m. In the CST zone, the new day commences at 6:00 p.m., and in CDST, 7:00 p.m. is the magic hour. This goes on across the country through MST and PST, etc. Remember the above, and log your QSO's accordingly. Then the QSL's will be sent out promptly with the correct time and dates.

Each QSL Manager has his own method of disposing of a large batch of cards. Usually the cards are first sorted according to date and time. Then it is simple to go right down the log, checking them off. But one annoying thing is to have all the QSL data on the back of the card and the call sign on the front. The QSL Manager must then turn each card over, using up valuable time and energy. Your cards should have all the information and call sign on one side. However, if you are aesthetic and insist on a two-sider, then for heaven's sake also put your call sign in small but fairly readable type on the same side as the QSL data. In this category, give a thought to the rising cost of postage and do not print your cards on heavy stock. If you send a batch of cards to a bureau, you can send many more light, thin cards than the thick, fancy variety. Who will know the difference? The QSL Manager doesn't care how the cards look, because in many cases the cards he receives never go any further than his attic or wastebasket. The DX stations, as a rule, don't care to have thousands of W/K cards. And in this vein, it seems futile to write notes on your cards which are sent to QSL Managers, because the

notes hardly ever reach the guy to whom you are writing. It is much nicer to drop the QSL Manager a short note thanking him for his efforts, which are generally given gratis.

Furthermore, always put your call sign on your return envelope. Cards have a habit of separating from the return envelope. Next, remember that just because a card is sent to a bureau doesn't mean that it costs nothing for the reply to be sent to you. The United States has no outgoing bureau, as do many other countries. It costs a great deal for a QSL Manager to send cards back to you via a bureau; many times, the DX station does not send the manager money to pay for that service. Therefore, if you really want a card from a manager, send him a self-addressed, stamped envelope (sase). You will receive a reply as soon as the manager receives the logs. But if you ship your card via the bureau, you may have to wait an indeterminable time to get your QSL in return. In this respect, if the manager handles more than one DX station, it is best to send an envelope for each station. Why? Well, the logs for one station may be at hand but the logs for the second station may not show for a year. So your cards will be delayed that much. I have been helping W2GHK, and sometimes he receives seven cards for seven stations with one return envelope. It may be that seven different people help Stu, and your cards wander all over the Eastern Seaboard before they get in the mails to you.

If you do not receive a fairly prompt reply from the QSL Manager, you must realize that he either doesn't have the logs or he cannot find you in the logs he does have. Not being facetious, I have noticed that CW cards are the ones which are usually sent for QSO's not in the logs, as the operator thinks he heard his call, while in reality the DX station was calling someone else with a similar call. And talking about not receiving logs, there is a lot of that going around. It is either due to the inefficient postal system or the procrastination of the DX station. Many a QSL Manager has had to give up because he was unable to get logs from the DX station.

Let me elaborate on another small item: writing the dates so they can be understood. *Around the world* (other than the United States) and in the military, *dates are written with the month in the middle.* Communication-wise, this is the best method whether the month is written out, set in roman numerals or arabic numerals. Most of the world writes Christmas as 25 December 1972, 25 XII 72 or 25/12/72. But here in the U.S., most people follow their early schooling by placing the month first: December 25, 1972; 12/25/72. This is not too confusing because the 25 in the middle can only be a day. However, look what happens with July, etc., – Independence Day is 7/4/72. What does the guy mean? April 7 or July 4? I maintain we should all use the month-in-the-middle method.

On the postage situation, please remember that you should not use an airmail envelope with its red, white and blue edges, unless you have sufficient postage on it to cover air mail, rather than surface. So unless you do this, don't send fancy air envelopes without supplying sufficient postage or International Reply Coupons for airmail. At the same time, for our overseas brethren, try

not to send U.S. IRC's to a U.S. QSL Manager. U.S. IRC's are for U.S. personnel to send *out* of their country. U.S. QSL Managers can't take them to a post office to get postage. Naturally, they may be kept to use to send for a QSL out of this country, but when a QSL Manager gets inundated with U.S. IRC's, he sometimes can't afford to send out the envelopes with his own money.

Now, as to how many IRC's to send for airmail from a certain country, it is best to check the Call Book and even that is incorrect at times. For example, a Nauru station told me it takes 3 IRC's for airmail there; the Call Book says it takes 4. It takes 2 IRC's for one-half ounce letter airmail to send a letter from the U.S. out of the country. True, there is a difference whether it goes to the Caribbean, Central or South America, or to the rest of the world. Central and South America and the Caribbean cost 17¢ per half ounce, while the rest of the world costs 21¢ for airmail, but one IRC rates only a 15¢ stamp good enough for surface mail, and thus two IR's are required.

Here are a few more hints. When you enclose your return envelope, always try to put it in the transmitting envelope by folding in half and placing the opened side *up*. In this way, when the QSL Manager slices the outside envelope with a letter opener, he will not also slice your return envelope in half. Furthermore, try to turn the flap of the return envelope outward and back on its front. Many envelopes are received glued tight and have to be tossed out. That means providing another envelope and addressing it; a time-consuming and costly task for the QSL manager.

In conclusion, be certain of the QSL Manager's address. Double check your Call Book list because frequently cards are sent to the fellow above or below the QSL Manager you desire. Your card will never reach its destination this way.

Many DX stations are active contest operators. Usually contest logs are separate from regular day-to-day logs. Therefore, when you QSL for a contest QSO, always mark the card to indicate that fact. It will save a lot of time. Good DXing,

. . .W4NJF

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(Social Events cont. from p. 10)

ROANOKE CONVENTION

The 1973 Roanoke Division Convention will be held at the Sheraton Inn and International Convention Center at Reston, Virginia on September 14-16. Technical symposiums, displays, exhibits and sessions such as AMSAT, SSTV, DX, Moon Bounce, FM, FCC, ARPSC, New Techniques, Traffic Nets and Contests will be held. Contact: K4MD at P. O. Box 7388, Warrenton, Va. 22186.

IN ARC-Fest

Sept. 30, 1973 Grant County ARC Annual Hamfest at 4-H park, Marion, Ind. Admission donation $1.00, XYL 50¢,children under 12 free. Large inside and outside flea market and exhibit area (no set up charge), food, drawings, tech sessions, camping, ladies bingo. Call in .94 Simplex. For flyer write H. Pence WB9GAT, 524 S. Washington, Montpelier, Indiana 47359.

MELBOURNE HAMFEST

The 8th Annual Melbourne Hamfest will be held September 8th and 9th at the Melbourne Civic Auditorium. Hours 9AM – 4PM. Advance registration $1.00, at the door $1.50. 25,000 sq. ft. swap area, parking for 2,000 cars free, 100% airconditioned building. The childrens entertainment will be a full length Walt Disney Movie, a fishing derby, novice symposium, radio controlled boats and airplanes, and a left footed code contest. A buffet style Hamfest Banquet for everyone Saturday 7PM. Contact: Donald E. Sanders W4BWS, 1422 Virginia Dr., Melbourne, Florida 32935.

PEORIA HAMFEST

The Peoria Area Amateur Radio Club, Inc. will hold it's 16th annual Hamfest Sunday, September 16, 1973, at Exposition Gardens (same place as last year), located on the northwest edge of Peoria, Illinois. Lunch will be available. There will be plenty of activities for the entire family, beginning with the campsite opening the preceeding evening and the banquet Sat., Sept. 15, at V Junction, $5.50 per person. Door prizes for men and women, cocktail hour 5:30 to 6:30, dinner 6:30. Two motels within walking distance. Free coffee and donuts from 9:00 to 9:30 AM GDT. Advance $1.50, at the gate $2.00. For further details and advance registration for banquet contact Larry Pearsall W9FDY, 2224 W. Herold Ave., Peoria, Ill. For Hamfest tickets write Wendell McWilliams, WB9DVJ, P. O. Box 1, Rome, Illinois 61562.

SHARON AUCTION

The Sharon Amateur Radio Association is holding an auction on September 16, 1973. It will take place at the Sharon Community Center in Sharon and will begin at 1:00 P. M. Inquiries should be addressed to David Sirkin, 18 Gorwin Drive, Sharon, Mass., 02067. (617) 784-2276.

WICHITA HAMFEST

On Sept. 9, 1973 the Wichita Amateur Radio Club will have its annual Hamfest at the Sedgwick County 4-H Building. It is located on the N. W. corner of West St. and Central Ave. in West Wichita. For those people who don't know the Wichita area there will be talk-ins on: 3.920 MHz, 7.275 MHz, 146.34 MHz, 146.94 MHz. MARS, ARRL and Kansas Net Meetings. Games, Free soft drinks, and Prizes. Starts 10:00 AM ends 4:00 PM C. D. T. Admission $1.75. Write: Todd Gearheart, 1320 Summitlawn Ct., Wichita, Kansas 67212.

CHECK-OUT MA

Middlesex A. R. C. Pi-Net is looking for check-ins. The net meets weekly September through June on Wednesday evenings at 8:00 P. M., E.S.T. or E.D.T. on 28.68 MHz. The primary purpose of the net is rag chewing and to provide a place to exchange views, information, news, etc. Traffic in and out of Boston area will be gladly handled – ANYONE and EVERYONE is invited to check-in. Colorful net certificates are issued for continued attendence of ten check-ins during twelve months.

CINCINNATI HAMFEST

The 36th Annual Hamfest will be held Sunday, September 16, 1973 at Stricker's Grove on State Route 128, one mile west of Ross (Venice), Ohio. Check local area map for location. Lots of food, flea market, contests, and model aircraft flying. $7.00 covers everything. For further information contact: Jim Wellman, W8HSI, 725 Stout Avenue, Wyoming, Ohio 45215.

CHICAGO HAMFEST

The Chicago Amateur Radio Club announces it's 4th annual Hamfest & Mini-Auction on September 30th, 1973. Time: 2PM till last deal made at St. Viator's School parking lot, 3606 N. Kedvale, N-W corner of Addison St. Donation at gate $1.50 or for advance $1.00 tickets contact: Don De Jong, W9KUJ, 6158 W. Grand Ave., Chicago, Ill., 60639. Ph. 889-329 or KL. 5-3622.

W9DXCC

On September 29, 1973 the Indianapolis DX Association will host the 21st annual meeting of the W9 Central Division Century Club. It will be an afternoon and evening affair at the Highland Park Holiday Inn near Chicago.

FINDLAY OHFEST

The Findlay Annual Hamfest will be held at Riverside Park in Findlay, Ohio – Sunday, Sept, 9 – Advance Donation Tickets $1.00 from C. Foltz W8UN, W. Hobart, Findlay, Ohio 45840.

HAMBURGFEST

Announcing the 1973 Hamburg International Hamfest, Saturday, September 15, 1973, at 9:00 A.M. at the Erie County Fairgrounds in Hamburg, New York. Admission: $2.50 at gate, $2.00 in advance. $1.00 admission to flea market parking. Children under 12 admitted free. Free parking for cars outside of flea market. Talk-in on 34/94, and on 7.255 and 3.925. For tickets and information contact: Lin Brownell, WB2HCL, 210 Buffalo St., Hamburg, New York 14075, (Tel. 716-649-3106).

MARS CONFERENCE

Air Force MARS will hold its first annual Eastern Division Conference on September 7th, 8th, and 9th, in the Washington, D. C. area. The conference will be held in the new Quality Inn in Pentagon City, Virginia.

The highlight of the conference will be the ganquest and awards presentation which will start at 8:00 P. M. on Saturday, September 8th. The guest speaker will be Senator Barry Goldwater, AFA?UGA. Inquiries and further information may be the banquet and awards Conference, P. O. Box 2836, EADS Station, Arlington, Virginia 22202.

W-10-W CERTIFICATE

The Puget Sound Council of Amateur Radio Clubs will issue a certificate signed by Governor Daniel J. Evans for contacts made during Washington State Amateur Radio Week, September 8th to 16th, 1973. Out of state hams must contact 10 Washington hams, and in state hams must contact 20 other Washington hams during this period. Send list of stations contacted, their locations, dates of contact, your name, call, address, and a self-addressed stamped legal size envelope to: The Puget Sound Council of Amateur Radio Clubs, 12306 80th Ave. East, Puyallup, Washington 98371.

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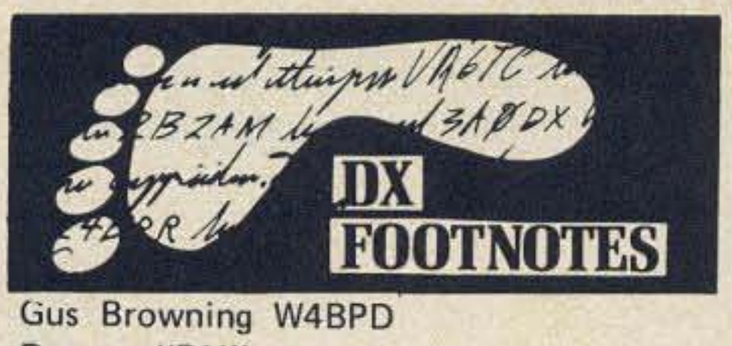

Gus Browning W4BPD
Drawer "DX"
Cordova, SC 29039

It still amazes me to see that the gang is still "in there" working DX on 160. I would suppose the fact that certain DX is on the other side of the equator where it's winter-time. Ten meters is just about for the birds right now and we all hope will sort of come to life when good old winter-time arrives. 15 is pretty good at times and our "bread and butter" DX band, 20 is still your best bet for DX and if you can battle the broadcast QRM and at times thunderstorm QRN you can find some pretty good stuff on 40. So "hang in there" fellows, the stuff is where you find it, if you will hunt.

We are still waiting for stickers for your WTW certificates to be delivered from the printers. No, I cannot print these fancy stickers, maybe I could learn how, but, life is just too short to be bothered !). When WTW at first was started we were issueing separate printed certificates for each WTW plateau (WTW-100, WTW-200 etc). When the award was given to Dave, K2AZ to manage, these separate certificates was changed over to the basic single WTW-100 certificate with stickers when you work the other plateaus. Those lucky ones who received the separate certificates will one of these days have "collector" material - Hang on to them fellows !

Except for sending out the "stamps" I have been pretty well keeping up with both the WTW and 73-73-73 certificates work, send me in your applications. EXCEPT those of you living in W1/K1, W2/K2, W3/K3, we have a very wide awake club to act as our verification check-point. Its:
Thomas Edison Radio Club,
QSL manager - WB2FVO
AND for the eighth district it's:
Blossomland Amateur Radio Assoc.
222 Jamesway
Benton Harbor
Michigan - 49022

This column is being written while I am under a lot of stress and strain because tomorrow morning I am away along with my XYL and daughter on a 3500 to 4000 mile tour of the Rocky Mountain areas, Grand Canyon, New Mexico, Texas, Louisiana etc. So I may jump from one subject to something entirely different. So doggoned many things to remember to do and so little time to do them in and each one is very important to do, before I can go. I like to take things "easy" and this "rushing" is not for me.

I suppose Wayne will be telling us about his trip over to Jordan because they told me at the 73 offices over the telephone that Wayne had made another trip over there. Maybe he will give us a personal report how each band sounded over in the Mid-East. (wish I was along with him, I sure am anxious to again be on the other end of some DX pile-ups !, maybe that "day" will arrive next year. Sure do want to be DX again. DXing can get in a fellows blood and I suppose it stays with you the rest of your life, and that makes it hard for a fellow that's not loaded with loot ! I believe Wayne has had the bug to bite him, too ! - hi.

Have any of you ever thought of becoming a QSL manager of some rare, active DX station ? I have asked any number of these QSL managers, Why ? Have got all kind of answers, the best answer so far came from WB2FVO (QSL manager for: DU1EN, ex-KG4ER -now in CN8 land, 7X2AD, and MP4BIN) he said he was a "nut", and then proceeded to give a good many other "good" reasons, all of them very good and reasonable. All I can say is "bravo" to them all, this in my book is nothing but "hard work". Their task would be much easier if all the cards sent them was filled out properly and for goodness sake be sure YOUR CARD has YOUR CALL on BOTH SIDES, always use ONLY GMT and be sure that the date is the GMT date - not necessarily YOURS. Many fellows don't seem to understand this fact. Just try to picture where the sun is in England and what day it is over there, and you HAVE IT. A nice "thank you" note to the QSL manager is very much appreciated. A little "donation" to help the QSL manager with HIS EXPENSES is a very good gesture. Always send along a self addressed, stamped envelope is a "must" with EVERY CARD, and put on the outside of this envelope the call of the DX station or some dope regarding the card you want. ALLOW plenty of time for your card because sometimes he has to wait for the logs of the DX station. Last but not least - DON'T WRITE A NASTY LETTER OR NOTE to him, he is not getting "paid" for his services, he is trying to help YOU !

CHINA NOTE: EP2PR (K4HLJ) is heading for Peking China (working for our government, Embassy, consul or something like that) so it may be that we will soon be hearing a "BY" station being operated by an American. Now, this is when you would hear the darndest pile-up you have ever heard in a long time. (tnx to Buddy, W4BBP for this info).

DXpedition of the month info:
If you want to receive a few times a year a nice little DX news sheet "free" you might drop a note to Stu-W2GHK/4 along with a nice large stamped, self addressed envelope and he will send you the next issue.

OGASAWARA ISLAND DXPEDITIONS: I keep getting info about the JA boys going to these islands on DXpeditions (the prefix is JD) and at times I look at one of the "late-late shows" on TV that has all JA actors. These are usually "monster" pictures and many wierd mountain and sea coast scenes are shown. I wonder if I am looking at some pictures made on these Ogasawara islands. Maybe I have seen some of the JA hams in a scene ? It might be - Who knows ?

JY - JORDAN - Silver Certificates: Work 6 different JY prefixes and you can get one of these beautiful, FB looking certificates. Send the dope to Box 2353, Amman, Jordan.

I overheard someone telling another DXer his version of why the French wont let anyone go to Clipperton Is. (FO8 is their prefix for Clipperton). He said he thought that "maybe" there was a lot of radioactive fallout on the island from some of the French A bomb tests held in the Pacific. I sure would like to know the "real reason", in case anyone really knows the truth. OR, maybe your "own" opinion as to why no one has been successful in obtaining a "permit" to go there and operate. There must be some "good" reason for this situation and it must be a high level "secret" of some sort. It begins to look like it may be easier to operate from China before anyone else gets back to Clipperton Island - Lets see which comes first, Clipperton Island or China.

A BIG P.S. about our first, second and third districts WTW check point, the address to send your cards to be checked is:
The Thomas A. Edison Amateur Radio Association,
c/o WB2FVO Club QSL Manager,
William W. Inkrote, Jr.,
52 Elliot Place,
Edison, N.J. - 08817
Bill will give you fast service I am sure.

We will be leaving for our "out west" trip in the next few hours and I will be telling you about some of the DXers I meet along the line of our travels. You know they live in the one part of the USA where I would suppose working DX is at times quite a problem with the west coast covering them in the Pacific and Asia, the East Coast eating them up alive into Europe and Africa and the W4's and W5's gobbling them up into South America - EXCEPT when they have the "skip" with them. Nothing I know of yet can beat Ole Man "skip".

Thats it till next month fellows-Gus-

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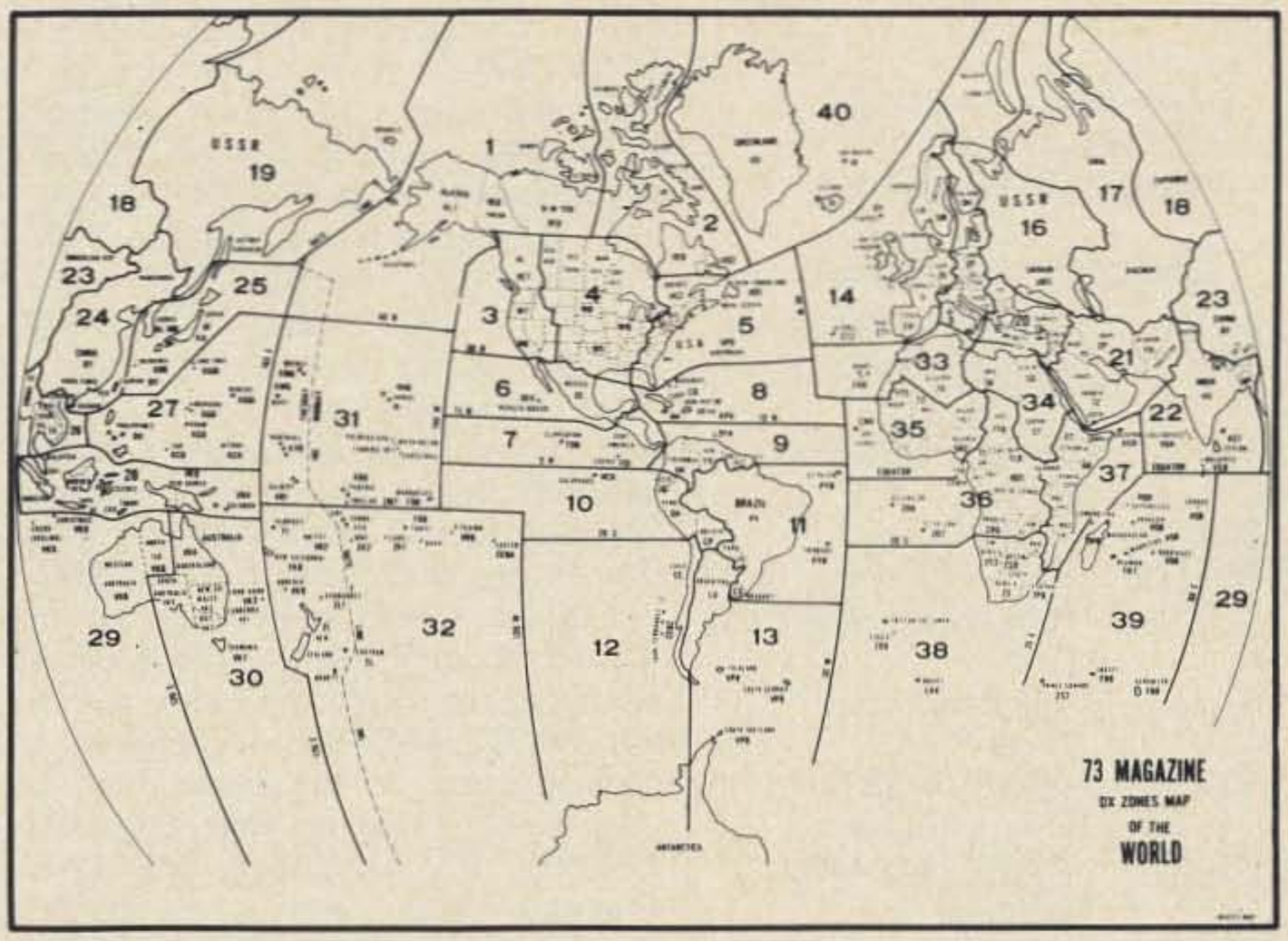

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CONTESTS

Tom DiBiase WB8KZD
708 6th Avenue
Steubenville OH 43952

CONTEST CALENDAR

Sep 8–10	Four-Land QSO Party
Sep 15–17	Washington State QSO Party
Sep 15–17	Pennsylvania QSO Party
Sep 22–23	VE/W Contest
Sep 29–Oct 1	Delta QSO Party
Oct 6–7	New Mexico QSO Party
Oct 6–7	California QSO Party
Oct 13–14	RSGB 21/28 MHz Phone Contest
Oct 20–21	RSGB 7 MHz CW Contest
Oct 20–22	North Carolina QSO Party
Nov 2–5	IARS CHC/FHC/HTH QSO Party
Nov 3–4	RSBG 7 MHz Phone Contest

THIS MONTH

Four-Land QSO Party

From 1800 GMT September 8th to 0200 GMT September 10th. The same station may be worked on each band and each mode from a fixed location, repeated again if operated portable or mobile, and from each different county. Fourth call district stations work any stations. Exchange QSO number, RS(T), county and state for 4th call area, state (or province or country) for others. Fourth call area stations score 1 point for W/VE QSOs, 3 points for all others. Multiply total points x states x counties. State and country count once only. Other stations score 2 points per 4th-land QSO x 4th-land states x 4th-land counties. Count each state and county once only. Frequencies are 3575, 7060, 14075, 21090, 28090, 3940, 7260, 14343, 21360, 28600, and Novices 3700, 7100, 21100, 28100 and up. Appropriate awards. Mail logs with score no later than 0200 GMT October 10, 1973, to 4th Call District A.R.A., Attn. Bob Knapp W4OMW, R#7, Box 187, Greenville NC 27834.

