

# QST FM

volume 2, number 7

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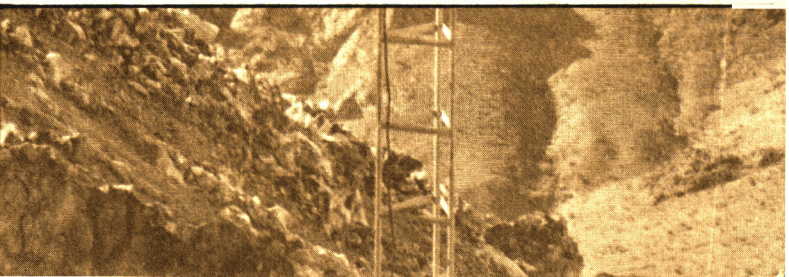
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AWARDS

35c



AUGUST 1968





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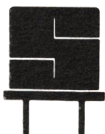
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# FM

**AUGUST 1968**

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# SAROC: THE BIG ONE

**SAROC — THE REALLY BIG ONE.** Killington repeater chain, contributor to FM chapter of 1969 ARRL Handbook

SAROC combines the regular annual worldwide ham convention with the **NATIONAL FM CONVENTION** to make it the biggest ham radio shindig of the year. Even if you never go to conventions, don't miss this one. It's held in the fun center of the world, Las Vegas, from the 8th to the 12th of January 1969.

SAROC will be the site of the annual presentation of Sarahs, too. Plan **NOW** to go and take your whole group with you. Among the prominent FM'ers planning to attend:

Mike Van Den Branden (WA8UTB),  
FM publisher

Ken Sessions (K6MVH),  
FM editor 73/CQ author

Don Milbury (W6YAN),  
FM staff consultant/FM author

Pat Devlin and other reps from Tulsa  
Repeater Assn.

Paul Hudson (VE3CWA),  
FM Canadian Liaison/  
Editor, Toronto FM Bulletin

Bill Carpenter (WA6AZY),  
FM staff photographer

Gary Hendrickson and other reps from  
Buffalo Repeater Assn,  
the group that originated the Buffalo  
petition to the FCC

Bob Pederson (K2IEZ),  
member of the  
East Coast VHF Association and one  
of the chief principals of the successful  
Paramus FM Conference

Gordon Pugh (W2GHR),  
FM author;  
designer and builder of the famous

Bob Kelty,  
Chairman of California  
Amateur Relay Council

You'll also see Wayne Green and Kayla Bloom of 73, Jim Fisk of Ham Radio, and many other famous personages of hamdom. If you're a member of an FM organization or group, let FM Magazine know right away how many in your group will be attending so we can publish a "who's who" of attendees. **EVERY FM ORGANIZATION SHOULD BE REPRESENTED.**

SAROC is offering \$1000 worth of equipment as an advance registration prize (choose what you want from participating exhibitors).

Besides all the regular convention activities, there will be FM symposia, a repeater conference, and a meeting of groups interested in joint "long-haul" cooperative links.

The registration fee of \$12 entitled you to special \$10 - a - night Sahara room rate (single or double).

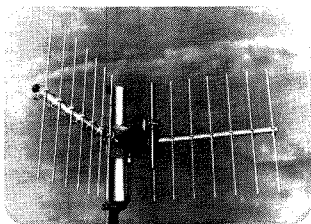
It also includes lots of free stuff, including booze. It is your ticket to cocktail parties, seminars, exhibit areas, a supershow in the spectacular tradition of the Sahara, and the gigantic breakfast banquet where the Sarah awards program will take place.

When you mail in your check, be sure to specify **FM** so you can wear the distinctive **FM** badge that distinguishes you from the other SAROC attendees. Mail to Southern Nevada ARC, Box 73, Boulder City, Nevada 89005.

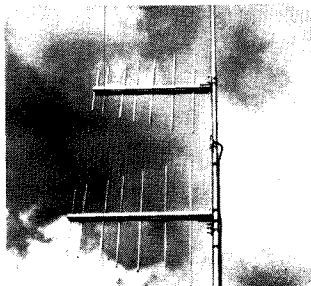


# ANTENNAS

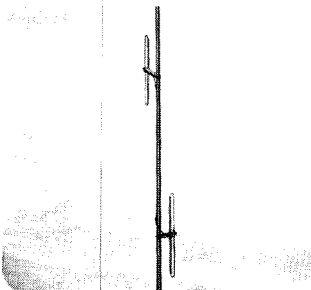
FOR COMMUNICATION SERVICE



**CORNER** 10 db gain  
120 to 470 MHz



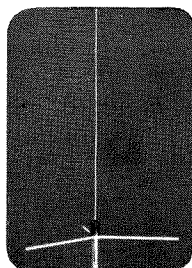
**UNI-LOG** 6 to 12 db gain  
132 to 470 MHz



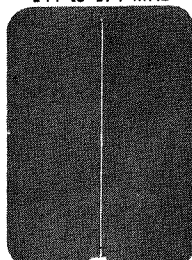
**VARI-LOOP** 3 to 12 db gain  
144 to 470 MHz



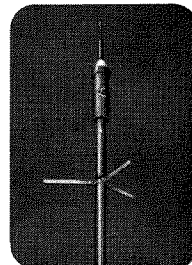
**OMNI-10** 10 db gain  
450 to 960 MHz



**LEWIS WHIP** 2 db  
144 to 174 MHz



**HIGH GAIN** 4.5 db  
450 to 470 MHz

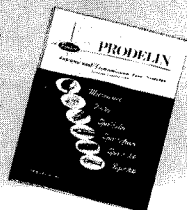


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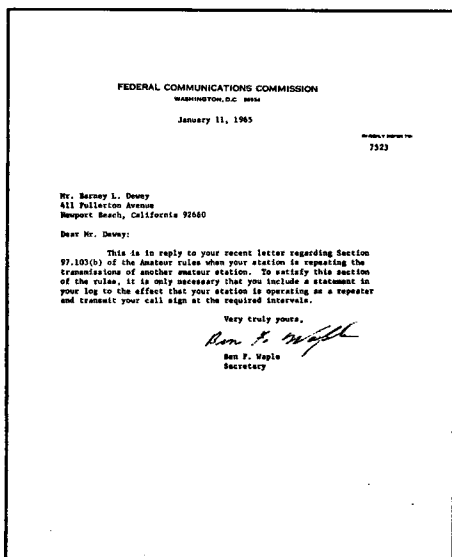
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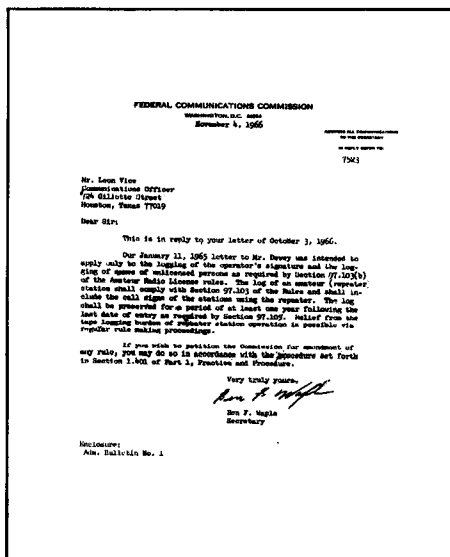
Number 2 on information card

# REPEATER LOGGING STILL REQUIRED!!



On the basis of information furnished by Art Gentry (trustee of two-meter AM repeater K6MYK), the FCC letter which tended to dispute the need for logging of repeaters ("FCC Does About-Face," FM, June 1968), was a false alarm.

The original FCC letter, signed by Mr. Ben Waple, was written to Mr. Barney Dewey in response to a query about on-site log signing of a repeater user. Taken at its face value, the letter (figure 1) appears to sanction the unlogged automatic operation of a repeater. Apparently, however, the FM staff was not the only group of individuals thrown by the startling FCC announcement. A Mr. Leon Vice saw the letter in 1966 and wrote to the FCC to verify its validity. The FCC's response (figure 2) explained the ambiguity of Waple's first letter and upheld the necessity for passive repeater logging. Copies of these letters were furnished FM by Art Gentry.



An interesting bit of encouragement to repeater owners is included in Waple's letter when he suggests that the logging requirement could be dispensed with via the conventional petition submittal technique so often employed by ARRL.

FM Magazine, as its first official act on behalf of amateur FM, will study the specified requirements for petition submittal and will recommend a rule change to the FCC with respect to the logging requirement. When this petition has been completed and prepared for submittal, it will be published. At that time, FM's position would be made a great deal more comfortable if readers would write in to the FCC in support of the recommendations.

The voice of FM is already loud. Now we must broaden it.



## FM REVIEWS

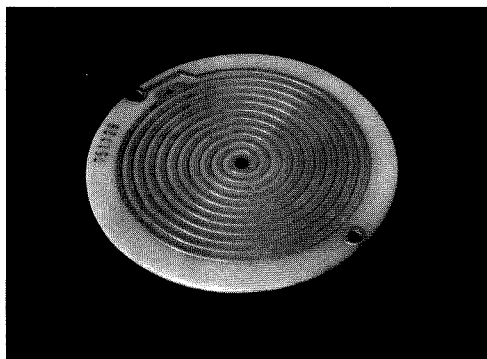
When manufactures mail samples of their products to various trade magazines for editorial evaluation, the samples are usually accompanied by carefully written "reviews" prepared in advance by the manufacturers or their ad agencies. FM Magazine is unique among such trade publications in that ALL product reviews are staff-written. The opinions expressed in the editorial verbiage are solely those of the staff; but they are written as objectively as possible. FM's reviews don't and won't dance to the tune of the advertisers; nor do they tread lightly to avoid rankling the chances for revenue from potential advertisers.

FM welcomes products from manufacturers for evaluation. But suppliers should be prepared to see an uninhibited and unbiased appraisal of their products, because the reviews are written for the benefit of the reader--and no one else.

### ENVOY 764 MOBILE ANTENNA FOR 6 & 2 (Hy-Gain, \$26.50)

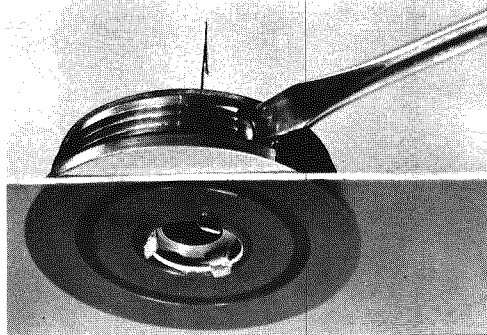
Hygain's newest entry in the two-band whip category represents what might be the start of a new era in mobile antenna design. The antenna, called the Envoy, is made for ham and commercial use. It's a half-wave base-loaded whip for the 130-174 MHz range which exhibits a claimed gain of at least 3db over that of a half-wave dipole. The Envoy's performance in the 50-54 MHz region is approximately the same as a conventional quarter-wave whip cut for six-meter operation. It will accept up to 100 watts of rf.

The Envoy is characterized by several revolutionary features that serve to enhance the antenna's reliability in service as well as give the whip a attractive "low-profile" appearance. The loading coil itself is also a departure from convention: Fashioned



on a "two-dimensional" plane, the precision coil is etched onto a circuit board (see photo). This approach has the advantage of an unprecedented uniformity in performance from one Envoy to the next because of the close tolerances that can be held in spacing of the printed conductor.

The mobile antenna is held in place by a unique claw arrangement whereby three "fingers" grasp the car body at the edges of the mounting hole. The hole can be any size between 3/8 and 3/4 inch diameter.



The Envoy is an elegant marriage of stainless steel and black high-impact plastic. The very low profile and slim conical spring combine to make a whip installation worthy of even the most conservative FM'er.

