FM

volume 2, number 8

35c

IN
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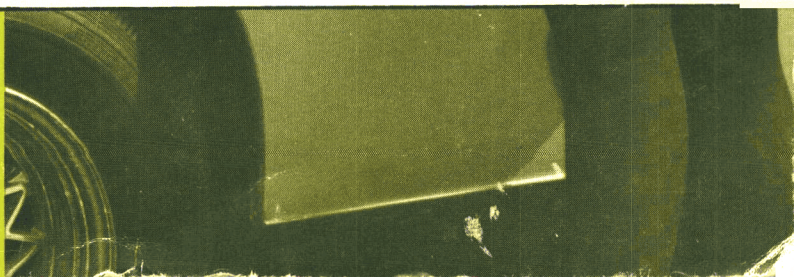
ZENER SQUELCH
NI-CAD CHARGER
TOUCHTONE DECODER
G-151 SERVICING

AMATEUR REPEATER DIRECTORY

SEPTEMBER 1968



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Circle Number 1

FM

SEPTEMBER 1968

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An FM Editorial

FM and the LEAGUE

A letter from a prominent amateur in New York questioned FM's editorial policy as related to the ARRL. The well-meaning amateur suggested it might be better for FM not to criticize the League, regardless of the justification. A kind comment, he said, would do more to command League support. Praise the League, he went on, even if it means inventing something to praise about.

Perhaps, as he suggested, there have been negative undertones with respect to the ARRL in FM Magazine. This is no accident. I think the ARRL is so conservative that it is doing ham radio more harm than good. The people there are so afraid to move on anything new and different that all radio suffers as a result. As a consequence, my attitude is reflected in FM. It could be that ARRL would bend more if the screws were loosened a bit, but it could be the FM readers wouldn't appreciate such whitewashing. The largest single reason for the tremendous success of FM is that we take an independent and unflinching stand for issues, and that we don't knuckle under to the ARRL. The overwhelming number of letters I've received from readers tends to bear this out. Softening up of the ARRL treatment would only hurt FM in the eyes of our readers. For this reason, we will maintain the independent spirit already instilled in our readership, regardless of whether or not this involves ruffling the feathers of the Newington group.

When you're unhappy with the way the Government is being run, do you offer critical protests or do you support its every move with unstilting loyalty? I'm a criticizer. If things aren't done the way I think they should be, I start running off at the mouth. So it is with the League. As a paid up member, I have the right AND THE DUTY to make my feelings known. If enough of us did it, the League would have to work FOR us or simply fold up.

Would the Auto Club lobby for a law to restrict the driving rights of the majority of its members? Of course not! Yet, the ARRL pushed through the incentive licensing thing which cost the average amateur and League member a healthy percentage of his operating rights. It seems to me the League supported the cause of a minority at the expense of the majority. As a member, I was justifiably incensed. As an amateur, I was outraged. And I still am.

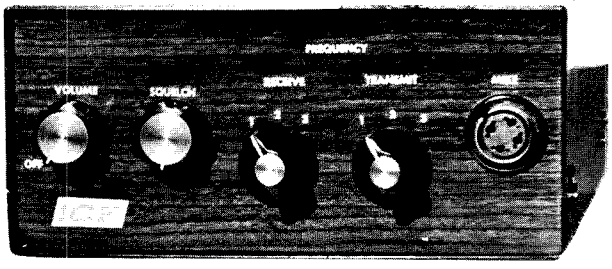
So, with due respect to the amateur's comments on how best to get League support, let me say that I really don't care if the League supports FM Magazine or FM as an operational mode. FM is representative of the modern-thinking ham. Every aspect of FM is a slice of something radically different from the old school. For this reason, I believe that FM is inevitably to be bigger than the League.

When they (the League) don't fall in line with the real way it is, they'll only look foolish and stupid. And they won't want to maintain that image very long, I'm sure. This is why the League wants to include FM as part of the handbook. This is why they are looking for articles dealing with this phase of ham radio. Those people aren't fools; they can see the trend. My guess is that the ARRL knows the VHF AM is dying and FM will take its place.

What kind of magazine would FM be if it kowtowed to the ARRL, lauding it for no good reason, patting it on the back when it should be kicking it in the rump? Another CQ, maybe. That's not good enough for me and it's not good enough for Mike. FM --regardless of what the ARRL does or doesn't do -- will be the voice of modern radio as it is. And when change is warranted to keep pace, FM will change. Our whole magazine is dedicated to this concept.

AT LAST!

2 Meter FM Transceivers



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FCC ABOLISHMENT... an answer to the 'Spectrum Squeeze'?

by DON MILBURY W6YAN

Continued squishing in the rf spectra gives rise to radical proposals from top-echelon wheels—

The spectrum squeeze now being felt by the communications industry isn't likely to let up. As a result, wilder and wilder plans are being formulated to ease the existing crisis. In a recent talk to the Illinois State Broadcasting Association at Quincy, Illinois, FCC Commissioner Robert Bartley proposed complete abolishment of the FCC in favor of a dual-agency frequency control and allocation scheme.

As part of his reasoning for the unprecedented proposal, Bartley cited the fact that no significant changes in communications law had been incorporated in nearly 40 years! He said the FCC was so overwhelmed with legal procedures that it was unable to keep pace with the rapidly expanding communications technology. After 20 years of vast expansion of communications facilities and FCC regulatory responsibilities, the FCC has increased its personnel complement by a mere 71 people since 1947, and many of these "were consumed by new management procedures and techniques imposed on the Commission."

The spectrum squeeze was slowed (but not stopped) with the recent "splitting" order, whereby land mobile users were required to halve their bandwidths to make way for a new wave of users. However, as pointed out by Neil Sclater in Electronic Design's "Electronics in the Public Sector, Part III" (ED, 18 July 1968, pp 42-45), this practice is limited in effectiveness because there is still a finite spectrum in which users can be jockeyed.

A possible approach was offered by William Plummer (one-time secretary of the FCC and now an associate director of the FCC's Office of Telecommunications Management). He suggested that further tightening of "equipment manufacturing standards" would allow "much more productive use of the spectrum...with less interference and more communications per unit of spectrum." Frequencies near and between TV stations could be used, he said, if home television receivers were made more selective.

Of all the proffered solutions to the problem, Commissioner Bartley's was the most "way out." His proposal involves the establishment of separate agencies for broadcasting and common-carrier services. With Bartley's approach, spectrum allocation would be performed by a special legislative group known as Telecommunications Resources Authority. Citing additional reasons for his controversial proposal, Bartley said his scheme would provide "a more effective management of all telecommunications resources in the national interest," as well as preclude the possibility of "encroachment of the Executive Branch over the field of commerce, ...defense, and foreign affairs."

A SIMPLIFIED TOUCHTONE DECODER

FOR AMATEUR REPEATER USE

by

PAT DEVLIN WA5BPS

&

DICK PEMBROKE K5LDR

In the June issue, Bill Strack (WA5ZTJ) gave some excellent arguments for Touchtone as a control system for amateur repeaters.

The Tulsa repeater recently converted its automatic phone patch to Touchtone and was amazed by the increase in reliability. Our engineering group immediately decided to use Touchtone exclusively for our control system.

Since Bell Telephone's central office equipment is not readily available to most groups, the first chore was to design a decoder which would give the desired degree of reliability yet be relatively inexpensive to build.

After considerable research into various decoding methods, we came up with basic design shown in figure 1. We have had considerable experience with single-tone decoders and the various pitfalls of each type. This design has all of the best features of each previous design.

A printed circuit board (figure 2) was designed for the decoder since in the WA5LVT repeater there are five sites where control functions are necessary. While each board in itself is a complete two-tone decoder and can be used by itself for a single function, it was necessary in the WA5LVT system to have a variety of control functions at each site.

Rather than build a board for each function, which would be rather expensive, it was decided to utilize computer techniques to recognize the individual tone outputs from each board and combine them to give an output for each digit decoded. Thus, only four boards are needed to decode all digits. With 10- and 12-digit decoders, one-half of one board is not used since it is necessary to recognize only seven different tones.

Components were picked for their cost and availability. The only critical components in the decoding system are the 88 mH five-for-a-buck telephone toroids and the accompanying capacitors. Metalized paper capacitors such as the Vitiman Q capacitors are recommended here.

On each board there are two individual circuits, each used for recognizing one tone out of a dual tone pair. The outputs of these circuits are kept separate; thus, each tone can be decoded separately for ANDing in various combinations to produce all ten digits. However, if one wanted merely to decode one Touchtone digit (tone pair), he would just series the two output stages by connecting pin 22 to pin 4 and grounding pin 3. This would cause pin 20 to go to ground only when both tones were present. By connecting a relay or other appropriate load from pin 20 to some + supply (+24V) a single function is accomplished.

Each circuit on the decode board basically breaks down into a high-gain audio amplifier with parallel-resonant traps on the first two stages. These traps are high Q types providing an amplifier bandwidth of approximately 1.5% at the 50% points. Transistor Q3 provides a very efficient

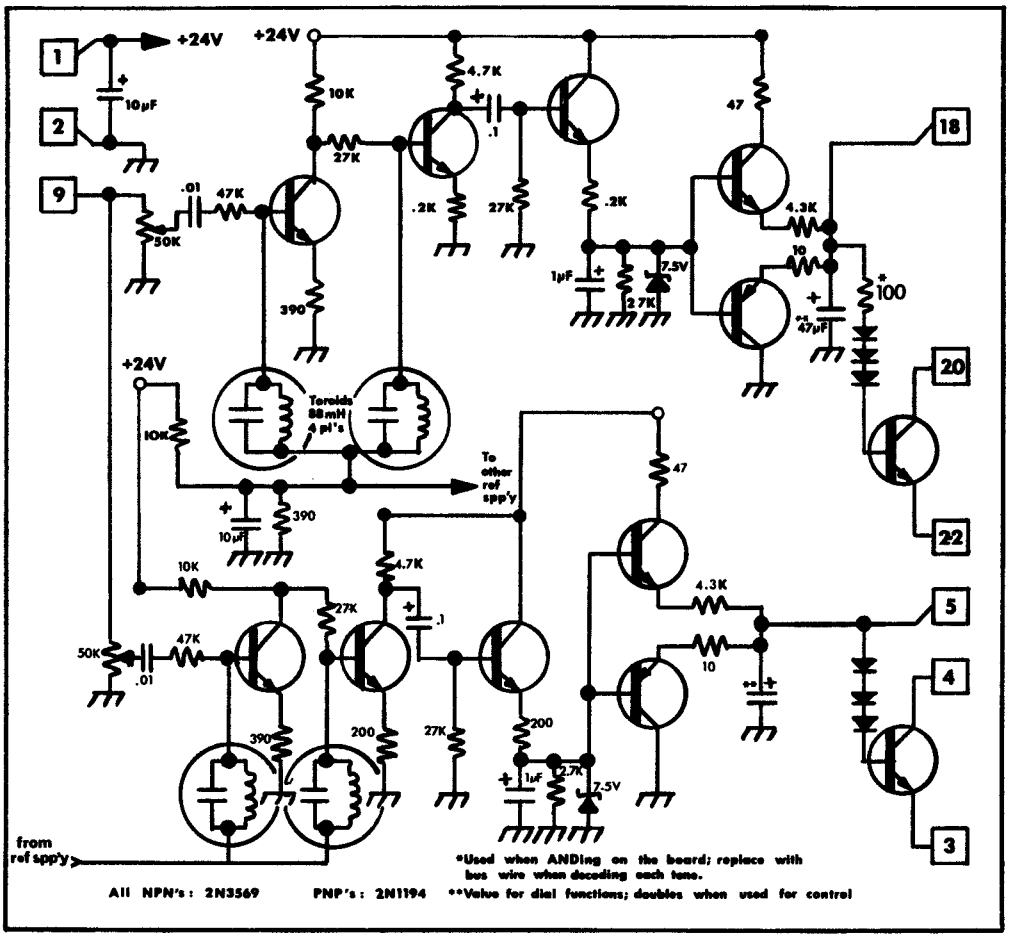

FIGURE 1. SIMPLIFIED TOUCHTONE DECODER CIRCUIT

rectifier circuit for producing a dc voltage when a tone signal passes the first two trap stages.