Washington State QSO Party

From 2000 GMT September 15 to 0200 GMT September 17. Stations may be worked each band and each mode for contact points and more than once each band/mode if they are additional multipliers. Exchange QSO number, RS(T) and QTH (county for Washington, state, province or country for non-Washington). Washington stations score 1 point per QSO with any stations. All others score 2 points per QSO with Washington stations. Washington stations multiply total QSOs x total states, provinces and countries. All others multiply total QSO points x total of different Washington counties worked. Suggested frequencies are 3560, 7060, 14060, 21060, 28160, 3935, 7260, 14280, 21380, 28660, 3735, 7125, 21150, 28160. Appropriate awards. Logs must show dates, times in GMT, stations worked, exchanges sent and received, bands and modes used and claimed scores. Include check sheet for entries with more than 50 QSOs. Include a signed statement that the Contest Committeee's decision will be accepted as final. No logs can be returned. SASE is not required to receive a copy of the results. Mail log sheets and scores no later than October 15, 1973 to Boeing Employees' Amateur Radio Society, c/o Contest Committee, Willis D. Propst K7RSB, 18415 38th Ave. South, Seattle, Washington 98188.

Pennsylvania QSO Party

From 2300 GMT September 15 to 0200 GMT September 17, 1973. Exchange QSO number, RS(T), QTH (ARRL section for non-PA, county for PA). The same station may be worked on different bands/modes. PA stations score 3 points per out-of-state QSO, 1 point per PA QSO, multiply by total different ARRL sections worked. Non-PA stations score 1 point per PA QSO, multiply by total different PA counties worked. Activity will be around 20 kHz from top of each phone band and 72.5 kHz from low end of each CW band. Appropriate awards. Multi-op stations are counted as a separate category. Logs must show date/time in GMT, stations worked, exchanges, and band/mode. Mail logs before October 15, 1973 to Nittany Amateur Radio Club, Inc., P.O. Box 60, State College PA 16801.

VE/W Contest

From 2300 GMT September 22 to 0200 GMT September 14, 1973. Open to all hams located in the ARRL sections listed on page 6 of any QST. Only 20 hours total operating time may be used in this contest. Times on and off the air must be shown in the log. Minimum time off period allowed is 15 minutes. All bands and modes may be used. A station may be worked once per band and once per mode (CW & SSB). Phone and CW are separate contests. There are two classes of entry, single-op and multi-op. W/Ks will work VE/VO stations and vice versa, W-to-W and VE-to-VE QSOs don't count. Complete exchanges must be made before claiming QSO points or multiplier points with a given station. Exchange a 5 or 6 digit consisting of RS(T) and QSO number number (e.g., 599001 etc. on CW, 59001 etc. on SSB), and ARRL section for W/Ks, geographical areas for VE/VOs. Each completed contact is 2 points x the number of sections worked on each band (e.g., 20 QSOs in 10 sections on 14 MHz and 12 QSOs in 8 sections on 7 MHz = 20 + 12 or 32 QSOs x 2 is 64 points. Multiply this by 10 + 8 or 18 and your score is 1152 points). Appropriate awards. Logs must show band, mode, date/time in GMT, times on/off, station worked, exchanges sent and received, indication of new multipliers, and your call and section on each log page (and on the top left hand corner of your envelope). Check sheets ("dupe" sheets) are required for every entry of 200 or more QSOs. Don't forget a summary sheet with your call, section, class of operation, mode, total operating time, breakdown of total QSO points and sections on each band, final totals for all bands, claimed score, equipment used, and signed statement that all rules were obeyed and that the decision of the Contest Committee will be accepted as final. All entries become the property of the committee. Log sheets are available from the address below for a large SAE and IRCs or Canadian stamps. Mail logs before October 31, 1973 to VE/W Contest Committee, VE2IZ, P.O. Box 2206, Dorval Station 780, Quebec, Canada.

Delta QSO Party

From 2000Z Sept. 29 to 0200Z Oct. 1. Amateurs outside the Delta Division will attempt to contact as many hams inside the Delta Division (Ark-La-Miss-Tenn) as possible. Delta Division hams contact any hams. Call "CQ Delta QSO Party" on SSB, "CQ Delta" or "CQ Test" on CW. Exchange QSO number, RST, and QTH (ARRL section for non-Delta Division, county and state for Delta Division). Stations may be worked on each band/mode. Portables and mobiles may be reworked if they change counties. Suggested frequencies are 3550, 7050, 14050, 21050, 28050, 3990, 7290, 14290, 21390, 28590, 3775, 7175, 21125, 28125. Delta Division hams socre 1 point per QSO x total different ARRL Sections. Non-Delta hams score 1 point per QSO x total different Delta counties worked. Appropriate awards. Logs must include date/time, station worked, exchange, band, mode, and multiplier. Mail logs before Nov. 5, 1973 to Malcolm P. Keown W5RUB, 213 Moonmist, Vicksburg, Miss. 39180. Logs will be returned, if requested.

I'm sorry to say that the Romanian RadioAmateur Federation and the

Japan Amateur Radio League sent their contest info too late for use, but we hope to get them for you next year.

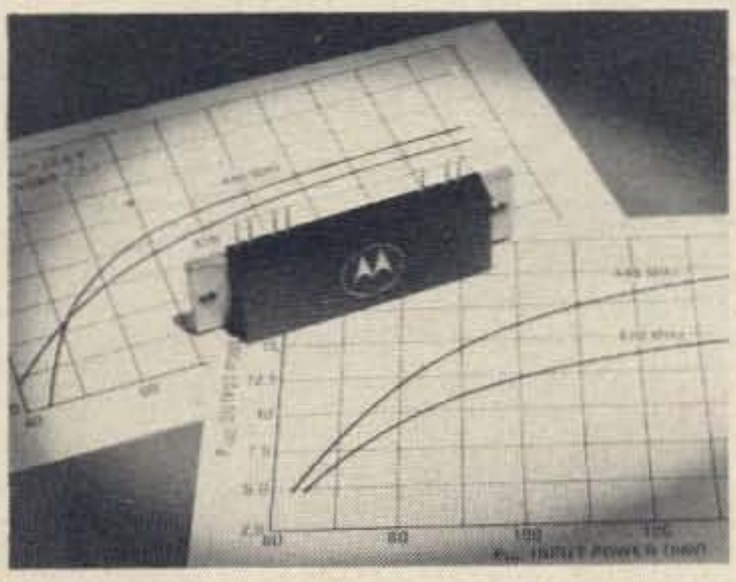
I suppose you've noticed the conflicting dates and times on some of the contests. For those of you who want to enter two contests that happen to be on the same weekend, try to divide your time equally between the two and do the best you can. I did last year, and won Ohio first place in the CA and MA QSO parties.

That's it for another month. Good luck in the upcoming contests, and I hope to see you in there adding to the chaos.

WB8KZD

NEW PRODUCTS

450 MHz AMPLIFIER MODULES



Designed for complete amplifier or driver applications at UHF, two new amplifier modules introduced by Motorola offer more than 18 dB power gain. Designated the MHW709, a 7.5W (min.), and the MHW710, a 13W (min.), UHF power modules, these are complete amplifier units capable of operation in the 450 MHz band.

Both units operate from a 12.5 volt dc supply, which is perfect for mobile installations. The MHW709 delivers 7.5W output with a driving power of approximately 100mW for a power gain of 18.8 dB. A full 13W can be produced by the MHW710 with only 150 mW of driving power for a power gain of 19.4 dB.

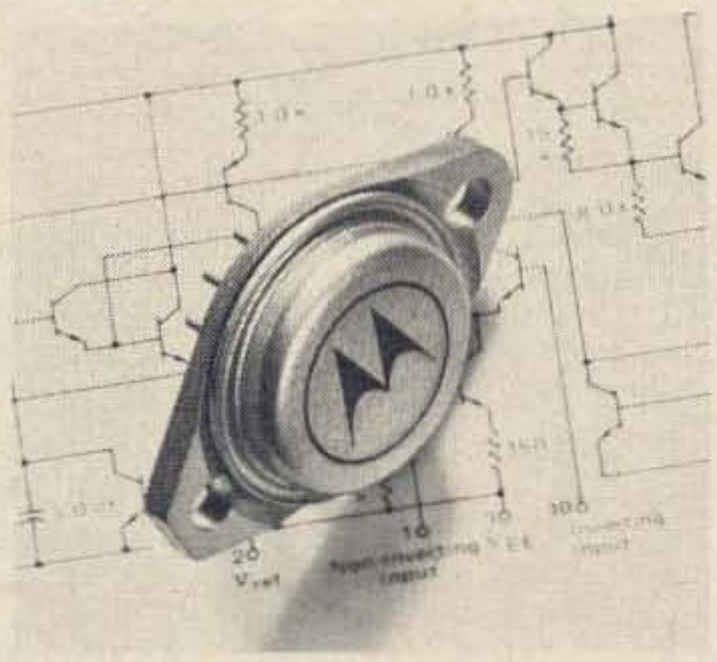
Harmonic suppression is at least -40 dB down across the frequency range with all spurious outputs more than 70 dB below desired signal. Input impedance is 50 ohm for both modules, and operation with a 20:1 load mismatch produces no damage to the unit. These units, when driven with a QRP 450 FM exciter, offer an extremely simple path to 3/4m operation.

QSL CONTEST

Stan Head W8KOI wins the QSL Contest this month by beating the Post Office at its own game of postmarking the front side of nearly every QSL it handles. Take a crack at winning a free 1 yr. subscription to *73*, enter the QSL Contest, *73* Magazine, Peterborough NH 03458.

The 7.5W amplifier sells for $43, while the 13W unit runs five dollars more. For more information contact the *Technical Information Center, Motorola Inc., Semiconductor Products Division, P. O. Box 20924, Phoenix, Arizona 85036.*

10 AMP VOLTAGE REGULATOR



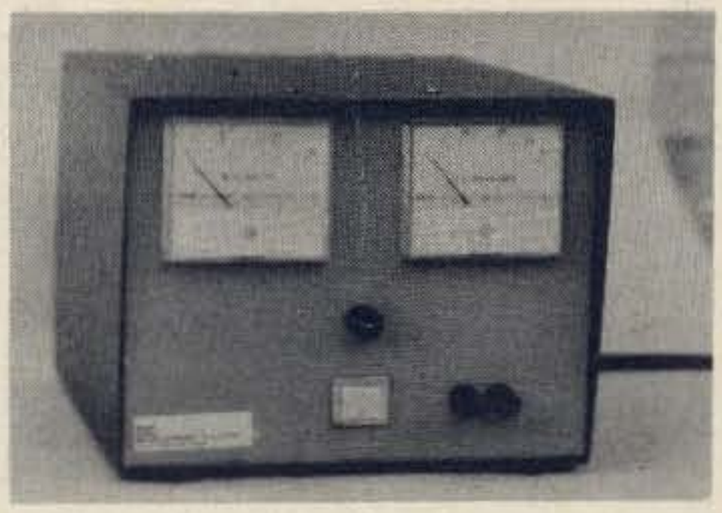
A 100W hybrid silicon voltage regulator capable of line regulation of 0.10% and load regulation of 0.15% has been introduced by Motorola. The MPC1000 is a 10-ampere positive or negative series voltage regulator capable of operating with input voltages as high was 60V. Output voltage can be adjusted from 2 to 35V to permit this single device to serve a wide range of output voltage requirements in the lab.

Output currents of 10-amperes are easily obtained from the MPC1000 without external pass transistors. Circuits using external pass transistors can expand the capability of the regulator to handle currents in excess of 50-amperes. Current limiting protection is built-in to protect the regulator from excessive surge currents.

Sample quantities are available from stock for immediate delivery, and volume orders can be filled 8 weeks after-receipt-of-order. Prices for the MPC1000 in a 9-pin metal TO-3 package are $14.95 each in 1 to 99 piece quantities.

For more information contact the *Technical Information Center, Motorola Inc., Semiconductor Products Division, P. O. Box 20924, Phoenix, Arizona 85036.*

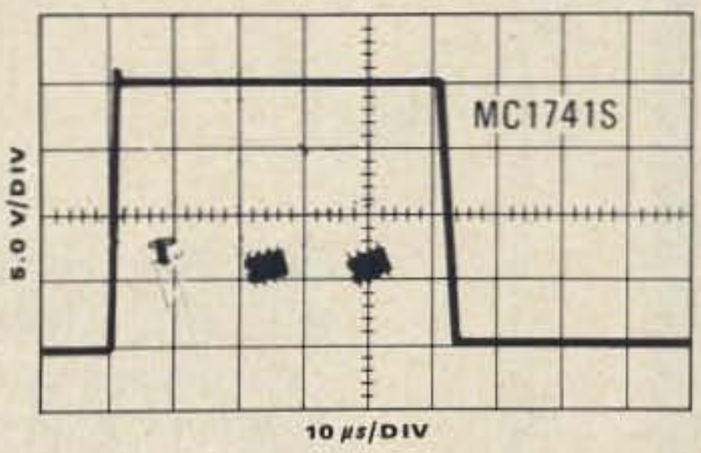
60 AMP POWER SUPPLY



Waller Electronics has a new power supply on the market that is capable of supplying a continuous current of 60 Amps at a nominal 12 Vdc. The PS 12-60 incorporates a husky constant voltage transformer which keeps the voltage between 12 and 13.6V-depending on the amount of loading. While not as precice as a solid state regulator, this system gives as much regulation as is probably needed at high current levels, while saving a bundle of money. The supply is offered in kit form for $100, but is also available completely assembled for $125. As more and more repeater groups are going all solid state, the Waller supply might be worth looking into. Even as equipment is added, this 720 Watt supply is just about all you'll ever need.

Contact*Waller Electronics, Box 9931, Chevy Chase MD 20015*

IMPROVED OP AMP



A new op amp with a minimum slew rate of 10V/μsec and a power bandwidth of 150 kHz is being offered by Motorola. It is a pin-for-pin replacement for the MC1741. Contact *Motorola Inc., Box 20942, Phoenix AR 85036.*

For the most powerful antennas under the sun

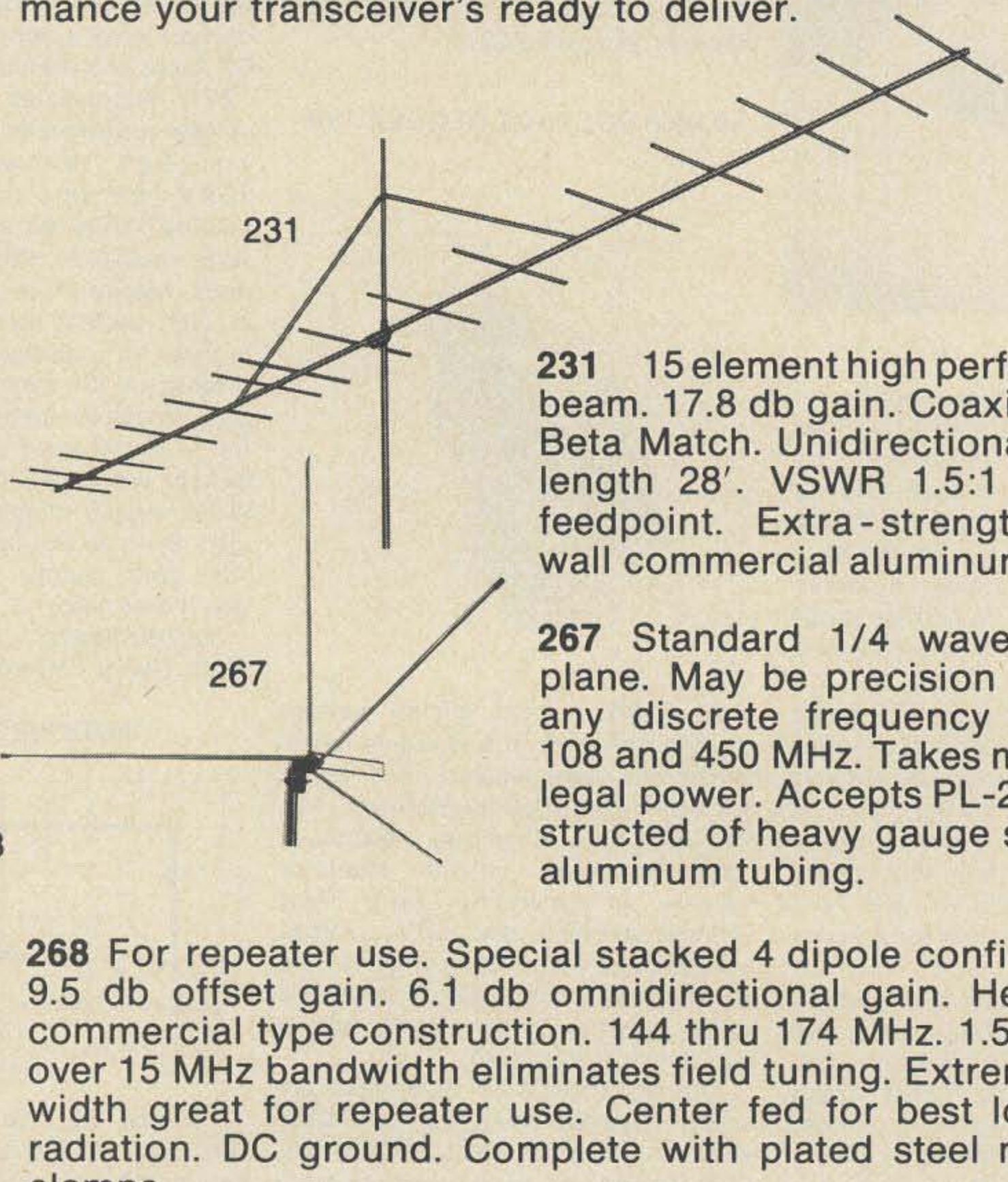
the REPEATER 2 Meter Fixed Station

Designed for the man who demands professional standards in 2 meter equipment. *REPEATER LINE* fixed station antennas are the 2 meter HAM's dream come true. With everything you need for top fixed station performance...toughness, efficiency and the gain to gain access to distant repeaters with ease. Work many stations, fixed or mobile, without access to a repeater.

The right antennas for the new FM transceivers...or any 2 meter fixed station.

REPEATER LINE Fixed Station Antennas

Tough, high efficiency antennas with a long, low radiation. For the top signal and reception you want...and the top performance your transceiver's ready to deliver.



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

267 Standard 1/4 wave ground plane. May be precision tuned to any discrete frequency between 108 and 450 MHz. Takes maximum legal power. Accepts PL-259. Constructed of heavy gauge seamless aluminum tubing.

268 For repeater use. Special stacked 4 dipole configuration. 9.5 db offset gain. 6.1 db omnidirectional gain. Heavy wall commercial type construction. 144 thru 174 MHz. 1.5:1 VSWR over 15 MHz bandwidth eliminates field tuning. Extreme bandwidth great for repeater use. Center fed for best low angle radiation. DC ground. Complete with plated steel mounting clamps.

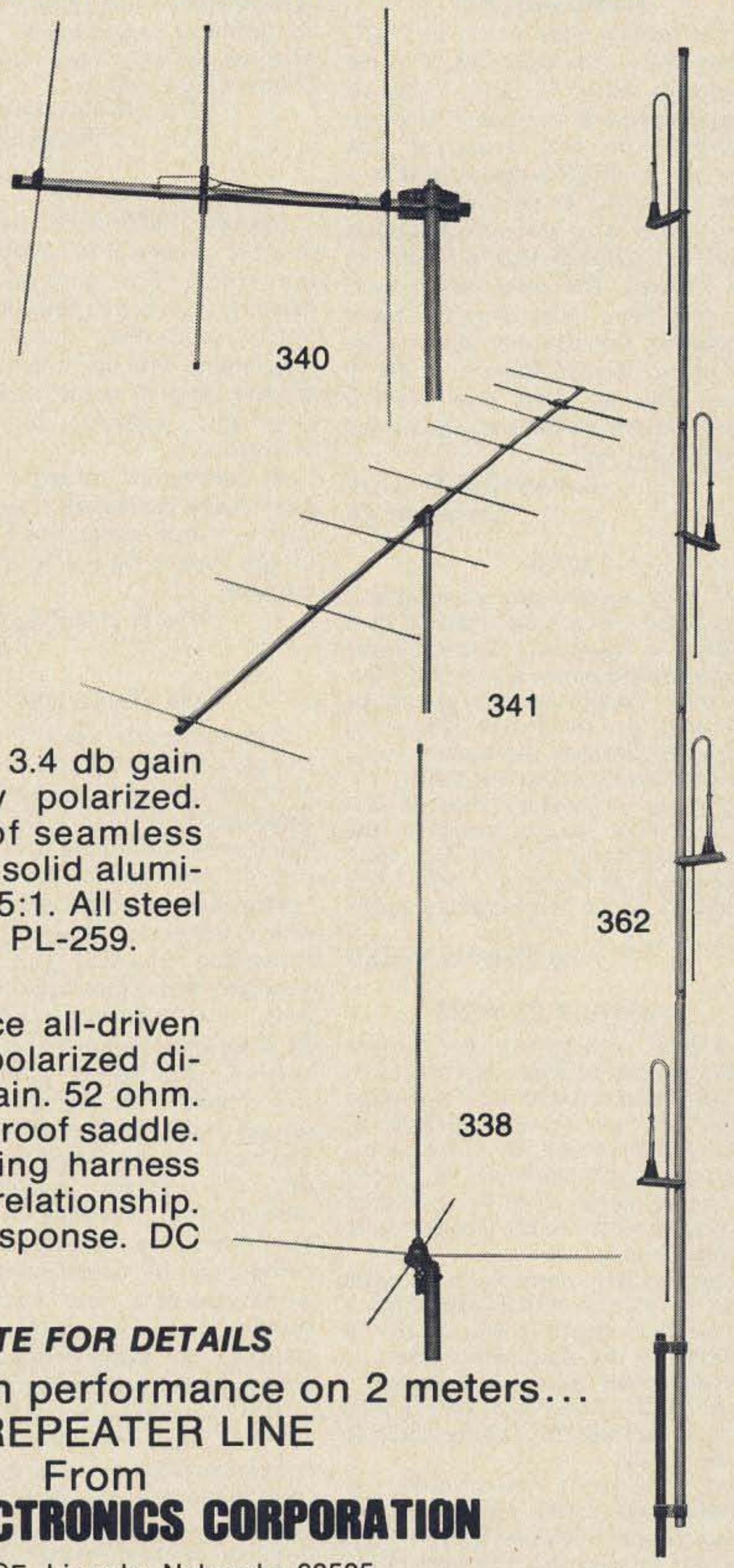
LINE from hy-gain
Antennas with real PUNCH!