# MOTOROLA

## PERMAKEYS

### LEGEND

1: 25-54 2: 75 MHz 3: 144-174 4: 406-470 5: 960 MHz

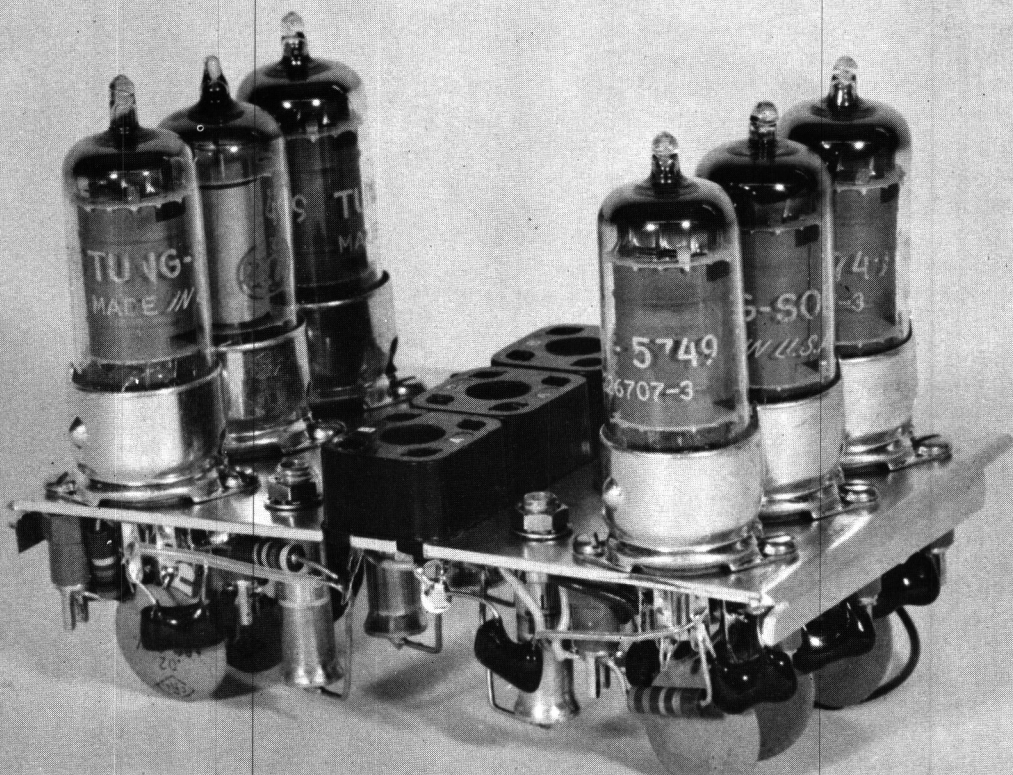
Thanks to the California Amateur Relay Council for providing this complete list of Permakays for FM readers:

	<u>MOD ACCEPT</u>	<u>CHANNEL SPACING</u>	<u>RECEIVER</u>	<u>FREQUENCY BAND</u>
F208	5			
KB435	7½	20/30	A	1/3
K8436A	15	40/60	A	1/3
K9035A	15		C	
K9076		AM Recvr	PA9077	1500-3000 kHz
K9135	30	120	Unichannel	3
K9240	5	20	G	1
K9241	15	40	D G	1
K9242	30	120	G	1
K9245	5		A	
K9341	15		A	
NFN 6000AW	15	40/60	Dispatcher	1/3
NFN 6000AS	5	20/30	Dispatcher	1/3
NFN 6001AW	15	40/60	VHF Pager	1/3
NFN 6001AS	5	20/30	VHF Pager	1/3
NFN 6003AW	15	40/60	NRD 6112 Series	1/3 (H21-23 DCN)
NFN 6003AS	5	20/30	NRD 6112 Series	1/3 (H21-23 DCN)
NFN 6004AW	15	40/60	NRD 1130 Series	1/3 (Portable)
NFN 6004AS	5	20/30	NRD 1130 Series	1/3 (Portable)
NFN 6005AW	15	50	NRE 6000	4 (H24DCN)
NFN 6006AW	15	40/60	NRD 6111 NRD 6112	1/3 (H21-23 DEN)
NFN 6006AS	5	20/30	NRD 6111 NRD 6112	1/3 (H21-23 DEN)
TFN 6000AW	15	50	U44BBT	4
TFN 6000AS	5	25	UHF B	4
TFN 6001A	15	50	UHF B	4
TFN 6004AX	30	120	Unichannel	3
TFN 6007AS	5	20	A	2
TFN 6008AW	15	40/60	H - C & D Motrac	1/3
TFN 6008AS	5	20/30	H - C & D Motrac	1/3
TFN 6013AW	15	40/60	H - C & D Motrac	1/3/4
TFN 6013AS	5	20/30	H - C & D Motrac	1/3/4
TFN 6014AS	5	30	T1230AH Cartelephone	3
TFN 6015AS	5	20/30	C Business Dispatcher	1/3
TFN 6017AW	15	40/60	H - E Motrac	1/3
			L & M Motrac/Motran	
TFN 6017AS	5	20/30	H - E Motrac	1/3
			L & M Motrac/Motran	
TFN 6017CS	5	20/30	M Motrac/Motran	1/3
TFN 6018AS	5	30	IMTS Cartelephone	3
TU 145	15	60	A D G	A-4, D&G-3
TU 145A	15	50	A G	3/4
TU 194	15	50	A	4
TU 322	15		A	4
TU 344	40	100	A	5
TU 406	5	20/30	A	1/3
TU 455	15	30	G	3
TU 456	30	120	G	3
TU 540W	15	40/60	G	1/3
TU 540S	5	20/30	G	1/3
TU 540X	30	120	G	1/3
1V847945	15	40/30	Early Dispatcher	1/3



# 6 FREQ CONVERSION: 80D & 140D Transmitters

BY CHARLES COPP W2ZSD



In an effort to obtain the maximum number of FM channels per transmitter, it is necessary to package as many oscillators as possible in the available space. For the Motorola 80D and 140D transmitters, the three oscillator decks can be removed and a single plate made to cover the existing opening. Without too much difficulty, it is possible to put four oscillators on this plate. See figure 1 for the layout of the four-frequency plate.

When I decided that a fifth frequency was desirable, I was in trouble. It now

became a matter of whether to mount a second transmitter strip in my already crowded cabinet or to get more oscillators into the existing space available ( $2\frac{3}{4} \times 4\frac{3}{8}$ "). After juggling components around, a six-frequency oscillator deck was decided upon and assembled with all components fitting neatly into their prescribed places. However, as can be seen from the photos, certain sacrifices and modifications have been made.

First of all, ovens are out of the question for this design, and second, tube

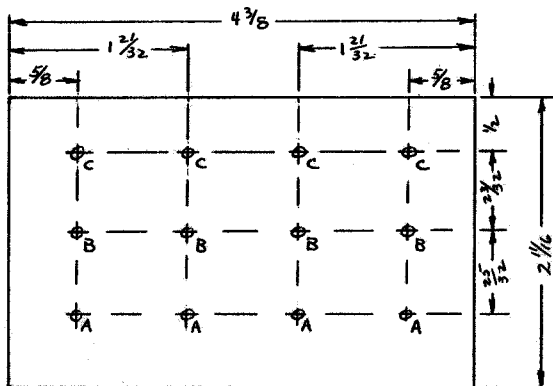
shields may have to be left off. However, with careful tube socket placement and the use of the black slipover tube shields, it is possible to shield the tubes, but it isn't necessary. The dual crystal sockets accommodate two crystals back to back. The air trimmer capacitor used by Motorola must give way to a piston capacitor. The ones I used were JFD MC604 with a tuning range of 1 to 42 pF. The exact tuning range is not important since the 10 pF capacitor across the trimmer can be made larger or smaller if there is not enough tuning range to put the crystal on frequency. Suitable piston capacitors can usually be found in the surplus stores.

For those who insist on using ovens it is possible to mount six dual sockets between the tube sockets in place of the three dual sockets. The piston trimmers are then replaced with ceramic trimmers mounted beneath the oscillator deck. Frequency adjustments will have to be done from below the chassis, but this should present no great problem. Ceramic trimmers can even be substituted for the piston trimmers in the no-oven design if pistons are not available.

Figures 1 and 2 show the layout of the four- and the six-frequency decks, respectively. A schematic has not been included since the circuit is an exact duplication of the Motorola P865 oscillator deck circuit shown in the FM Schematic Digest.<sup>1</sup>

The basic transmitter must also have some wiring changes in order to accept the six-frequency deck. There are twelve terminals available for the original three oscillators, and ten of these terminals will be used. The following list gives the number of terminals required for each use.

1. FM Schematic Digest, Two-Way Radio Engineers, Inc., 1100 Tremont Street, Boston, Mass 02120

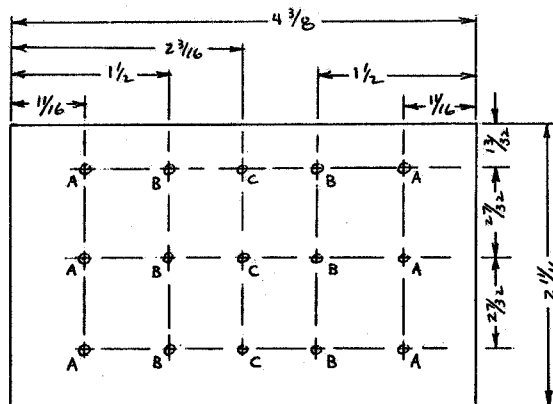


#### HOLES:

- "A" 5/8" Dia. (for tube socket)
- "B" Mounting hole for trimmer
- "C" Center of crystal socket cluster

FIGURE 1

### FOUR FREQUENCY OSCILLATOR DECK



#### HOLES:

- "A" 5/8" Dia. (for tube socket)
- "B" Mounting hole for trimmer
- "C" Center of crystal socket cluster

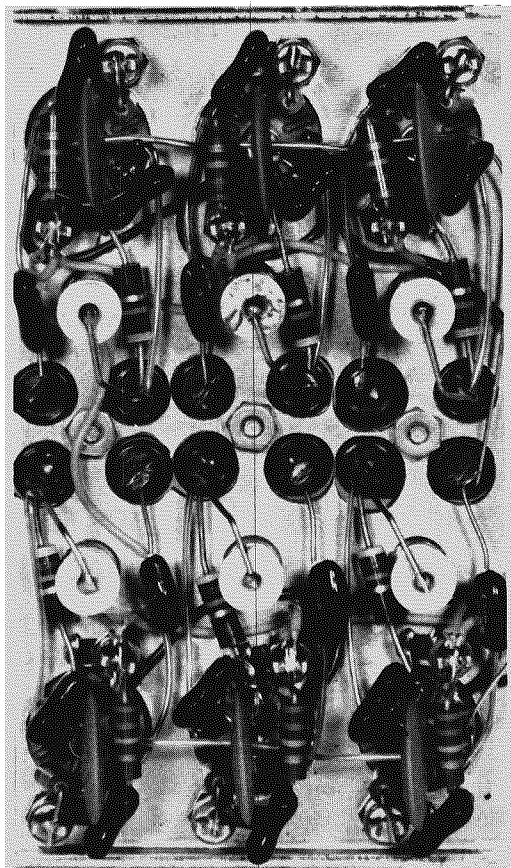
FIGURE 2

### SIX FREQUENCY OSCILLATOR DECK



# NOTE

Use	Terminals Required
Filament	1
Plates	2
Screen voltage	1
Cathodes	6



The plates of each group of three oscillators are wired together and brought out to the nearest terminal, keeping the leads as short as possible. The remaining leads are not critical and can be wired in any convenient arrangement. It is desirable to keep the transmitter strip capable of being plugged in, so five of the oscillators will be wired to the power socket (pins 1, 2, 3, 9, and 11) and the remaining oscillator will be wired to pin 9 on the meter socket.

Use the power socket connections to control the two frequencies furthest apart so that they can be switched back and forth while tuning up with a test meter inserted in meter socket. Also, since there are jumpers between some of the terminals on the oscillator deck terminal strip, the unneeded jumpers will have to be removed.

A little effort was involved in getting the completed deck into the transmitter strip, but it does fit. It might be necessary to notch out slightly for the crystal or tube sockets. However, the extra work is worthwhile in order to have six transmit frequencies available using a single transmitter strip.

I would like to thank John Olsen (W2-WJS) for supplying the photographs of the six-frequency oscillator deck.

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# FM Calendar

**AUG 30 - 1 SEP — ARRL SOUTHWEST DIVISION CONVENTION.** This affair will be held at Del Webb's Townehouse in Phoenix. It features a roundtable discussion on FM repeaters as well as conferences on RTTY, VHF, MARS, and other subjects. Arizona Repeater Association will be hosting the FM portions of the event. Preregistration cost is \$10, which includes banquet and all programs and sessions. Send checks to ARRL SW Div. Convention, Box 15297, Phoenix, Arizona 85018.