Transistors Q4 and Q5 work in a complementary circuit to process the dc voltage into a sawtooth charge-and-reset waveform. The function of this sawtooth circuit is to produce a slow response and quick reset to any unwanted signals (noise) that might activate the decoding stages. The output of this sawtooth circuit drives a dc amplifier which has a sharp threshold level (approximately +2.25V).

A test point is provided for monitoring the voltage drive to the base of the dc amplifier. When connected to the typical FM receiver with its squelch open (noise) the voltage at the test points will run approximately 0.25 to 0.5V positive, and will saturate at +2.5V when a tone is properly decoded.

The output stage is capable of driving relays on integrated circuit logic directly.

Where the Bell System divides the tones into the high group and low group, this decoder does not attempt to do this. Each tone is recognized individually throughout. Where the full bank of decoders is utilized, preliminary bandpass filters could be used ahead of the tone groups.

The bandwidth of the decoder is approximately the same as the Bell version. Speed of recognition is slightly slower than the Bell version--less than 100 milliseconds (still plenty fast enough for amateur use).

The Tulsa repeater designers have gone one step further in their decoding system. After the tones are detected and processed to individual outputs, a diode matrix system and simple timing device provides us with ten separate "exchangers," each having 112 functions. (We have committed the last two digits for use in our automatic phone patch, thus reducing our number to eight exchanges.)

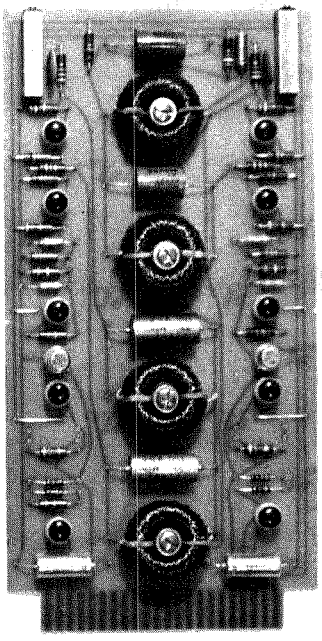

FIGURE 2.

THE TOUCHTONE DECODER IS BUILT ON A STANDARD CIRCUIT BOARD. VIEW SHOWS LAYOUT OF THE FOUR TOROIDS ON THE CARD.

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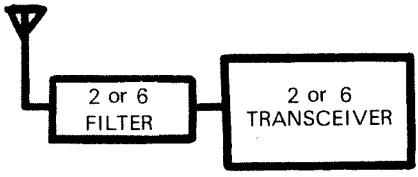

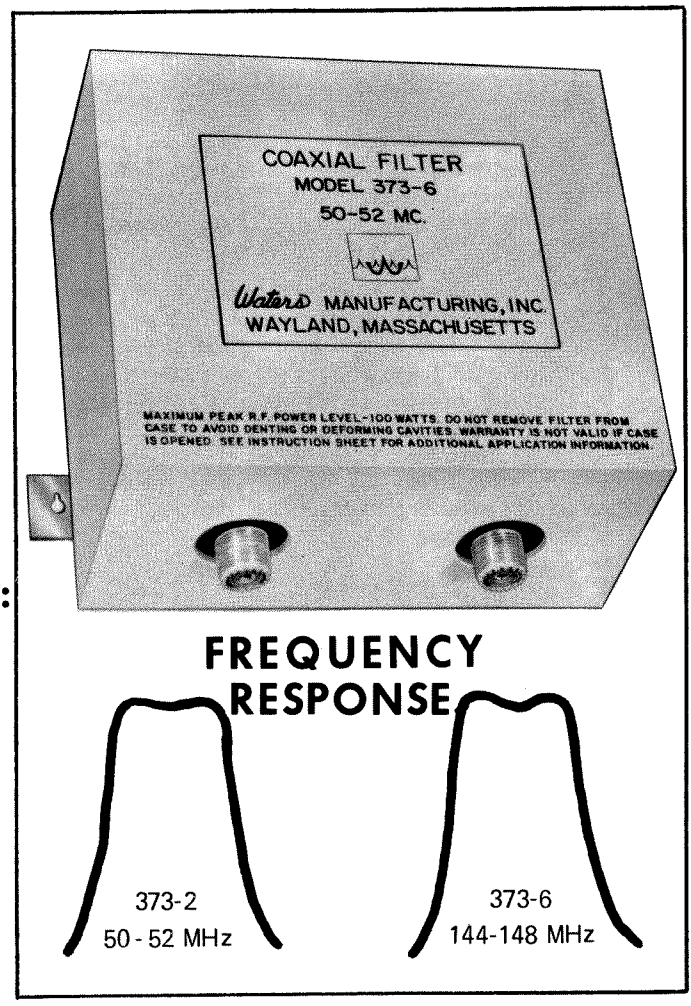

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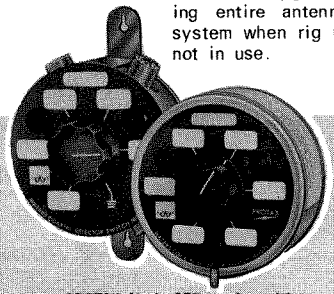

PROTAX Mod. 375 . . . 6 position rear mounted axial connectors $13.95

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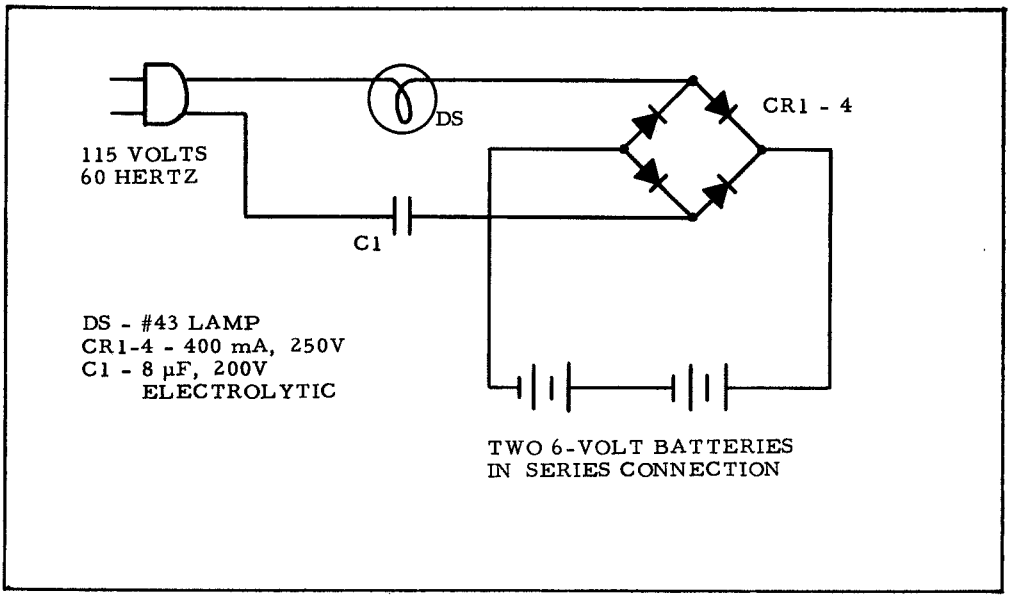
Controlled Charging of Ni-Cad Batteries

by NEIL McKIE WA6KLA



A desirable feature of a ni-cad charger is the capability of supplying a diminishing charge to the battery to minimize the gassing characteristic of ni-cad cells during the final charging hours. (See "Ni-Cads: How NOT to Ruin Them," K6MVH, FM Magazine, May 1968.) Motorola's approach is both effective and easy to duplicate, as shown in the circuit.

The capacitor in the circuit is selected according to the charge rate required, which should be on the order of 10 percent of the ampere-hour capacity. In the case shown, the ideal battery to be charged would be the 4 ampere-hour types used in Motorola's P33 and P31 units. The 8 μF capacitor drops the initial charge current to approximately 375 mA.

The #43 lamp serves several functions. It is fuse for the entire circuit and it acts as a charging indicator. But most important, it is a current-limiter. The #43 lamp draws approximately one-half amp. By replacing it with higher- or lower-rated lamps, the charge rate can be controlled to some degree.

If the charge rate is to be changed to any great extent, the capacitor value should be changed. The proper capacitor for charging the 250 mA-hr cells in the Handie-Talkie series of units would be 0.5 μF.

The lamp exhibits the greatest degree of brilliance when the charge cycle is initiated. Toward the end of the charge, the lamp dims somewhat, indicating charging is complete.

FM Repeater Directory

No attempt has been made to record all repeaters. Those listed in the directory are repeaters of the "open" type, designed for free use by all FM amateurs. There are approximately 350 additional repeaters currently in use, all of the "closed" or private concept. Corrections, deletions, additions should be addressed to FM Magazine, One Radio Ranch, San Dimas, Calif 91773, and marked "FM Repeater Directory."