340 3 element high performance beam. 9 db gain. Coaxial balun. Special VHF Beta Match configuration. Unidirectional pattern. VSWR 1.5:1. 52 ohm impedance. Heavy gauge aluminum tubing and tough aluminum rod construction.

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

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

362 SJ2S4 high performance all-driven stacked array. 4 vertically polarized dipoles. 6.2 omnidirectional gain. 52 ohm. May be mounted on mast or roof saddle. Unique phasing and matching harness for perfect parallel phase relationship. Center fed. Broad band response. DC ground.



WRITE FOR DETAILS

For top fixed station performance on 2 meters...
THE REPEATER LINE
From
HY-GAIN ELECTRONICS CORPORATION
P. O. Box 5407- GF Lincoln, Nebraska 68505

LETTERS

ou goons don't ever proofr
l asy m s fr b
bunch of rocks re n
you ignored my comments In
I insist that you print ev

HAMS UNITE

After reading your article on "FCC Responsibilty" in July 73, I agree completely with it, but I feel a stronger appeal is necessary. If every amateur in the U.S. wrote *just one* letter to the FCC suggesting that a move be made to encourage Ham Radio rather than discourage it, that would be 250,000 letters swamping their offices! The only people who can save ham radio are the hams themselves. Complaining about rules will never change them — only a reason will. So, let's give them a reason. United we can survive, divided we will surely fall.

Robery Gray WA1JQT
Townsend MA

20-20

OK, here we go again for another 3 years. When I first subscribed to 73 it was because I was an avid (but blind!) follower of the league policy and I felt that your "mad" ravings should be monitored just to say I'd listened to both sides. Besides, the articles in 73 were good and steadily improving.

So now, it appears that all has changed. Your insane ravings of the past (hindsight is 20-20) were amazingly to-the-point and 73's articles are at the "fantastically good" level.

Ike Meissner K5CXN

ANOTHER CB MESS

I concur with you on every point on the matter of Prose Walker, as an amateur radio repeater operator and a citizen of the United States of America. Please add my name to the list of any instrument you or others can devise to rid us of Prose Walker and restore sanity to the amateur rules and regulations.

I am seldom compelled to write letters to anyone, but this situation is another story and this will not be the last letter I write about this matter.

Never before have I had contempt for the FCC, but Prose Walker may try mine and others patience down to the last thread.

His apparent contempt for amateurs and praise for the lot of uncontrollable hooligans on 11 meters does not suggest that the commision wants any operators to conform to the rules on a voluntary basis, at least not in my way of thinking.

There is no doubt in my mind that the numbers of amateurs would exceed that of the CBers if there were no technical requirements. But then what would you have? One gigantic CB mess. God help us!

Ronald Pitts WA4SGI
Burmingham ALA

6m DEAD

Docket 18803 from the FCC has resulted in virtual annihilation of an ingenious 6m communications network in this area (esp. K1IIG). To my knowledge, there was no interference with any other systems or services, and it would have been an excellent system in time of emergency.

A substantial quantity of good, used 2-way radios are now collecting dust — a true waste. 6m FM activity of any type is now 1/10 of this time last year.

John R. Haserick, Jr. W1GPO
Rockville CT

WEATHER NET?

For about 15 years I have been involved with the electrical monitoring of severe weather (specifically 10 kHz "spherics"). The monitoring technique has improved over the years and last summer I think I discovered an electrical characteristic which appears capable of locating an impending tornado. This has been discussed with knowledgeable persons with the National Oceanic and Atmospheric Administration (weather bureau). They appear interested but are presently committed to other severe weather forcasting projects. The next step necessary to investigate this characteristic involves several monitoring stations and many observers to collect data for correlation of actual weather with monitoring data. I can visualize a Ham Weather Net with several monitoring stations and observers reporting to a central plotting or analyzing location.

Ham Radio has the technical ability, the manhours, and the communication systems available to investigate this discovery. I cannot guarantee success but it would be quite a feather in the Ham Radio "hat" if we could develop a *reliable* severe weather warning system.

The simplest monitoring equipment is similar to an oscilloscope. Equipment capable of indicating the discovered characteristic is more complicated but not expensive with present IC prices. This equipment has a range of about a thousand miles so one net could handle most of the United States with a concentration in the midwest. Even without a functioning weather net, the equipment can be used for following weather fronts. It has been an interesting experience for me over the years to try to analyze weather from one location.

I would be happy to discuss this in greater detail with you or any other interested party.

Richard "Dick" Fergus W9DTW
Lombard, Ill

Developments such as this are a major reason for amateur radio to exist — so let's get cracking on your ideas. Please start with an article and a call for interested volunteers.

WHEEL INVENTED AGAIN

The dual-voltage power supply circuit, shown on page 83 of the July 1973 issue and described as a new "spin-off" from NASA, is a long way from new, having been used in commercial instruments since 1959. The attached portion of the schematic of the Branson Inst. C. "Sonoray", Ultrasonic Flaw Detector shows the circuit and the date are encircled.!

Since several thousand of these instruments have been sold and are in service today and that NASA purchased several, one wonders if the wheel has been reinvented or what?

The description by the author is somewhat misleading in that the only feature of the circuit is a means of providing a low current, higher voltage output from a conventional choke input filter. Condenser C, (Fig. 1, page 83) should be very large and the load very low so that C1 charges only on the peaks of the input wave. As the conduction period increased, C1 is effectively across the output of the full-wave rectifier for longer periods and the filter for output A assumes the characteristic of a condenser input filter, increasing the output voltage of A and degrading the voltage regulation. It is a nice trick for limited and special conditions, but you can't get something for nothing.

Elliott A. Henry, W1YUI
Newtown CN

I AGREE

When I read your column in 73 back in January I was a little bit surprised and a bit upset with the attitude and the content of your column. I couldn't understand how someone like you could sit back and

(Continued on p. 109)

Caveat Emptor?

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

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

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

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

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

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

GONSET Communicator III 2 meters $100, Gonset 3063 2 meter power amplifier $75, package $150; Motorola P-33BAC with Ni-Cads 94/94 34/94 $125; Heath HX-20 $110, HR-20 $75, HP-20 $25, HP-10 $35, Hustler 80-10 mobile antennas mast mount $35, package $245; you pay shipping – W5PNY, 2506-A 35th St., Los Alamos, New Mexico 87544.

CLEANING TIME: National HRO-500, $1200. Drake TR-4, RV-4, AC-3, $550. Motorola HT-220, 2 watt, 2 frequency, with nicad, charger, on 94/94 and 34/94, $275. Dycomm 500D amplifier, $65. Regency TML-6, 6 channel lo-band transistorized monitor, $70. TCS surplus transmitter, $20. All excellent. Mel Stoller, K2AOQ, 373 Park Avenue, Rochester, N. Y. 14607, (716-244-2839).

GREAT CIRCLE BEARING CHARTS: Computer generated for your exact QTH. Bearings distances, return bearings for 660 worldwide locations. PRICE $1.00 postpaid worldwide. See also Ham Radio Magazine April 1973, Radio Communication November 1972. (SASE for copies of these articles.) Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

FINDLAY ANNUAL HAMFEST, Riverside Park, Findlay, Ohio – Sunday, Sept. 9 – Advance Donation Tickets $1.00 from C. Foltz W8UN, W. Hobart, Findlay, Ohio 45840.

PT-300's: P31DDN xcvr, NPN1007A Nicad Battery supply with battery, NLN6474A battery charger, with mike and all cables, 117/234 VAC, 6/12/24 VDC, and mobile mounting bracket. Have ten sets. Make offer over $150 each. Box A, 73 Magazine, Peterborough, NH 03458.

EQUIPMENT FROM 73

The following list of gear, unless otherwise noted, consists of brand new equipment purchased for testing purposes only. Some have been tested, some remain unopened in original cartons. We are offering this gear at a considerable discount on a first-come-first-served basis.

Heath IB 101 and Vanguard Scaler	$250
Miida Digipet 60 counter with Digipet 160 converter	$400
Tempo CL 220 220 xcvr	$265
HR2MS 8 ch scanning 2m xcvr 15W	$255
TME-H-LMU 16 ch scanning rcvr 6/2/¾/m	$255
Digital Logiclocks	$80
Midland 13509 220 xcvr	$200
Midland 1520 hand-held 2 meter	$190
SBE 450 450 xcvr	$340
Clegg 27B 2m xcvr	$380
Dycomm 2m repeater	$425
Standard repeater	$550
HR-6 25W	$190
Wilson 6 el. 20m beam (pick-up only)	$250
Wilson 7 el. 15m beam (pick-up only)	$250

JOBS FOR HAMS (73 will list job openings free). 73 Magazine is growing rapidly and needs dedicated hams to help with circulation and advertising. Typing skill required. Telephone experience useful. The pay is about average for the area, but – oh – the hamming we're doing up here in one of the most beautiful parts of the whole country! Ham gear is NO problem when you're working on a ham magazine. Send resume and reasons why you think you'd like to work at 73. Write to Wayne. You can play an important part in giving tens of thousands of amateurs enjoyment, helping amateur radio to grow around the world, and helping to assure its future in our country.

We are still signing on sales agents to handle 73 subscriptions and books. If you have the time and means to attend most of the activities in your area, and a personality that enables you to meet and deal with other people, you have an opportunity to turn your favorite hobby into a profitable one. One of our agents recently made over $100 for a weekend's work at a Swap & Shop Picnic. For further details write to the Circulation Department of 73 Magazine.

WESTERN UNION DESK-FAX transceiver manual: Complete theory of operation, adjustment, lubrication, preventive maintenance, troubleshooting, parts list. Includes all schematics and mechanical parts drawings. $3.80 postpaid. Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

"DON AND BOB" new guaranteed buys. Discount prices plus full warranty. SBE 144 2mFM ($259.95 list) $199.95; SBE 450 TRC converts 2mFM to 3/4m. T&R ($179.95 list) $149.95; Triex MW50 tower $250.75; MW65 $331.50; W51 $386.00 FOB, Cal; W67 ($983.50 list) $834.50 FOB, Cal; Ham-M $99.00; TR44 $59.95; AR2 2R $31.95; Belden 8 wire rotor cable #8448 10¢/ft; Mosley CL36 $146.00; CL33 $124.00; TA33 $144.00; MCQ3B $91.00; S402 $143.00; MP33 $90.00; HyGain TH6DXX $139.00; 204BA $129.00; Belden 8214 RB8 Foam 17¢/ft; Motorola HEP 170 epoxy diode 2.5 A/1000 PIV 29¢ ea, $25/100; Calrad KW SWR-relative power dualmeter bridge $15.95; write specific needs, new panel meters, stock; quote discontinued tubes; Radio Master 1972 $3.50; Motorola Semiconductor Data Book series $7.50; quote Clegg FM27B; Genave GTX2; Regency HR212; Midland 13500; Standard 826MA; 146A; hardbound technical magazines, many types from Petrochemical Library $3.00/yr; Amphenol PL259 49¢; USED: Collins 75A4 $345.00; Kenwood T599 $350.00; R599 $300.00; shipping charges collect. Madison Electronics, 1508 McKinney, Houston, Texas 77002, 713-224-2668.

FOR SALE: Complete Drake 4 line, plus TC-2 and TC-6 transmitting converters. All mint. Jim Gysan, W1VYB, 617-922-3850.

WANTED: HT-32-B. Must be in excellent condition, with manual. Also a HA-2. Jim Gysan, W1VYB, 617-922-3850.

MUST SELL: GETTING MARRIED, YAESU FTDx560 under guarantee, mint condition, highest offer over $425, Dale Krohse, WWAØTUC, 444 South Western, Sioux Falls, South Dakota 57104.

AUGAT 9009 SINCS for TO36, 2/$1.50, with 2N173 or 2N441, $2.00. Anyone have some cheap ART 13 or ARO 5, prefer close. 2N173-2N441 pulls 4/$1.00, 2N2016 pulls 3/$1.00 with cross reference. SASE for list of test equipment. Trade any items for Valiant, Vikings 11, Linears, Good Receivers. Will buy if reasonable. 14 typing repert. with keyboard, $10.00. Douglas Craton, 5625 Balfrey Dr., W. Palm Beach, Florida 33406.

FOUNDATION for AMATEUR RADIO annual Hamfest Sunday 21 October 1973 at Gaithersburg Maryland Fairgrounds.

COMPLETE SWAN STATION for sale, all mint. 600R custom/55-16 with CW filter $465, 600T Xmtr $440, 600 SP spkr/patch $48, Model 330 external tuner $95. All for $1000. Write Mike, WA9YZA, 535 Eagleview Ct., Zionsville, Ind. 46077, or call evenings, 317-873-3225.

SERVO CORP SWEEPERS 2-4 GHz sweep up or down, 2 settable markers, $225. NM50A with ps, cables & accessories, $325. Beckman R-1 Fitgo amplifier, 1000 MHz input impedance, $125. 70/752 VDT nice $900. Alfa-numeric keyboard from UNIVAC VDT, $40. SASE for list. Douglas Craton, 5625 Balfrey Dr., W. Palm Beach, Florida 33406.

NATIONAL SECURITY AGENCY miniature printer, in original boxes; Teletype #109000 (Model 51). $8.95 each, or 3 for $25. Include postage for 20 pounds. Jim Cooper, 651 Forest Avenue, Paramus, NJ 07652.

WANTED URGENTLY: 2 or more FFRD-7 8-16 MHz tuning heads for AN/FRR-49 receiver. Must be in working condition , state price and condition first letter, no junk wanted. Will also consider other range tuning heads and parts for heads and FRR-49 receivers. John Fail KL7GRF, Box 1196, Petersburg, Alaska 99833.

HOOSIER ELECTRONICS – Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Individual, personal service by experienced and active hams. Factory-authorized dealers for Clegg, Genave, Regency, Drake, Standard, Hallicrafters, Ten-Tec, Kenwood, Tempo, Midland, Galaxy, Hy-Gain, CushCraft, Mosley, Ham-M, Hustler, plus many more. Orders for in-stock merchandise shipped the same day. Write or call today for our quote and try our personal, friendly Hoosier service. Hoosier Electronics, R. R. 25, Box 403, Terre Haute, Indiana 47802. (812)-894-2397.

MEMPHIS AREA HAMFEST, Sunday, October 7, at State Technical Institute, conveniently located on Interstate 40 at Exit 11. Tennessee Section ARRL Convention in conjunction. ARRL Forum, MARS meetings, prizes, Flea Market, XYL entertainment. Informal group dinners Saturday night. Talk in on 34-94 and 3980. All your friends will be there!

CANADIANS – FREE 120 page electronics catalog ETCO-B, 464 McGill, Montreal.

FOR SALE: Hallicrafters SX-140, HT-40, HA-5 VFO – $225. Manuals, Xtals, 80-6 AM & CW. Good condition. WA5JVL, 2517 Matairie Court, Metairie, LA. 70002.

WESTERN UNION DESK-FAX TELEFAX TRANSCEIVERS: Several extra machines (checked out), $14 each, shipping collect. Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

ENHANCE, frame & organize your QSL cards with 20 pocket plastic holders. Two for $1.00, seven for $3.00, prepaid-guaranteed. TEPABCO, Box 198M, Gallatin, Tennessee 37066.

COMPLETE 36 page QSL catalog, 3rd edition. New "SPARKLING" QSLs. Hundreds of cuts, ten report forms, thriteen colored stocks, 25¢. Ten sample QSL cards. Corneilson's Quality QSLs, 321 Warren St., N. Babylon, N. Y. 11704.

MOTOROLA MOTRAN U43LLT, almost new, 30 watts, 34/76, .94, accessories. First $285 takes. McLaughlin, Box 8781, Madeira Beach, Florida 33738, 813-367-1344.

GIANT N. E. CONVENTION sponsored by FEMARA Sept. 29 & 30 at Dunfey's Hyannis Resort on Cape Cod. Huge flea market, seminars, FM, SSTV, NEDXCC, AMSAT, YL trips, 2 pools, golf, beaches, sailing. Early bird registration still only $3 from W1ZQQ, 17 Barnes Aveneue, E. Boston, Mass. 02128.

(W2NSD/1 continued from p. 84)

Is there any point in writing him – isn't it just a waste of time? Is there any way to write that will have a good chance of actually being read by him and not just thrown away by an assistant? And how can you make your point with him effectively and not just waste both of your times?

Firstly, finding out who you should write to – you can call city hall and ask them who the congressman is for your area and who your senators are. If you are in a small town you can call the town clerk.

Once you know their names you need to know where to write to them. Will you do better to get their local office address in your state or write to them in Washington? Washington is by far the best – their main office is there and they are there most of the time. The address is simple – just address it to Senator ------, Washington DC 20510. Or to Congressman -----, Washington DC 20510.

Long letters – vague letters – wandering letters – shotgun letters – all will miss their mark. These are the letters the administrative assistants handle. The letter that will get through and have an effect is the short, clear one, preferably hand written (oddly enough).

You might want to try and head off Walker on his ideas for call sign changes – on FCC type acceptance of ham gear (and probable taxation) – on power/bandwidth formulas which would greatly reduce our power limits – on crossband of repeaters – etc.

Pick your major complaint and explain it clearly and in lay terms. Explain what the problem is and what your congressman or senator can do to help.

Are You Going to Jordan?

73, in conjunction with Alia, has put together a travel package that may be of interest – particularly to amateurs. If there are enough amateurs interested, (we need a minimum of 40), we can plan on going over to see Jordan in April of 1974. The tour would be all inclusive, and would cover round trip air fare (and Alia takes you first class), hotels and all meals in Jordan, tours of the antiquities – Jarash, Petra, Irbid, Madaba, and Aqaba. Bring your bathing suit.

And don't forget a two meter hand unit, if you have one or can borrow one – you might get to work JY1! The tour also includes your JY8 call, if you have a ham ticket. You'll also be able to work the DX station at the hotel, and other club stations around the country, as well as the ham station on the 707 jet on the trip over and back.

Rather than have everyone go all at once to the antiquities, we thought it might be better to split into perhaps four groups so that about ten or twelve would go to each site at a time – with one group going up to Irbid up on the northern border – one to Jarash just north of Amman, one to Madaba, one to Petra and one to Aqaba. With the 2m intercom and the repeater it should be a blast.

There are some very nice places to shop right near the hotel, and prices are most reasonable. Wives will probably go for the hand embroidered dresses and the attractive, yet inexpensive, jewelry. They'll come home with a lot of new recipes.

We're not sure yet exactly what the dates of the flight will be, but we'll try to aim it around the first week in April. The complete price for the whole trip is $595, so if you want to get in on this super combination of a DXpedition and tour, get your reservations in soon. Write to 73, Peterborough, New Hampshire, 03458.

WAYNE

(Letters cont. from p. 106)

cut down the FCC as you did, and organization that is there to control and put to the best possible use the frequencies and bands that are given to the hams.

As time went on and as I boned up on what was going on I began to realize that you weren't just spouting hot air. I also began to realize that this organization that I thought so highly of was in fact a danger (possibly even an enemy) to me and amateur radio.

I went back and again read your columns. I wish to thank you and your magazine for having the courage to print what you have printed warning us of the dangers and destruction that the FCC is bringing down upon us. I also hope that you will continue to write more in the future.

Sgt. W. J. Segraves WBØJDV
Korea

MORE COVER COMPLAINTS

The covers on your last six magazines have been very unacceptable. Mr. Lawrey has other magazines with acceptable covers coming into our home. These last six covers lack the good taste that the November 1972 or February 1973 had.

Mrs. Lloyd Lawrey
Kansas City MO

PETITION

The primary purpose of this letter is to send you the enclosed petition, filled out as per your July Editorial. The signatures were collected at the July meeting of the Southern Counties Amateur Radio Association; most of the signers are members; and most are users of the local repeater. In fact, the top signature is that of the repeater licensee.

You may be interested in the problems we have had with the license (which, incidentally, is actually owned by the licensee but supported to some extent by the club). The application was sent back with three things wrong:

1. We failed to exclude from the HAAT calculations those points which fell in the ocean (8 out of the 40 do so here; but on the other hand all of the admissable points are either 0, 25, 50, 75, or 100 feet).

2. We claimed a simple antenna, a ground-plane, and copied the pattern out of the handbook; unfortunately we marked the circle 0 dB instead of -1.8 dB.

3. We forgot to specify that the xmtr output power was measured with a Bird Wattmeter.

Now admittedly, these *were* errors. But in the first case and the second, all the data was there, and it seems to point up the atrocity of the regulations that allow the rejection on these grounds. As far as the wattmeter goes, it appears that the purpose here is simply to be sure that the ERP is not exceeded, and one would think that *any* measure of output (such as final tube type in a case like ours where the power is no where near the maximum would do.

So good luck with the fight. Me, I'm seriously considering writing up this mess and sending it to Jack Anderson.

Jim Hartley W2CXC
Linwood, NJ

DXPEDITION ANYONE?

I am very interested in going on a DXpedition and/or expedition to anywhere in the world. Could anyone advise me on how to find someone who would like to share an expedition with me?

Also, I am interested in employment on a sailing vessel as a mate or deck hand. I am interested in sailing the seas. I have been trying to obtain employment as a radiotelegraph operator, but it seems that the job is next to impossible to get. Does anyone know the current situation? I would be very pleased if someone could get me in touch with someone who could help me out. I can schedule on 40 and 80m CW with my Ten Tec PMI. Thanks.

Dennis Selwg WA8KKY/VE7
Alta Lake B. C. Canada

FLASHY ARTICLES

Keep up the pressure on Prose Walker!

For your reader feedback – I would like to see an article(s) on strobe lights (flashtubes – simple circuits, etc.). Must be a number of us hams who have airplanes or are building airplanes and need to make their own strobes. I am especially interested in multiple strobes, firing in sequence, etc.

Al LurieW9KCB
Peoria, Ill

FM BOOST

73 is the first magazine that really and truly boosts FM, rather than keeping it in a minor or second place. The FM advertisements, literature, news, and articles are the "most." So I just wanted to tell you to keep up the excellent work.