**1 SEP - LA'S 4TH ANNUAL SEVEN-SIX JAMFEST.** Come out and meet the characters described in the controversial "Chronicles of Seven-Six." It's free. There are always hordes of prizes, gifts, and beer. All FM'ers, all channels welcome. The event starts around 11 AM local time and goes on all day. Among the contests will be the popular now-famous Kapture Kon-test, Battle of the Giants (remote jamout), and other questionable bouts. Held at Legg Lake, which is in the Whittier Narrows Recreation Area near the junction of the 605 and Pomona freeways. Also near the Pomona freeway Tyler Avenue offramp. The four main channels (146.70, .76, .82, and .94) will be monitored. (If you're lost, be sure to get directions from some channel other than seven-six!)

**DEC 3-4 — 1968 Vehicular Technology Group (IEEE).** A nonamateur conference to be held at the San Francisco Hilton Hotel in San Francisco, California. Conference to feature exhibits from the nation's top communications firms and symposia on mobile com-

munications, personal/pedestrian communications, and other FM topics. Make reservations early by writing R. H. Moore, VTG Chairman, Dept of Communications, City of San Jose, California.

**JAN 8-12 — SAROC.** Advance registration prize \$1000 of radio equipment (winner's choice from participating exhibitors) at fourth annual SAROC January 8-12, 1969 (2nd annual National FM Convention), Hotel Sahara's new space convention center, Las Vegas, Nevada. FM, Ladies, MARS, RTTY, QCWA, WCARS-7255, WSSB programs scheduled. Registration \$12 per person entitles SAROC participants to special room rate \$10 plus room tax per night (single or double occupancy); admittance to cocktail parties, technical seminars, exhibit area, Hotel Sahara's late show, Sunday Sarah presentation breakfast equal to any banquet dinner. Ask any SAROC veteran. For details write Southern Nevada ARC, Box 73, Boulder City, Nevada 89005.



"Now turn the dohickey behind the whatchamacallit a quarter turn."



# The case for narrowband

by Robert Kelly W6DJT

Recent discussions concerning operation of amateur relay systems at the 5 kHz narrowband standard have evoked not only considerable constructive debate but some misinformation as well. Within two years or less, surplus FM mobile equipment availability will be the determining factor as to what deviation amateurs use in FM systems just as surpluses of 450 MHz equipment available after 1 June will encourage continuing expansion into UHF.

But what is wrong with what we have operating now? Why change anything? Everything is working OK now, so what's the difference? All quite true, and I would be last to suggest wholesale conversions for no reason. But let's examine the situation facing us so that we have a better appreciation of what is coming in amateur FM systems.

Historically consider the progression of events in FM mobile since we are directly affected by using equipment built to standards for these services. Up until 1950, deviation was not controlled very rigidly. Channels were in 120 kHz spacings, deviation limiting was not common, stability was not important (pressure-mounted crystals were the rule), receivers were wide as all outdoors--even purposely swamped by resistors across IF circuits, and no attempt was made to control audio frequencies transmitted. Listening to these old systems was almost like listening to a broadcast receiver; and the manufacturers must have thought sim-

ilarly since large soft-cone speakers were a part of mobile installations.

But radio became popular in more than police cars and commercial vehicles. The spectrum had to accept users from areas that previously had never considered radio. And regulations tightened. In 1950, deviation limiting was required of all older equipment -- at the figure of 15 kHz to permit users to occupy channels only 60 kHz spaced. It was quite apparent that equipment was to be asked to do more. Manufacturers looked ahead and saw what was coming with an ever-increasing number of spectrum users.

In 1952, the first equipment was produced that could be readily converted to a tighter expected standard, an inevitability dictated only by the economics of a nationwide program. Narrowband was the scheme; it meant a four-year period of preparation, replacement of all older gear which could not be economically converted, and design of more modern equipment to meet requirements. But the impetus given by a plan of this nature meant more than just spending dollars so that more users could occupy the radio spectrum. It encouraged better equipment development, improvement of techniques, and considerably upgraded systems. It spelled the end of loctal tubes, pressure-mounted nonheated crystals, and when the 12-volt V8 cars became the standard in 1955, it meant an entirely new approach to FM mobile.

The wideband system was to be as out of date as the flathead 6-volt V8 cars or AM radio itself.

In 1956, the plan was implemented and conversions began. Large quantities of older, nonconvertible gear were removed from service -- equipment that may have had more years of life. But when 12-volt conversions were added to narrowband conversions, economics ruled and replacement was the only answer.

Up to this point, the amateur concerned himself more with AM or sideband, while FM was about as uncommon as amateur TV. But we are not well known for letting surpluses go to waste nor to disregarding an economically feasible idea. True to style, an imaginative group procured a few mobile units, and although the idea of going FM was not new, they built an FM mobile relay, located it at an advantageous location, and started a whole new field of endeavor.

Today is 1968, the amateur FM relay has gone through several stages, and equipment available to affluent and knowledgeable FM enthusiasts is certainly quite different from the way it was 10 years ago. Rather than loctal-tubed, pressure-mounted-crystal units being the grade of surplus available, we find narrowband, heated-crystal, transistor-powered equipment the thing

Converting equipment back to wideband operation for amateur use has become a matter of concern and an economic and time-consuming problem yet to be resolved. Differences in wide and narrow systems were discussed by land mobile people in the early 1950s, material was widely published during conversions in 1956-1958, and resurrected by concerned amateurs facing conversion of systems in 1967-1958 when narrow standard equipment became readily available. But the facts have not changed one iota. Let's look at them on a practical basis.

FCC Amateur Service Regulations are sketchy at best for FM deviation. Wideband is not specified, narrowband is described as "occupying a bandwidth not more than a comparable AM signal of similar audio characteristics." A calculated guess at what this means is  $\pm 3.0$  kHz, a figure totally impractical for FM mobile equipment built for either the  $\pm 5$  or  $\pm 15$  kHz standard. A  $\pm 2.5$  kHz standard was considered and rejected in 1958 as being out of the question for land mobile use. On the other hand, wideband deviation could be  $\pm 20$  or even  $\pm 30$  kHz and not be in violation.

How does equipment differ in wide and narrow systems? Transmitters of modern design have deviation limiters and postlimiter filters which roll off audio at a predetermined rate. Deviation can be kept at maximum permissible level, 5 or 15 kHz, without overshoot or failure to occupy the full channel width. In narrowband systems, transmitter deviation is not merely turned down. The postlimiter filter for audio rolloff also is a simple but important part to tailor audio and prevent splattering the adjacent channels with higher frequency audio. In one's own system this splatter could be seen in receivers as high frequency noise; it serves to close the squelch and chop audio. All transmitters built since the 1952-1954 era usually have these desirable characteristics. Receiver differences are equally simple and are comprised of circuit changes for audio recovery, bandpass acceptance, and in some cases squelch circuitry. Discriminators in narrowband equipment must recover 1/3 the audio of wideband systems and are commonly converted by tripling the value of two diode-load resistors or otherwise increasing audio passed on to AF stages. Bandpass acceptance of receivers is modified by replacement of a passive filter in some equipment while in others the change is made by altering the 2nd IF transformer coil coupling. In some cases, a minor change in squelch cir-

circuitry changes biasing to balance relation of a fixed dc voltage and rectified high frequency noise which serves to close the squelch. In all cases, receiver sensitivity increases in narrowband operation, the squelch takes on a more positive operation, and that indefinable sharper sound is noticed. Although some older receivers cannot be converted down to a very sharp 5 kHz modulation acceptance, such gear as Link 1905-1907 (when 2nd IF swamping resistors are removed) are significantly sharper and narrower, tune with sharp peaks, and improve in sensitivity. Others approach the desired bandpass for acceptable performances. All transmitters and receivers in narrowband systems have heated crystals, or otherwise stabilized frequency-determining elements if equipment is that modern. And, of course, the pressure-mounted crystal is out of the question due to tolerances and drift. One of the more important requirements in modern systems is maintaining all transmitters and receivers on the same frequency -- easily done with crystal ovens and quality crystals. Transmitters and receivers should be within about 750 Hz of designated frequency but designs are such that when both drift in opposite directions (the worst possible case), no severe misoperation occurs.

Reviewing all differences and requirements detailed for transmitters and receivers might appear to be a monumental task for the individual but when it is considered that all current properly operating equipment already has these desirable characteristics built in, the situation is not so severe. The conversion kits for nonconverted equipment are simple and inexpensive. Whether using the 5 or 15 kHz standard is a matter of preference; as long as manufacturers circuitry is used, that great gray area of figuring it out for yourself is eliminated.

What about equipment performance? First of all, receiver sensitivity in-

creases somewhat. As noted earlier, squelch operation is less sloppy while sharper performance is noted. Possibility of interference from off frequency or AM stations is reduced by virtue of occupancy of less spectrum and the fellow who tries to whistle stop-tune on channel has a harder time. In the case of older receivers which were never intended to operate on narrow standards, conversions noted above are readily accomplished if only partially.

Unless receivers are converted for better audio recovery (wideband discriminator recovering narrowband audio) there could be marked difference between squelch tail and audio amplitude. Some receivers -- GE Progress, Motorola Research, and Link 1905 -- had audio recovery which was quite adequate for narrow systems. The two-resistor discriminator modification is usually not necessary on these units, but bandpass is another matter. Consider a typical IF-swamped wide receiver to be operated narrow. Unless the signal is quieting the receiver, an undesirable condition can occur in that only 1/3 of the bandwidth in the wide receiver is occupied. The signal-to-noise ratio can be intolerable; intelligibility is degraded. Relay systems usually give adequate signals to receivers if no adjacent channel users are on the air. Ideally, however, the user should try to occupy all of his receiver bandwidth. In the overly broad receiver conditions described above, ignition noise can be a nuisance, but when bandwidth of receivers is modified, intelligibility is less likely to be degraded.

Transmitters in narrow systems, while occupying less frequency than in wide, also produce less splatter and noise. In so doing, an associated receiver working as a part of a relay system is less likely to be interfered with, adjacent channel users receive less splatter, and less spectrum is occupied per user, really not of significance to

the nonconservation-oriented amateur. Despite a tendency to think in terms of "just turning down" deviation, any conversion to narrowband operation should include the other minor requirements mentioned earlier.

And how about performance comparison of wide and narrow systems? The major difference is in signal-to-noise ratio. Narrow bandwidths are more susceptible to ignition noise from high-compression engines without proper noise reduction, particularly at low signal levels. When pushed to the limit, audio recovery in narrowband receivers renders considerably less intelligibility than wideband. In the typical relay system, signals are usually high enough to eliminate this minor difference and performance is usually improved because modern receivers have been designed for narrow characteristics and consequently have better performance. The receiver converted to wideband has been done so at a deliberate sacrifice in sensitivity, but the improved signal-to-noise ratio may more than compensate for this.

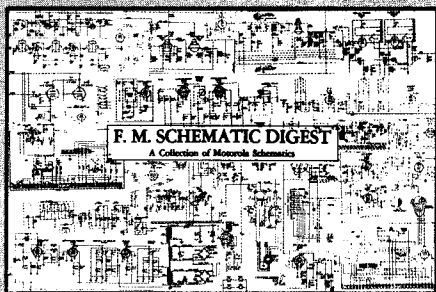
Another requirement of narrow systems is better frequency control -- commercial quality crystals and ovens. Although Sentry or International crystal cost is generally double that of the

average amateur crystal, the equipment into which the high-quality crystal is placed is certainly a grade beyond average amateur VHF gear. Considering the importance of crystals to radio equipment, this is only a small part of costs, remaining with a transmitter or receiver throughout its useful life, not deteriorating such as tubes, and carrying a warranty of performance. How many other parts of a combination is so much trust put into?

Whether choosing a wide or narrow arrangement is immaterial so long as group objectives are met. The choice will depend on equipment available, expected conversion costs, and economics. Despite misinformation available, either bandwidths operate well when all equipment complies with the standard established. No further proof of this is better represented as in the many systems operating in other land mobile services.

If equipment available today is causing you to wonder about what to do, have faith. Most of that older wide equipment can be integrated or converted satisfactorily. A whole lot cheaper, I might add, than widening a MASTR, MOTRAC, TPL, or even Progress-T Power category.