Repeater	In	Out	(Location) Coverage	NOTES
		ALABAMA		
W4RFR	146.34	146.94		
		ALASKA		
		(none)		
		ARIZONA		
WA7CEM	146.34	146.94	Greater Phoenix area	
W7AJU	146.34	146.94	Prescott	
		ARKANSAS		
	146.34	146.94	Little Rock	
		CALIFORNIA		
W6FNO	146.82	146.70	San Gabriel Valley, Los Angeles	
WB6SFU	146.28	146.70	Los Angeles area	
	146.34	146.94	Los Angeles area	
WB6AAE	146.2	146.8	Grizzly Peak	
WB6TSO	146.2	146.8	Central Coast	
W6NCG	146.85	147.71	Meadow Lakes	
WA6YCZ	146.85	147.71	(Mt Umunhum)	
W6DOO	146.85	147.71	(Mt Allison)	
W6AQU	146.85	147.71	(Mt Toro)	
W6AEX	146.2	146.85	(Mt Vaca)	
W6CX	147.8	146.94	(Walnut Creek)	
K6IXA	146.34	146.94	Modesto	
K6JIM	146.0	147.7	Central Valley	
WA6VFO	146.52	147.18	Los Angeles	
WA6MPV	145.12	146.9	Los Angeles	
WB6GUA	146.44	146.94	Los Angeles	
WB6DSL	146.34	146.94	San Diego	

Repeater	In	Out	Location (Cov'ge)	NOTES
CALIFORNIA (Cont)				
WB6QEO	51.20	51.0	Alameda	
WB6QVV	51.20	51.0	Placer County	
WB6LJR	51.624	51.024	Santa Clara	
	51.624	51.024	Solano County	
WB6NDJ	51.70	51.075	Alameda	
CAROLINAS				
W4WID	52.76	52.525	Lenoir NC	
WA4FYS	52.76	52.525	Burlington NC	
		146.98	Burlington NC	
W4DCD	52.78	52.525	N Wilkesboro NC	
	52.525	146.9	N Wilkesboro NC	
	52.76	52.525	Columbia, SC	
	146.34	146.94	Columbia, SC	
COLORADO				
	145.32	146.92	(Grand Junction) Western Colorado, East Utah	
	145.32	146.92	(Grand Valley) Local backup for above	
	146.34	146.94	(Cheyenne Mt) Pueblo, Colo Springs	
	146.34	146.94	(Denver)	
	146.88	146.94	(Denver)	
CONNECTICUT				
W1VVK	146.34	146.94	(Avon) South to Newhaven and	
W1VVK	146.94	52.92	East L.I., North to Greenfield, Mass	
W1LRC	146.34	146.94	(Danbury) Intermittent operation	
K1PKD	52.80	146.88	(Stanford)	
K1TKJ	146.31	146.88	South Conn and L.I., N.Y.	
W1LVL	146.94	52.525	East Conn	
DAKOTAS				
(none recorded)				
DELAWARE				
		(none)		

Repeater	In	Out	Location (Coverage)	NOTES
		FLORIDA		
WB4HAE	146.34	146.76	(Tampa)	
	146.34	146.94	(Starke)	
W4RKH	146.34	146.94	(Ft Walton Beach)	
K4HYE	146.34	146.76	(Miami)	
		GEORGIA		
		(none)		
		HAWAII		
	52.525	53.52	Diamond Head	
	146.20	146.80	Diamond Head	
	147.0	146.80	Diamond Head	
	148.01	143.98	MARS	
		IDAHO		
		(none)		
		ILLINOIS		
W9ZND	146.46	146.88	Upper Chicago	
WA9DZO	146.10*	146.85	MAPS Chicago	
WA9EAE	146.46*	146.64	Chicago	
WA9EAE	146.34*	146.88	SARA Chicago	
WA9ORC	146.34*	146.64	(Moving to 146.76 out) Chicago	
WA9VJZ**	146.34*	146.64	(Joliet)	
W9NGI	147.75*	147.50	SRO CFAR	
W9YRB	146.34	147.80	(Aurora)	
K9KGO	146.34	146.94	(Petersburg)	
*Data not 100% reliable.				
**Also:	146.385	146.987	Joliet	
		INDIANA		
	146.94	52.525	(South Bend)	
WA9GOP	146.46	146.88	(South Bend)	
		IOWA		
		(none)		
		KANSAS		
W0DKU	146.34	146.94	Wichita (extended)	
	146.34	146.94	Topeka (intermittent)	
WA0CJQ	146.34	146.94	(Salina)	
	146.34	146.94	(Canton)	
WA0OFH	146.34	146.94	(Kansas City)	
	52.70	52.525	(Kansas City)	

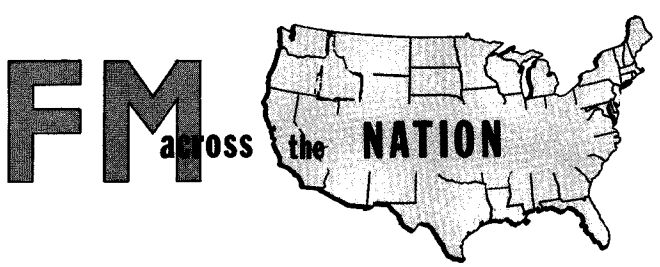
Repeater	In	Out	(Location) Coverage	NOTES
		KENTUCKY		
W4MOP	146.34	146.94	(Louisville)	
K4UCS	146.34	146.94	(Owensboro)	
		LOUISIANA		
			(none)	
		MAINE		
			(none)	
		MARYLAND		
WA3DZD	146.34	146.76	(Harmans) Balti-	
	52.525	146.82	more, Wash D.C.	
	146.22	52.525	(Baltimore)	
		MASSACHUSETTS		
W1VAK	146.34	146.94	(Cape Cod)	
	146.94	52.92	(Cape Cod)	
	146.94	52.525	(Cape Cod)	
W1CDO	146.34	146.94	New Bedford to	
W1CDO	146.34	52.525	Providence	
W1DRP	146.34	146.94	Wooster and	
	146.34	52.525	Boston	
	146.34	146.94	North Adams	
W1ALE	146.34	146.94	Concord N.H. to Boston	
		MICHIGAN		
K8TIW	146.34	146.94	Kalamazoo (intermittent)	
WA8OYE	146.34	146.76	Detroit	
		MINNESOTA		
W0PZT	146.54	146.85	Hennepin County	
		MISSISSIPPI		
			(none)	
		MISSOURI		
	146.34	146.94	Kansas City	
	52.70	52.525	Kansas City	
W0CJW	146.34	146.94	St Louis	
		MONTANA		
			.34-to-.94 in the works for Anaconda, Butte	

Repeater	In	Out	(Location) Coverage	NOTES
		NEBRASKA		
	146.34	146.94	Omaha	
		NEVADA		
W7DDB	146.34	146.94	Las Vegas	
W7DDB	146.94	147.84	Las Vegas	
K7UGT	146.94	146.34	Virginia City, Reno	
		NEW HAMPSHIRE		
W1ALE	146.34	146.94	Concord (thru Boston)	
		NEW JERSEY		
		Coverage from N.Y. repeaters		
		NEW MEXICO		
WA5KUI	146.34	146.94	Alamagordo	
WA5JDZ	146.34	146.94	Albuquerque	
K5CQH	146.46	147.06	Albuquerque	
WA5DMQ	145.50	146.50	Roswell	
W5PDO	146.34	146.94	Los Alamos	
	146.34	146.94	Caprock	
		NEW YORK		
WA2VNU	146.34	52.72		
	52.80	146.76		
K2SDP	146.34	146.76	Schenectady	
W2GHR	146.34	146.94	(Manhasset) Ver-	
		146.76	mont, Mass, N.J., N.Y.	
W2OQI	146.34	146.94	Long Island (Center Moriches)	
K2GUG	146.34	146.94	(Buffalo)	
	146.76	52.92	Suffolk County	
W2CVT	146.34	146.76	(Poughkeepsie)	
W2CVT	146.94	149.40	(Poughkeepsie)	
K2GVI	146.94	146.76	(Utica)	
K2GVI	146.34	146.94	(Utica)	
W1JTB	146.94	146.34	Tone operated (Manhasset)	
WB2YQJ	146.94	?	(Milbrook)	
W2YRL	146.46	146.94	(Syracuse)	
K2AE	146.46	146.94	(Troy)	
WB2NNZ	146.34	146.94	(Newburgh)	
		OHIO		
W8LGL	146.34	146.94	(Delaware)	
	146.34	146.76	(Lorain)	

Repeater	In	Out	(Location) Coverage	NOTES
		OKLAHOMA		
WA5LVT*	52.68	52.525	(Tulsa) Extended coverage	
WA5LVT*	146.34	146.94	(Tulsa) Extended coverage	
WA5LDB	146.34	146.94	(Bartlesville)	
*Interconnected for common output				
		OREGON		
K7TBL	146.34	146.94	(Eugene)	
WA7ANG	146.76	146.58	Portland	
	146.76	146.94	(Newport)	
	53.46	52.92	Dalles (Mt Livingston)	
	146.34	146.76	(Pendleton)	
	146.34	146.76	(LaGrande)	
		PENNSYLVANIA		
K3UQD	146.34	146.94	Pittsburgh	
	146.34	146.76	(Alternate for UQD)	
K3PQZ	146.34	146.76	York	
WA3ICC	146.34	146.76	(Harrisburg)	
WA3BKO	146.34	146.76	Philadelphia (Berwyn)	
	146.34	146.76	State College	
	146.40	146.46	Sayreville	
		RHODE ISLAND		
W1CDO	146.34	146.94	Providence	
	146.34	52.525	Providence	
		TENNESSEE		
WA4HBY*	146.34	146.94	Memphis	
	146.94	146.20	Nashville	
	146.22	146.94	Nashville	
	146.34	146.94	Chattanooga	
W4IWV	146.34	146.94	(Shelbyville)	
*Not offical call.				
		TEXAS		
	53.05	53.15	Fort Worth	
W5OZW	146.34	146.94	Fort Worth	
W5YUO	146.16	146.76	Fort Worth	
WA5LDL	146.34	146.94	(Tyler)	
WA5QLA	146.28	146.88	Houston	
	146.34	146.94	Austin	

Repeater	In	Out	(Location) Coverage	NOTES
	TEXAS (Cont)			
	146.22	146.82	Dallas	
	52.85	52.95	Dallas	
	146.34	146.94	San Antonio	
	146.34	146.94	(Port Arthur)	
	UTAH			
	146.34	146.94	Salt Lake City	
	VERMONT*			
W1JTB	146.34	146.94	Killington (multi-state coverage)	
W1KOO	146.34	146.94	Mt Mansfield (multistate coverage)	
	146.34	146.94	Mt Snow	
*See also listings for New York.				
	VIRGINIA			
W4GCE	146.22	147.42	Lynchburg	
W4DXC	52.72	52.64	Richmond	
K8SXO	146.76	52.525	Ridgeley	
K8SXO	52.525	146.76	Ridgeley	
	WASHINGTON (STATE)			
W7AAG	046.34	146.76	Spokane	
W7AJF	146.58	146.76	Upper state	
W7DAQ*	146.76	53.29	Longview (intermittent)	
W7DAQ	53.29	146.76	Longview (intermittent)	
	146.34*	146.58	Seattle	
	146.76*	146.58	Seattle	
	145.26	147.21	Yakima	
	52.525	53.29	Richland	
*Interlinked, with precedence to .34.				
	WASHINGTON D.C.			
W3JCN	146.34	146.94		
	WEST VIRGINIA			
Coverage from neighboring states.				