Stan WA2EXX
Waldwich NJ

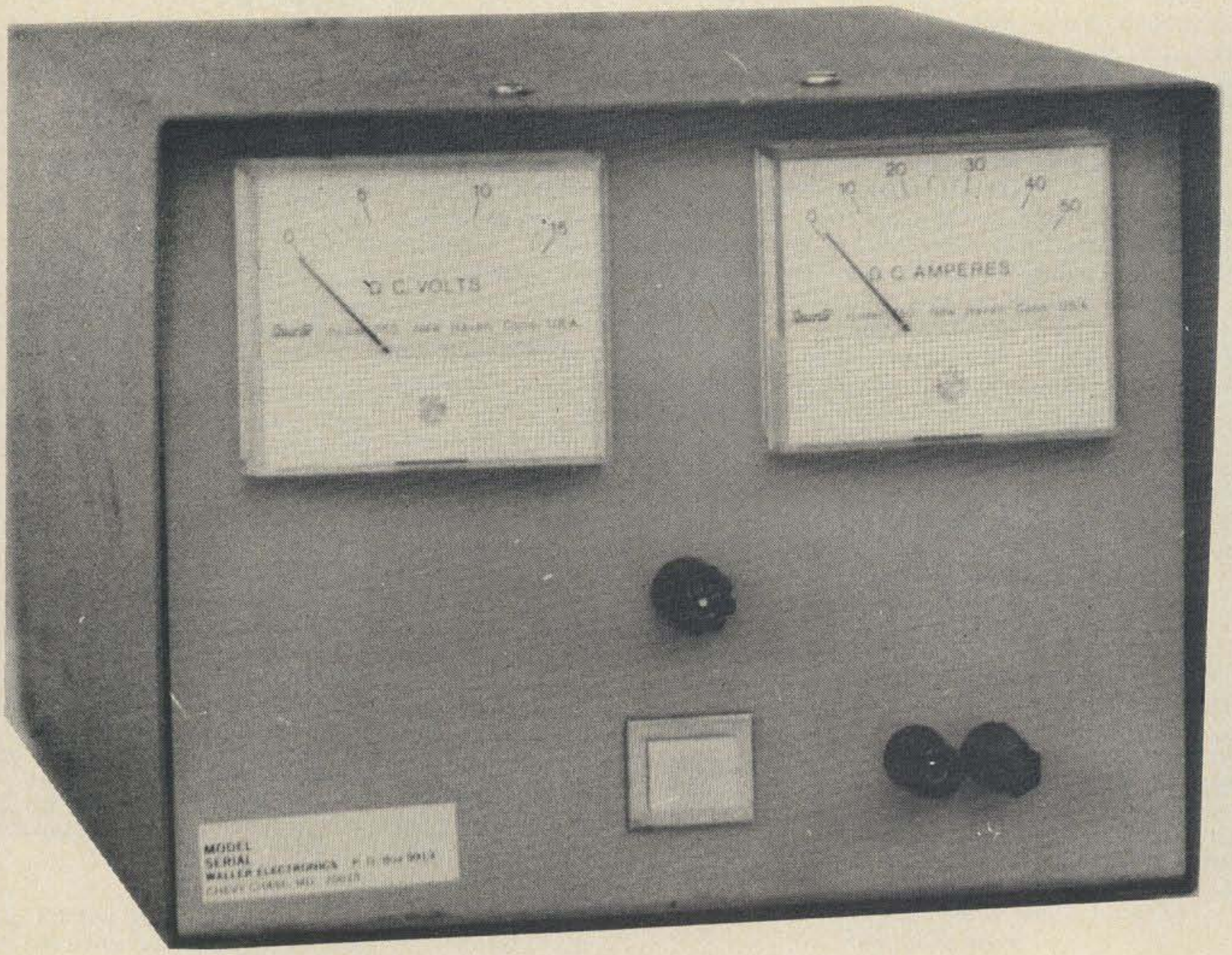
3 + 3

Many of the hams and CB operators down this way are using a rig called a 3+3 which is a . . . 3 to 5 watt input vfo or qrp or ssb driving a . . . 50 to 100 watt grounded grid linear which is driving a . . . 500 to 1 kw grounded linear which is driving a . . . 5 to 10 kw pep linear!

The problem is that the antenna insulators arc over. Can you run an article on this and give some points on reducing arcing while still running full power 10 kw?

K4TXH

Yes, that has been a serious problem for many of the CB ops too and they have come up with some ingenious solutions – perhaps some readers can pass along hints which will be helpful.



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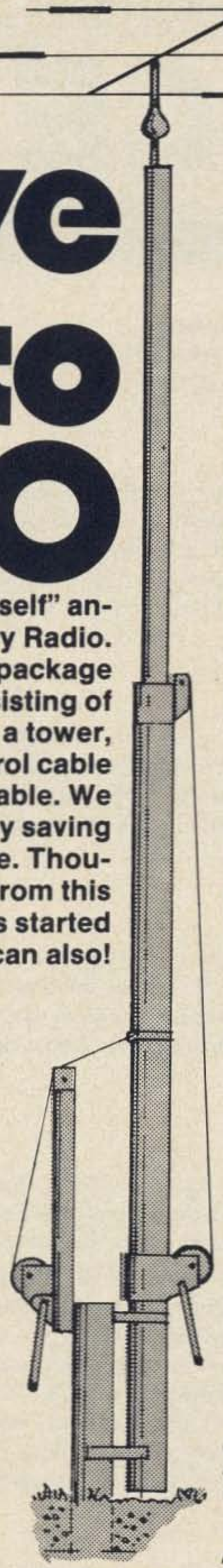

The Tristao MM-40 with accessories shown

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DB10-15A - 10-15 meter beam	109.95
HyQuad - 3 band, 2 element quad	139.95
203BA - 3 element, 20 meter beam	139.95
TH3Mk3 - 3 element, 10-15-20 meter beam	144.95
204BA - 4 element, 20 meter beam	149.95*
TH6DXX - 6 element, 10-15-20 meter beam	179.95*
MOSLEY	
TA32Jr - 2 element, 10-15-20 meter, 300 watt beam	73.15
TA33Jr - 3 element, 10-15-20 meter, 300 watt beam	100.00
TA32 - 2 element, 10-15-20 meter beam	103.00
MP33 - 3 element, 10-15-20 meter, 750 watt beam	111.95
TA33 - 3 element, 10-15-20 meter beam	143.50
CL33 - 3 element, 10-15-20 meter beam	153.75*
TA36 - 6 element, 10-15-20 meter beam	185.10*
CL36 - 6 element, 10-15-20 meter beam	188.50
CL20 - 5 element. 20 meter beam	306.00
WILSON	
M510 - 5 element, 10 meter beam	89.95
DB-32 - 3 element-20 meter and 2 element-15 meter beam	118.95
M420 - 4 element, 20 meter beam	151.95
M615 - 6 element, 15 meter beam	139.95*
M240 - 2 element, 40 meter beam	189.95*
DB-65 - 6 element-15 meter and 5 element-20 meter beam	219.95*
DB-54 - 5 element-20 meter and 4 element-15 mete meter beam	244.95*
M620 - 6 element, 20 meter beam	317.00*
DB-52 - 5 element-20 meter and 2 element-40 meter beam	364.00*

ROTATORS

CDR AR-22R Rotator	44.95**
CDR TR-44 Rotator	69.95
CDR Ham-M Rotator	129.95
HyGain 400 Rotator	229.95

TOWERS

TRISTAO	
MM-40 - Mini-mast, 35' crank-up tubular self-supporting tower	174.95
Optional MB-10 free-standing base	46.25
Optional MF-50 raising fixture	57.95
Optional MRB-80 rotor base	98.95
MA-490 - Magna-mast, 49' crank-up tubular self-supporting tower	357.45
Optional MAF-40 raising fixture	104.95
Optional MARB-40 rotor base	225.45
MA-660 - Magna-mast, 66' crank-up tubular self-supporting tower	974.45
Optional MAF-60 raising fixture	119.95
Optional MARB-66 rotor base	419.45
CZ-454-FX - 54' crank-up, free-standing tower with 10 foot mast	464.95
CZ-471-FS - 71' crank-up, free-standing tower with 10 foot mast	869.95
TRIEX	
MW-35 - 35' self-supporting, crank-up tower	173.00
W-51 - 51' free-standing, crank-up tower	454.50
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LM-470D - 70' Self-supporting, crank-up tower	1679.00***
TM-370 - 70' Sky needle tower with motor raising and lowering unit	2520.00***

CABLE

4 conductor rotator cable (AR-22 only)	per foot	.07
8 conductor rotator cable	per foot	.18
RG-58A/U Coax	per foot	.06
RG-8/U Coax	per foot	.16

ACCESSORIES

HyGain BN-86 Balun	14.95
Triex TB-2 Thrust Bearing	22.50
Unadilla W2AU Balun	12.95

* These antennas are not recommended for use with the MM-40 or the MW-35
** Recommended for use only with the smaller antennas
*** These towers are ideal for stacked antenna arrays

You may specify components not shown on this list

Henry Radio

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PART NO.	INPUT POWER	OUTPUT POWER	FREQUENCY RANGE
PA3-1AE	50-250mw	15-25W	136-175MHz
PA3-1AB	.75-3W	20-25W	"
PA3-1EC	50-150mw	30-50W	"
PA3-1AC	1-5W	35-50W	"
PA3-1DC	6-15W	30-55W	"
PA3-1ED	50-250mw	60-80W	"

PART NO.	INPUT POWER	OUTPUT POWER	FREQUENCY RANGE
PA3-1DD	5-15W	60-80W	136-175MHz
PA3-1EE	50-250mw	80-120W	"
PA3-1AE	.75-3W	80-120W	"
PA3-1DE	5-15W	80-120W	"
PA6-1DE	1-4W	20-30W	400-512MHz
PA6-1AD	4-10W	25-35W	"

FCC type accepted for operation under parts 21, 81, 89, 91, 93, 95. Meets FCC specification: Part 5, subpart C, paragraph 5 103 (a).

Other products:
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DuPage FM

WILL NOT BE UNDERSOLD!

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TWO METER FANS:

Here is the ideal rig to get into the repeater at a low cost. 20 watts output on two meters, vibrator supply, **RCA CMC-20**, less accessories: a mere **$25.00** each
RCA CMC25, 25 watts out on two meters, has a transistor power supply, only a few are left for only (less accessories) ..... **$30.00** each
CMCT-30: Another goodie by RCA. The receiver is partially transistorized, and with a transistor power supply, this rig puts out a good 30 watts. The radios are dirty and have an occasional missing part. Our ridiculously low price for these gems is **$30.00** each or TWO FOR **$50.00**
Aerotron two meter base station (we were told that it puts out 100 watts, but it hasn't been plugged in, so don't quote us). For orders received before September 30, 1973 we will include a remote control unit, all for only **$99.95**
Aerotron mobiles, Model 500, including accessories (such as we have) a mere . . .. **$39.95** each

450 MHz users take note of this fine selection

RCA E-Line (Model CMUE-15) Transistor power supply, tone burst encoder built in, accessories, (except mike) included. These are so clean you won't believe it until you see the unit. For September only we cut our price to a mere **$60.00**
RCA CMU-15. These are ideal for repeater links or ATV. No accessories included in our giveaway price of **$25.00**

Six and Ten Meter enthusiasts, these are for you:

DuMont Model 5820 and **Link Model 6000**. Believe it or not these rigs were in commercial service four months ago. They are presently tuned to 35 MHz, and look easy to convert to either six or ten meter service. Cables and some accessories are included at our housecleaning price of only ..... **$30.00** each

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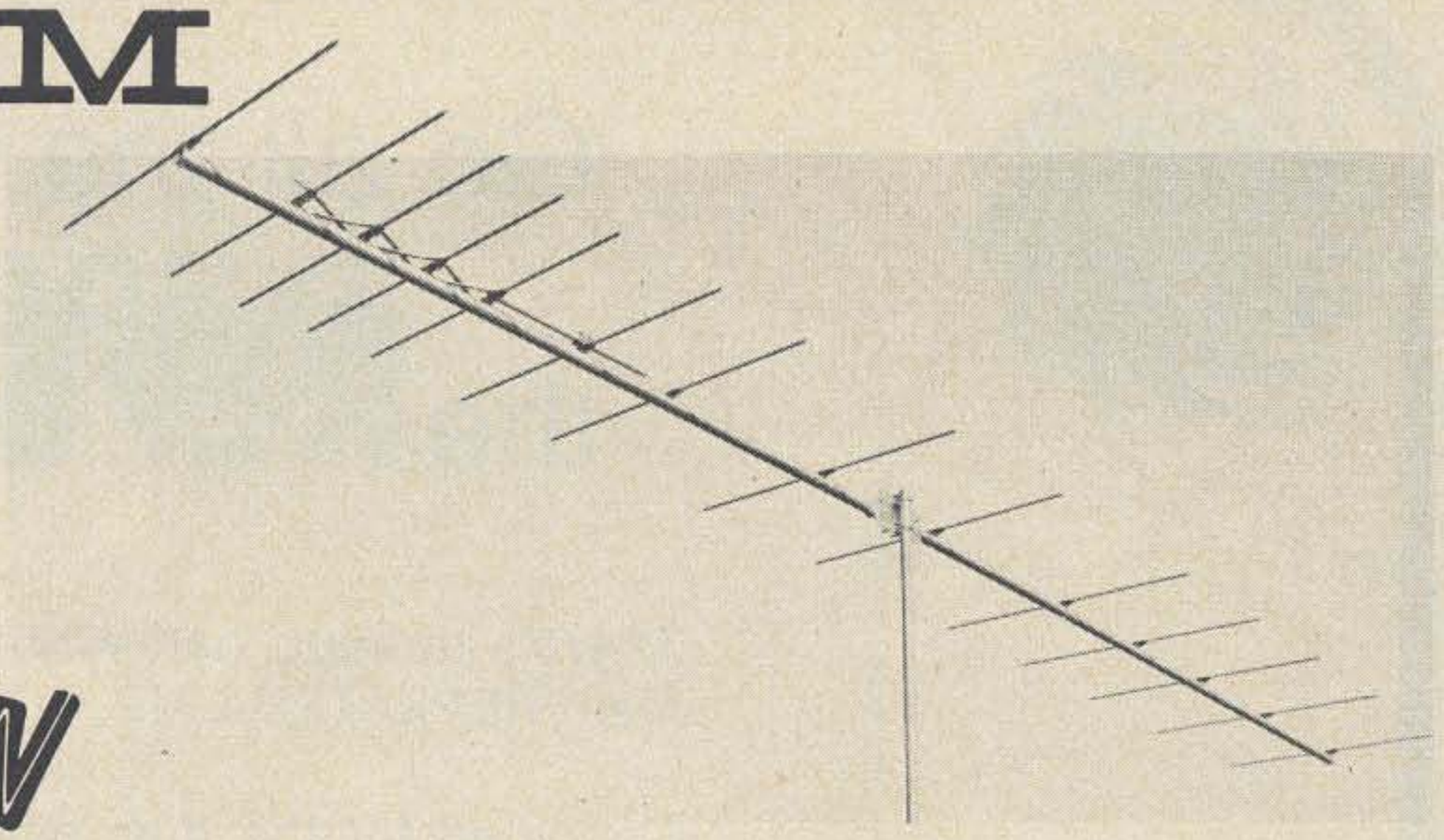
Terms: All equipment sold as is. If not satisfied return for exchange or refund within five days of receipt, shipping charges prepaid. Illinois residents add 5% for sales tax.

FOR **KLM**



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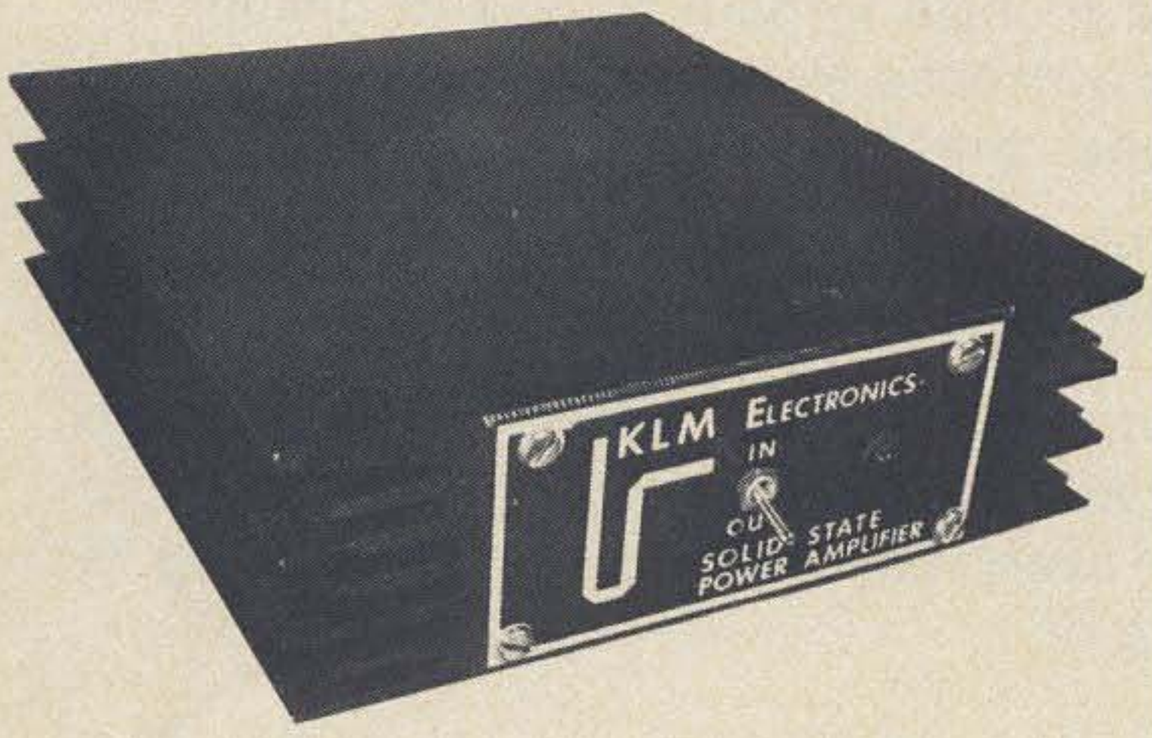

AMPLIFIERS

Frequency (MHz)	Model	Input Range (w)	Nominal P_O (w)
144	PA2-12B	1 – 4	12
	PA10-40B	5 – 15	40
	PA10-70B	5 – 15	70
	PA2-70B	1 – 4	70
	PA10-140B	5 – 15	140
	PA2-140B	1 – 4	140

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40-130	KLM 40-130	7 typ.
50-52	KLM 50-52-8	12
50-52	KLM 50-52-11	14
144-148	KLM 144-148-7	9†
	KLM 144-148-8	10.3
	-9	11.5
	-11	12.2
	-12	13.5
	-14	14.2
144-148	KLM 144-148-16	14.8
220-225	KLM 220-225-9	11.5
	-11	12.2
220-225	KLM 220-225-14	14.1
420-450	KLM 420-450-14	11.5†
420-450	KLM 420-450-27	14.5

† Rearmountable
** PA2-140B and KLM 144-148-16*

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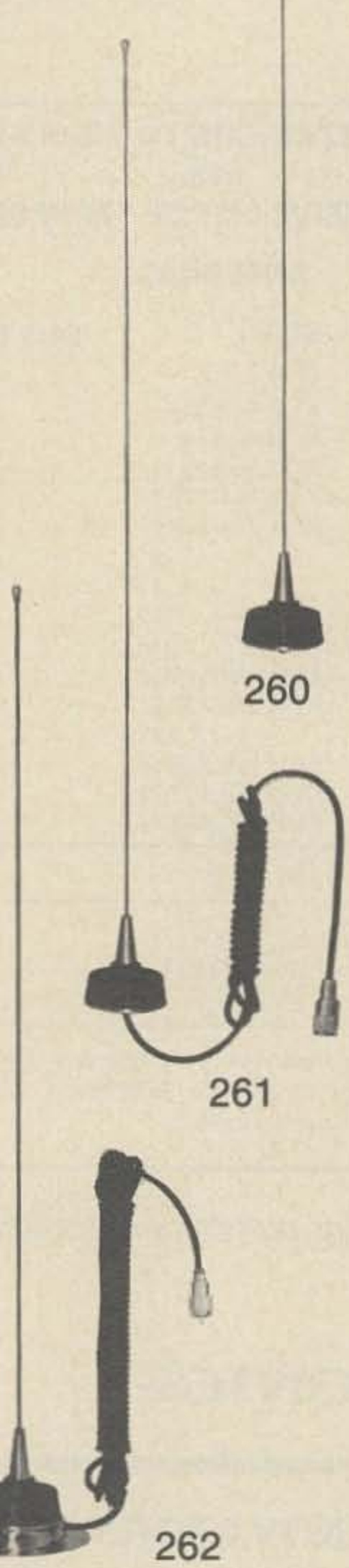
The right antennas for the new FM transceivers ...or any 2 meter mobile rig.

Rugged, high riding mobiles. Ready to go where you go, take what you dish out...and deliver every bit of performance your rig is capable of.



260

260 Commercial duty 1/4 wave, claw mounted roof top whip. Precision tunable to any discrete frequency 108 thru 470 MHz. 17-7 ph stainless steel whip.

261

261 Same as above. Furnished complete with 18′ of coax and connector.

262

262 Rugged, magnetic mount whip. 108 thru 470 MHz. Great for temporary or semi-permanent no-hold installation. Holds secure to 100 mph. Complete with coax and connector. Base matching coil for 52 ohm match. 17-7 ph stainless steel whip.