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## MYSTERY GIRL

### Who is she??

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## Canadian Activity Growing on 6 FM and 2 RTTY

At last there is some six-meter activity in southern Ontario. In the Toronto area VE3CSO, VE3FBH, VE3OV, and K9ILJ/VE3 are active on 52.525 FM mobile. This area is a channel 2 fringe area (from Buffalo), thus prohibiting six-meter activity.

A recent release of RTTY machines has inspired an autostart net on 146.7 in the Toronto-Niagara-Buffalo area. Several stations are now active and another ten or twelve will be on soon. The group is using 850 Hz AFSK with squelch-operated motor control. The FM'ers have recruited some RTTY advocates to their group and of course vice versa.

## PALM SPRINGS GOLF SCORES VIA WIDEBAND FM

On Saturday, 11 May 1968, the Edison Amateur Radio Net joined forces with the East San Gabriel Valley Amateur Radio Emergency Corps to provide communications for the Third Annual Edison Golf Classic in Palm Springs, California. The event involved more than three hundred golfers and six golf courses (one course was further than twenty miles from headquarters).

Net control was in the lobby of the convention center at the Holiday Inn-

## MANUFACTURERS CITE PLANS TO ENCOURAGE HAMS TO PARTICIPATE IN NEW ACTIVITIES...

### AREC group to get repeater

The AREC group headquartered in the city of Baldwin Park recently received the OK on its application to install and maintain a repeater at Radio Ranch, California (north of the city of San Dimas). The facility will transmit and receive via wideband FM on 146.82 MHz, and will be remotely controlled from an undisclosed frequency in the 450 MHz spectrum. Donald L. Milbury (W6YAN) will be the licensed control operator. The remote station will be put into operation following a series of compatibility tests to determine if the facility will cause interference to other stations in the immediate area.

Mr. Arthur Fury, representing the General Electric Company, has announced the availability of sample quantities of GE semiconductors (including integrated circuits) for amateurs seriously interested in miniaturization, experimentation, and developmental work. The only string, Fury said, is that the recipient be prepared to allow circuits and design data to be published. The designs need not be new ones, he emphasized, but they must be of a nature that would interest amateurs in general.

Published circuits and articles will be credited to the amateur supplying the design data. The QRM editor may be contacted for further information.

### US-wide Award Program

A special cooperative award program will be initiated this year by most of the major amateur journals. Each magazine will participate by running a ballot whereby readers can nominate amateurs for prominence in particular fields. The awards themselves, resembling Oscars, are to be presented to the winners at SAROC in January. (SAROC, by the way, is the annual superconvention held each year at the Sahara Hotel in Las Vegas.)

These special awards were originated by Sentry Manufacturing Company and are called SARAH presentations, for Sentry Amateur Radio Awards of Honor.

From five to seven awards will be presented by each magazine, a Sentry spokesman said. Categories will be determined by the magazine editors; they may include DX, technical accomplishments, public service, best technical article, outstanding amateur, and a variety of other appropriate categories.

Sentry Manufacturing Company has also exhibited an interest in amateurs. This company announces a special discount price to recognized amateur radio organizations. Speaking for the noted crystal manufacturing firm, Mr. Pete Warren, Sentry sales manager, said that prices would be reduced to encourage joint participation in club "communications" projects. This policy, he said, is not applicable to individually ordered crystals on a piecemeal basis; rather, it is for quantity orders that are placed through the club. Warren offered no restrictions as to frequency, crystal grade, type, or temperature requirements.

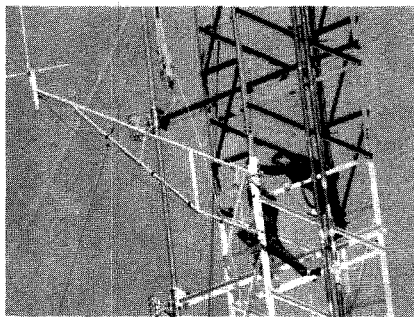
Riviera Hotel. All radio units were wideband FM on 146.82 MHz.

The amateurs passed all the golf scores over the circuit, relaying the complete hole-by-hole tally. Sixteen amateurs participated in the operation: K6AYT, K6BEP, K6CJM, K6KCO, W6JQB, W6NQX, W6VBV, W6YAN, W6ZJZ, W6AXH, WA6JXG, WA6KLA, WA6QZY, WB6HIE, WB6LOY and WB6LOZ.

In Monrovia, California on Saturday, 13 May 1968, the Monrovia Day Association sponsored its annual Western

Days parade and the East San Gabriel Valley AREC was requested to supply parade communications. Net control was set up at the Monrovia police department on 146.82 MHz (wideband FM, of course) with twelve mobile units placed at strategic locations along the parade route. The net used "commercial" type unit numbers rather than amateur calls. This procedure has been found to considerably speed up the traffic-handling process, and proved to streamline the whole net operation. Jack Bankson (WA6JXG), AREC spokesman, said the "unit designation" identifying procedure would be employed at all future AREC net operations.

Amateurs in the Monrovia parade operation were: W6YAN, WA6CJD, WA6DNP, WA6JXG, WA6KLA, WA6PAV, WA6QZY, WB6DZU, WB6HIE, WB6IQT, WB6LOY, WB6LXP, WB6OCA, WB6PZV, and WB6YPC.



# FM across



## ARIZONA REPEATER ASSOCIATION NEWS

By Mary V. Bunn, correspondence secretary

The long-awaited letter arrived with the very important enclosure: the club license, WA7CEM.

Last minute wiring, checking, tuning were completed and the moment arrived to make the first contact on the repeater. It was over the weekend and by Sunday night there were over 3000 contacts made. Never a dull moment! Happiness grew. So did the "bugs"!

There has been quite a bit of trouble with isolation of the receiver. Cavities have been used. All sizes and kinds. The antenna system has been checked and changed and as of this date there are problems in this area.

Coverage is very far reaching but the main issue of the repeater receiver has consumed many man-hours, as the members attacked the problem from every angle, even to changing receivers. All members are checking coverage of the repeater and will compile a map showing the best contact points and we hope to have those points marked on the highways so all visitors to our area can announce their arrival and be assured that a welcome is waiting. If need of aid should arise, we'll know it as the repeater is monitored 24 hours a day.

We plan to eliminate any and all of our problems by the time of the ARRL convention in Phoenix at Del Webb's Townhouse. The plans for the convention are to have a very complete coverage of all phases of ham interest. Displays, exhibits, roundtable discussions, noted speakers, and prizes. And for the girls who "couldn't care less" about radio, there will be a luncheon, bus trips, games, and prizes independent of the noisy, goodtime get-together that hams always enjoy.

In spite of the bugs to be ironed out, we are at least happy to be on the air. We welcome you all to come and visit and assure you of a hearty welcome. If problems arise on your journey we will be glad to assist you even to aiding you to "getting around" in a strange town.

WA7CEM has over 60 members who are looking forward to meeting and talking with the FM readers.

## OKLAHOMA FM ACTION

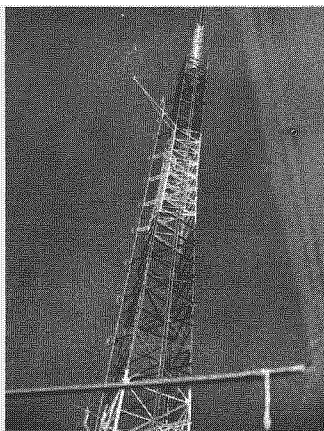
by Pat Devlin WA5BPS

Two-meter activity in Oklahoma is booming. Bartlesville is sporting a new repeater (WA5LDJ) with .34/.94 capabilities. Rumors have it that Enid, Oklahoma will soon be repeating also, under the direction of K5CAY. And Oklahoma City is working on a .22/.82 effort.

Tulsa's famous WA5LVT now has a six-meter repeater going with input on 52.68 and output on 52.525. It normally is interconnected with the two-meter facility (.34-to-.94). Tulsa's ears will get a boost in mid-July when a receiver for the system and a complete 440 MHz repeater will be installed on the KOTV tower at the 500-foot level. The Eastern Oklahoma satellite receiver will be operative soon on Fort Gibson Lake. 440 MHz interconnects with the Bartlesville repeater are also under consideration. All repeater satellites will feed the system via 440 MHz interconnect links. There is simplex activity on 146.76 and teletype on 146.70 in Tulsa.

The WA5LVT repeater now has almost 80 active dues-paying members within a 150-mile radius of Tulsa.

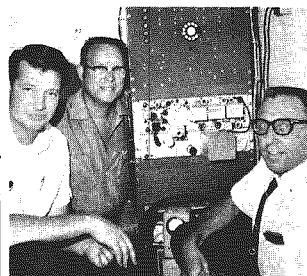
The new Touchtone control system is being installed now in WA5LVT. Its autopatch telephone circuit has been capable of Touchtone operation since early in March.



## SAROC'S FM VOICE READIED



LEFT TO RIGHT: W7AKE-W7FJM Working on the W7DDB FM repeater antennas atop Red Mountain near the Boulder City, Nev. area.



LEFT TO RIGHT: W7FJM, W7AKE, and W7PBV Working on the W7DDB FM repeater which serves the Lake Mead, Southern Nevada, Utah and Arizona area. Input is 146.340 MHz and the output is 146.940 MHz. This repeater will be in top shape for the SAROC Show.

SEE MORE ON THE SAROC SHOW ON PAGES 4, 22, and 23 OF THIS ISSUE. MORE INFO TO FOLLOW IN THE MONTHS TO COME.



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# **SARAH**

## **...the amateur's oscar**

The next annual SAROC and giant FM convention in Las Vegas will be the scene of the most elaborate and extensive amateur radio "awards" program ever attempted. Sentry Manufacturing Company has just announced the initiation of a continuing annual award-presentation program for the ham radio world, to be conducted concurrently by the leading independent amateur journals.

In a ceremony resembling the Oscar and Emmy affairs of Hollywood, prominent amateur radio operators will be awarded "Sarah" trophies, each of which is inscribed with (1) the winner's name, (2) the category of prominence, and (3) the name of amateur journal which determined the winner. The name Sarah was chosen because of its similarity to Sahara, the Las Vegas hotel where the awards will be presented, and because it is a natural acronym for Sentry Amateur Radio Awards of Honor.

Only a few of the categories have been announced by the participating publications. Among them, however, will be DX, VHF, public service, and "outstanding amateur" awards by 73, "technical excellence" and "best article of the year" awards by Ham Radio, and public service, technical achievement, and "best article" awards by FM. CQ Magazine has not yet announced the categories for which it will present Sarahs.

Each of the journals will conduct an independent poll to determine winners in seven categories; none of them has released information yet as to how this

will be accomplished. FM Magazine readers will determine winners in the five categories published below. The two remaining Sarahs will be awarded on a staff-selection basis. These staff-determined categories are "Technical Achievement" and "Contribution to Amateur Radio." These two Sarahs may be presented to either individuals or groups, and both trophies will be accompanied by certificates explaining the basis for award.

The five FM categories whose winners are to be determined by readers are these:

- Best FM Technical Article of the Year
- FM Author of the Year
- FM Public Service Award
- Outstanding FM Amateur
- FM Special Award

Nominations to these categories will be accepted by FM Magazine until 10 October 1968. On this date, three individuals will be selected from each category as official candidates. The names of these candidates will be published in the November issue. The names of all candidates (from all magazines) will be forwarded in early December) to the Sarah Committee who will objectively evaluate the candidates and select the winner in each category. The decisions of the committee will be final.

FM Magazine will award "Professional Amateur" certificates to all three candidates in each of its published

categories, even though only one Sarah will be awarded per category.

Once the Sarah committee has made its decisions, the winners' names will be supplied to Mr. Ray Meyers (W6MLZ), another prominent amateur and ham radio columnist and commentator. Mr. Meyers, as emcee for the SAROC breakfast banquet, will make the actual award presentations.

### How to Select Nominees

Use as much paper as you like to list the names of amateurs you would like to see named as Sarah winners to the five categories. For each category, try to list the name, call, and address of the individual you are nominating. This is not mandatory, but it would be extremely helpful. In as few words as possible, tell the reasons why you think your nominee merits an award. You are entitled to only one nomination per category per journal, so be sure to sign your name and give your call. Here are particulars on the five FM categories:

Best Technical Article. To nominate an entry for this category, write the title of the FM article you feel is the year's best, from the standpoint of technical excellence, general usefulness, or any other reason. Briefly describe your reason for naming it as Best Technical Article.