Repeater	In	Out	(Location) Coverage	NOTES
WISCONSIN				
.34-to.94 under construction for Milwaukee.				
WYOMING				
No FM activity in Wyoming.				
CANADA				
VE3NPS	146.22	147.24	Niagara Falls	
VE3RPT	146.46	146.94	Toronto	
VE3RPT	146.46	147.06	Toronto	
VE3SIX	146.22	147.24	St Catherine	
VE2CRA	146.46	146.94	Ottawa	
VE2CTR	146.46	146.94	Quebec	
VE2TA	146.34	147.06	Montreal (intermittent)	
	146.52	147.5	Eastern Montreal townships	
VE2MT	146.46	146.94	Montreal	
VE3SSM	146.34	146.94	Sault Ste Marie	
VE7MQ	146.34*	146.58	UBC (Vancouver to Seattle)	
VE7APU	147.33*	146.58	UBC	
*Precedence to 146.34.				



EDITOR GIVES FIRST-HAND REPORT ON FM REPEATER ACTIVITY FROM CALIFORNIA TO THE GREAT LAKES

From the looks of the FM activity across the country, the time is not too far off when a west coast station can hook up with any other area at will. I have just returned from an extensive mobile tour of the U. S., and was surprised to find a remarkable degree of uniformity in system operation from one activity center to another.

I took two transmit crystals (146.34 and 146.94 MHz) and one receive crystal (146.94 MHz), and found action in nearly every city of respectable size. I went from California through Phoenix, Albuquerque, the Texas panhandle, Oklahoma City, Tulsa, Wichita, Topeka, Kansas City, St. Louis, Chicago, South Bend, and straight through Michigan to Detroit. The only location of conspicuous and inexplicable inactivity was Oklahoma City.

Phoenix was hopping! A .34-to-.94 repeater was operating and was teeming with action that could be heard for nearly 50 miles either side of the city. The input coverage wasn't quite as good, but reports in Phoenix indicate imminent improvement here. The Globe, Arizona repeater (reported in the FM repeater directory) turned out to be a private remote system with a 450 MHz input. Kind of a shame, too, because the coverage of that 146.94 remote system was unbelievable. The thing is located on Mt. Pinal and provided solid communications to my .94 flea-power mobile from 40 miles west of Phoenix to nearly 100 miles northeast of Globe. The opportunity for extended conversation with the Globe and Phoenix machines gave me the chance to learn in detail about activity in Tucson, Flagstaff, and other areas of Arizona.

The Albuquerque repeater turned out to be a disappointment. As I went through the city, I kept keying the .34 transmitter and listening for a telltale squelch tail. I heard one once. Immediately one of the locals came on to inform me the repeater was poorly situated. I continued through the metropolis hoping to get within range, but never did. My end assumption was that the poorly situated repeater was buried somewhere about 500 miles out of town. I made no contacts on .94 in Albuquerque, either, but that could be attributed to the hour at which I passed; it was between 7 and 8 a.m.

The rest of New Mexico and the Texas panhandle was a drag. I could have saved wear and tear on the radio by shutting it down completely. One signal broke the squelch one time, but it was probably an AM'er passing by in another mobile.

I stopped in Oklahoma City to tour the big Sentry Manufacturing Company plant, but I got there too late in the day--it was already closed. I checked into a motel there and spent some of the evening hours monitoring .94. I heard lots of stations, but none of them was local. The signals I heard were coming from the WA5LVT machine in Tulsa, about 150 miles away! Before settling in for the night, I decided to make a detour into Tulsa the following day.

Before I go on, I would very much like to make one more side comment: People who travel around the country find themselves with the inescapable problem of finding decent places to eat. There are tour guides and Auto Club recommendations, but the task is still for the most part a hit-or-miss proposition. I traveled a total of nearly 6000 miles and tarried at perhaps a hundred places along the way for food, coffee, or both. Nowhere -- but nowhere -- did I find coffee such as is served at the Rowntowner Motel in Oklahoma City. I will swear the chef at the Rowntowner must have discovered the secret sought after by housewives since the coffee bean was invented. Never in my life have I tasted such perfect brew. I get the urge to go back just thinking about it. I had four cups in the Rowntowner grille, took two paper cups full to my room, and came back for more before the grille closed. In the morning, I filled up my thermos and took as many paper cups full as I could carry. And I was out before I hit Tulsa. If you go through Oklahoma, it's worth a 50-mile side trip just to taste the coffee at the Rowntowner.

The Tulsa repeater is an extremely well organized system of tremendous activity and few problems. Virtually every two-meter FM'er operates through the Tulsa machine. Pat Devlin demonstrated system control and showed the operation of the integral Touchtone telephone system. The Tulsa repeater is a classic example of how a repeater should be run; it includes automatic logging, 3-minute identification (with a very sexy voice), and excellent coverage. Like the Phoenix repeater, WA5LVT leaves something to be desired in terms of input coverage because output range exceeds input by about two to one. But a new and better receiver location is in the works and should be a functional part of the system within a matter of weeks.

The Wichita repeater is the only one I used where the input and output coverage were the same. I was unable to get into the machine at about the same time I could no longer hear it. The repeater, controlled

and maintained by Don Chase (WØDKU), is high enough to give excellent coverage over the Kansas flatlands. On occasions, Don says, the Wichita repeater makes two-way contact with the repeater in Tulsa. Plans are under way for a controllable link somewhere between the two cities which can be used as an intercity tie. Such a system would be a major initial step in the interconnection of cross-country links.

Topeka purportedly has a repeater, but it wasn't operational on either of my two trips through the city. A part-time repeater, I feel, is nearly as valueless as no repeater at all. The prime attribute of a repeater is to give extended coverage consistently. Extended coverage on an occasional basis can be done on the lower frequencies without the use of a repeater. It may be that the Topeka repeater was merely down temporarily for repairs, but reports from the area indicate the repeater operates on a "whim" basis.

Kansas City was alive with action--to such an extent that I could scarcely get a word in edgewise! The repeater seemed best characterized by growth. Of those I talked to, about two out of five were newcomers to FM. I'm not sure that the KC .34-to-.94 repeater is the only machine in the city, but if it is, it probably won't be for long. The intense activity warrants the development of extra channels and new repeaters.

There's an unseemly long stretch across Missouri with no activity at all. As I drove through this country, I almost got the impression that radio itself was unheard of. But the St. Louis action compensated for the long period of inactivity. The St. Louis repeater was the only one I used in the entire country where the input pattern seems 180° from the output. I could trigger the repeater from the west long before I could hear it, and was putting in full-quieting signals from my five-watt mobile when the repeater transmitter was just spotty. East of St. Louis, the situation reversed. The repeater poked unbelievably strong signals deep into Illinois when my mobile couldn't even so much as trip the squelch. Actual coverage of the St. Louis repeater, however, is excellent in spite of this disparity.

Chicago remains a mystery to me. There must be at least three operational repeaters in and around Chicago, but I couldn't hit any of them. I suspect they are tone-controlled and cannot be accessed by transient mobiles. Indiana seems to be an FM stronghold; I was able to work Indiana stations direct on .94 while mobiling through the center of Illinois. There was some interference, however, from various distant repeaters too weak to be heard on my own mobile rig.

The activity from Chicago to Detroit was all "direct." Many repeater construction projects are in high gear, and the coming months should see the installation of repeaters in such areas as Kalamazoo, Detroit, and Windsor, Canada.

I went through much of the same area on my return trip, but forked off at Topeka and headed northwest to check out Colorado and Utah. I might as well have stayed home, though, because I could drum up no action in either state.

I could hear stations in Colorado, but they were almost too weak for me to hear and I'm sure my mobile couldn't have been heard by them. I went as far north as Pueblo and could hear distant stuff which I assumed to be from Denver. I went on to Utah through Durango, Colorado, without hearing so much as a squelch break.

I didn't really expect much in the south part of Utah, anyway. Most of the FM subscribers live in the extreme north end of the state. My receiver didn't get active again until I got to Flagstaff, and even then I couldn't make out the calls. I assumed the weak signals were those of the big machine in Globe, but I couldn't be sure.

Of all the repeaters and remotes encountered on my trip, none had the coverage of Jim Lev's (K6DGX). I made solid two-way contact with Jim right after crossing from Arizona into California on the last leg of my journey, and was able to converse with him (and with Gar, W6AXM, who has a remote in the same general area) for the balance of the trip--a distance of nearly 400 miles.

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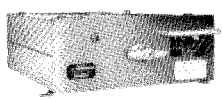

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FM Service Center

BY DON CHASE W@DKU

If the hum level is too high on a transmitter using the General Electric EP-4 series power supplies, check the filter capacitors in the bias circuit. Also, remove the lead of R532 from C511, and reconnect to microphone low (pin 1 of the microphone receptacle). Do this only if you do NOT intend to use a carbon microphone.

###

Don't be afraid to "borrow" methods and materials from other professions. The handiest tools to use when working on pocket-size portables include surgeon's forceps, jeweler's eye loupes, a machinist's vise (used to hold subassemblies during soldering and testing) and even such simple things as round wood toothpicks.

***

Just a touch of silicone grease on the threads when installing antennas will keep the parts from freezing together just when you need to disassemble it. It will also tend to weatherproof the connection.

:::::

Early-model vibrator power supplies for GE Progress line mobile equipment used two capacitors in series in the high voltage circuit. One was 15 μF, the other was 30 μF. A 56K 2-watt resistor should be connected across each capacitor. If the capacitors go bad, make sure that the 15 μF is replaced with a 30 μF.

A quick check of capacitors connected in series (high voltage power supplies) is to measure the ripple voltage across each capacitor. Use the ac portion of your VOM with a 0.1 μF capacitor in series, or the "output" position of a Simpson 260 or equivalent.

***

It is never a good idea to use the broadcast radio loudspeaker instead of the one made for your rig. Commercial two-way radio loudspeakers are restricted-range types, selected to match the audio response of the radio. Also, connecting of your two-way audio to a broadcast speaker will result in distortion and reduced level because of the mismatch and inherent resistance across the speaker when two output transformers are attached.

++++

Narrowband Motorola equipment using Permakay filters can be widebanded the easy way by jumpering around the Permakay. In most cases the unit works OK, but once in a while the squelch circuit will act up. Check the diagrams of a similar wideband model, as one or two resistors in the noise amplifier may need to be changed.

###

GE Progress line receiver power supplies use a 1/8th amp fuse in the B-plus circuit. If this fuse blows often, the 6AQ5 probably is at fault. The proper replacement for the fuse should be 1/4 amp as field experience has shown a tendency to blow the 1/8 amp fuse from transients.

:::::

A good source of U-bolts for fastening antenna assemblies is the local automotive parts house. Muffler clamps come in many sizes, and will fit against a flat surface without deforming pipes and tubing. While at the store, check the possibility of using plastic wiring-harness tiedown parts to hang coaxial cable.

The Two-Way Repeater

by Gordon Pugh W2GHR

Have you ever thought that a "local" repeater--serving a limited area for that every-day communication--should also be capable of "extended" coverage? Sounds easy--and in some cases, it is. A different input channel or perhaps tone coding could just key up the PA .....