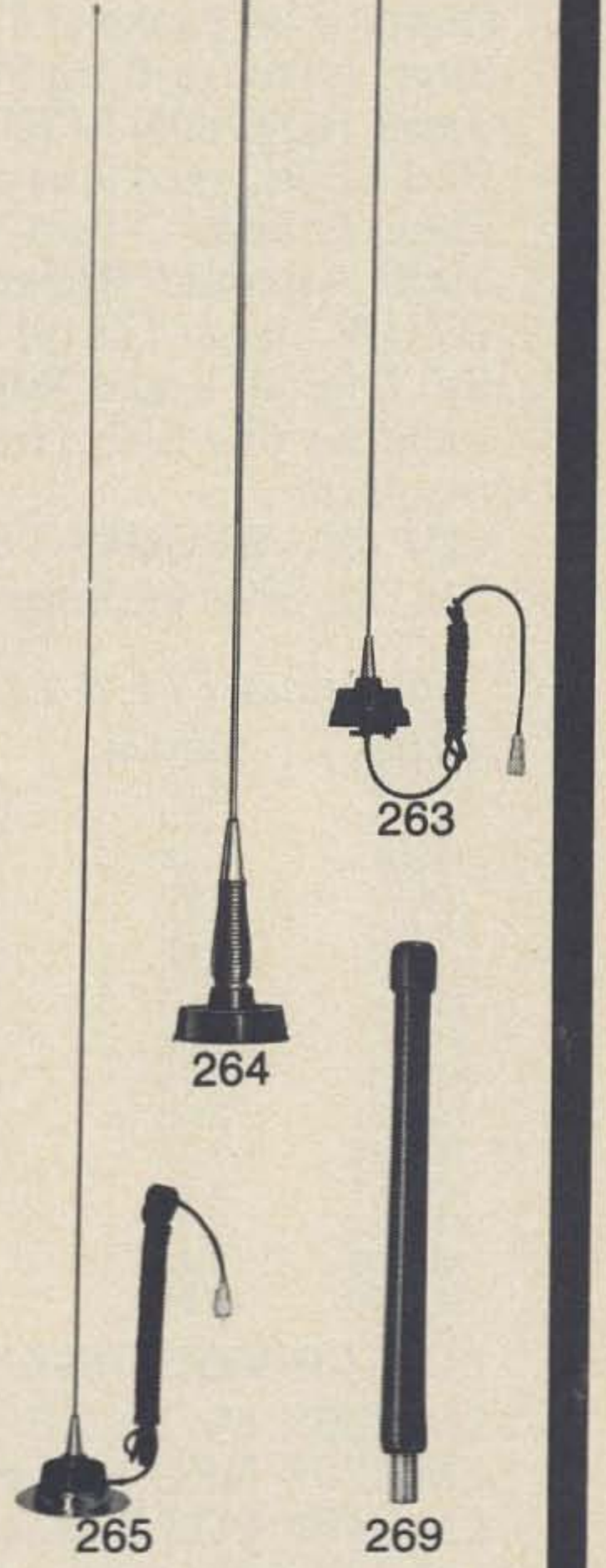
2 meter mobile! with LINE from hy-gain

263 Special no-hole trunk lip mount. 3 db gain. 130 thru 174 MHz. 5/8 wave. Complete with 16′ coax. Operates at DC ground. Base matching coil for 52 ohm match. 17-7 ph stainless steel whip.

264 High efficiency, vertically polarized omnidirectional roof top whip. 3 db gain. Perfect 52 ohm match provided by base matching coil with DC ground. Coax and connector furnished.

265 Special magnetic mount. 3 db gain. Performance equal to permanent mounts. Holds at 90 mph plus. 12′ of coax and connector. Base matching coil for 52 ohm match. 17-7 ph stainless steel whip. DC ground.

269 Rugged, durable, continuously loaded flexible VHF antenna for portables and walkie talkies. Completely insulated with special vinyl coating. Bends at all angles without breaking or cracking finish. Cannot be accidentally shorted out. Furnished with 5/16-32 base. Fits Motorola HT; Johnson; RCA Personalfone; Federal Sign & Signal; and certain KAAR, Aerotron, Comco and Renco units.



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74C20	.70	CD4011	.70	LM 380	1.75	
74C73	1.65	CD4012	.70	741T	.45	
74C74	1.50	CD4013	1.50	CA 3028	.75	
74C76	1.65	CD4016	1.50	CA 3065	.75	
74C107	1.65	CD4019	1.40	CA 3086	.45	
74C151	3.00	CD4023	.70			
74C160	3.25	CD4025	.70			
74C161	3.25	CD4035	3.00			
74C162	3.25					
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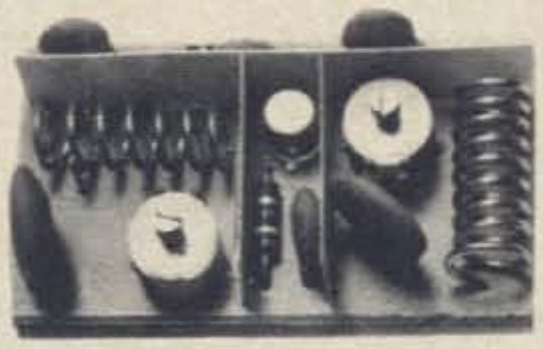

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Kit **$9.50**
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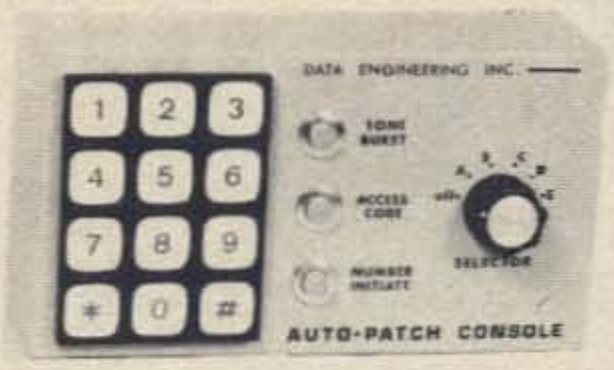

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TTP Kit $34.50

PAD-PULSER

Now you can also obtain pulsed operation from your Touch Tone Pad. Convert Touch-Tone frequencies to decimal pulses at 2805 Hertz with just a flip of the switch. Option can be added to TTP-2/K, TTD-4/K and APC-4/K.

PP-12K Kit $22.95
PP-12 Wired $29.95

REPEATER ID

Highly stable oscillator for automatic timing. AC or DC operation. ROM provides for more than 25 characters, more than necessary for DC "any call" RPT. AUX is automatically added to ID if desired when main power is lost. Toneburst operation available.

ID-101K Kit $49.95
ID-101 Wired/Tested
$69.95

ID-101R assembled in 1½" rack cabinet $109.00

TOUCH-TONE DIALER

The electronic touch-tone dialer for home and car. It's safer and more accurate to use than a pad. Memory includes Access Code plus five phone numbers. Numbers easily updated. Built-in monitor. Complete PTT operation with transmitter hold.

TTD-4K
. . . . . WIRED . $59.00
Kit $49.00

TONE DECODER

Versatile single/dual tone decoder. PLL circuitry for extreme stability. 1 amp output relay can be reset automatically or manually. Monitor position. Adjustable sensitivity. Internal strap selects single or dual tone operation.

TD-2K Kit $31.95
TD-2 Wired $39.95

5—year guarantees. **Send for Catalog**

Your BANKAMERICARD welcome here

master charge

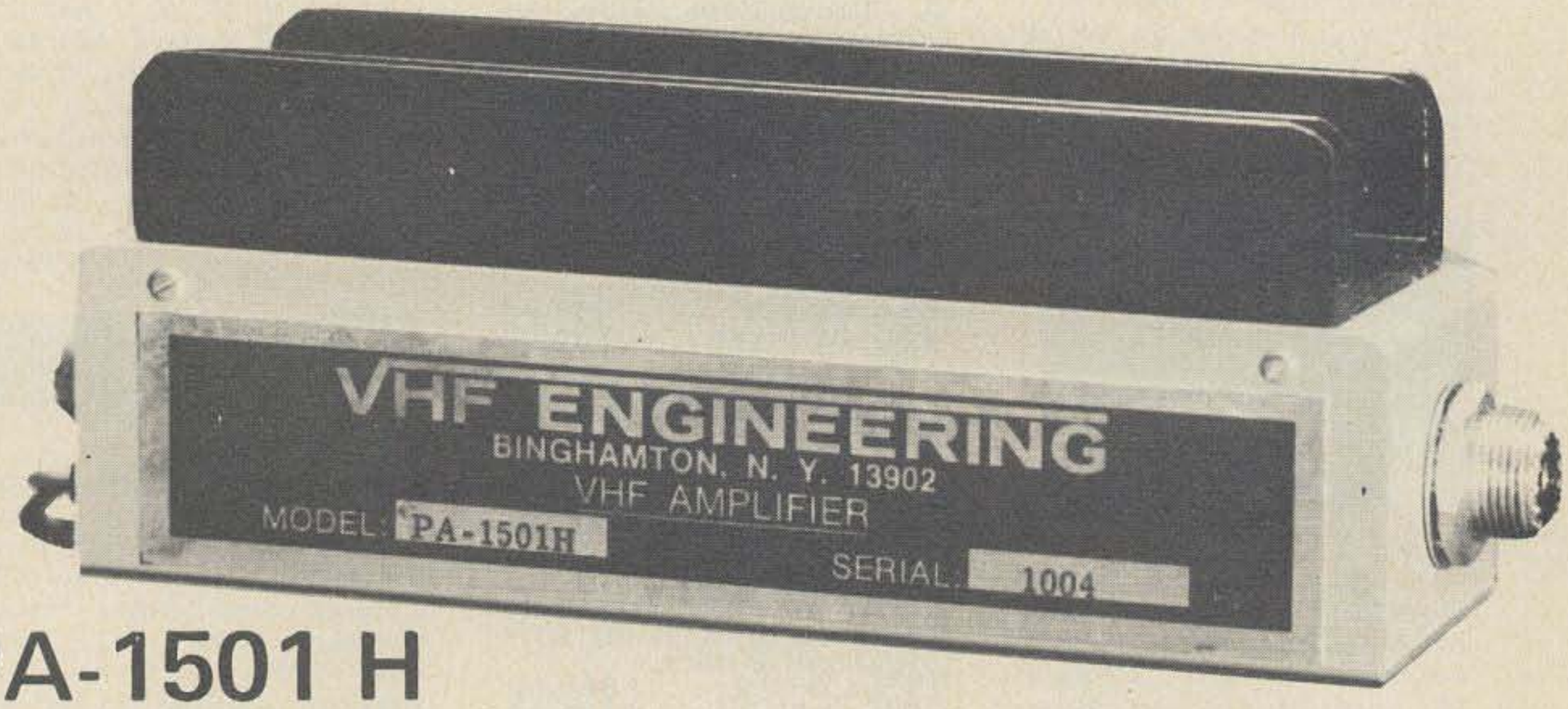
Data Engineering, Inc. 5554 Port Royal Road

Ravensworth Industrial Park, Springfield VA 22151

Phone: 703-321-7171

NEW..... $49.95 *Wired and Tested*

- 1–2 WATTS IN 15 WATTS PLUS OUT
- SOLID STATE SWITCHING
- 12–14 VOLTS NEGATIVE GROUND
- LESS THAN 1 DB LOSS ON RECEIVE



PA-1501 H

NEW KITS: **$39.95** *complete kit*

New — 10 Channel Scanner SC-1 . . . . . $14.95
less crystal deck, works on any receiver

New — 10 Channel Crystal Deck CD-1 . . . . . $6.95
with diode switching

New — Carrier Operated Relay COR-1 . . . . . $19.95
includes 3 minute and three second timers

New — 450 MHz 10 Watt Power Amplifier $39.95
similar to PA-144, 1 to 2 watts in

New — Regulated 12 Ampere Power Supply $59.95
adjustable 12-15 volt with current limiting

New — Regulated 20 Ampere Power Supply $69.95
same as above less case

Add $1.00 shipping per kit ordered. New York residents add sales tax.

BANKAMERICARD

VHF ENGINEERING

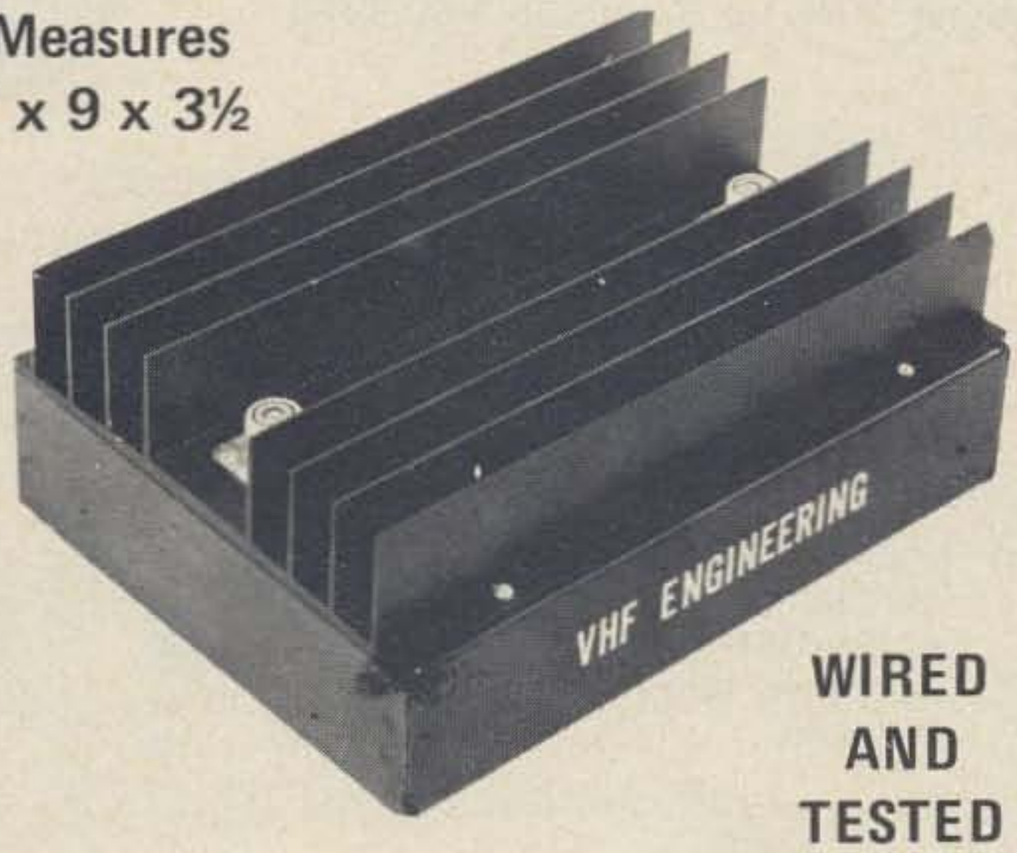
320 Water Street POB 1921
BINGHAMTON, NEW YORK 13902

607-723-9574

POWER-BOOSTER

60—90 Watts

Measures
7 x 9 x 3½



WIRED AND TESTED

TWO MODELS

8005H 2—6 watts in 60-90 watts out
(60 watts from your standard)

8020H 10—25 watts in 60-90 watts out
(Increase the power of your REGENCY by over 400%)

8005H $159.95
8020H $129.95

Not a kit, but a completely wired and tested power amplifier with automatic antenna switching. Uses NEW not surplus, balance emitter power transistors for missload protection. Large heat sink for cool operation. Less than 1 dB loss on receive. SO 239 connectors, nominal 50 ohm impedance.

OTHER KITS AVAILABLE:

RX-144/220A **$59.95**
2 meter or 220 FM receiver kit

RX-144/220F **$65.95**
Same as above except with ±7.5 KHz ceramic filter

RX-144/220C **$69.95**
Same as above except with ±7.5 KHz crystal filter

TX-144 ..... **$29.95**
A one watt 2 meter FM exciter

TX-220 ..... **$29.95**
A one watt 220 MHz FM exciter

PA-144/220 ..... **$29.95**
15 watt amplifier less cabinet and relay for above

Add $1.00 shipping per kit ordered. New York residents add sales tax.

BANKAMERICARD

VHF ENGINEERING

320 Water Street POB 1921
BINGHAMTON, NEW YORK 13902

607-723-9574

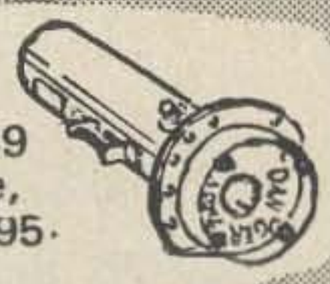
surplus specials!

Relays, Millisec relay, Stevens-Arnold, DPDT, coil: 47 VDC, 3640 ohm contacts: 110 V, .25 amp, octal base shp. wt. 2 lbs for 6, unused $.60, 6/$3

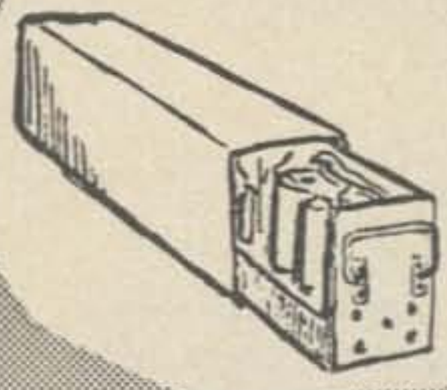
Allied Control, TAHX-47, 4PST coil: 75 VDC, 5000 ohm contacts: 29 VDC, 2 amp, 2 lbs for 6. **$.60, 6/$3**

Polarized Relay, Potter and Brumfield, MDP-330-1A, SPDT bistable, 150 ohms per coil octal base, ½ lb., unused $6.50

Tuned Cavity, Wilcox Electric 1250-1350 MHz, 500 watts peak for tube 2C39 etc:, brass, heavy silver plate, less tube, 4 lbs. unused $14.95



Long Period Phototube Amplifier Geotech model 4300, with spares, tubes: 12AT7, 2/5582, less galvo and power supply, 40 lbs. used excellent **$13.95**

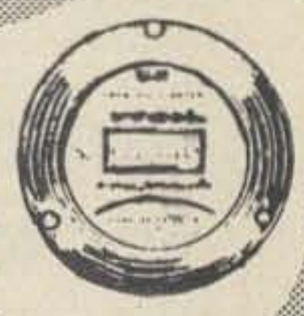


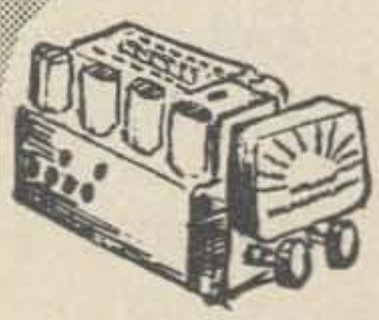
FM Conversion, Discriminator-I.F. Strip (Convert your .455 MHz I.F. AM receiver to FM), five stages of .455 MHz I.F., two limiters and discriminator, tubes: 7/5678, requires 1.4, 145 VDC, with schematic, 2½ lbs. unused **$6.95**

R.F. Probe MX-1019/U 900-12,400 MHz, length 8", with diode (1N21B) 1 lb., Unused **$3.95**

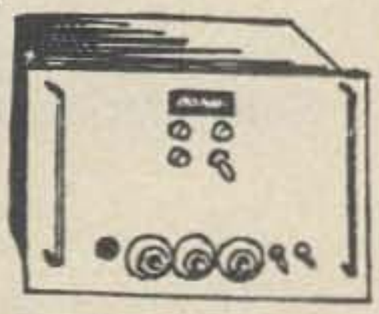
Meter Phastron. ruggedized, 100 microamp, 2500 ohm DC movement, dial calibrated 0-150, 2 lbs., unused **$2.95**

Frequency Meter Frahm, 380-420 Hz in 2 Hz steps, 21 reeds 100-150 volts, 1.5 watts, 90 Ohms/Volt, 2 lbs., unused **$3.95**



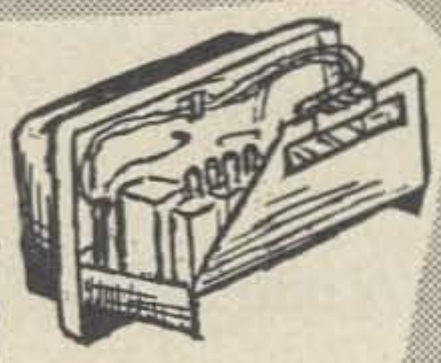


Oscillator-I.F. Amplifier Collins, one shaft tunes coils other switches 10 xtals: 17,18,19,20, 21,22, 23,24,25,26 MHz, tubes: 4/5654, 5670, 3 lbs, used . . . . . **$2.95, 4/$10**



Receiver R993/GR 220-400 MHz, AM, single channel xtal controlled, dual conversion, 22 tubes, 115/230 VAC, with schematic, 72 lbs., used **$14.95**

2 Meter Transceiver from VHF 461-L flight unit, single channel, crystal controlled, sensitivity less than 1 microvolt, tubes: 9/1AD4, 6/1AH4, 3/CK6397, 2G21 requires 90, 180 VDC plus filaments, with cover, 6 lbs., unused **$14.95**



AC Generator (Sine wave generator) Electric Indicator Co., permanent magnet, 2 poles, 2 phase, 3.0 volts @ 100 rpm, 2¼" x 4", 2½ lbs., unused **$5.95**

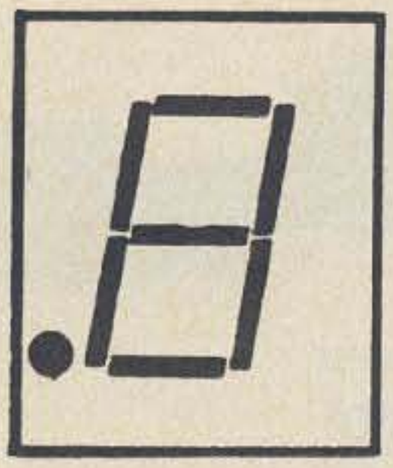
Power Supply 6 V vibrator supply, provides 90, 180 VDC and filaments, plugs directly into VHF transceiver, with cover, unused **$8.95**

P. WOOD
P.O. BOX 112,
GOLETA, CA 93017

URC-11 WALKY TALKY

243 MC 2 way radio, hand held, measures 3 x 4 inches. Used for survival in downed aircraft. May be converted for other frequencies.

URC-11 $15 each or 3 for $40.00



7 SEGMENT LED

Hobby craft due to being factory rejects. Most have a segment or decimal inoperative. Still a great "buy" for the experimenter. What an unusual tie clip you can make with pocket battery . . . demo displays, etc. In many applications you don't need full 7 segments. $1.00 each or $10 the dozen. 0.333 inches high character.

GIANT 7 SEGMENT

As above only this one is the giant display 13/16 inches hgt. of character. First time offered and as far as we know, offered no where else. This one is quite an attention getter. Also available in this giant display numeral "one" with "plus" and "minus" sign. Again, these are rejects. Giant display $1.50 each 12 for $15.00

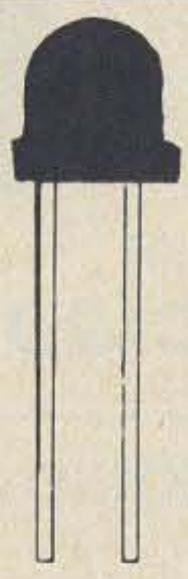
GIANT LED 83¢

Price break at last on these giant LED with 1,000,000 hours of life. Measure full ¼ by ¼ inch. First time offered.

RED $1.00
GREEN $1.25

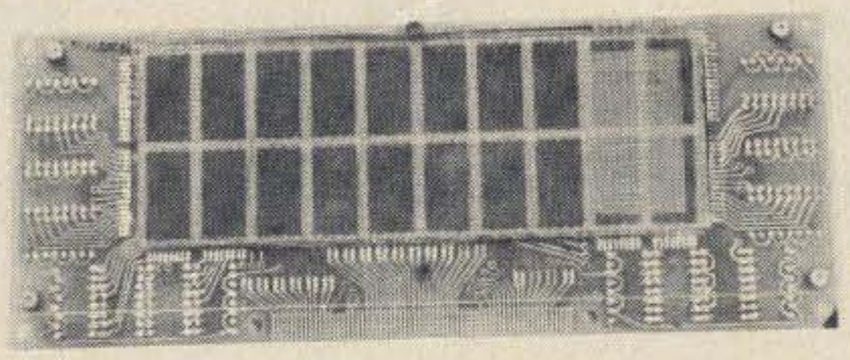
SUPER BRIGHT collimated RED with parabolic reflector, measures 3/16 diameter. A real hi-intensity red visible over 100 ft.