Author of the Year. Tell which FM author you think best qualified for this title. Your reasoning can be based on quantity of articles published, caliber of material, or any other reason. Briefly tell why you think the author qualifies; even one sentence will do.

Public Service Award. Name an amateur or group who you think has performed an outstanding public service. Describe the service performed by the amateur, organization, or group.

Outstanding Amateur. Name any individual who you believe has best served the cause of FM radio or who has in some way earned the title of Outstanding Amateur. Be sure to state your reason.

FM Special Award. Do you know someone who deserves merit for some special act? Here's the ideal opportunity. Name him for Special Award, and describe your reasons.

The most important thing to remember is to get your nominations in before October 10. As a matter of fact, why not do it now -- before you forget. Use ordinary typewriter paper or stationery. At the top, place your name, call, and address. List the categories, nominations, and your reasons as indicated above. Then mail it to FM-SARAH, One Radio Ranch, San Dimas, California 91773.

## **TORONTO'S BULLETIN: FM CLUB PAPER WITH CLASS**

### **an FM review**

The Toronto FM Association Bulletin consistently provides a wealth of information for the FM'er. The Bulletin is edited by VE3CWA, our own Canadian liaison, and contains technical articles by some of the best. A good example are the occasional offerings from Gil Boelke (W2EUP); he's one of the hottest properties in the FM field today. The Bulletin comes out once a month (as a rule) and contains about ten pages of text, photos, and circuits. A subscription comes with membership in the Toronto FM Communications Association. But if you're too far away to be a regular member, you might be able to work out something just to get on the mailing list. The address is:

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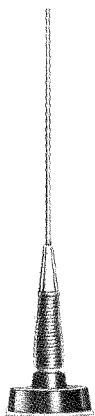
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# A NEW LEASE ON LIFE

## FOR GE 450 PRE-PROG RECEIVERS

BY JIM LEV, K6DGX

Here is a worthwhile modification that will increase the MTBF (a military abbreviation for "mean time between failure") of your "Pre-Prog" mountaintop receiver or mobile unit. Other than the standard afc first-oscillator platter, the 6AM4 rf stage is the second weak link in an otherwise fine receiver; the 6AM4 is the most often replaced tube in the Pre-Prog receiver.

Amperex makes a tube, the ECC88/6DL4, that has proved itself in hundreds of these receivers. While it offers no really noticeable improvement in receiver sensitivity, it doesn't degrade performance by one iota, either. What it does do is last and last. Who doesn't want reliability?

Cost is no problem, either. According to a recent price list, the 6AM4 sells for \$2.72 while the Amperex ECC88/6DL4 goes for \$2.60. Once you have accomplished the simple modification on your first receiver, you'll be able to perform the necessary socket wiring changes in ten minutes.

I claim no credit for originating this innovation; the originator's name is -- as the proverbial saying goes -- "lost in antiquity."

This modification is being used with great success by many service shops.

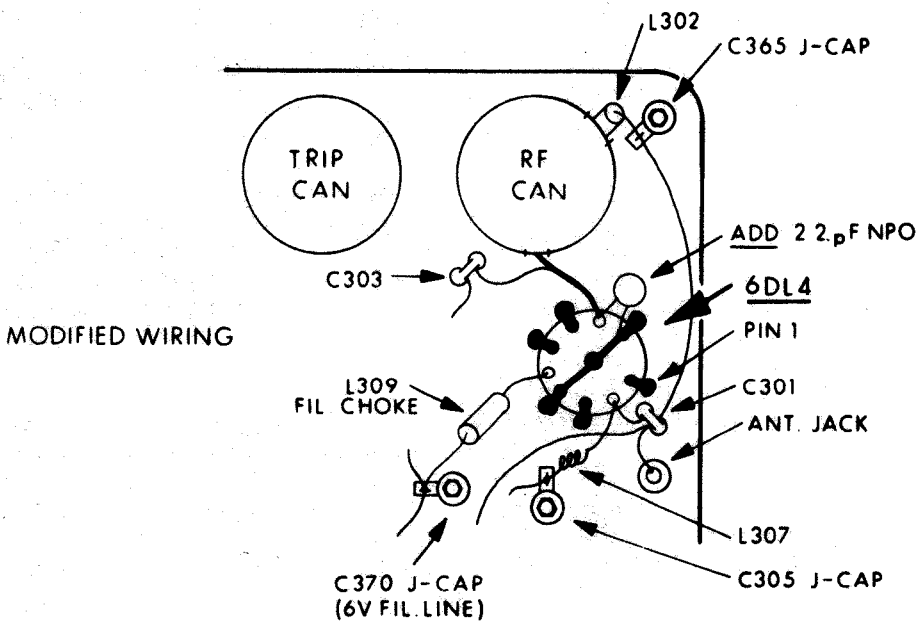
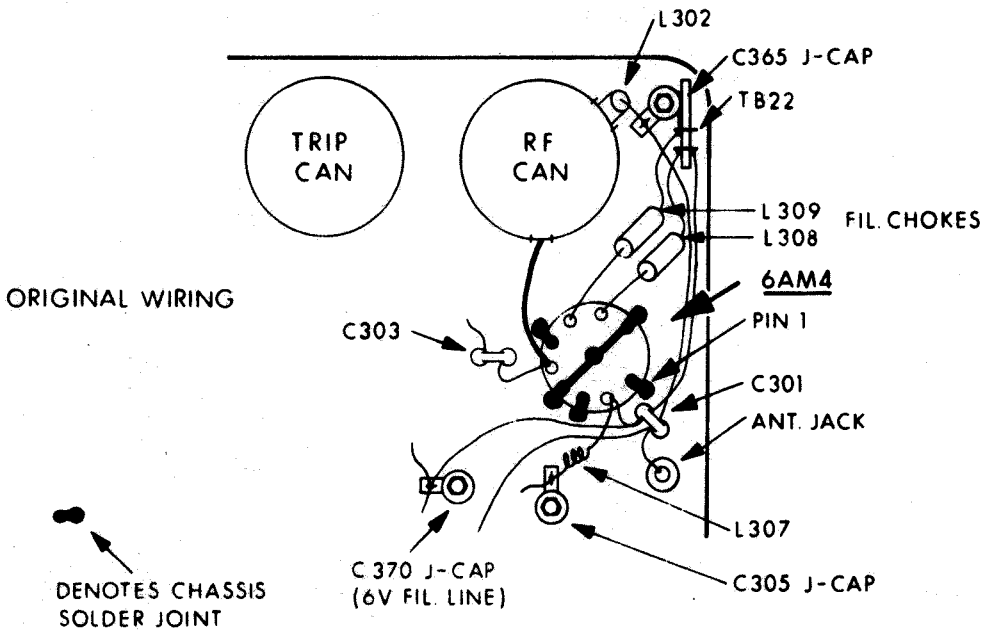
In the Los Angeles area, it is a standard modification for Mobile Communications Service, Chapman TV & Electronics, and Mobilfone.

The Pre-Prog receivers in my own W6FHF remote system at Blue Ridge Summit are also modified with the Amperex tube.

The necessary tube socket wiring changes should be quite evident after a careful study of the pictorial wiring diagram. A 2.2 pF NPO capacitor is added from the 6DL4 plate to ground because of a slight difference in inter-electrode capacitance and to facilitate proper rf stage tuning in the 440-450 MHz region. Naturally, the lead length should be as short as physically possible. Filament choke L309, which normally has the longest leads, is removed from pin 7 and reused as shown at pin 5.

A word of caution is in order: When relocating the plate bus strap from pin 5 over to pin 8, be very careful not to use too much "vigor"; this bus lead can be broken or shorted inside the rf shield very easily. And remember, always check the plate pin to ground with an ohmmeter before applying power: You want an improved receiver, NOT a smoke generator!

# UNDER CHASSIS VIEW



# THE SECOND INPUT CHANNEL

BY GORDON PUGH, W2GHR

In the northeast, as in some other areas of the United States, repeaters are faced with a serious problem -- too much coverage. New repeater installations will, in many cases, have coverage that overlaps the existing areas of other repeaters. Unfortunately, it is seldom possible to tailor the service area to avoid this overlap.

Most repeaters in the northeast, with the exception of the Washington, D.C. to New York City area, operate by repeating 146.34 to 146.94 MHz. As long as the coverage areas do not overlap -- or do so in lightly used places -- few problems will be encountered. However, if two or more repeaters using the same input channel serve an area of considerable activity, chaos may result. Unusual band openings have produced this condition occasionally in recent years.

Selecting the desired repeater becomes a problem. There are several avenues to reduce unintentional operation of more than one repeater:

1. Use tone coded selection of each co-input-channel repeater.
2. Use directional antennas to reduce the signal radiated toward the unwanted repeater.
3. Use an alternate input channel at each repeater.

Many areas have run out of frequencies that could be used as second channels. It would be worthwhile for all repeater users/operators in a region to coordinate frequencies in order to obtain the

best use of both the 60 kHz and "split" channels.

Second channels are nearly nonexistent in the New York City area. A coordination meeting held in June 1968 allocated the last four channels (splits) that were not in use between 146.19 and 147 MHz in the area. These will be used for a repeater in northern New Jersey and one on a tall building in Manhattan.

The second channel is equally effective in areas where the repeater output is on 146.76 MHz or where the output channels alternate between 146.76 and 146.94 MHz. While the second channel will not eliminate overlapping transmitter coverage of adjacent repeaters, it can substantially reduce interference due to keying of unwanted repeaters.

Someone complained at the Paramus FM meeting, "Must I carry a whole trunkload of crystals to use these repeaters?" The "second channel" concept does indeed tax the capacity of most mobiles. And this is an unfortunate condition we simply have to live with. Base station operation, where the second channel does the most good, is more easily equipped for multiple frequencies. But the mobile situation isn't entirely hopeless. Maybe some of the eleven-channel mobile sets will become available in the near future. Or better yet, maybe an inexpensive, simple, and totally compatible synthesizer will come along. The outlook in this regard seems the most promising.

It must also be compatible with the rest of the station operation. If a

duplexer is used at the repeater, the maximum separation between the two input channels is about 60 kHz with the duplexer tuned to the midpoint. The normal insertion loss of 1.6 dB for the Sinclair F150-4E duplexer increases to about 2 dB when used this way. Repeaters using remote receiver sites or other isolation methods are not as severely limited but should keep within the limits of any antenna coupler in the receiver circuits. Mt. Mansfield (W1KOO) and Mt. Beacon (W2CVT) are now setting up second input channels on 146.37 MHz. The land use application for Mt. Snow includes a second input on 146.31 MHz. A second input will be available to Concord, N.H. from Ascutney, Vermont, on 146.46, tone-coded. And the Lenox Mountain repeater group has selected 146.22 MHz as a second input.

The second input has one other advantage. When two or more repeaters can be interconnected on frequencies above 220 MHz, second-channel receivers can be set up at adjacent repeater sites without interfering with the local operation at either repeater. For example, a remote receiver on 146.28 MHz can be installed at Mt. Mansfield and connected to Killington on 220 MHz, and a remote 136.37 MHz receiver can be installed at Killington and connected to Mt. Mansfield on 420 MHz. In this case, the remote receiver at each site would be operated from the common antenna and duplexer without interference to the existing station. Since the remote second-channel receivers will both be 60 kHz off the center frequency of the duplexer at these sites, some additional loss will be introduced. This loss is desirable when the overall site is considered.

Tone coding will work as a means to select one of several repeaters, though it will not solve the main channel congestion problem. It appears that tone coding will eventually be necessary on

a common input channel if activity continues to increase.

Directional antennas and limited power would aid overall operation as has been demonstrated in northern Vermont. The directional pattern reduces congestion on the common channel. This type of installation is desirable at a fixed station but is quite impractical in a mobile.

The alternate - channel approach has more to offer. If regional coordination of second or alternate channel inputs is established, each repeater would have an input channel that would not carry traffic for another repeater within the reception limits of the station. The second input would reduce congestion on the main channel, provide access to only one repeater on an "uncluttered" frequency (that could remain open or uncoded), and also permit remote receiver installations at adjacent repeaters without mutual interference. By using the second channel for base station input, a mobile station could break in more easily when operating in the repeater "fringe area" if both inputs were usable simultaneously. Duplex operation would also be possible.