Here is an approach to the local-and-extended coverage operation when the repeater is at the edge of the "local" service area using directional antennas to limit access and coverage to a specific area.

The repeater site in question is on the edge of a large metropolitan area where there is considerable activity on the input frequency. The circuit to be described keeps an ear on the overall input channel activity but allows weak stations in the "local" area to capture the station in the presence of strong signals from outside. The first requirement is similar coverage of the local area on both the local and omni antennas. The repeater must be capable of operating on either antenna without receiver or transmitter adjustment or interference. The only requirement is a quick-release COR (by adjustment, in most cases) and a good quality antenna relay (it will see many operations under no-load conditions).

The circuit will accept tone-coded (tone burst) signals on the omni antenna and all signals on the local antenna. This allows "extended" operation from either the local area or from within the extended area upon request (tone burst) by the user. At the end of each continuous transmission the station returns to the local-open/extended-tone coded mode and will examine each incoming signal received.

Circuit Description

A single receiver is used with a carrier-operated relay (COR) and audio tone decoder. Relay closures from the COR and tone receiver are connected to the selection circuit. A high-quality coaxial relay is connected to the diplexer "antenna" terminal, the normally closed path connects to the omni antenna and the normally open terminal connects to the directional antenna.

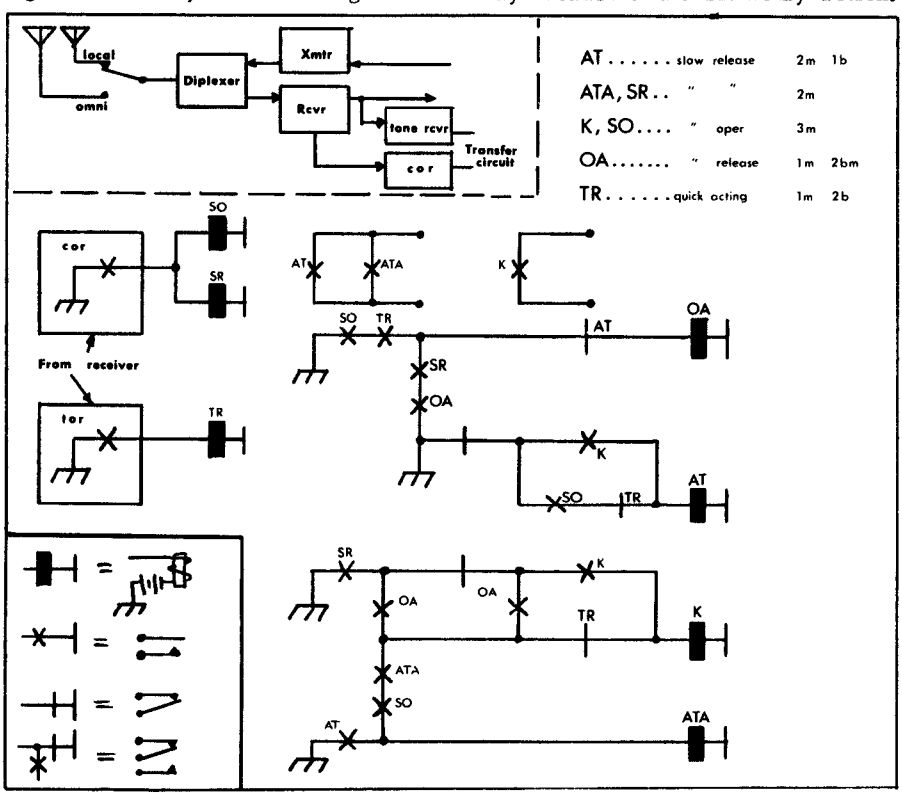
When an incoming signal is received on the omni antenna, contact COR closes a path to the SO and SR relays. The SR operates quickly. The SO relay operates after 150 ms. If a tone is present at the tone receiver, contact TOR operates the TR relay. A path is completed through the TR contacts, the normally closed AT contacts and the SO contacts operating the OA relay. The OA relay locks on itself through the normally closed AT contacts, the SR and the OA contacts. Closure of the OA relay opens the path to the AT relay and closes a path through the OA and SR contacts in the K relay circuit. The operated TR relay prevents operation of the K relay. When the tone ends the TR releases, completing the circuit and operating the K relay which locks out the TR contacts, preventing false release of the K relay by subsequent tone signals. The K relay operates the repeater input keying circuits

to activate the repeater. When the COR releases, the SO releases followed by the SR, the K and the OA relays.

When an incoming signal without the tone is received on the omni antenna only the COR operates, closing a path to the SO and SR relays. Operation of the SO relay closes a path through the normally closed contacts of the OA and TR relays and the SO contacts operating the AT relay. Operation of the AT relay opens the path to the OA relay, closes the path to the ATA relay, and operates the antenna relay, switching the receiver to the directional antenna. Operation of the ATA relay follows the AT completing the operation path to the K relay through the normally closed TR contacts, the ATA, AT and SO contacts. Relay K is slow to operate and pulls in only after time has elapsed to permit the COR to drop out, releasing the SO relay and breaking the K relay operation circuit. If the COR drops out due to lack of signal at the directional antenna, the AT relay will release after 250 ms, breaking the ATA relay operating circuit. During this interval the antenna relay remains operated holding the receiver on the directional antenna. With the release of the ATA relay 250 ms after the release of the AT, the antenna relay releases, returning the receiver to omni directional monitoring.

If a signal is again received, the sequence is repeated.

If the COR remains operated after transfer to the directional antenna, the circuit is completed to the K relay which energizes, locking the AT relay until release of the K relay and transferring control of the K relay to the SR relay. Momentary release of the COR relay is not transferred to the K relay because of the SR relay action.



Improving the Gonset G-151 FM Communicator

BY BILL HARRIS K9FOV

The Gonset G-151 FM Communicator is a rather late model of commercial two-way gear that may as yet be unfamiliar to amateurs not engaged in land mobile service work, but it does happen to be one of the more common sets in some areas. The G-151 falls under the heading of "licensable" gear, and as such may be used legally in commercial service, although some are appearing on the used equipment market at various prices. This may be due to the fact that it is a rather delicate piece of construction when compared to the more popular makes, and tends to require more frequent maintenance as a result. In addition, the G-151 had a few design shortcomings that have plagued service shops no end.

This article is intended for the enlightenment of the amateur using or contemplating the G-151 FM Communicator, and as a possible help to the two-way service technician who might like to help his clients who have these units achieve more satisfaction from their equipment.

The main problem that I have found with the G-151 has been the receiver; the transmitters seem to have only one major fault which is usually easily corrected with the installation of three new 6360 tubes in the driver and PA stages. The receiver, however, as it comes, generally leaves something to be desired in the way of sensitivity, stability and squelch action.

General Improvement

The first item is to run a complete tube check, replacing any that flunk for any reason. The 6FG5 rf and 6U8A first mixer and multiplier are best bets to watch for shorted or flat condition. These tubes run excessively hot in a stock unit, and as a result don't last long. Correct this by replacing the 47 ohm, 1/2 watt resistor feeding the rf screen with a 22K or 27K, 1/2 watt. Incidentally, if you have to replace the 6FG5 and don't have one handy, the old reliable 6AK5 or even a 6CB6 will do the job as well without changes. (Gonset made some fantastic claims about the 6FG5, but in truth the tube was nothing more than a frame-grid version of the 6CB6. At present, all VHF tube types, including the 6CB6, are made as frame-grid types.)

While you have the soldering iron hot, locate the 1K (1 watt) resistor feeding the plate of the 6U8 first mixer from B-plus through the first high i-f can primary. Replace this with a 10 or 15K, 2-watt unit. Changing these resistors should actually increase the sensitivity of the receiver by lowering the noise figure as well as lowering the dissipation of the tubes enough to lower their mortality rate appreciably.

Squelch

Now that we have cooled down the front end, the squelch department is the next stop. In addition to heat caused by excessive current dissipation due to poor voltage distribution, squelch action could best be described as "sloppy" in most units. Now if you are happy with squelch action and the resistors aren't charred too badly, by all means leave it unmodified if you wish. But if you're a tinkerer and would like to try a change, grab the soldering gat and:

Look at the schematic (figure 1), which will tell you the squelch/first-audio tube, a 6EB8, is wired as a pentode clamp driving a triode gate. Due to the slow cutoff characteristics of a pentode, this is not an ideal situation. Disconnect the screen wire (pin 8) from the terminal board junction of R149-R150-R152 and R162 and reconnect it to pin 9, the plate of the 6EB8. This essen-

tially makes a power triode of the pentode section of the tube.

Look also at the plate load resistor of the clamp section of the tube; most models use a 47K. For better control swing, change this to about a 470K (I just wired the new resistor in series with one end of the old one). These two steps should make the squelch act a little more like the high-priced spread, providing you can control it with the front-panel control. If not, change the pot to a 5K (linear taper) of good quality, and you should have the range you need.

As a further improvement, try various values of resistance in series with the ground side of the control (original value in most is a 560-ohm, 1/2 watt) until you arrive at one that will permit a moderately strong signal to open a "full tight" squelch setting. Some later G-151's had a small screwdriver-adjusted pot behind the front panel for this purpose (shades of DuMont!). In addition, the 4.7K, 1/2 watt resistor feeding B-plus to the top of the control, located by itself on a strip near the center rear of the chassis, should be replaced if it is charred badly. Experiment here for a value that will improve the "feel" of the squelch control. (I ended up with a 1.5K, 1-watt on the bottom of the pot and 1K 1-watt on the top.)

The apparent quieting sensitivity can be improved markedly by adding a little more deemphasis; it's easiest in the audio output stage. A 0.0039μF Discap from the 12AQ5 grid to ground, or a 0.02μF at 1 kV or higher across the primary of the output transformer will help the rolloff of unnecessary response to frequencies and noise above 3 kHz.

On aligning the receiver strip, don't touch any of the i-f cans until you have managed to get an on-frequency signal through the receiver and peaked up the various front-end coils. A good idea is the use of a good grid-dipper to put the rf coils "in the ball park" before attempting final alignment. None of the coils should require padding to reach 147 MHz, but due to the low amount of capacitance range of the piston-type trimmers used, some may be compressed a little in order to lower the tuning range.