SUPER RED $1.25
All above LED's 12 for the price of 10

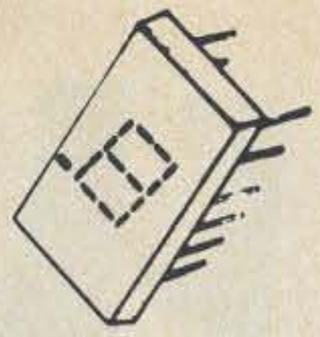


CORE STACK

Late model memory stacks, unused



1Kx9	$ 35.00
2Kx9	$ 50.00
8K 4 bit Y-plane	$ 40.00
16K 4 bit Y-plane	$ 60.00
147K stack	$100.00



7 SEGMENT LED

Similar to MAN-1 in size. Factory seconds but tested and fully functional. Fit 14 pin DIP socket.

7 Segment w/left decimal	#LED-A-L	$3.00
7 Segment w/right decimal . . .	#LED-A-R	3.25
7 Segment, no decimal	#LED-A	2.75
Sockets for above, gold plates leads		3/1.00

LASER DIODES & ARRAYS

Send for latest list of Laser Diodes

POWER TRANSFORMER

115ac/12V@3 amps . . . $2.50

POWER AMP TRANSFORMER

Brand new compact, regular 115 V 60 cycle input. Output of 40 VCT at 4 amps plus another winding 6V at 2.5 amps. Fine business for Power Amps, Logic or Op Amp supply.

$5.50 each or 5 for $25.00

12VCT 2A XFMR $1.50

Regular 115 volt 60 cycle input. 12 volt transformers are always in demand, these are brand new. **$1.50 each or 10 for $12.00**

15 AMP BATTERY CHARGER

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

PK–4 **$7.50**

12VDC 3 AMP POWER KIT $5.00

Just right for powering car tape deck, CB sets, car radio, etc. from regular house current. We furnish parts – transformer, silicon bridge, filtering caps, directions. All new parts, order #KT-3 at $5.00 ea or 6 for $25.00

Meshna

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

2 METER FM HEADQUARTERS

only **STANDARD**
sells more **STANDARDS**
than Erickson....and here's why

List Price: **$369.00**
YOU SAVE: **50.00**
YOUR PRICE: *only* **$319.00**

- *Charger*
- *"Stubby" antenna*
- *Leather case*
- *Ni-Cads*
- *94/94, 34/94 and one channel of your choice*

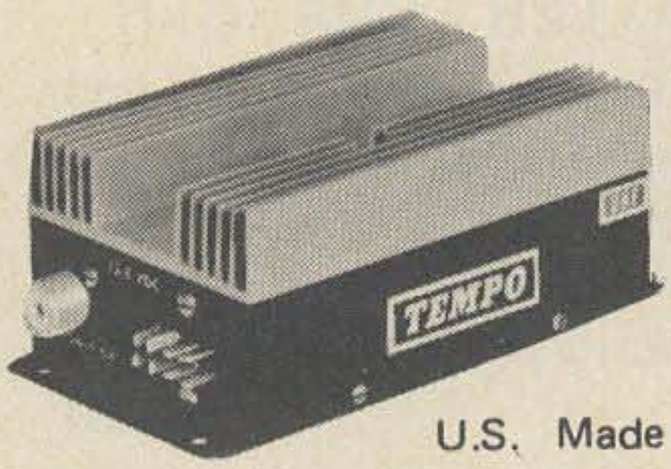
146-A

12 Channels
94/94 - 34/94 - 16/76 - 28/88 - 52/52
supplied MOSFET Front End - 5 helical cavities - Signal Strength/Output Metered
Modular Construction **Only $299.00**

ALL PURPOSE
STANDARD 826MA
12 channels (4 with crystals)
10 Watt output
PL available
Hot MOSFET receiver, helical resonators
Only $369.00

ICOM
IC-20

TEMPO SOLID-STATE POWER AMPS



U.S. Made

MODEL	DRIVE POWER	OUTPUT POWER	PRICE
1002-3	5-25 watts	100-135 watts	$220
1002-3B	1-2.5 watts	120-130 watts	$235
802	5-12 watts	70-90 watts	$180
802B	1-2.5 watts	80-90 watts	$195
502	5-15 watts	35-55 watts	$105
502B	1-2.5 watts	45-50 watts	$130
242-A2	1-2.5 watts	25-30 watts	$ 85

And many more from SBE/Clegg/Gladding/Kenwood/Tempo/Antenna Specialists/Larsen

Make ERICKSON your headquarters for all your FM needs
SEND QSL FOR COMPLETE SPECIFICATIONS

ERICKSON COMMUNICATIONS
4653 N. Ravenswood Ave., Chicago, Ill. 60640 (312) 334-3200

now there is no excuse for not building your pet project!

If you have been putting off building because of circuit board layout; you have no problems ..... just send a schematic to PEMCO and we will design and build your circuit board to your specs using high quality G10-FR4 2 oz. copper and tin plated for long resistance to oxidation.

CHECK THESE PRICES

SC 250 8 DIGIT COUNTER SEMI-KIT with built in prescaler, and p.s. good up to approximately 250 MHz. Fully assembled and tested board.
Send for data ..... $165.

ST-5A BOARDS ONLY (same size as those in the ST-6)	$ 5.25
ST-5A KIT OF ELECTRONIC PARTS	$ 54.00
ST-6 BOARDS ONLY (these are the 8 original by W6FFC)	$ 18.00
ST-6 KIT OF ELECTRONIC PARTS	$128.50
MOD. KIT FOR UPDATING THE ST-5 TO THE ST5A	$ 9.00
AK-1 BOARD ONLY (same size as those in the ST-6)	$ 3.25
AK-1 KIT OF ELECTRONIC PARTS (Same size as those in the ST-6)	$ 20.00
PEMCO MODEL 50A FREQUENCY COUNTER SEMI-KIT	$125.00

This is a fully assembled and tested board with built-in power supply, cabinet, etc.
Write for details.

You must supply the cabinet, A.C. cord, meter, switches, etc. on all kits except where noted oth erwise. (All prices are postage paid — we pay shipping.)

We will do most any printed circuit board for individuals or prototypes. If required we will also do the layout of the boards. All our boards are G-10 glass-epoxy solder plated and come drilled only. At present time we can do only single sided. All component parts used in our kits are new manufacturers stock. We Do Not Use Any Used or Surplus Parts. All inquiries are answered promptly.

PEMCO Inc. ELECTRONICS MANUFACTURING

422 18th St., N.E., Salem, Ore. 97301, (503) 585-1641

A&W FM VHF UHF A&W

Clegg

FM27B

~~$479.95~~

$430.00

FM-21 220 MC ~~$299.00~~

$280.00 with BBL-220

All 2 and 6 Meter Xtals in stock. . .
BOMAR $3.95

We also stock VHF and UHF amplifiers
TPL, Dy-Comm, Standard

with each Regency rig you purchase. . . you receive **4 FREE CRYSTALS** of your choice!

Regency

HR-2B NEW
12 ch xmt-rcv
15W min
$229.00

HR-220 NEW
12 ch 20W 220 MC
$239.00

AR-2
80W 2 meter amp.
$100.00

EC-175
175 MC counter
$400.00

HR-6
6 meter 25W
$239.00

HR-212
12 ch 20 watt
$259.00

SBE

SB-144
12 ch 10 W
~~$259.00~~
$239.00

SB-450
12 ch 10W
450 MC
~~$399.00~~ **$350.00**

Standard Communications

146A
2 meter walkie
~~$289.00~~ **$255.00**

SR815TH
25W 12 ch
~~$588.00~~ **$499.95**

826MA
12 ch 10 watts
~~$398.00~~
$350.00

SCARPT-1A
2 meter RPT
~~$698.00~~ **$579.95**

SRC14
24 ch 10 watt
base unit
~~$598.00~~
$529.00

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491 Riverside, Medford, Mass. 02155
(617-396-5550)

TTL INTEGRATED CIRCUITS (DIP)

7400	$.35	7475	$1.20
7441	$1.25	7490	$1.00
7447	$1.50		

MAGNETIC RECORDING HEADS Nortronic W2R8N
"Dual Half Track", track width .056", center-to-center spacing .088". Bias current 1.3 ma. @60 KHz. Record current .13 ma. Inductance @100 mv. @1KHz. = 10 mh. Gap spacer 200 micro-inches ..... Only $1.50 each, 12 for $15.00

FILAMENT TRANSFORMER, 6.3 v. ct. @25 Amps. 115/230 v. 60 Hz. primary. 4" x 4½" x 6" h. 14 lbs. ..... Only $3.00 each.

PRINTED CIRCUIT BOARD, 1/16" glass-epoxy, 5" x 6". 2 oz. copper coated, your choice of 1 side or 2 sides. ..... 3 for $1.00.

ETCHANT, Ammonium Persulfate Crystals. Just mix with water, does a better job. 1 pound, enough for 100 sq. in. of 2 oz. copper. ..... $1.00 per pound.

PRINTED CIRCUIT BOARD EDGE SOCKETS, 5/32" contact spacing. Solder lug terminals. 6 or 10 contacts. ..... $.25 each.

ELECTROLYTIC CAPACITORS

4000 mf, 25 vdc. Ind. Cond. Co. 1 7/8" d. x 4½" l. Black bakelite case. ..... each $1.50.
2000 mf, 30 vdc, Sprague. 1 3/8" x 2 3/4" Twistprong. ..... $.40.
400 mf, 100 vdc, Gen. Instr. Plugs into octal socket. 1 3/8" d x 3½". ..... each $.40.
10 mf x 20 mf, 450 vdc. Aerovox. 1 3/8" x 3", with mounting clamps. ..... $.40 each, ... 6 for $2.00.
500 mf, 25 vdc, Gen. Instr. 1" d x 2½" l. ..... $.40 each, 6 for $2.00.
30 mf x 30 mf x 20 mf, 500 vdc, Pyramid, 1 3/8" x 3" Twistprong. ..... $.75 each, 3 for $1.90.
30 mf x 10 mf, 450 v. & 20 mf, 25 vdc, Mallory FP, 1" d x 3" l. Twistprong. ..... $.35 each, ... 3 for $1.00.

TEST EQUIPMENT

USM-24 scope. 2 cps-8 MHz. Triggered sweep, calibrator. Used, exc. cond. ..$87.50.
LM Frequency Meter, used with crystal, less cal. book. ..... $14.75.
BC-221 Frequency Meter, used, exc. cond. with xtal & cal. book. ..... $50.00.
H-P 500 B Frequency Meter with 506-A Tachometer Pickup. ..... $95.00.
Time-interval Plug-in for H-P 524 counters. ..... $30.00.
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UPM-12 Standing Wave Indicator, X/Band. ..... $65.00.
G-R 1550-A Octave Band Noise Analyzer. ..... $95.00.

We stock LMB boxes & cabinets, Air-dux coils, Premier chassis, Amidon, National.

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Send $.25 in coin or stamps for our latest flyer . . .
Please include shipping charges with your order . . .

master charge

ANOTHER SELECTRONIC SPECIAL

The R648/ARR41 Receiver

Can be best described as a mini version of the R390A class of receivers, having most of the key features of the R390s. The unit covers from 0 kc to 24.999 Mc in 24 one megacycle bands. It does not include the band covering 1 Mc to 2 Mc. As you might surmise, the rec. includes two Collins mechanical filters. Operation of the receiver is most pleasurable, especially when tuning sideband. Incidentally, the crystal controlled calibrator delivers a tone every 100 kc and is of frequency meter accuracy. The receiver contains a dynamotor designed to operate from 27.5 volts DC at about 4 to 5 amps. Since most of the dynamotors are free of hash, retaining it and operating the set from 24 to 28 v. DC is not really a bad alternative. If you wish to power with A.C. supply requirements are 250 V @100 ma. and 28v for fil. These sets are in like new condition overhauled and checked out. Wt. 34 lbs.

Price: $175.00 ea.

Solid State 866A Direct Replacement T.

Price: $5.95 ea. or 2/$10.00

R508 VHF Rec. 118-148 MHz

Price: $14.95 ea.

MODERN ALUMINUM BENCH RACK CABINET

11½" H x 18" D x 19" W. 8" panel openings w/rubber feet and disappearing handle.
Lt Blue

Price: $7.95 ea.

R.F. AMPLIFIERS

TUNES 50 to 100 mhz – COMPACT ALL ALUM. CASE 12" x 15" x 6¼" WITH SK 600 EIMAC SOCKET. 1 LARGE AIR VARIABLE CAP. – 2 SMALL AIR VARIABLE TRIMMERS – TEFLON MOUNTED ROTARY INDUCTOR – GOOD FOR LINEAR AMPLIFIER – CAN USE EITHER 4 CX150A or 4 CX250 – LESS TUBE, PRICE: ....$14.95 ea.
WITH 4 CX150A, PRICE: .....$19.95 ea.

ADJUSTABLE PRINTED CARD BOX

For Rack Mount

5" to 7¼" – 16 slides and sockets – includes 30 double contact position edge connector type

Price: $9.95 ea.

WINTRONIX MODEL 850 INDUCED WAVE FORM ANALYZER. This unit, in conjunction with your present oscilloscope, permits you to view wave forms in the range from audio thru MHz without any direct connection. The probe is simply placed over the tube in question and the wave form is displayed on the oscilloscope. It may also be used as a high gain amplifier to increase scope sensitivity. Excellent for TV, radio, amplifier, and transmitter repair and maintenance. Brand new, with probe.
SHIP WT. 13 lbs.

Price: $19.95 ea.

MODULE TYPE POWER SUPPLY TRANSISTOR, REGULATED.

115V – 60 cycle in +12 –12 –6V @ 3 amp output. Front Panel adj + or –10%. On-off switch. Fuses. Barrier strip output. 6" x 5" x 7". Excellent Cond.
Ship. Wt. 10#

Price: $14.95 ea.

DIGITAL READOUT SET

Make your own counter, frequency meter, digital voltmeter, readouts, etc.

Kit includes –

6 nixies with 6 sockets
1 transformer
1 P/S board w/socket

PRICE: .....$12.95, 2/$20.00

B-7971 LARGE ALPHA NUMERIC READOUT

With sockets & driver board. Can be hardwired to form unusual house address numbers. 2 tubes, 2 sockets, mounted on one driver board. Save $3.00

Price: 5/$5.00

COMPUTER TYPE CAPACITORS

40,000 @ 20V
32,500 @ 25V
55,000 @ 15V
100,000 @ 8V

50¢ each or 5 for $2.00

40,000 @ 10V
30,000 @ 10V

PRICE: 3 for $1.00

SPECIAL – Just Arrived in Limited Numbers – B-5031 small numeric readouts nixies with sockets.

Price: 3/$5.00.

Coaxial relays, single pole - double throw, available in UHF,BNC, Type N. Specify.

Price:$4.95 each.

LAMBDA POWER SUPPLIES, LT 2095, 0-32 V 2 amp. rack mount. Like New.

Price:$34.95 each.

Adapters BNC to SO-239. Price: 2/$1.00.

VACUUM VARIABLES, UCS 300, 300 mmF, 10,000 V.

Price: $19.95 each.

SPECIAL ONE OF A KIND

Sorenson Power Supplies:

MA 28 30, 28 V, 30 A	Price: $125.00
ERA 0–36 V, 50 A	Price: $150.00
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Transmitter, 110 W FM, 406–420 Mc. Rack mount, with power supply.

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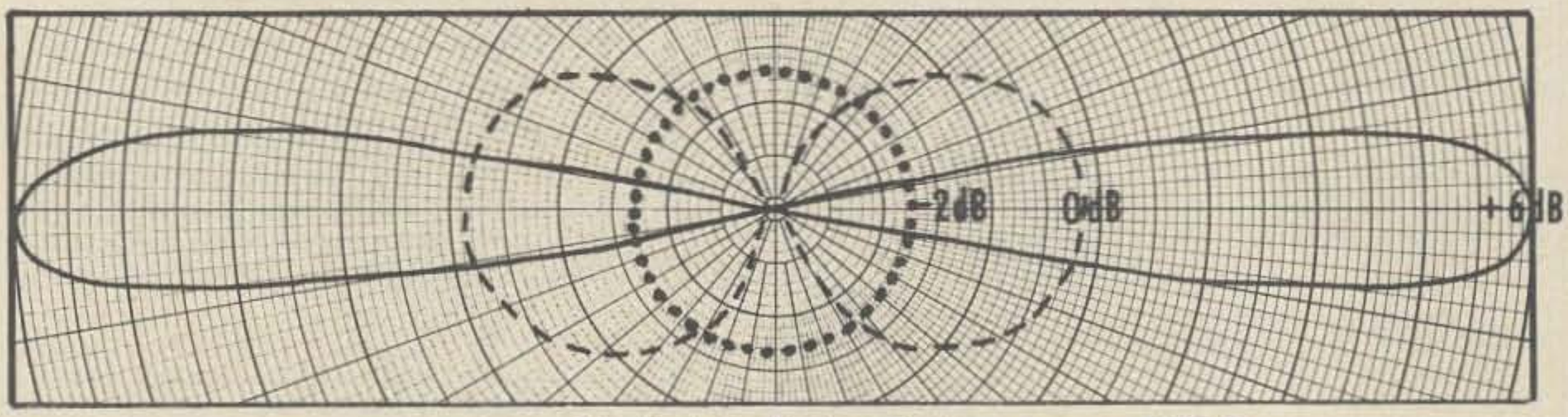
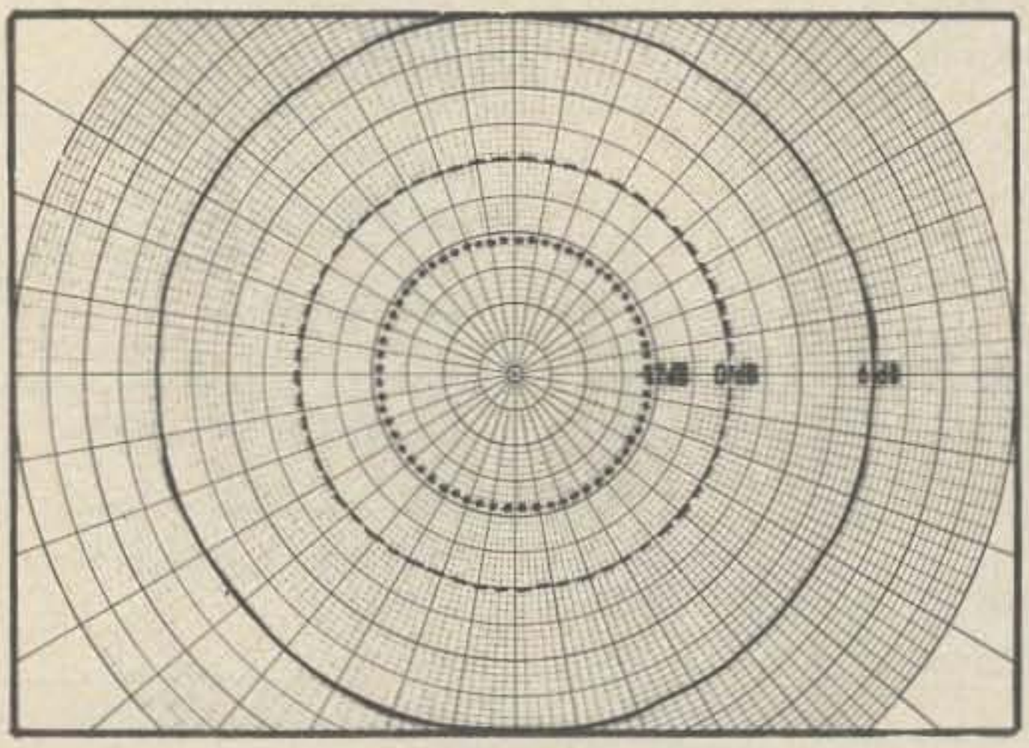
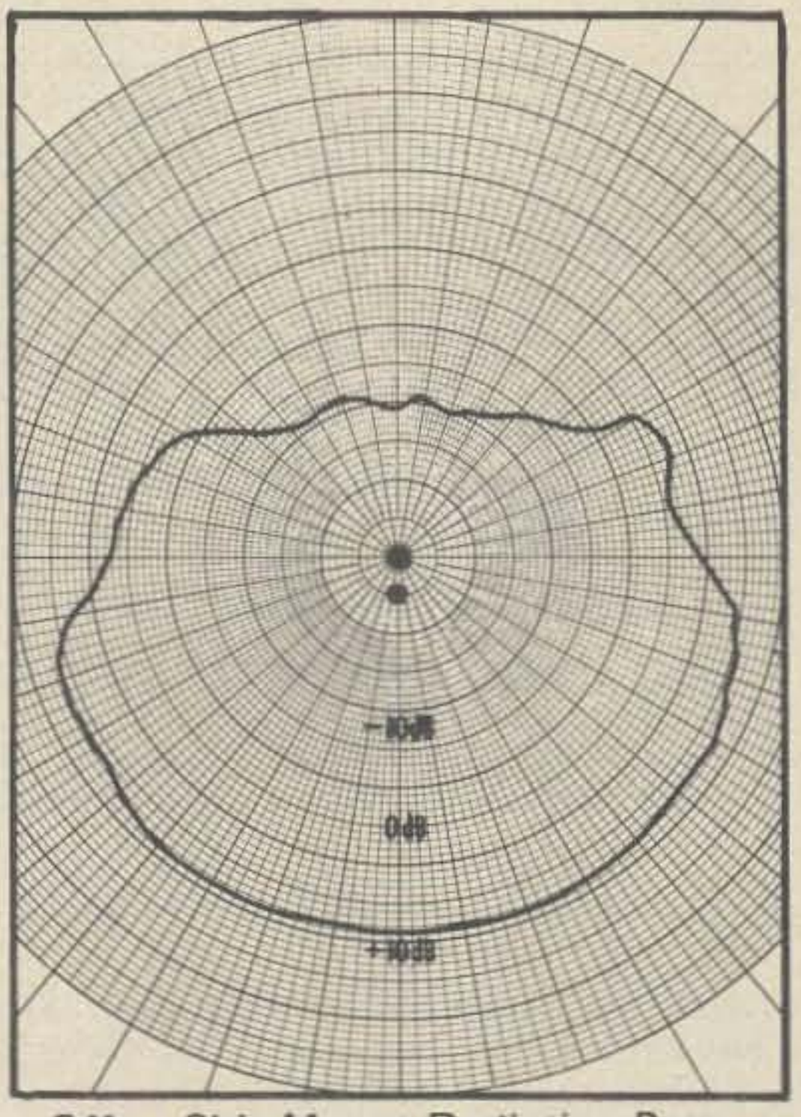


Vertical Radiation Pattern
—— TG5-S
- - - Dipole
• • • • Isotropic



Horizontal Radiation Pattern
—— TG5-S
- - - Dipole
• • • • Isotropic



Offset Side Mount Radiation Pattern
Reference: Dipole

(ON FILE WITH FCC)

MODEL TG5-S

$104.50 LIST PRICE

Weight 3½ lbs.