Repeater activity has expanded north along the Hudson and Champlain valleys during the past ten years. Stations were installed in New York at Mt. Beacon, Troy, Schenectady, and in Vermont at Mt. Mansfield. All the repeaters transmit on 146.94 MHz and receive on 146.34 MHz (except Schenectady, which receives on 146.46).

Two of the repeaters, Schenectady and Mt. Mansfield, are horizontally polarized. The Schenectady and Troy repeaters share much of the same area but are cross polarized and are on different input channels. The only other overlap has been between Mt. Beacon and Troy in a lightly used area



of the Hudson Valley. There were many areas of no coverage between the repeaters, including central-southern Vermont and the western portion of Massachusetts and Connecticut.

A repeater was set up at Killington, the highest mountain in central Vermont, to fill the gap between Troy, Mt. Mansfield, and a repeater in Concord, New Hampshire, also operating on 146.34 to 146.94 MHz. In order to cover this area, it also overlaps the other coverage areas. Mobile stations using these repeaters occasionally pick up Killington. Many base stations operating on 146.34 MHz key Killington in addition to the intended repeater. Recently, W1KOO converted to vertical polarization and many of the stations using W1KOO also changed to vertical. Following the change, about

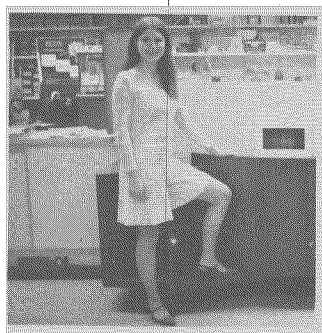
90 percent of the traffic through W1KOO was also transmitted by W1ABI at Killington.

This overlap had been predicted and the repeater at Killington was designed to repeat either 146.34 or 146.28 to 146.94 or 146.88 independently. In addition, the 146.34 receiver can be switched to either "open" or tone-coded operation. If it is programmed to transmit on both outputs, selected by the input channel, use may be made of the alternate output frequency on a time-shared basis with normal operation. Break-in is still possible.

Selection of a second input channel should be carefully coordinated. The frequency should not be reused within twice the maximum normal base station working range into the repeater.

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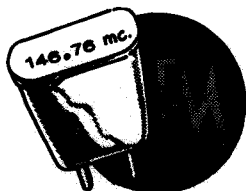
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Circle Number 10



## CHRONICLES OF SEVEN-SIX

By Ken Sessions

In peace and war, man must contend with two basic elements: man and nature. In retrospect, I'm not too sure which was the most devastating to the repeater station Fred and I had built. The problems posed by man against man can be tackled with anger, guile, and second-guessing. But the problems caused by nature's subtleties must be faced with sheer determination.

The MVH/NQS repeater and remote base station is situated four and one-half miles off a paved road deep in closed forest area. When it rains, tight security is placed at all access roads because of the landslide danger, erosion, and deep mud. The U.S. Forest Service rushes men to all such roads where tamperproof locks are placed on all entry points. Access into the area during these times must be on foot.

Coincidentally, during rains, the MVH/NQS repeater and remote base station always fails. Sunny weather means trouble-free, failsafe operation. But rain means malfunctions. And malfunctions mean frustration for two idiots determined to have a smoothly operating machine.

I never believed too much in voodoo. But it does seem strange that rainfall in our area has exceeded all previous records since our system became operative on the hill.

In early December, my wife casually commented that it looked like rain. "Guess I'd better plan on repairing the system," I said, without even bothering to see if an ailment really existed. It was just as well, too, because within minutes the sky was wringing itself out. And in less than an hour Fred called. The 450 MHz receiver was inoperative.

Naturally, when I can't transmit and be heard, it's particularly frustrating to sit at home and hear -- via the 450 transmitter on the hill -- what the hill-top two-meter receiver hears. When the system isn't functioning, channel inhabitants have some innate sense that makes them speak on controversial issues that demand an answer from me.

I asked Fred to walk up the hill to shape things up. I urged. I coaxed. I pleaded. Then I went myself. I parked the car at the locked gate at the bottom of the hill, swore a little at my own imbecility, then began the long uphill trek.

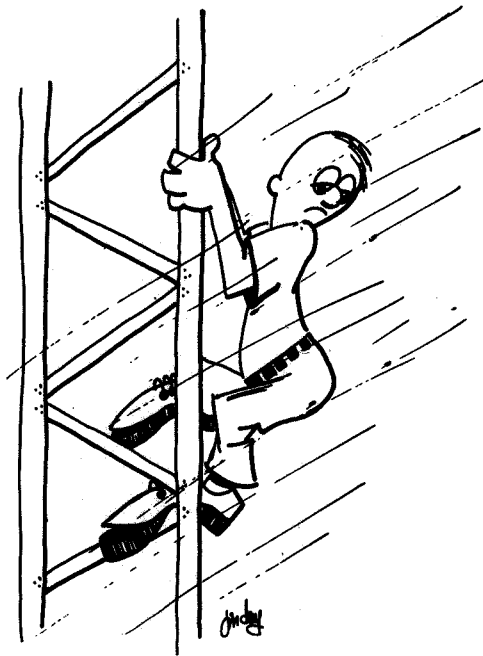
It had never seemed so steep when I had driven the road in the car. Surely the incline must be better than 45 degrees. The further from the car I got, the colder and wetter and muddier and steeper and darker it got. The cloud bank was particularly rough. I couldn't even see the mud through which I waded, and I was all too painfully aware that a sharp 600-foot dropoff awaited me at one side of the road. So I groped at the embankment on the left and inched my way through the slime. I began to wish I'd dressed for the occasion. A business suit and street shoes do not lend themselves well to mountain climbing during inclement seasons.

As it happened, I reached our building as the sky

began to clear. It was cold inside and I was drenched, hungry, and dog-tired. The cement floor was submerged under an inch or so of water or I'd have reclined right then and there. I almost did anyway.

The 450 MHz receiver looked OK. I zipped through the troubleshooting procedure with no signal, and all test points showed good indication. But it couldn't hear. I communicated with Fred on the two-meter system, and he agreed to keep a carrier on the input frequency of our 450 repeater. It wasn't until after I'd disconnected the coax connector to the 450 MHz receive antenna and inserted a screwdriver that I heard his signal. I had isolated the fault to our 450 MHz receiving antenna, but it wasn't a particularly satisfying experience. The 450 MHz antenna is mounted on a ten-foot mast at the top of the 60-foot tower.

But as long as I was there and the rain had stopped, I'd try to fix the antenna. The tower felt like refrigerator coils. Slippery, wet, freezing refrigerator coils. And Somebody Up There kept tabs on what I was doing. As I passed the 30-foot mark, He unleashed the water He'd been saving for me. It wasn't enough for the rain to fall -- it must be driven. And as I climbed the north side of the tower, a cold gale whipped up from the south.



I really didn't give a damn about the system any more. But the Sessionses are noted for their bull-headedness and dogged determination. So I climbed on.

A glimpse at the antenna told the story. A BNC connector vertically affixed to the boom was filled with water. The resulting vawr was great enough to show a shorted coax. I had to climb down, get some electrical tape and a dry rag from the building, and make the perilous ascent again.

But with this minor repair accomplished, the system once more functioned beautifully.

In the end, it didn't really seem so terribly bad. I was halfway down the hill before the blizzard started. And the system didn't crap out until I got home.

While writing the Chronicles of Seven-Six, I stopped at this point. There were a number of things left to be said, but the order in which they should be presented eluded me. Seven-sixers, aware of my project, were rich with suggestions; but none of them seemed totally satisfactory.

Paul Signorelli (K6CHR), who plays such an important role in the story of seven-six, suggested the Chronicles be aired on the Preferred Frequency. After carefully considering some of the libelous content, and weighing the possible repercussions of a wounded ego, I agreed. The Chronicles would be read to K6CHR on request at the rate of one chapter per evening in normal two-way transmission. The first was scheduled for Thursday at 9 PM.

At 9 I began. I used my mobile transmitter to key the hilltop remote rig. The words were eloquent. The delivery was superb. Alas, no one heard it but me. The remote transmitter is equipped with a three-minute timer. Any transmission exceeding the limit causes the remote facility to shut down. With considerable embarrassment, I shut down the mobile rig and bled a little.

Under normal conditions, I would have been able to merely dial the five-digit number that turns everything on again. But Fred had removed the control system earlier to replace the decoder element. To resume operation, it meant going to the hill and connecting the two-meter system into the 450 MHz network manually.

Fred called on the 450-to-450 repeater to poke fun at my fruitless transmission. Fred is cruel. WB6DEJ once said, "Fred has the heart of a small boy; he keeps it in a jar on his dresser." When he'd gotten his jollies, Fred agreed to ride to the hill with me.

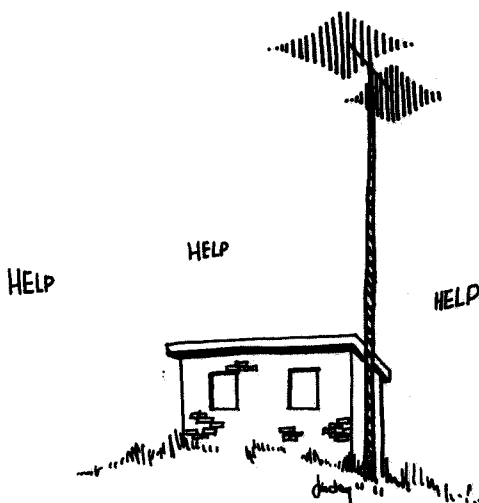
The weather, as it happened, was getting "that way" again. A heartless wind had developed and was working itself into a hurricane. Water drops had been teasing the windshield for the past hour. We knew only too well that if we didn't visit the remote site now, it might be a long time before we could. Neither of us were prepared for another infantry maneuver.

As we drove the dirt road up the hillside, neither of us spoke. Dust whipped the car and tumbleweeds hurled into and over the hood at fantastic speeds. We were both worrying about the condition of our "windproof" free-standing tower.

We breathed audibly in relief as the tower came into view. Everything appeared normal. We unlocked the door to the brick building and went in. It was unusually cold inside. Even the heater didn't seem to help. As I redipped the final on the two-meter transmitter, I felt an icy drop on my arm. Then another. "That looks like snow," I said, and chuckled aloud.

With sudden and sickening horror, Fred and I looked up. There was no roof!

We connected a large floodlight and went outdoors. Large sheets of corrugated metal dotted the wind-swept hillside. The gale was taking its toll. The tower creaked. The snow was less reluctant than before, and began to salt the exposed transmitters



and receivers. On the roof, a mast doubled. An antenna fell. And the wind howled with fiendish glee.

It was midafternoon on the following day before the building again sported a roof. And it was not until then that we really got the chance to appraise the damage. The door had been left open most of the day, and had swollen somewhat, making it difficult to close. The ice on the floor was melting, leaving muddy pools just itching to rust our open relays.

Schematics and notes -- we kept them inside the building on the workbench -- had dropped into the water or blown away. The few that remained were sogged up and smeared so badly the copy was unintelligible.

As I said, the door, which opened inwardly, was difficult to close. But it was cold inside, so Fred helped me push it shut.

That 100-pound steel-on-oak door stayed shut. Now, if I were to tell you that two hams could get locked inside their own brick building and that ex-trication could only be accomplished by removing the door from the outside, would you believe me?

#### EPILOG

When I first announced my intention to record and organize for posterity the chronological events of seven-six into a multichapter tome, I was besieged by queries from channel inhabitants. Did I remember NUC driving his car off the cliff? Was any mention made of the transmitter hunt during which the finders snatched and rehid the transmitter without the operator's knowledge? Did I mention how I dropped my transmission trying to get to my remote site when the rig on the hill was stuck in the transmit mode? Or how the guys from the adjacent FM channel (146.82 MHz) defiled the sacred Wouff Hong rites at the Disneyland ARRL shindig? And a thousand other incidents.

In response, I could have answered that the Chronicles were but a cross section of the FM activity. I could have answered, but it would have been pointless. I surely would have been jammed out!

# DIAL-ON FREQUENCY STANDARD

## LETS YOU ZERO YOUR MOBILES AND BASE STATIONS TO THE UHF REPEATER DISCRIMINATOR BY REMOTE CONTROL...

by C. L. Coltin K6VBT

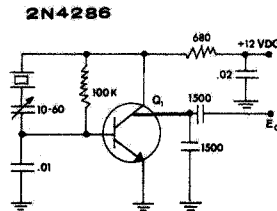
The fellow who first said "Necessity is the mother of Invention" might well have been an FM'er. What remote repeater operator hasn't found it necessary to traipse up to the site for no better reason than to zero in a few user mobiles? In my case, the combination of distance (25 miles to the site) and increasing repeater population (12 users) prompted me to seek a method for accomplishing this function without physically viewing a discriminator meter.