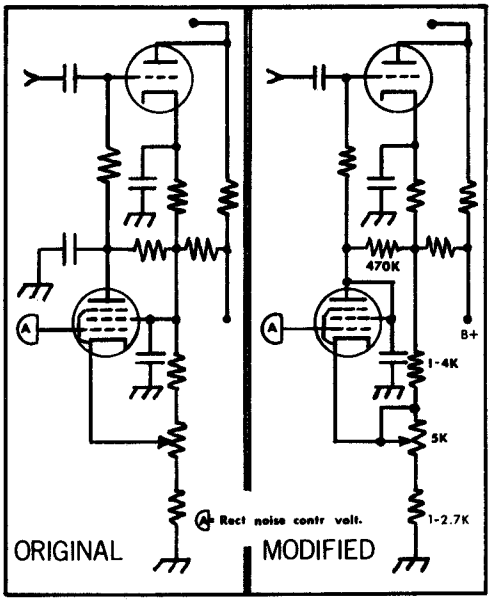
After the front end is aligned, recheck the discriminator and make sure the "rubbering coil" near the receiver crystal will move the signal both ways a little; if it won't, check to see whether some enterprising service monkey hasn't soldered a jumper across the coil or clipped the 15 pF silver-mica cap from the terminals of the second i-f crystal socket in order to compensate for a defective original crystal. If either of these defects is noted, correct it.

Carefully go through the low and high i-f strips once or twice and recheck discriminator idling on noise and signal. If you can get them even close, that's good for the G-151. If not, don't worry about it--wideband will correct that problem to a great extent. After alignment is completed, check for proper squelch action with and without signal. If the alignment or stage gain is not up to par, you may not be able to close the squelch by means of the front panel control. It may close properly but refuse to open even on a full-quieting signal; if one or the other is the case, check the 6EB8 and the 6BN8 tubes for low emission.

Assuming that the receiver appears to operate ok (25 or 30μA, or about 0.5V first limiter current at the metering socket), the next step is to wideband the dear little thing, that is unless you are planning to use it in conjunction with a system of unmodified TPL's and Motracs. To "unsplit," we'll need the following: one 2-inch piece of insulated hookup wire stripped 1/4 inch at both ends; three 68K, 1/2 watt resistors; one 180K or 220K, 1/2 watt resistor, and one 150K, 1/2 watt resistor.

Widebanding

Assuming that you have access to a working Gonset G-151 and you want to put it on say, 146.94, the first step would naturally be the selection and procurement of new crystals. The receiver will take a 45,413.33 kHz (146.94 - 10.7 $\div$ 3) and the transmitter will go on with a 12.245 MHz crystal. A good point to make here is that some units will not quite make 15 kHz deviation using a 12 MHz crystal, and modifying the circuit will not help this. Using



instead a 6,122.50 slab and doubling in the oscillator or modulator (like GE) should allow more than adequate deviation within control range. A good idea would be to check the unit on its original frequency before conversion, providing you have access to shop facilities, in order to ascertain whether it will deviate 15 kHz. If not, have Sentry correlate the 6,122.5 crystal for you instead of the 12.245. Also, at the point of ordering crystals, decide whether you want the oven or not; if so, order small-pin, 85°C oven type crystals. Otherwise get standard commercial-grade 0.093-pin room-temp units. Either type should be comparably stable.

When the crystals make their debut, chonk them in the PROPER sides of the oven or oven socket as the case may be, then fire the unit up and align the transmitter strip according to the instructions in the service manual. All coils should tune very close to their original settings, although L202 (the 75 MHz tripler plate coil) may have to have the turns compressed a bit closer together. Disregard power output if you get anything at all. Unless the 6360's are almost new, 15 or 20 watts is about par; just make sure you have at least -45 volts drive (use VTVM) at the centertap of the PA grid coil.

Note that there are two 455 kHz i-f transformers coupled back-to-back between the first low i-f amp and the second. Unsolder the 2.2 pF tubular ceramic cap from lug 1 of T104 (the can in the corner); unsolder the lead coming from lug 1 of T105 from the grid (pin 1) of the second i-f tube socket. Connect the 2-inch piece of hookup wire from lug 1 of T104 to pin 1 of the 6BJ6 second i-f socket. This effectively removes T105 from the circuit. A good idea is to tag the top of T105 with a small label saying "do not tune" or something to that effect. This keeps it from adding to the confusion during alignment.

Continuing, connect a 68K resistor across the secondaries of each of the 455 kHz i-f and limiter transformers; put the 150K across the primary of the discriminator can and the 180 or 220K across the secondary winding. All these resistors are installed at the transformer terminals externally; there is no need to remove the cans from the chassis. This completes the electrical "widebanding" of the G-151 communicator.

Upon completing the above procedure, careful realignment of the complete receiver is a good idea. Use your favorite method, and repeat the process until you are satisfied with the sound of the unit. Again on the squelch, if operation is sluggish or control will not close squelch, jumper across the 2.2K resistor in the cathode circuit of the noise amplifier (6BN8) tube. This will increase the noise amp again.

Even after all modifications, the G-151 must be used carefully for best results. Avoid overtightening the squelch, and make allowance (or corrections) for overdeviating signals. The unit will accept 15, and that's about it! Anything more and the distortion is really severe.

The Gonset G-151 FM Communicator is a fine "little tiny radio," and will prove adequate for the job it was intended to perform. As long as you don't insist on mounting one on a Motorcycle or a LeTourneau, it should stand right up alongside the "big boys" in performance and convenience. Let's dig 'em out and get 'em on!

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Circle Number 27

Two-Wire Remote with Zener-Stabilized Squelch

...PLUS OTHER SQUELCH TRICKS

BY P. J. FERRELL W7PUG

One way to keep a radio system simple enough to be controlled from a single pair of wires and reliable enough to be operated by remote control is to eliminate the adjustable squelch of the receiver to be used. The most common problem with fixed-setting squelch systems is "drift." During hot weather the squelch on the remote receiver may open or otherwise operate erratically. In the cold of night, the squelch may lock down tight enough to keep the receiver from hearing weaker stations. This squelch drift can be eliminated through the incorporation of a simple zener-diode stabilization scheme. Zener stabilization eliminates squelch drift and allows instantaneous squelch recovery when the remote station returns to the receive mode.

As shown in the typical squelch circuit of figure 1, the zener (about 30V breakdown) replaces the R/C network at the cathode of the squelch amplifier.

Figure 2 shows a method by which a single wire pair can be used to control a remote transmitter / receiver combination. The dc control voltage should be held down to no more than is required to key the current-operated relay (K1). This relay is a DPDT type used to key the transmitter and switch audio between transmit and receive. The circuit within the dashed-line area shows a network which can be used to replace the jumper at AB in case on/off control of ac power is required or if a sufficiently sensitive relay is unobtainable. The relay coil specifications are the same, but the enclosed circuit enhances the relay sensitivity.

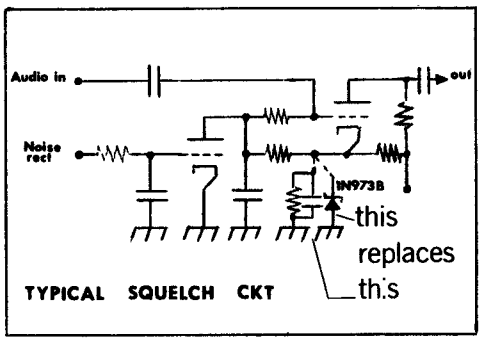


FIGURE 1. ZENER DIODE REPLACES R/C NET TO STABILIZE SQUELCH.

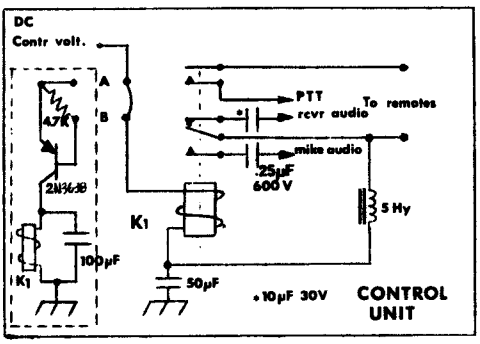


FIGURE 2. USING A SINGLE PAIR OF WIRES FOR CONTROLLING REMOTE FUNCTIONS.

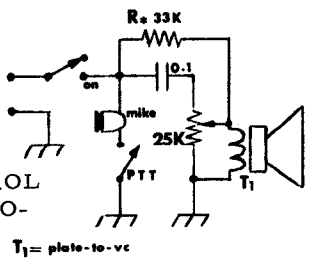


FIGURE 3. CIRCUITRY FOR CONTROL END OF TWO-WIRE LINE.

The remote unit itself is shown in figure 3. Several of these remotes can be paralleled, but keep the total wire capacity below about 0.05 μF. This plus the high audio voltage specifically precludes use of conventional telephone lines for control. Speaking of phone lines, keep the remote wires away from your phone wiring or you'll have real live ham talk on your phone. Keep the level of the line down to about $\emptyset$ dB if possible.

Nearby rf (broadcast, low-band hams, etc) can modulate your transmitter, too, but an rf choke and a 0.001 capacitor at the control unit eliminates the problem super-quick.

Channel changing? How about automatic receiver selection such as shown in figure 4. This modification uses FET's as dc amplifiers freeing a triode as the other audio amplifier. Either receiver can be given priority with zener diode Z_2. Or a "first-on-wins" capability (not shown) can be obtained by cross connecting another zener opposite Z_2.

Switches in series with these diodes allows for a certain flexibility of response.

Lastly--and having absolutely no connection with the remote capability--we present a carrier - operated lamp circuit (figure 5). This is a must for the flashing - lights set; it has the nice feature that lamp brilliance is proportional to quieting for signals in the vicinity of receiver threshold.

.... W7PUG

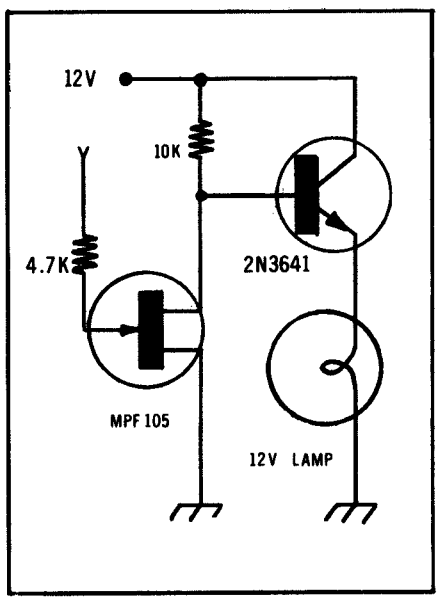
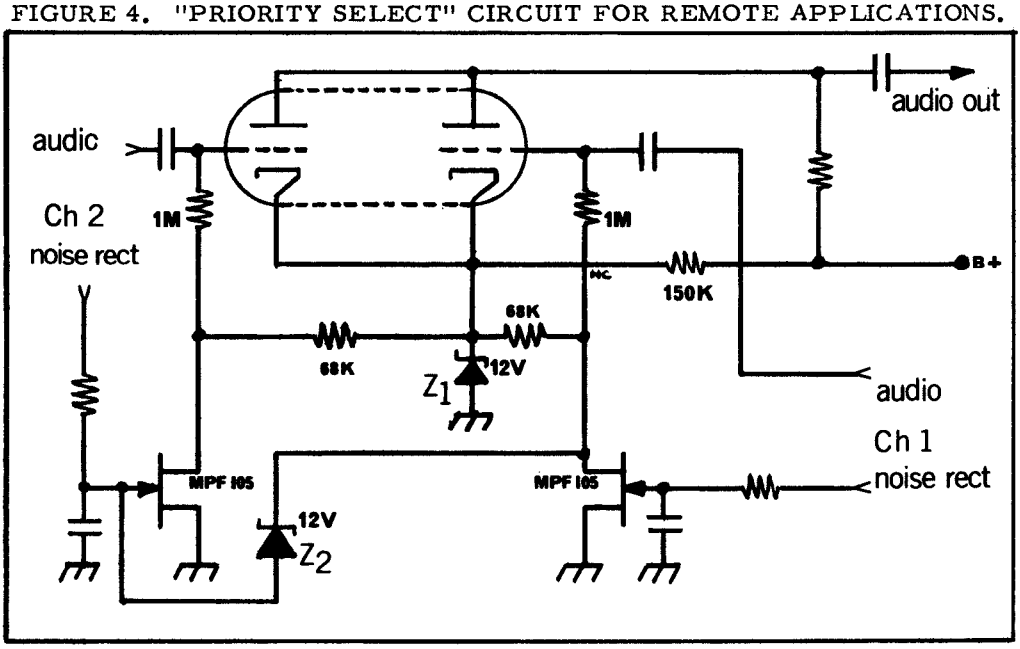