GAM Electronics

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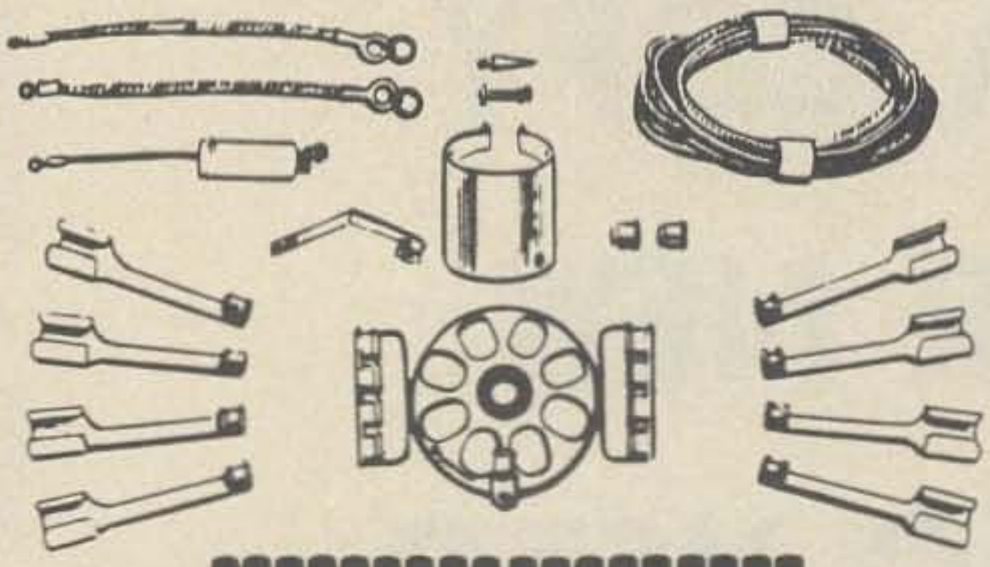

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Gain (2 Meters) 3db
Gain (6 Meters) .....Unity
Nominal Impedance 55 ohms
Overall Length .....55 in.

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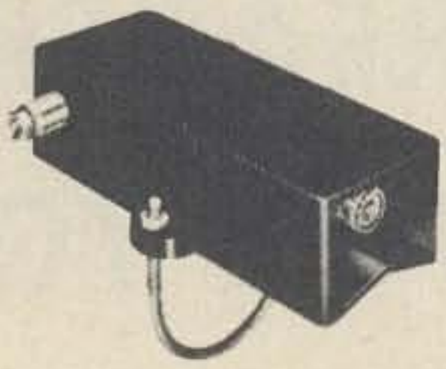

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POWER RATING	1KW DC 2KW PEP
IMPEDANCE RATIO	1:1 AT 52 OHMS
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All circuits are stressed to the fullest output to give **Full Drive** to the next stage and final output.

Modulation is pure and full using the **Finest American Parts** and **American Labor**. **Shielding** is used between each stage.

Net Price to Amateurs **$49.95**
Complete with Tubes
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$9.95 Solid State

- **Base Station**
- **Mobile**
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Tube Compliment
6U8 OSC
2E26 Final
12AX7 Speech Amp.
6BQ5 Modulator

EXCELLO EX20S
Dealer Inquiries Invited

2 METER

Now you can QSO all over your local community with the *NEW* **Excello Two Meter AM Phone Transmitter!**

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- **Mobile**
- **Aircraft**
- **Boats**

Tube Compliment
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6CX8 Final Amp.
6AQ5 Modulator
12AX7 Speech Amp.

NOVICE-CW

80-40 METER

The *NEW* **Excello CW Novice Transmitter** is *THE ANSWER* to the New Amateur getting on the air and enjoying the *GREATEST OF ALL* hobbies!

The New Excello Novice CW Transmitter puts out a **Fine CW Signal** on the air. The unit is **Small** and **Compact** and **Complete with Built-in Power Supply, Tubes,** less crystals and key.

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Complete F.O.B. N.Y.

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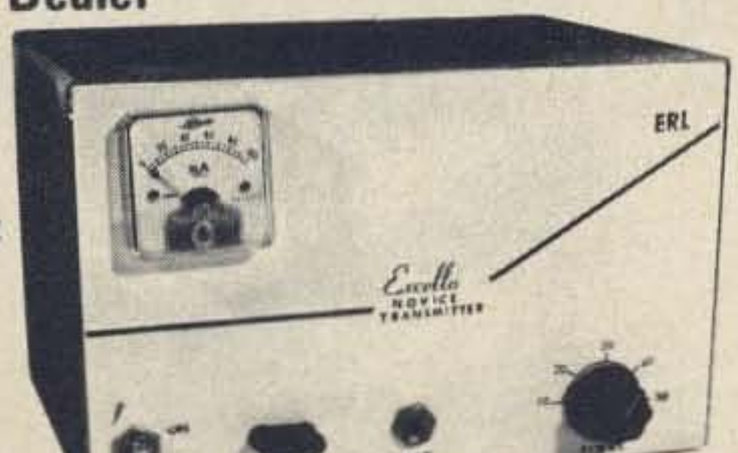

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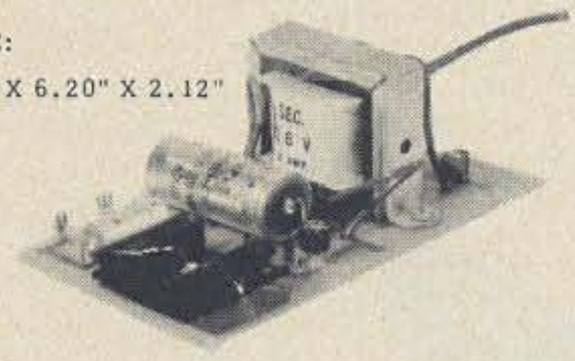

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MODEL SW-10639 contains 61 #1SW11 Solid-State switches including key tops, ROM encoded into EBCDIC.

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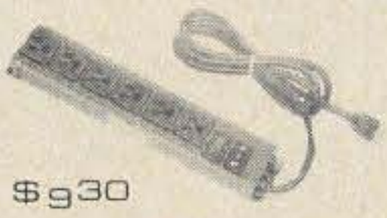
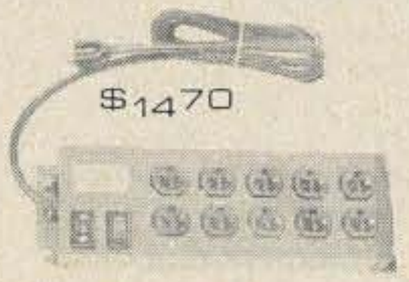


$9.30



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MODEL 11 — Other Models Available — MODEL 12

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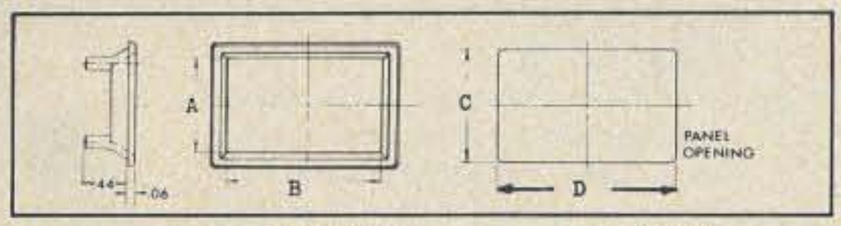
alpha-numeric display bezels



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905-XX	.80	1.37	1.172	1.74	$2.25	2.07	1.91
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915-XX	.80	3.00	1.172	3.37	2.40	2.21	2.04
920-XX	.80	4.00	1.172	4.37	2.45	2.25	2.08
930-XX	1.38	5.00	1.750	5.37	2.75	2.53	2.33
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WHEN ORDERING REPLACE XX WITH FILTER COLOR CODE:
NEUTRAL = 15, RED = 60, AMBER = 70, GREEN = 90
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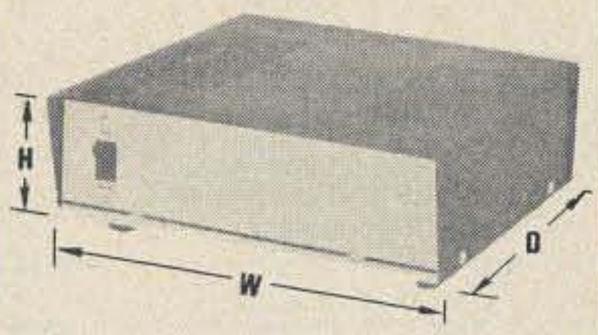

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"E"	6½ x 3½ x 7⅛	yes	8.25
"F"	7½ x 4½ x 10	yes	9.95
"G"	10¼ x 3⅜ x 9	yes	9.95
"H"	4¾ x 6¼ x 4	no	8.95
"D1"	Mtg. bracket set for "D"		.35
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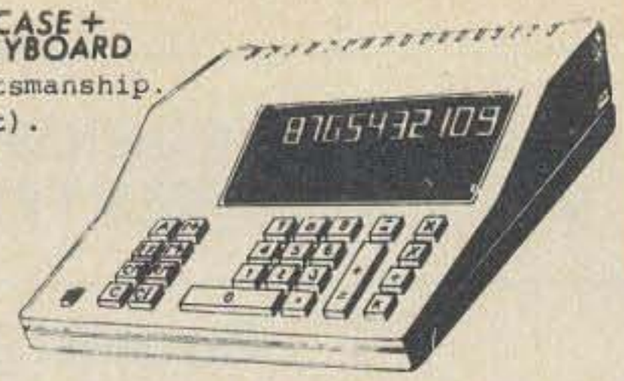

Attractively designed!!!Excellent craftsmanship. Case and keyboard (designed as one unit). Cabinet is made of high-impact plastic beige color with black bezel and amber window. Keyboard consists of a 3 position slide switch and 25 keys, 5 of which are used for memory function. 20 keys gray, 5 keys orange. All keys mounted on one printed circuit board.....

11" wide X 10.5" X 2.9" high

This modular unit is well suited for our calculator chips. Ideal for the CT5005

Case and keyboard complete only $29.95

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Chips and data------$7.95
Data only----------1.00
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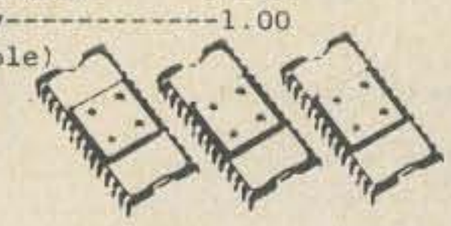
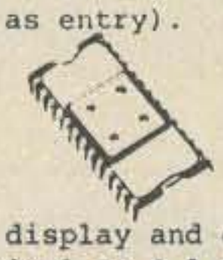


CT5005 CALCULATOR

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



12 digit display and calc.
fixed decimal at 0,1,2,3,4, or 5
leading zero suppression
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true credit sign display
single 28 pin chip

Chip and data----------$14.95
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40 pin calculator chip will add, subtract, multiply, and divide. 12 digit display and calculate. Chain calculations. True credit balance sign output. Automatic overflow indication. Fixed decimal point at 0, 2, 3, or 4 Leading zero suppression. Complete data supplied with chip.

Chip and data, only $9.95
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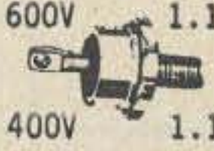
7401	.35	74L54	.50
74H01	.50	74L55	.50
7403	.35	7460	.35
7404	.35	74L71	.30
74L04	.50	7472	.50
74H04	.50	74L72	.60
7405	.35	7473	.65
74H05	.50	74L73	.90
74H08	.50	7474	.65
7410	.35	74L74	.90
74L10	.50	74H74	.90
74H11	.60	7476	.70
7413	1.75	74L78	1.00
7420	.35	7480	.65
74L20	.50	7483	1.30
74H20	.50	7486	.80
74H22	.50		
7430	.35		
74L30	.50	7491	1.15
7440	.35	7492	1.15
74H40	.50	7493	1.15
7441	1.60	7495	1.25
7442	1.30	74L95	2.00
7446	1.75	74107	.70
7447	1.75	74121	1.60
7448	1.15	74123	2.00
7450	.35	74154	2.50
74H50	.50		
7451	.35	74192	2.50
74L51	.50	74193	1.50
74H51	.50	74195	1.10
7453	.35		

RECTIFIERS

Varo Bridges

VS447	2A	400V	$ .90
VS647	2A	600V	1.10



35A Stud	400V	1.10

MR810	50V 1A	.10
1N4997	50V 1A	.10
1N4001	1A	.10
1N4002	1A	.11
1N4003	1A	.12
1N4004	1A	.13
1N4007	1A	.17

SCR's

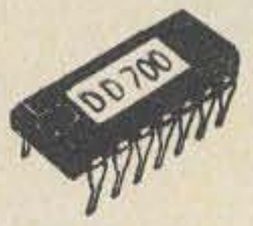
IR122	100V 8AMP	.50
IR122	200V 8AMP	.60
IR122	300V 8AMP	.80
IR122	400V 8AMP	1.00

LED's

MV-50 red emitting 10-40ma@2V	$ .25
	5 for 1.00
MV5054 red LED 15-100ma@2V	$ .30
	10 for 2.50
MV-10B Visible red 5-70ma @ 2V	$ .30
	10 for 2.50

GIANT "NIXIE"

Comes complete with Socket and DD700 202 Numeric Driver. Readability in high ambient light...200 footlamberts brightness!! All DC operation. Long life with no loss of brightness. Compatible with conventional solid state circuitry.



Only $2.25

These were used in the New York Stock Exchange

RCA 2010 NUMITRON

Popular digital display tube. This incandescent five volt, seven segment device provides a .6" high numeral which can be seen from a distance of 30 feet. The tube has a standard nine pin base (solderable) and a left hand decimal point....

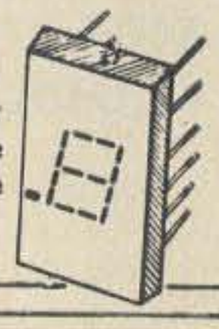
$5.00 each

$4.00 each for 5 or more

MAN1

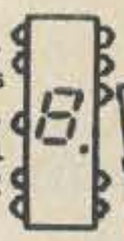
Seven Segment, 0-9 plus letters. Snaps in 14-pin DIP socket or Molex. Operates with IC voltage requirements. Long operating life

$4.25 each



MAN4

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



Each.....$ 3.00
Ten or more..$25.00 red lens

MAN3

0-9 plus letters. Right hand decimal point. Flat-Pack type case. Long operating life. IC voltage requirements. Ideal for pocket calculators !!!!!

Each.....$ 2.50
Ten or more..$20.00 red lens

'73 SPECIALS

LINEARS

NE531	op amp TO-5	$2.00
NE560	phase lock loop DIP	3.25
NE561	phase lock loop DIP	3.25
NE565	phase lock loop TO-5	3.25
NE566	function generator TO-5	4.00
NE567	tone decoder TO-5	4.00
NE5556	op amp DIP	1.00
709	popular op amp DIP	.45
710	voltage comparator DIP	.50
711	dual comparator DIP	.40
723	precision voltage regulator DIP	1.00
747	dual 741 op amp DIP	1.00
748	op amp TO-5	1.00
LM100	positive DC regulator TO-5	1.00
LM302	op amp voltage follower TO-5	1.25
LM1595	4 quadrant multiplier	$2.00
LM311	comparator TO-5	1.75
LM380	2W audio amp DIP	1.75
LM703	RF-IF amp epoxy TO-5	1.00
LM309H	5V-200ma power supply TO-5	1.00
LM309K	5V-1A power supply module TO-3	2.00

Opto Electronics

LED GaAs INDICATORS

- ☐ **2-MV1***, Amber, visible jumbo epoxy lens upright **$1.00**
- ☐ **1-MV2***, TO-18, Dome, green, visible **1.19**
- ☐ **3-MV3***, visible, "coax pin pak", red, mini dome lens . . **1.00**
- ☐ **1-MV4***, stud, high power, red, 2-watts **3.95**
- ☐ **1-MV4H***, stud, high power, hi-dome, red, 2-watts **3.95**
- ☐ **3-MV10B**, visible, red, clear, dome lens, TO-18 . . . . . **1.00**
- ☐ **3-MV10C** visible, red, diffused, dome lens, TO-18. . . . **1.00**
- ☐ **3-MV50***, axial leads micro-mini dome, clear, red **1.00**
- ☐ **3-MV5012***, visible, red, small dome lens. **1.00**
- ☐ **2-MV5022***, jumbo red dome, TO-18, visible **1.00**
- ☐ **2-MV5020***, jumbo clear dome, TO-18, visible, red . . . **1.00**
- ☐ **1-MV5040***, 4-LED red array, with 5-lead pak **1.49**
- ☐ **3-MV5054***, visible, red, jumbo dome lens, upright . . . **1.00**
- ☐ **2-MV5080***, TO-18, micro-mini, clear dome, red **1.00**
- ☐ **4-MV5082**, visible, red, clear flat lens, TO-18 . . . . . **1.00**
- ☐ **1-MV5222***, jumbo dome, green, panel snap-in **1.98**
- ☐ **1-MV5322***, jumbo dome, GaAsp, panel snap-in Yellow . **1.98**
- ☐ **1-MV9000***, cartridge panel lamp, sealed, red, clear lens **1.49**
- ☐ **2-MT-2***, Photo Transistor, light sensor, TO-18. . . . . **1.00**
- ☐ **1-ME-1***, infra-red, parabolic lens, pin type **1.19**
- ☐ **2-ME-4***, infra-red, "invisible", TO-18, diff. dome **1.19**
- ☐ **2-ME60***, infra-red, "invisible", axial, micro-mini **1.00**

OPTO-COUPLERS *Monsanto Equivalent

- ☐ **MCA2-30*** 1500V Photo Darlington Relay . . **$1.00**
- ☐ **MCD1*** 4000V Isolation Photo Transistor. **4.95**
- ☐ **MCD2*** 1500V Isolation Photo Diode. **1.00**
- ☐ **MCT1*** 4000V Isolation Photo Transistor. **4.95**
- ☐ **MCT2*** 1500V Isolation Photo Transistor. **1.00**
- ☐ **MCT2-D*** 1500V Isolation Twin Photo Transistor **1.98**
- ☐ **MCT5-10*** 10,000V Isolation Photo Transistor. . **4.95**
- ☐ **MCT5-25*** 25,000V Isolation Photo Transistor. . **5.95**

CALCULATOR KEYBOARD

☐ **$12.50** **3 for $30**

☐ Etched calculator board with holes, as above, less switches . . . . **$2.50 Board**

Properly etched, drilled, "MULTIPLEXED," with proper diodes. Ready to go! Used with our own CAL TECH's 5001 chip advertised at $ 9.95 or equal to Cal Tech or Mostek chip. Keyboard uses the new manufactured by OAK, printed-circuit low-profile FEATHER TOUCH switches. 0-to-9 in white with black letters. Decimal white with black dot. CE, CL and the 4 function switches are in blue with white characters. Designed by top maker. Size: 6½ x 4½ x ½". All etched connections link to take a 12-pin edge connector.

OAK FEATHER-TOUCH SWITCHES

***For RTTY** ***For Unique Panel Switches**

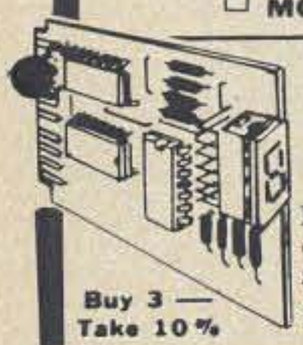
***Printed Circuits**

Mfd. by OAK (Ham's note, RTTY, too) data systems, same as used in Keyboard Calculator, SPST, Normally Open, 24V 1 amp contacts. Characters and letters easily changed. ⅜" high. Printed circuit.

No.	Sale		
☐ 0*	$.69	☐ 8*	.49
☐ 1*	.49	☐ 9*	.49
☐ 2*	.49	☐ CE†	.69
☐ 3*	.49	☐ CL†	.69
☐ 4*	.49	☐ −†	.69
☐ 5*	.49	☐ +=†	.69
☐ 6*	.49	☐ ÷†	.69
☐ 7*	.49	☐ ×†	.69
		☐ •*	.49

*White top, black numbers.
†Blue top, white characters.

☐ **Kit of 17 above switches for keyboard $9.**



LED MITY DIGITS "DCM'S"

Digital Counting Modules ☐ **9.99**

INCLUDES P.C. EDGE CONNECTOR — FREE!

Kit includes: 3 x 2" printed ckt board, with fingers too! Side-mounting socket, MAN-4 resistors, 7448, 7475, 7490, booklet.

Will outperform any other DCM on the market today, not gaseous, not incandescent, but a device that will READ almost for life. MAN-4, Monsanto equal.

Buy 3 — Take 10%

GENERAL TELEPHONE DATA ENTRY KEYBOARD

Only $8.88 ☐

Used in calculators, touch-tone, encoding, programming devices. **10 PUSH BUTTONS (0 to 9)** & 2 uncommitted. All switches have 2 separate poles & 6 separate busses — totalling 6 busses & 24 poles. . . . Any combination of which can be used! Size: 3x2½x1".

LITRONICS-MONSANTO-OPCOA LED Readouts

All fit 14-pin IC sockets, 5V 10 to 20 mils, 0-to-9 numerals, plus letters & decimal. With spec sheets.

*Monsanto Equal.
**MAN-1 Specs.

†35-Diode Array.

Type	Character Size:	Color Display:	Decimal	Driver	Each	Special
☐ MAN-1*	.27	Red	Yes	SN7447	4.50	3 for $12.
☐ MAN-2*	.32†	Red	Yes	2513	8.88	3 for $24.
☐ MAN-3*	.115	Red	Yes	SN7448	2.25	3 for $6.
☐ MAN-3*	.115	Red	No	SN7448	1.49	3 for $3.
☐ MAN-4*	.190	Red	Yes	SN7448	2.95	3 for $8.
☐ MAN-4*	.190	Red	No	SN7448	1.79	3 for $5.
☐ MAN-5*	.27	Green	Yes	SN7447	8.88	3 for $24.
☐ MAN-8*	.27	Yellow	Yes	SN7447	8.88	3 for $24.
☐ LITRONICS 707** (MAN-1)	.33	Red	Yes	SN7447	3.50	3 for $9.
☐ OPCOA ** SLA-7 (MAN-1)	.33	Red	Yes	SN7447	3.50	3 for $9.
☐ OPCOA ** SLA-7 (MAN-1)	.33	Red	No	SN7447	1.95	3 for $5.