The challenge was posed to our more technically inclined members, and within a short time Bob Mueller (K6-ASK) came up with the perfect solution. He suggested installation of an oscillator at the site that could be dialed on from the control points. The oscillator, crystal controlled at the discriminator frequency, is coupled, on command, into the low i-f of the repeater receiver so the receiver "thinks" it sees a weak on-channel signal. With the oscillator in the circuit, mobile operators with duplexed radios need only zero their transmitters while monitoring the heterodyne of the output for a zero indication.

Since our remote receiver is a GE Progress Line, the crystal oscillator frequency was 290 kHz. In the event you don't feel inclined to construction, Sentry Manufacturing Company sells the complete oscillator assemblies as well as the crystals. The units (less crystal) cost about \$ 5.00 each.\* The Sentry catalog shows various simple

\* Sentry Model F60-112

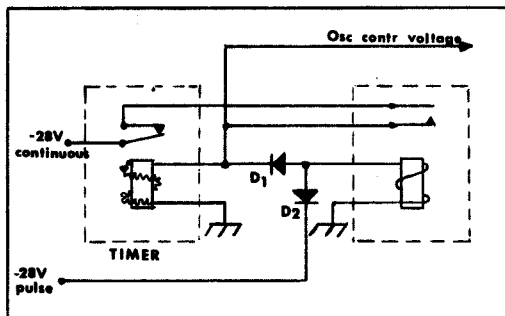
oscillator circuits if you'd rather build your own as Bob did. Figure 1 shows an oscillator circuit that is compatible with a 28-volt control system.



When you install the oscillator, disconnect the repeater receive antenna during setup. Then, with the oscillator in the circuit, tune the dial-on oscillator trimmer for zero on the discriminator, and reconnect the antenna.

If you don't take certain precautions to maintain control of your repeater, you'll likely experience the same sad fate we did: that of being jammed out by our own brainchild. When the oscillator is dialed on, the oscillator feeds the receiver a legitimate signal. And if your signal is weaker than the oscillator's, you've lost control. This problem can be precluded by installation of a timer to turn off the oscillator automatically after a predetermined period (30 seconds or so).

Figure 2 shows how this can be accomplished using a single pulse for control without a latching relay. When the function is dialed on, a -28 volt pulse pulls in the relay, which stays closed because its own contacts supply coil voltage. The timer (an Agastat pneu-



matic type for best results) begins the timing sequence the instant the relay pulls in.

The normally closed timer contacts supply the control voltage for the oscillator as well as the constant relay voltage. At the end of the timed period, the timer contacts open, releasing the relay and removing control voltage from the oscillator.

The diodes may or may not be required in your own control scheme, but it is good engineering practice to incorporate them. Diode D1 prevents the trigger pulse from working too hard; it is arranged so that presence of a negative pulse keys only the relay. Remote owners who don't use diodes in circuits such as this sometimes find themselves with unreliable control systems. When a pulse is required to perform a number of functions, the excessive current can cause the pulse voltage to drop to such a level that many functions may go untriggered. Diode D2 offers nothing more than isolation; it prevents the constant relay coil voltage from appearing at the control wiper arm or the pulse source.

4th Annual  
NORTHEASTERN MICH. HAM-FEST  
OCT. 4, 5, 6 1968

## FM SERVICE CENTER

by Don Chase WØDKU

In both Motorola and GE high-band transmitters using triode modulator stages, if you have low power output, but all voltages and drive levels check out OK, look for high power factor in the electrolytic capacitor from cathode to chassis ground in the modulator stage. If the power factor is high, even though you have adequate grid drive to the final, the power output will be low.

If you come into possession of a very dirty radio, take it to the local "do-it-yourself" carwash. Use the hot detergent generously; just be sure to rinse very thoroughly with clear water. Then take it home, set your oven on its lowest heat (usually 150-175 degrees) and bake for four hours. Any parts that would be damaged by this treatment would need replacement anyway. Just be sure the equipment is completely dry before applying any power. GE technicians even recommend washing transmitter and receiver strips in the family automatic dishwasher.

Using the 6146B in 12-volt mobile transmitters? Check the filament balance: The 6146B draws less current than the 6146 or 6146A.

Tight-fitting slugs in your equipment? An easy way to lubricate them is to use one of the silicone spray products for lubricating sticky drawers, available at most hardware stores and supermarkets.

GE's "Message Mate" is made only in a narrowband version. By carefully stagger-tuning the low i-f filter (the three cans immediately following the second mixer), the units perform quite well on wideband.



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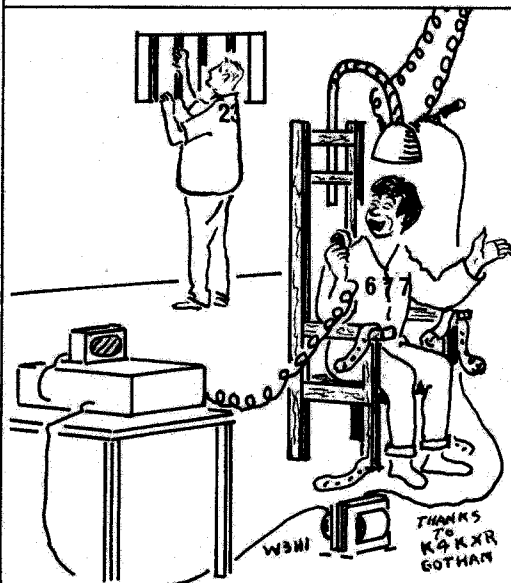
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"Well- one advantage this club has is  
a reliable power source."

## **We're sorry...**

The publication business can be a hectic one. There are times when the editor must become a publisher; the publisher an editor; and sometimes both the editor and the publisher become advertising men.

Sometimes we write and publish opinions or ideas or some other sort of text that is unpopular. Occasionally, we are embarrassed because we have published a partial truth or an inaccurate circuit diagram. Sometimes we design and print advertising copy that pleases the advertiser and sells equipment for him.

But once in a while, we antagonize without intent. So it was with an ad for Newsome Electronics last March. The ad was designed by our staff; the copy read: **TOO GOOD FOR AMATEURS**. The intent, of course, was to show that the equipment used in commercial service is superior in almost every way to the equipment normally available in the amateur market per se. Some readers didn't see it that way, nor did Newsome Electronics. And the result was an unhappy sponsor and a red-faced publisher.

Let it suffice to say that Newsome was not responsible for the copy that appeared, and that no aspersions on the amateur world were intended. There is nothing wrong with a man wearing many hats, but one must expect to find a hat or two ill-fitting from time to time.

Our sincere apologies to Newsome and to our readers.

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## LETTERS FROM FM READERS

ADDRESS YOUR LETTERS TO:

FM MAGAZINE  
Ken Sessions, Jr.  
1 Radio Ranch  
San Dimas (8), CA 91773

This letter is to inform you of how very pleased I am with the contents and format of FM magazine. To say the least it far surpassed my expectations.

Being a total newcomer to FM and its techniques, I am most eager to catch up on the subject and especially on what you fellows have published. Can you give me a price on all FM back issues available?

Do you have any info on what FM activity there is here in the Cleveland area, and if so, whom to contact?

I am personally interested in UHF FM. Can you recommend a Pre-Prog unit, either GE or Motorola, which is the easiest to convert to the 420mc band?

Finally, may I enter a word with regard to FM's cooperation with the ARRL and its handbook. I feel that you would be losing the initiative that you gained through foresight of the growth of FM if you, in effect, gave them the right to print all your articles. I think you should retain your initiative and the confidence of your readers by remaining independent and publishing your own handbook. The ARRL has done its share of good -- and bad.

Albert R Farrant WA8WLI  
Euclid, Ohio 44117

In reference to your article "Civil Strife: Long Island versus Poughkeepsie": I do subscribe to FM Magazine; however, I strongly disagree with the editor on many major points. One specific point has to do with the cluttering up and misusing of our major calling frequency. To obtain a clear view of the editor's feelings let me quote him: "... and eventually, that channel (.94) will be useless as a straight-through simplex channel." Why will it be useless? Well, it'll be useless because "... sooner or later there will be repeater outputs on 146.94 all the way across the country."

I think this is a grave mistake; .94 must not be made a pure communal project with individualistic amateur ing dead or dying.

I am not knocking repeaters. I am knocking the use of them on a calling frequency, and .94 is a calling frequency. Surely amateurs cannot overlook the fact that when an excellent repeater is used on a frequency, no other transmissions can be made within a

radius of 30-70 miles. There may be 50-100 amateur FM stations within that radius, but only two can use the frequency at a time. How stupid and what a waste of frequency!

I enjoy separate station-to-station contact; that is my right. I will probably use a repeater someday. If I do it will be on an "off" frequency. On .94, now, separate contacts can be maintained, three or four different locations at a time within a 30-70 mile radius of my antenna sight; if we had a repeater only one contact would be possible. The above statements and feelings can be disputed a little; however, my next statement cannot.

Everyone wants a calling channel -- some frequency where they know if they transmit they will be heard and also where they will hear. Everyone wants some frequency where the individual stations still matter. Well, we have one. It is .94. Almost every FM'er has .94 in and out crystals, without having to worry about .16, .34, .7, .86, .88 or any other random frequency. Is it so much trouble to pick some other national frequency for repeaters? Well, it sure isn't as much trouble as making the simplex operators move. I want to talk to my mobile, other mobiles, other bases, and even walkie-talkies any time I want to, without having to worry about one person 70 miles away drowning me out.

Please, I ask that all clubs or groups planning to install a repeater plan to consider the frequency as well as the construction. I ask that those FM'ers supporting .94 as a calling frequency write in and support it now, or lose it.

Terry W Hancock WA9KLZ  
11-7 Ross Ade Dr  
West Lafayette, Indiana

THE EDITOR DOESN'T DISAGREE. THE OBSERVATIONS NOTED IN "CIVIL STRIFE" WERE OBJECTIVE, NOT OPINIONATED. AS I LOOKED OVER THE REPEATER DIRECTORY OF THE PREVIOUS MONTH'S FM, I NOTED WITH A BIT OF DISMAY THAT THE TREMENDOUS MAJORITY OF REPEATERS ARE OPERATING 0.34-TO-0.94. THE INCOMPATIBILITY OF REPEATERS AND SIMPLEX ON A GIVEN FREQUENCY IS OBVIOUS. PLEASE UNDERSTAND THAT THESE FREQUENCY USAGES DO NOT NECESSARILY REFLECT "EDITOR'S FEELINGS." ANYONE READING THE LIST OF REPEATER OUTPUTS ACROSS THE COUNTRY WOULD COME TO THE SAME CONCLUSION: 146.94 IS THE NATIONAL REPEATER OUTPUT CHANNEL, WHETHER WE LIKE IT OR NOT. FM MAGAZINE WILL SUPPORT ANY ORGANIZATION WILLING TO UNDERTAKE AN ATTEMPT TO CHANGE THIS ADOPTED CHANNEL.

I just read the June issue of FM. Congratulations! It really grabbed me. I noticed one thing that should be corrected, I think. In "Converting the Handie-Talkie," transmitter section, the paragraph covering the modulator seems to imply that coil L1 should be peaked. This is incorrect. L1 should be adjusted for -7.5 volts on pin 4 of the 2E36 in stage 16U. Otherwise, deviation may be improper.

Bill Lyon WA6VIF  
1775 Coolidge  
Altadena, California 91001

Due to the similarity in other amateur club names in the Reno area, we have elected to change our society's name to:

Sierra Nevada Amateur Radio  
Society, Inc.  
P.O. Box 7808  
Reno, Nevada 89502

Our club calls, K7UGT and WA7JWX, are not affected by this change.

Larry E Oakley, Trustee  
W7DNX

First, I have just been introduced to FM Magazine, and I like it. Next time the wife gives me a couple of bucks I think I'll spend it on the mag. I think Ken Sessions is nuts, but he also is apparently technically well qualified.