FIGURE 5.
LAMP DRIVER CIRCUIT

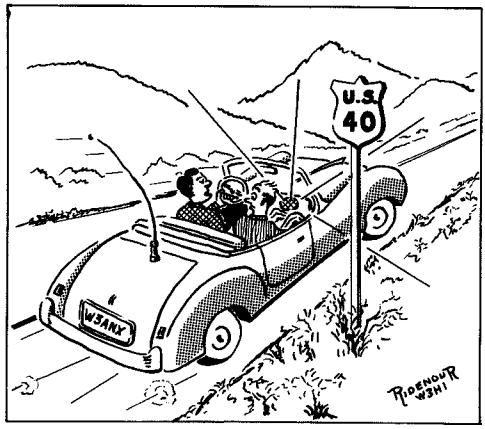
FIGURE 4. "PRIORITY SELECT" CIRCUIT FOR REMOTE APPLICATIONS.



OCTOBER 5&6

ANNUAL N.E. MICHIGAN HAM FEST

TAWAS CITY, MICHIGAN



"That guy screaming through the repeater must also be an HF DX nut - says there's a bad pile up on forty."

FM REVIEWS...

TAB's VHF Ham Radio Handbook

FM Magazine during the past month has received a number of TAB books with a variety of interesting titles. But one title seemed particularly appropriate for FM'ers: the VHF Ham Radio Handbook, by Edward G. Mackinnon (copyright 1968 by TAB Books).

The cover is a rich green "library" binder onto which the title is embossed in what appears to be leaf gold. All in all, a very attractive package.

But the content bears out the verity about not being able to judge a book by its cover. The most readily apparent flaw is in the editing. The glaring inconsistencies of usage, the frequent subject-verb nonagreement, the misspelled words, the switching of voice from active first person to passive third -- all combine to make one distrust the technical material, which might well be flawless.

The saddest error, though, and the most inexcusable, is the inclusion of an outrageously inaccurate chapter on FM activity. It would be interesting to know how many prospective FM'ers will be misdirected by the almost completely invalid data included under Chapter 9, Station Listings. A typical example of the directory: 146.94 MHz is shown to be in use in four areas only: Chicago, Seattle, Milwaukee, a small county in Maryland. Of these four, Seattle and Milwaukee are listed as limited-use areas.

Equally outdated are the activity directories for 220, 450 (referred to as 432 MHz), 1215, and 1296 MHz.

The preponderance of "bum dope" would be just cause for readers to question the accuracy of the many published circuits. VHF needs a handbook, without doubt, but this isn't it.

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Outdoor Housing
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Includes:
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Motorola	GE	RCA
P 8270	RC-4	CC 8A
Remote control	Remote control	Remote control
$65	**$85**	**$65**

THE TECHNICAL ABBREVIATION MYSTERY

EDITORIAL POLICY EXPLAINED

Why are the first two letters in the abbreviation "MHz" capitalized? Why are any of the letters uppercase? Or why aren't they all?

There really is a plan behind the seemingly arbitrary use of capital letters in abbreviations. And there is a national standard for abbreviation format. The standard forms were chosen on the basis of (1) national convention, (2) word or words represented, and (3) adopted philosophy.

In the first category are such commonly used abbreviations as TV, CRT, and VHF. Tradition just won't allow them to be expressed in lowercase letters. Nobody seems to think they look right that way (tv crt vhf). The second general rule states that the letters of the abbreviation must agree in "case" with the words they represent (with the exception of categories 1 and 3). This just says that if the expression is normally capitalized, the abbreviation should be also (ARRL, USA, CIO, etc.)

The final category is the one that should be of most concern to amateurs, writers, and editors today. This is the philosophy adopted in the fifties by the American scientific community as a unit, and recorded as a national standard by the American Institute of Physics. The rule states that units and measurements named in honor of an individual will be abbreviated with initial capital letters, even though the word itself may not necessarily be a proper noun. Thus, hertz is abbreviated Hz, volt is V, watt is W, henry is H, farad is F.

If you're now wondering why millihenry is abbreviated mH, and megahertz is MHz, you're stumbling onto another rule: The uppercase M is for millions (mega), the lowercase for thousandths (milli). So you see, it all really does make sense. And incidentally, a lowercase u is "printing license." It is used to represent the Greek letter omicron and it stands for micro.

Just to test your skill, now, fill in the correct (universally accepted) abbreviations for these elementary units of measurement:

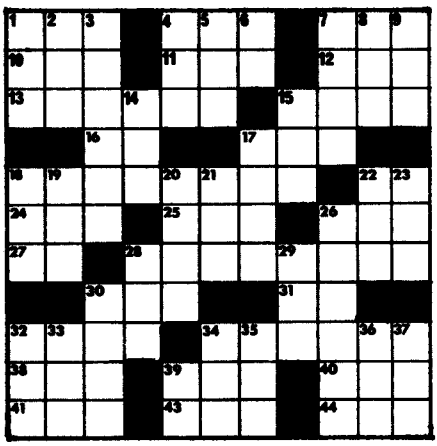
milliampere	picofarad
gigahertz	microfarad
kilohertz	decibel

The answers are mA, gHz, kHz, pF, μF (uF), and dB. Every major scientific culture in the world uses these abbreviations. Every one, that is, except the American Radio Relay League.

League correspondence indicates that QST will be using some of these abbreviations shortly, too. Some evidence of it already shows. The June issue of QST shows that an effort is under way: For every twenty or thirty MCs there was at least one mHz or MHz (and sometimes both). The League moves gradually.

FM crossword

by K6MVH



ACROSS

1. Open-repeater relay
4. 10 dB
7. FM'er's scope
10. --- FM'ers' journal
11. Pre-Pre-Prog
12. Boy's name
13. A variable x a constant =
15. Ham's appointment
16. Mouth (med.)
17. Garden implement
18. Modulates the frequency
22. Finer mode
24. OK (var.)
25. Jeweler's jig
26. The --- Bander covers 3 bands
27. MASTR maker
28. Mfr of commercial/ham gear
30. QSL addressee prefix
31. The 3-toed sloth that no crossword could be without
32. FCC's 610
34. Triad's TY-82
38. The mobile
39. Pod vegetable
40. Canada's FCC
41. Canadian Football League
43. Rent or lease
44. Printer's measures

DOWN

1. Tube container (abbr.)
2. Troubleshooter's cry of triumph
3. Turn off power before you do this to the final amplifier
4. Strangler snake
5. Coaxial fitting for right-angle bends
6. Some other area code
7. FM Honcho
8. Mineral source
9. K6MQB is K6MVH's
14. St. Francis ---
15. Even FM'ers can send this in code
17. Ham at disaster scene
18. A rig that can't be tuned up
19. Supplement (as income)
20. Fruit drinks
21. Closed-repeater relay
22. From
23. Least (abbr.)
26. First tube replaced by transistors
28. Branch
29. Transformer goo
30. Those Newington conservatives
32. The last word in radio
33. Unconscious, loquatious jammer
34. Coaxial fitting for two-way distr.
35. Breakfast grain
36. Solar particle
37. Alcoholic's heebiejeebies (abbr.)
39. Low-frequency tone for restrictive radio use.

LIKE THIS CROSSWORD? Want to see more of them? If so, all you have to do is say so. Write to: FM MAGAZINE, EditorialOffice, One Radio Ranch, San Dimas (8), California 91773.

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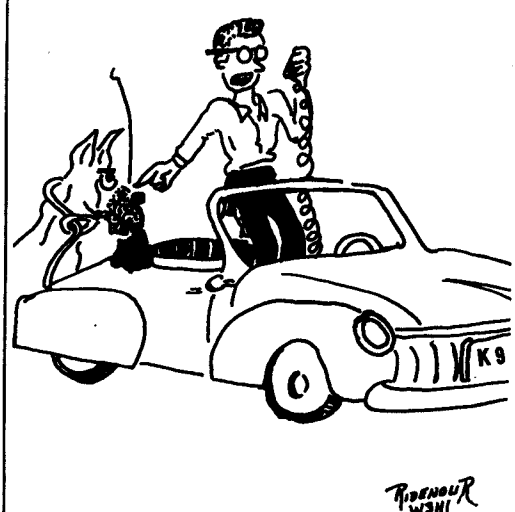

"Hey! - Net control. Tell Joe I've located his runaway dog."

LETTERS

About those Chronicles

I subscribed to FM at the Garden State Amateur Radio Exposition on May 2 and have just received the first issue; enjoyed it very much. I also received two back issues which I have read and they are both fine. There is, however, one point that blurs the image, and that is "Chronicles of Seven-Six." When I read some of the letters to the editor in the first two issues I thought you would get the message. However, in the current issue I see that the series continues. So, my only response can be to voice my opposition to this type of "Citizens Band" operation and the publishing of the Chronicles. It is only going to degrade the amateur service and ruin a good magazine.

I would also like to take this opportunity to inform you that there is formal narrowband (5 kHz) operation on the VHF amateur bands. The Land Rovers Amateur Radio Club is operating an all GE system with some 20 base stations, 12 mobile and 8 portable units on 146.61 MHz using all narrowband equipment. We soon hope to have ten more GE TPL's of late vintage to add to our system. With this late-model equipment it is almost impossible to use wideband as it would require "wideranding" 95% of our equipment. Also, in the New York-New Jersey area it is becoming hard to find a clear frequency on two meters and the Land Rovers are proud to say that we are not taking more space than is necessary (answer to letter to editor, page 41 of your March 68 issue).

As publisher of the newsletter for the Land Rovers, I want to wish you the best of luck with FM, but please, for the good of amateur radio, no more of this Seven-Six nonsense.