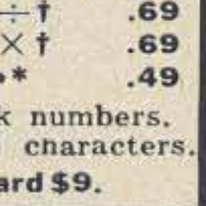
HOBBY EXPERIMENTAL "LED" KORNER

- ☐ **5-MAN-3*** "The claw", some segments missing, hobby use, **$1.00**
- ☐ **1-MAN-*4** some segments missing, hobby use, readout. **1.00**
- ☐ **1-SLA-7 Opcoa's MAN-1**, 1-segment missing. **1.49**
- ☐ **1-SLA-7 Opcoa's MAN-1**, hobby, some segments missing . . . **1.00**
- ☐ **10-LED HOBBY SURPRIZE!** asst. types, no-test. **1.00**
- ☐ **5-MONSANTO's Opto Coupler** surprise, asst. no-test **1.00**
- ☐ **3-PC. KIT**, MAN-1, MAN-3, MAN-4, some segments missing **1.49**

12-DIGIT 'CALCULATOR CHIP'

☐ **CT5001** **$9.95** ☐ **3 for $27.**

Similar to Mostek 5001. Outperforms Texas 8-digit TMS1802. A 40-pin DIP. Adds, multiplies, subtracts, and divides. Use with 7-segment readouts, Nixies, and LED's. We include schematics, instructions to build calculator.



$9.95

☐ **CT5002 — Same as above** Operates on 9V battery

☐ **CT5005 — Same as above with MEMORY — $14.95**

NATIONAL EQUALS ON "DIGITAL CLOCK on a CHIP"

Any "Chip" ☐ **$12.88**

Mfrs #	Description	Sale
☐ 5311	28-pin, ceramic, any readout, 6-digits: A-B-D	$12.88
☐ 5312	24-pin, ceramic, any readout, 4-digits: C-D	$12.88
☐ 5313	28-pin, ceramic, any readout, 6-digits: A-C	$12.88
☐ 5314	24-pin, plastic, LED and incandescent readouts, 6-digits: A-B	$12.88

***With Spec Sheet**

Code: A—Hold Count. C—1 PPS Output.
B—Output Strobe. D—BCD

***Money Back Guarantee!**

☐ **2.95**

☐ **6-DIGIT MAN-3A MUX'D PC BOARD**

Clock DCMs, VTVM, DVM, calculators, multiplexed.

☐ **6-MAN-3A's for above board. $9.50.**

STUD 'TRIACS'

PRV	15 amp	25 amp
50	☐ $.65	☐ $.85
100	☐ .85	☐ 1.05
200	☐ 1.25	☐ 1.45
300	☐ 1.45	☐ 1.65
400	☐ 1.85	☐ 1.95
500	☐ 2.55	☐ 2.25
600	—	☐ 2.65

Potter & Brumfield KAP RELAYS

Your choice 3 for $7.50 **$2.98**

☐ 115 VAC 3PDT . $2.98
☐ 12 VDC 3PDT . 2.98

Excellent for "HAM" use as antenna switching, latching, transmit, receive, etc., and 100's of commercial or industrial uses. Includes plastic dust-cover with diagram and hookup info, 11-pin plug-in base. Contacts movable gold flashed silver, stationary overlay, with silver cadmium oxide movables. All contacts 10 amp 3PDT. Coil data, 115VAC 2250 ohms, 17.5 ma. 12 VDC 21 ma. 168 ohms. Size: 2¼" x 1 5/16". Wt. 4 ozs. Center pin missing. Comar Mfg. type equal too.

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25-WATT SOLID-STATE SECOND GENERATION 2-METER 12-CHANNEL FM TRANSCEIVER

• Manufactured Prior to Revaluation of the Dollar—Manufacturer's Cost Today Would Be Greater Than Our Selling Price!

The Unimetrics ULTRACOM-25 is a 144-148 MHz FM transceiver with provision for *12 crystal-control transmit channels and 12 crystal-control receive channels*. It features rugged, commercial-quality construction throughout. The dual-gate FET front end results in a sensitivity of better than 0.5 uV for 20 dB quieting. It includes controls for volume, power and squelch, illuminated channel selector, RF power output signal-strength meter, hand-held dynamic mike and mounting bracket. The transceiver is factory equipped for operation on the following frequencies—.94/.94 Simplex, .34/.76 Duplex, .76/.76 Simplex and .34/.94 Duplex. It also has an integral 12VDC power supply—if you purchase it with our antenna below, you'll be ready for immediate mobile operation. An AC power supply, additional crystals, and touch-tone pad for auto patch are also available. For further information or phone orders, contact Walt Corrigan WB8PCP, Olson Electronics (216) 535-1800.

Hustler 2-Meter Mobile Antenna. 5/8 wavelength, stainless steel, 3.4 dB gain. With trunk lip mobile mount and 17' of cable. ▶

Regulated AC Power Supply. 4 amps, 12 volts. Operate the Ultracom-25 from 117 VAC house current.

Crystal Certificates. Fill out and mail to manufacturer with desired transmit or receive frequency indicated. Each certificate good for a single crystal.

Touch-Tone Encoder. Ties Ultracom-25 into repeaters with TT auto patch facilities. Data Engineering Model TTP-2 wired and including built-in monitor.

FREE! 1974 Olson Catalog

Reg. $2 W9IOP DX Calculator GIVEN AWAY with first 250 catalog requests!

Olson electronics THE VALUE LEADER SINCE 1931

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Please send me the following:

☐ Ultracom-25. DX-067 **192.95**

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☐ Touch-Tone Encoder DX-076 **44.50**

☐ Crystal Certificate. DX-041 **4.95**

Check or money order for $_____ enclosed. (Total amount plus applicable sales taxes).

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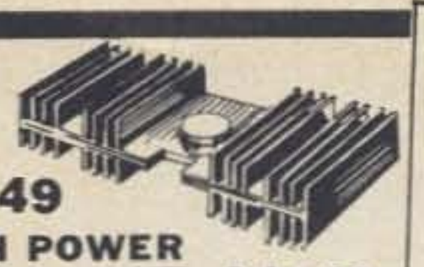

$1.49 HIGH POWER TRANSISTOR WITH HEAT SINK

3 for $3

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

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3 for $10. **$3.95**

By RCA or equal 2N3632. NPN, 23 watts, 3 amps, TO-60 case, with stud mtg. VCEV max 65.

1-WATT FLANGELESS TOP HAT ZENERS

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Type TK, Metal Case!

Volts	Volts	Volts	Volts
☐ 4.7	☐ 9.1	☐ 13.	☐ 33.
☐ 6.3	☐ 10.	☐ 15.	
☐ 8.2	☐ 12.	☐ 30.	

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Type	Sale
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☐ SN7403	.30
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☐ SN7405	.32
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☐ SN7407	.55
☐ SN7408	.35
☐ SN7409	.35
☐ SN7410	.30
☐ SN7411	.35
☐ SN7413	.95
☐ SN7415	.55
☐ SN7416	.55
☐ SN7417	.55
☐ SN7420	.30
☐ SN7421	.35
☐ SN7422	.35
☐ SN7426	.37
☐ SN7430	.30
☐ SN7432	.30
☐ SN7437	.60
☐ SN7438	.60
☐ SN7440	.30
☐ SN7441	1.40
☐ SN7442	1.25
☐ SN7443	1.35
☐ SN7444	1.35
☐ SN7445	1.35
☐ SN7446	1.65
☐ SN7447	1.65
☐ SN7448	1.50
☐ SN7450	.35
☐ SN7451	.35
☐ SN7453	.35
☐ SN7454	.50
☐ SN7455	.35
☐ SN7460	.35
☐ SN7464	.50
☐ SN7465	.50
☐ SN7470	.50
☐ SN7472	.50
☐ SN7473	.65
☐ SN7474	.65
☐ SN7475	1.30
☐ SN7476	.75
☐ SN7478	.95
☐ SN7480	.75
☐ SN7481	1.50
☐ SN7482	.95
☐ SN7483	1.50
☐ SN7485	1.41
☐ SN7486	.55
☐ SN7489	3.75
☐ SN7490	1.50
☐ SN7491	1.50
☐ SN7492	1.10
☐ SN7493	1.10
☐ SN7494	1.10
☐ SN7495	1.10
☐ SN7496	1.10
☐ SN74104	.55
☐ SN74105	.55
☐ SN74106	1.25
☐ SN74107	.60
☐ SN74108	1.25
☐ SN74112	1.25
☐ SN74113	1.25
☐ SN74114	1.25
☐ SN74121	.70
☐ SN74122	.75
☐ SN74123	1.20
☐ SN74140	.50
☐ SN74145	1.40
☐ SN74151	1.25
☐ SN74153	1.60
☐ SN74154	2.10
☐ SN74155	1.55
☐ SN74156	1.55
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☐ SN74160	1.95
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KRONOS $47.

With Cabinet

Designed by our Scientific Device engineers as the most advanced digital timing device in the consumer "time" field. One radio-and-TV station engineer tells us, "Not a change of a second in 3 months." It is so accurate we use it as our standard. KRONOS KR100 Series, in the new sleek all-purpose walnut-and-black modern design cabinet, enhances any office, home, den, etc. It becomes a "visible-action conversation piece" wherever it is placed. Has modern LSI National Clock Chip, and 8-page brochure chock-full with pictorials and easy-to-understand, step-by-step instructions. This kit is COMPUTER SIMPLIFIED making do-it-yourself easy! Other features include 3 setting controls, 1 hour per second, 1 minute per second, and hold button. Easy-to-change from 12 to 24 hours, 4 to 6 digits, 50 to 60 hz operation. Your choice of different type readout systems: ☐ MAN-3 Type LED, ☐ MAN-1 Type LED (the larger character size), ☐ MAN-4 Type LED, ☐ 7-Segment Nixie Type Tubes. Kit includes POLAROID filter.

Size of cabinet: 6" x 5¼" x 6" deep

'TIME STANDARD' CHRONOMETER

- ☐ **KR101** 7-Segment MAN-3 Type LED, 6 Digits $47.00
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- ☐ **KR103** 7-Segment MAN-4 Type LED, 6 Digits $57.00
- ☐ **KR104** 7-Segment Nixie Type Tubes $47.00

Buy 3 — Take 10%

'AUDIO AMP ALLEY'

Buy Any 3 — Take 10%

Watts	Mfr.	Type	Case	Heat Sink	Sale
☐ 1W	Westinghou	WC334	TO5	No	$1.49
☐ 2W	National	LM380	DIP	No	$1.95
☐ 3-5W	G.E.	PA263	DIP	Yes	$2.95
☐ 4W	Texas	SN76024	DIP	Yes	$3.95
☐ 5W	SGS	TBA800	DIP	Yes	$4.50
☐ 4W	Motorola	MEP9000*	DIP	Yes	$2.95
☐ Dual 1W	Sprague	2277	DIP	Yes	$2.95
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*With built-in preamp. All 9-24V, to 8-16 ohms load

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- ☐ 550 Precision 723 voltage reg. (DIP) . . . 1.17
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- ☐ 558 Dual 741 (mini DIP) 1.00
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- ☐ 561 Phase lock loops (DIP) 3.25
- ☐ 562 Phase lock loops (DIP) 3.25
- ☐ 565 Phase lock loops (A) 3.25
- ☐ 566 Function generator (A) 3.25
- ☐ 567 Tone generator (A) 3.25
- ☐ 595 Four quadrant multiplier 3.10
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- ☐ 703C RF-IF, amp, 14 ckts (TO-5) 1.00
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- ☐ 709CV Op amp (mini DIP) 49
- ☐ 710C Differential amp (A) 49
- ☐ 711C Dual diff. comp (A) 49
- ☐ 723C Voltage regulator (A) 95
- ☐ 733 Diff. Video Amp 1.75
- ☐ 741C Frequency compensator 709 (A) . . .49
- ☐ 741CV Freq. comp 709 (Mini DIP) 49
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- ☐ 748C Freq. adj. 741C (A) 44
- ☐ 748CV Freq. adi. 741C (mini DIP) 49
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(A) TO-5 or DIP dual in line pak

HIGH VOLT 1AMP

PIV	SALE
☐ 2000*	1.00
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Type	Description	Sale
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☐ LM-301	Hi-performance amp	.49
☐ LM-302	Voltage follower	1.49
☐ LM-304	Neg. V. reg.	1.49
☐ LM-305	Pos. V. reg.	1.49
☐ LM-307	Super 741	.59
☐ LM-308	Super gain op amp	1.50
☐ LM-309H	5V 200 mil V. reg.	1.50
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☐ LM-370	AGC squelch op amp	1.49
☐ LM-371	R-F, I-F, op amp	.69
☐ LM-380	2-watt audio amplifier	1.95

*TO-3 case, — others TO-5

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Type F. Screwdriver adjust. **Any 4 for $1**

Ohms		
☐ 75	☐ 7.5K	
☐ 100	☐ 10.0K	
☐ 200	☐ 20.0K	
☐ 250	☐ 25.K	
☐ 500	☐ 50.K	
☐ 750	☐ 75.K	
☐ 1.0K	☐ 100K	
☐ 2.5K	☐ 250K	
☐ 5.0K	☐ 2 Meg	
	☐ 5 Meg	

"C-MOS" IC CIRCUITS

Type	Sale		
☐ 74C00	$.95		
☐ 74C02	.95		
☐ 74C04	1.15	☐ 74C157	2.50
☐ 74C10	.95	☐ 74C160	3.50
☐ 74C73	1.79	☐ 74C161	3.50
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- ☐ 5U4 . . . . . $1.49
- ☐ 5R4 . . . . . 3.95
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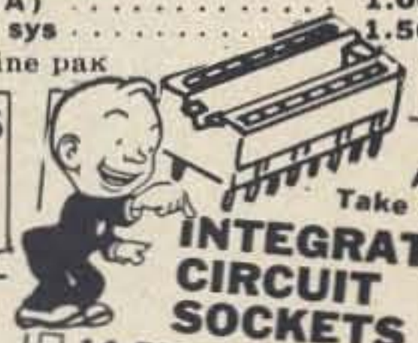

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- ☐ 14-Pin, DIP . . . . . $.45
- ☐ 14-Pin, Wire Wrap . .59
- ☐ 14-Pin, Side Mount 1.00
- ☐ 16-Pin, DIP 50
- ☐ 16-Pin, Wire Wrap .59
- ☐ TO-5, 8 or 10-Pins . .29

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Type G, 1/2" dia. x 1/2" high. Mounts 1/4" hole, with shaft, linear, immersion-proof high freq. **2 for $1**

Ohms			
☐ 75	☐ 2.5K		
☐ 100	☐ 5.0K	☐ 25.K	
☐ 500	☐ 7.K	☐ 75.K	
☐ 2.0K	☐ 10.K	☐ 100.K	
	☐ 20.K	☐ 5 Meg	

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*microminiature

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100	☐ .06	☐ .06	☐ .12
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400	☐ .09	☐ .09	☐ .22
600	☐ .12	☐ .12	☐ .28
800	☐ .15	☐ .15	☐ .39
1000	☐ .18	☐ .18	☐ .45

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50	☐ $.69	☐ $.88
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600	☐ 1.35	☐ 1.75
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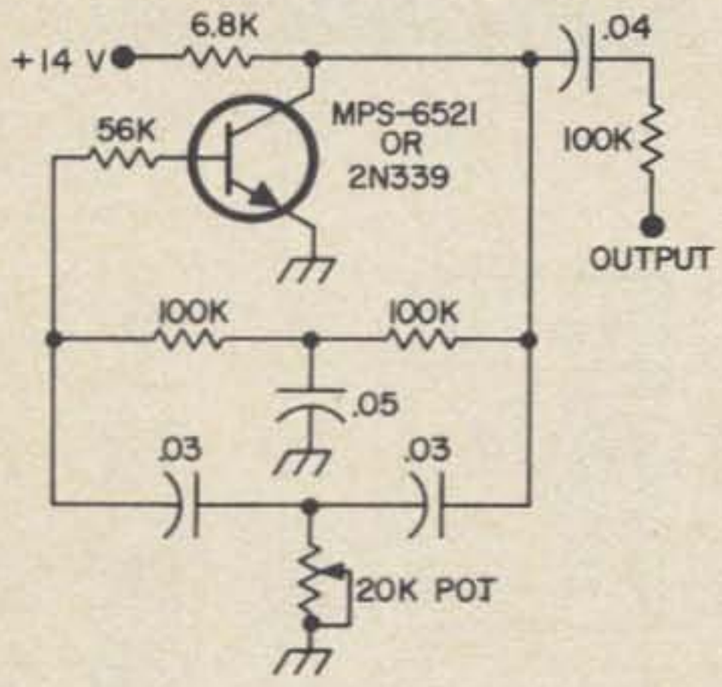
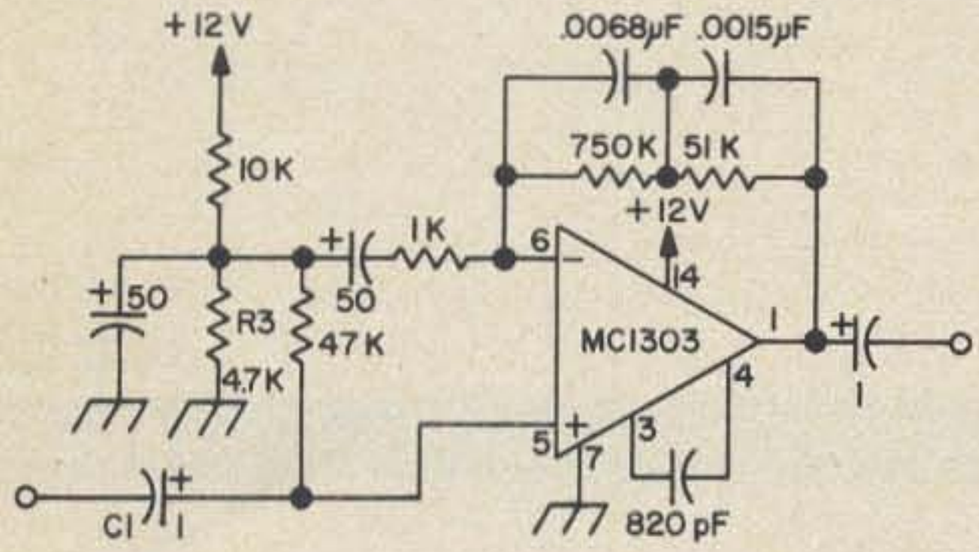
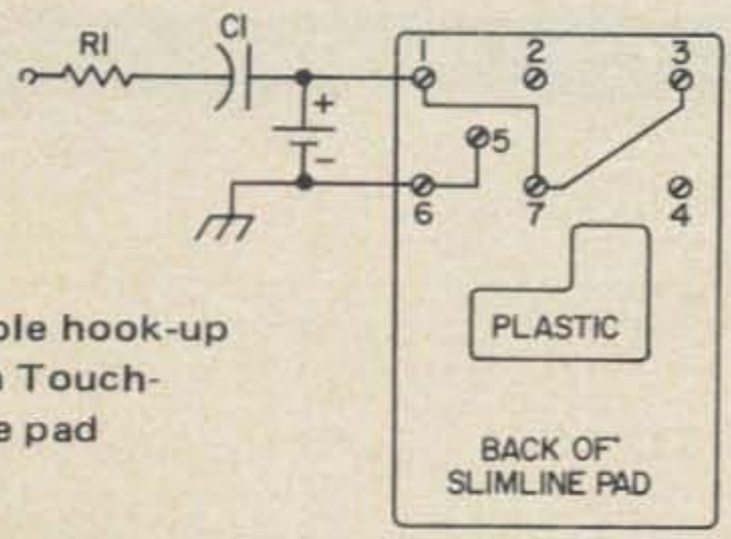
A FEW CIRCUITS. . .



A simple and stable sub-audible tone generator for PL use with FM repeaters. With miniature components it can be made postage stamp size and tucked away into any rig. For stability, mylar capacitors and film resistors are best, but carbon resistors can be sutstituted successfully. It was originally designed for 100 Hz output and the 20k potentiometer is used for adjusting this to optimum. Thanks to WB8OQC.

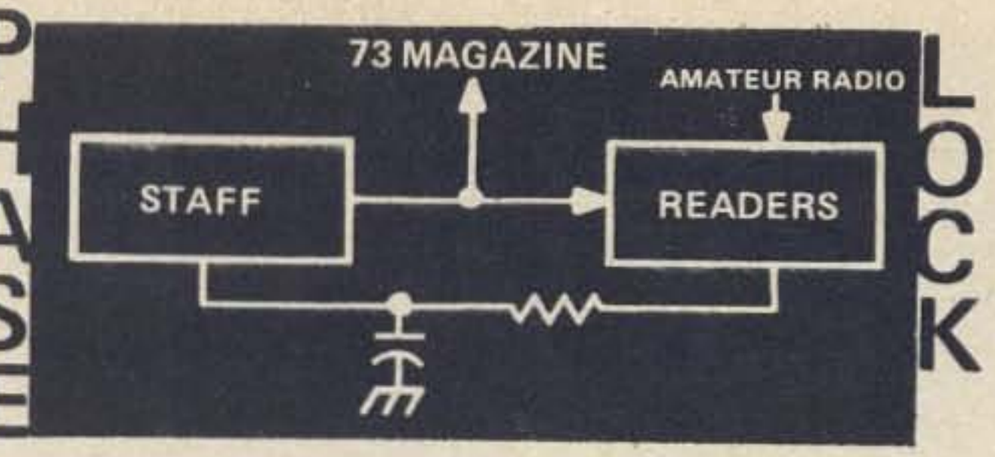


A preamplifier designed for use with a stereo magnetic phono cartridge using the MC1303. The IC is a dual device and only one half of the preamp (one channel) is shown in the schematic. Build the other half exactly the same as the first but change the following pin numbers to those in parentheses: 6(5), 5(8), 3(11), 4(10) and 1(13).



Simple hook-up for a Touch-Tone pad

Use a 1½V hearing aid battery mounted inside the slimline handset. C1 is approximately a .5–3 μF, with 1½V. I found no need for R1. Thanks to K2ZCU.



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Complex construction projects	☐	☐
General interest articles	☐	☐
Humor articles	☐	☐
Specialized columns	☐	☐
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Comment (b):

Comment (c):

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September 1973

SUN	MON	TUES	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Possible aurora 9, 10, 19, 20.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7	7	7	3A	3A	3A	7	7	7	14	14
ARGENTINA	14	7	7B	7	7	7	14	14	14	14	21	21
AUSTRALIA	14	7A	7B	7B	7	7	7	7	7B	7B	14	14
CANAL ZONE	14	7	7	7	7	7	14	14	14	14A	21	21
ENGLAND	7	7	7	7	7	7B	14	14A	14A	14A	14	7B
HAWAII	14	7A	7B	7	7	7	7	7B	14	14	14	14
INDIA	7	7B	7B	7B	7B	7B	7A	14	7A	7	7	7
JAPAN	14	7B	7B	7B	7B	3A	7	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	14	14	14	14A	14
PHILIPPINES	14	7B	7B	7B	7B	3B	7	7	7	7	7B	14
PUERTO RICO	7A	7	7	7	7	7	7	14	14	14	14	14
SOUTH AFRICA	7	7	7	7	7B	14	14	14	21	21	14A	14
U.S.S.R.	7	3	3	7	7	7B	7B	14	14	14	7B	7
WEST COAST	14	7A	7	7	7	7	7	14	14	14	14	14

CENTRAL UNITED STATES TO:

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

WESTERN UNITED STATES TO:

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

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

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