The other thing I have in mind is a plan for coping with AM operators. It's called the "Love/Loan" program. First, issue tranquilizers to all FM operators on the afflicted channel. This will help in being especially nice to the AM boys. Once you have established a cooperative atmosphere, you have to work fast since it might not last too long. You scrounge up every available piece of FM equipment, and loan complete stations to the AM boys for a week or two at a time. They will undoubtedly see the light quickly, and once one does, that's one more on your side and one less on the other. There may be a few hardcore cases who won't even try it, but anyone who is reasonable and who already has a two-meter antenna should have no reason to refuse to try it. SSB might have caught on much quicker on the lower bands this way ... who knows?

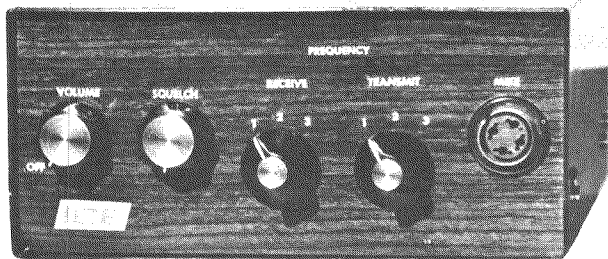
Eric K Albrecht KB8FBH  
2987 Edgehill Road  
Cleveland Heights, Ohio 44118

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**FOR SALE ...** GE DT03, 30-watt T-power. Ideal for repeater use. Six freq.; all accessories including handset, control head, cables, ovens (6), relay. Mint condition. Contact Ed Rasmussen, W4CYE/2, Rt 2, East Chatham, NY 12060 phone (578)365-5303

**FOR SALE ...** (11) 10 ft spun aluminum parabolic dishes, 400 to 8500 MHz, made by Prodelin. Also (1) RCA 450 MHz CMU 15A 6/12V, very clean unit; complete with all accessories and in good condition - \$59.95. Also (1) Motorola PA 8270 remote control with mike - \$35.00. Contact Douglas L. Flair, 1963 Wilcox Ct., Topeka, KS 6608 phone (913) CE3-7580

**NOTICE ...** My classified ad in the May 68 issue sure paid off. Seems as though an Arkansas ham had the squelch module I've been needing. Also received a card from K6GAO in San Diego stating that he had what I wanted. Thanks. Gordon Bean, Saginaw, Mich

**WILL SWAP ...** A 2-meter GE TPL receiver for a 6-meter GE TPL receiver. Contact: Walt MacDonald, K2VOX, 793 Pioneer Dr., North Tonawanda, NY 14120 phone (716)693-1881

**FOR SALE ...** GE Voice Commander III, perfect cond. Crystaled up on 146.94. Includes charger, mike, carrying case, and complete manual. Complete and ready to use w/mi-cad batteries. \$175.00. Lew Reinberg W2BIE, 109-20 71st Rd., Apt 6-A, Forest Hills, NY 11375

**WANTED ...** Two or more wide-band filters type NFN6000AW for Motorola P33 walkie-talkie. Ralph Steloff, 64 S. Cottage St., Valley Stream, NY 11580

**FOR SALE ...** Excellent Geiger counter with accessories, \$35 or will swap for FM gear (two-meter or 450 MHz only). J. Thomsen, W9YVP, 8280 S. Tennessee, Claredon Hills, Ill. 60514

**WANTED ...** High-band transmitter strip for GE Progress Line. Contact Jim Lora, K3ILJ, 2532 Garfield Ave., West Lawn, Pa. 19609 phone (215)678-1623

**FOR SALE ...** Motorola T41G, control head & mic, 2 freq. Tx. \$45; Low Band 80D Tx strip, 2 freq. \$15; Set of Tx & Rcvr. crystals for 80D on 52.525 MHz \$8.00. Charles Copp, W2ZSD, 6 Northfield Ln, Westbury, NY 11590

**FOR SALE ...** 250W RCA Base Station, complete with crystals for operation on 52.525 MHz. Works fine and extra clean, will also include a remote for operation up to 15 miles away, via phone line. Would also consider trading for some VHF or UHF equipment. Price without trade: \$200 R. E. Tillotson, 4 Alpine Dr., Taylors, S.C. 29687

**WANTED ...** Will buy, borrow, or rent an instruction manual and schematics for RCA type CT 12A, MI-31437 VHF FM transmitter, 152-174 MHz rack mount. Contact William K. Fink, W7ORG, 221 Pershing Dr., Las Vegas, NV 89107

**WANTED ...** GE or Motorola portable and/or base-repeater stations for Civil Defense use (Price open to question) converting whole CD operation to FM and need equipment very badly. Commercial outfits are welcome to submit catalogs for perusal too!! Van W2DLT, 302FM Passaic Ave., Stirling, N.J. 07980 (Please - clearly identify makes and models and clearly describe condition.

**FLEA MARKET.** At Ben Lami's Closed Circuit TV Center, 12pm to 4pm every Sunday. West-bound Rt. 46 in Little Falls, N.J. Bring any and all used or new amateur gear.

**WANTED ...** Info on Westinghouse receiver style 1477037 FM operates on about 160MHz Believe old railroad rig. I need power requirements and pin connections. J Stutesman WABGRI, 519 Elm, Saginaw, MI. 48602

**FOR SALE ...** 2 Motorola low band 41GGV mobile units. No accessories, 2 freq. \$60 ea. Dick Wolf, W8GMS, 1963 Brainerd Rd., Lyndhurst, OH 44124 - (216) 442-0261

**WANTED ...** Hi-band pocket xmtr and rcvr or xcvr. Also For Sale or Trade: Johnson Ranger I, 6N2 and VFO. J. R. Ott, K9AHX, 2319 Dakota Dr., Lafayette, IN. 47905 474-4668

**FOR SALE ...** GE 30W base on 94- GE 60W base on 94. Link 40W base, 3 channel: SCR522, AC power- 432MHz 4cx250 in final; 2 Mt. 4cx250. Need good quality rcvr strips Mike Fetckenko, K8ICZ, 20323 Champaign, Taylor, MI 48180 (313) 291-9567

**FOR SALE ...** GE 6/12V ovens at \$2.50 p.p.d. GE Hi band TPL \$200. Motorola FMTRU 80D 2 freq-rx & tx. Sensicon A rcvr and Ameco preamp. Wallace Murray, 5696 Williams, Dearborn, MI 48126

**NEED ...** Conversion info for RT66, 67, & 68. Bruce Sugarberg, 1415 DeWitt Dr., in Akron, OH 44313

**NEED ...** Manual for Motorola T44 7A 450-470MHz. R. E. Schlenker, 5646 Skyway Dr., N.E., Comstock Park, MI.

**ATTENTION ...** Take a post card today and send your freq. of the repeaters in your area to: FM Magazine Repeater Directory 1 Radio Ranch San Dimas (8), CA 91773

**WANTED ...** A repeater for the Detroit area. We need workers to help get this thing out of the basement and up on the site. ....K8IYZ

**TRADE ...** Two 4CX250s and two 4X150A's for three 7034's Trade GE FM Transceiver 4ES12C, 150-174MHz with control head and cables. Needs new power relay & osc. tuning capacitor. Want 5W Handie-Talkie or low-power AC base (Hi-band). F. Harmon, PO Box 203, Owasso, OK 74055

**FOR SALE or TRADE ...** Signal Corps. (Motorola) high band transceiver (T-278/U) transmitter and type R-394/U rcvr with control head. All in Alum. case 10x18x19- complete with power supplies. Excellent cond. \$125.00 (FOB Newport News, VA) R. Arthur 5 Eastwood Dr., Apt. L., Newport News, VA 23602

**WANTED ...** Any FM equipment available in the N. Calif. area. Mail order not preferable, but will consider it. Especially looking for GE, Motorola gear (circa 1960 or later), 2 meter or 450 MHz, mobile or base. Edward H. Zumstein (WB6NCO) 6 Wilshire Ave., Vallejo, CA 94590

**WANTED ...** Motorola FMTRU 41B(A) AC unit or 41V(AF) front mount 6/12V or similar low-power unit. If similar unit in low-band, wide band is available, will consider. Gerard A. Baldauf, W3JKH, 175 Wernersville Blvd, Wernersville, PA 19565

**NEED ...** Aerotron schematics, data, and 150MHz equipment. Especially need units with com bo 6/12/110V supplies, and info on compatibility with Motorola or GE subaudible tone squelch systems. B. Cooper KV4FU, Gen. Deliv., Frederiksted, St. Croix, Virgin Islands. 00840

**NOTICE ...** The second issue of "Two Meter FM Activity in the Chicago Area" will be published in September. This is a listing of the known two-meter FM activity in the NE Illinois area. Single copies may be obtained by sending a 9 1/4 x 4 inch self-addressed stamped envelope to Frank Cerny, K9VVL; 8922 W. 24th St., N. Riverside, IL 60546

**BACK ISSUES ...** Please do not send money for back issues of FM because there just is not any to send back and this makes a lot of work for us to send it back to you. I might hope that you could find someone you could get some from to photo copy.

**WANT ADS ...** FM Magazine PO Box 5203 Grosse Pointe, MI 48236

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**WANTED ...** Manual or alignment info on Motorola 5V. Richard Bennet, WB6UKB, 259 S. Dearing, Fresno, CA 93702

**NEED ...** Two power change-over relays for GE ES12-C (The one that changes power from rec. to transmit. Fred R. Harmon, PO Box 203, Owasso, OK 74055

**SALE ...** Several RCA CMU3E 6M xcvsr with partial access. These are 60W output, 2freq. easily converted to 12V by adding resistor and changing 4 wires; or make good base station. Only \$30.00 ea. Richard Beaty, 1904 114Ave. Tampa, FL 33612

**SALE ...** GE transmitter with (6146's), 63W out with .94 crystal, AC pwr supply, hi-impedance mic input and all new tubes. A Regency TMH rcvr with FET preamp, fully transistorized, AC or 12V. Sensitivity less than 0.3uv. for 20db. All of above for \$250.00 or trade for Gonset or Swan SSB VHF gear. T. W. Hancock, WA9KLZ, 11-7 Ross Ade Dr., W. Lafayette, IN. 47906 (743-0468)

**WANTED ...** GE ProgLine, low band, 60W. Also looking for 4-freq. deck for hi-band Prog Line. Bob Coburn, W1JJO, RFD 2, Tinkham Ln., Londonderry, NH 03053

**NOTICE ...** Sunday, August 18, 1968 will be the Third Annual MINI-HAMFEST, Boone County Fairgrounds just north of Belvedere, Ill. on Highway 76. Talk-In on 146.94 MHz. For more info contact: Dan Hammell, WA9ZT, 1227 Moore St., Beloit, Wisc 53511

**WANTED ...** 2nd receiver osc. Plate Tank Coil for GE Prog-prog, hi-band receiver. GE part number PL-7138048-G1. Need 3 but one will help. To K2JMU, 6651 Bishop Rd., in Rome, NY 13440

**FOR SALE ...** Motorola 80D, wide band, 12V, 2 freq'ble, with 52.525 MHz transmit & receive crystals. Ready to operate with mic, control head, cables and speaker. \$80.00 Ed Pores (WA2ZBV) 16 Dorchester Drive, Manhasset, NY 11030

**FM PICNIC ...** August 18th, Same location as always, at the 4H Park on Crooked Lake at Angola, IN. A real pot Luck Picnic, eating about 1pm All families to bring a covered dish with goodies and drink and extra paper plates & etc. for the bachelors. All bachelors are to bring a pie or something. Anyone may bring goodies to sell or swap. We are asking 50¢ donation to help pay expenses. Games for the children and ladies. Price for the Flea market sales - is a donation of a part for our free drawing. Planned talks on TV, RTTY, and Repeaters. For anyone arriving on Saturday, the Official Hang-out will be the Red Wood Motel on Hy. 20. All to get together for Dinner and go open a Keg & have a big rag chew. All FM'ers welcome.

THE END.....



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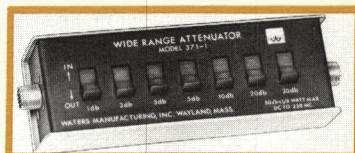
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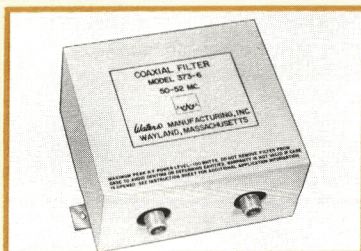
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