R. D. Schisler Jr, WB2RUM
Land Rovers Public Relations

CHRONICLES SERIES IS COMPLETED. WE'RE SORRY YOU DIDN'T APPROVE.

When FM published the copies of the FCC citation, K6MVH Newsbeat, and Mr. Sessions' reply, you made a private matter public, giving me the freedom to express my opinions.

I disagree with Mr. Sessions. The Newsbeat of 27 Aug 65 was not a bulletin within the meaning of Section 97.91(b). The Newsbeat of 27 Aug 65 was a group of inflammatory statements ridiculing a regulatory agency of our government made of some of the finest people I have ever dealt with.

Mr. Sessions must be either two-faced or scared. He hides behind the rules he ridicules.

William L Matthews WA4AVJ
1307 Riverview Avenue, S. E.
Decatur, Alabama 35601

Each issue of FM is better than the last. At least that is my opinion. I have been talking it up to everyone I speak to, and I imagine you will pick up four or five new subscribers.

I don't mean to carp or criticize, but I would like a lot more authority to keep only a "technical" log for the Wichita repeater. (English translation: someone is going to have to stick his neck in the noose, and I don't want to be the one.) The article "FCC Speaks Out" is a slightly expanded version of what I got from the Kansas City office when I put Wichita on the air. We were operating for a short time with "civilian" people on duty at the control point, which should have been OK if you are liberal in interpreting the rules--after all, only a licensed ham would actually put the repeater on the air. But a very short conversation with a passing FCC man produced a few rules like what you published. What is needed is to have an FCC man come out and state what is the absolute minimum, clearly, simply, and accurately. For example,

if you talked to Pat Devlin, of the Tulsa Repeater, he uses ten-minute intervals for I.D. but I have been specifically told three minutes maximum. And what about those MARS repeaters springing up all over -- no I.D., no constant monitoring, just hook it up and go off and leave it. If we tried it on the regular bands, we would be in big trouble.

One thing I noticed in the July issue, there was no "Table I" printed, although the story on crystals made reference to it. I guess the jigsaw puzzle slipped and it didn't get in.

I don't mean to argue, but I still think that the "Chronicles of 76" is not too good. I was surprised to see you print the citation K6MVH received, as most people want to hide them and pretend they never happened. We have lots of people here who key the repeater to hear it talk back to them (we have 5-second dropout delay) or maybe just to cause someone to speak up. The repeater identifies itself, but these jokers don't and it will be them, not the repeater, getting the citation for non-identification. I slowed up a lot of them for a while, though; I put a half-second delay on the keying circuit. They had to hold their button down a little longer, but most have learned this now. Any suggestions?

Donald E Chase WØDKU
4543 South Elizabeth
Wichita Kansas, 67217

LOGS NOW NECESSARY! REMOTES MUST BE MANNED (OR CONTROLLED) BY LICENSEE, QTH REPEATERS MUST BE MANNED BY LICENSED AMATEUR. PAT DEVLIN IS WRONG IF HE I.D.'S EVERY 10 MINUTES. FCC NOW REQUIRES 3-MINUTE I.D. INTERVALS. MARS REPEATERS NOT CONSTRAINED TO FCC REQUIREMENTS; THEY FALL UNDER MILITARY RULE EXCLUSIVELY, WHICH IS MUCH LOOSER THAN FCC. TABLE I INADVERTENTLY OMITTED, BUT IT APPEARS IN SENTRY CATALOG -- SEND FOR IT! BEAR UP ... "CHRONICLES OF 76" NOW OFFICIALLY ENDED. ON YOUR LAST ITEM: TRY TURNING ON REPEATER WITH A WHISTLE; AFTER 3 MINUTES OF NONUSE IT CAN REVERT BACK TO NONREPEAT MODE SO THAT USER MUST AGAIN WHISTLE TO TURN IT ON.

10 Meters?

In the June issue you had an article about a walkie-talkie conversion. I think that these conversions are great for the readers. Now I have one question about that conversion. I have one of the walkies; where do you get tubes for them? I should really ask Bob Lyon the author of the article, but seeing I was going to write anyway I thought I would ask you.

Is there any reason that there is never any mention about FM operation in the ten meter section of the amateur spectrum? I do a lot of operating on 29.6 FM and there are a lot of people that do likewise. (This is where, by the way, I found out about FM Magazine.)

I hope there is activity on two meters in the Milwaukee area. We have about 50 FM rigs on 29.6 here in the city and numerous units outside this area in easy contact distance by ground wave. I want to bridge the gap and get started on two to cover areas not easily reached. We are using GE ET6 ER6 FM gear; it is easy to convert if anyone wants to know. I am available if there is any interest by the readers for this conversion data. I have had articles published in other magazines and would be happy to provide photos and data for the conversion.

Keep the press running for us FM readers.

Joel Eschmann K9MLD
Racine, Wisconsin

WE WOULD LIKE TO SEE 10-METER CONVERSIONS; A NUMBER OF READERS HAVE ASKED ABOUT THIS.

QST on FM Policy

One of the major points of dissension in the growth of ham VHF practices was over "polarization." In my own isolated provincialism I had believed that FM, with its strong mobile ties, had bypassed all this and had automatically standardized on vertical polarization on all bands. I abruptly found I was mistaken when I read the 450 conversion article in Aug 68 QST. In closing, the author recommended the use of a mobile antenna he had described in Oct 67 QST. This antenna is horizontally polarized, it is stated, for use with the 432.9 MHz FM activity in Detroit.

I think it would be interesting to create a little discussion on this subject to determine who is doing what to whom. I realize that many other 440 systems are private and for special use, and also that the Detroit gang is free to pick any polarization that they please; however, I object to an author in a national magazine implying by omission that only one polarization is in vogue. The best answer would be to solicit letters to this magazine specifying the 440 polarization in use in various areas. Then an individual can make an intelligent selection for his system based on complete data, not on the prejudices of one author.

My prejudices tell me that a horizontal mobile antenna on 440 is a mechanical abomination, unjustified by technical considerations. What do you think?

Les Cobb W6TEE
4124 Pasadena Avenue
Sacramento, California 95821

WE THINK YOU'RE RIGHT! WHAT COULD BE MORE USELESS (OR MORE TYPICAL OF THE ARRL) THAN A HORIZONTALLY POLARIZED REPEATER NETWORK ON 450? QST EDITORS MEAN WELL, BUT THEIR FM DATA IS ABOUT AS RELIABLE AS AN ARTICLE IN FM MAGAZINE ON HOW TO PERFORM BRAIN SURGERY WITH A BROKEN BEER BOTTLE.

WANTED....Motorola FSTRU-80 a table type base station, 110VAC, tuned for 146.94 MHz. Ready to use. Jay O. Achenbach, W3QB, 8019 Seminole Ave., Phila., PA. 19118

FOR SALE..One Motorola T43GGT, T-Power, made in April 1961, has latest G line receiver. Receives 2 freqs. at one time; or singly. Transmits on 4 freqs. Receiver and the transmitter are wide band but will ship narrow banded if desired. RF output is more than 35 watts. The receiver sen. less than .25 mu at 20dB. Radio and all accessories are in very good condition, has plastic snake head mike. Sold as is on R-146.82, R-146.94/T-146.34, T-146.40, T 146.82 and T 146.94 MHz. $289.50. Also have one RCA CMU 15A, 6/12V, 450 MHz, 16-18W, & complete and in good condition; just $49.50. Contact Douglas L. Flair, 1963 Wilcox Court, Topeka, KS 66608 phone 913-CE3-7580

WANTED...Tech. manual or schematic diagram for a KAAR model TR-500A or TR-501A, write to R. W. Ciamaga, ETN3 697 08 99, U.S.S. Sarsfield, DD837, C/O FPO New York, NY 09501

WANTED....Service information & or schematics on Western Electric model 41AA FM receiver. Will pay for photo - copying charges, if not for sale. Gordon Bean, K8MRS, 2313 Cooper Ave., Saginaw, Mich. 48602

TRADE...One Motorola T41GGV-20 with PL for equivilant Motorola High band gear. Contact: R. Des Rosiers, W1KGZ, 540 Clay St., Manchester, NH 03103

FOR SALE....Motorola T44A6A- a twin V just out of service; $50.00 plus shipping. Complete with all accessories. E. J. Hokamson, at 6517 North Atwhall Drive, Glendale, Wisc. 53209

FOR SALE or TRADE..Hammarlund HQ 180C with speaker; $225, Heath DX60; $40.00. Tapetone 2 meter converter 14-18 MHz IF; $30.00. I am looking for high band GE Base, or what have you. Contact John Gubernard K2LSX, 220 Mt. Vernon Place, Apt. 6A, Newark, N.J. Zip 07106

FOR SALE....Mobile Accessories: Microphones, Communications quality (Brand Name), Carbon $6.95ea., Minature Control Heads $3.00, 15 conductor 18' cable kits $1.25, Power Cables $1.00 ea. Contact K-Enterprises, 763 Colfax, Elmhurst, Ill. 60126

NOTICE....The newly formed Iosco Amateur Radio Club is playing host to this years Northeastern Michigan Ham-Fest at Tawas City, Oct. 5,6. After three successive years of attracting hams from all over the state the Tawas Radio Club took on a new face, and combined efforts with the fellows at The Wurtsmith Air Force Base to form a new and better Ham-Fest this year. This event will be staged at the Tawas High School, on M-55 in Tawas City, and will feature RTTY, FM, FM repeater with an input of 146.340 and output on 146.94. A Fabulous dislay of electronic equipment, along with boat rides color tours, air base tours, and various displays of talent. Lee Smits will host the banquet on Saturday evening, and the HAM-OF-THE-YEAR Award will be presented. If you are at all interested be sure to read last years editorial in the November Issue of this magazine, your publisher had a ball. Additional information available from: Jerry Mertz W8DET, at 8303-E Hawaii St., Wurtsmith AFB, Oscoda, Michigan

FOR SALE...Two brand new, in the original box, Motorola P-9303 1800Hz single tone decoders; $29.00 each. One Motorola W44AAV-1, 450 MHz 2 freq. R/T mobile; $50.00. One Motorola T44AV-1, 450 MHz mobile for; $35.00. One Doolittle frequency monitor FD-12 with crystals for 146.94, 146.82, 146.40 and 146.34: $45.00 Want to trade Motorola Industrial Dispacher T33AAT, 12V, 2 freq. xmt, highband for T31 low band unit. Gary M. Hoffsommer, 3501 Croco Road, Topeka, Kans. 66605 Phone 913-266-8771

FOR SALE...FM-12 Deviation and Modulation meter; $40.00. Comco 220 MHz repeater / remote station; $75.00 Motorola 150 MHz Sensicon Rec. W/Filter and 146.94 MHz xtal; $30.00 Comco Mobile 220 MHz transceiver W/Control; $40.00 RCA 450 MHz, T-Powered Mobile transceiver complete; $35.00. W. J. Davis, 4434 Josie Ave., Lakewood, Calif. 90713

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