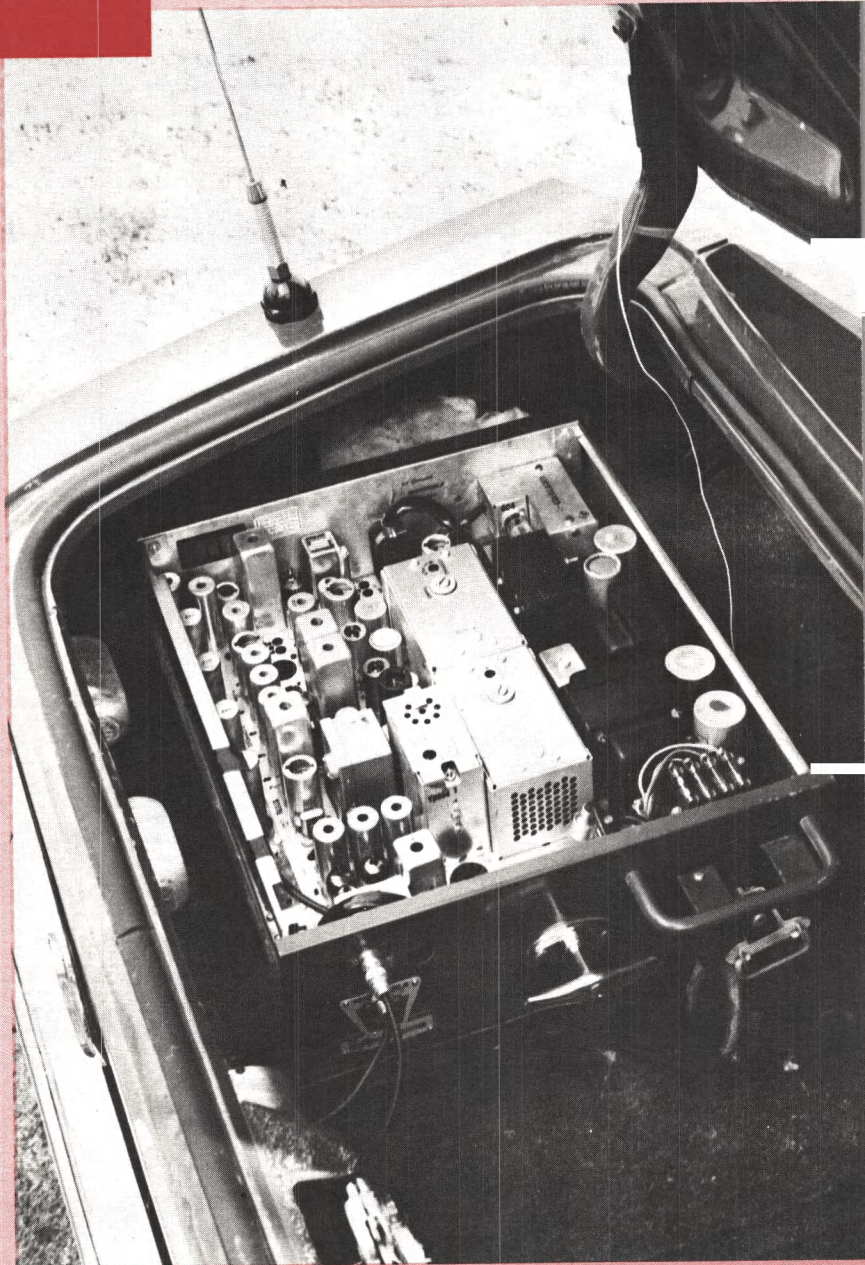


FM

The National FM'ers' Journal

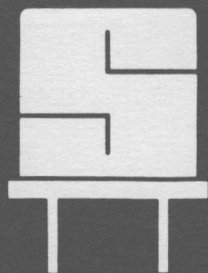
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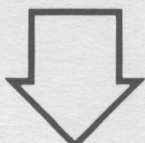
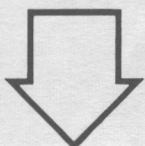
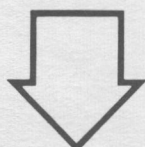
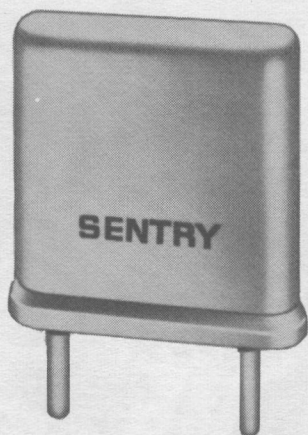
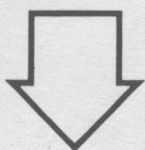


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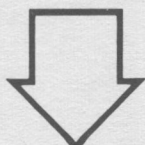
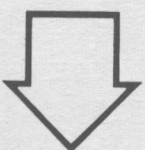


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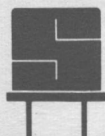
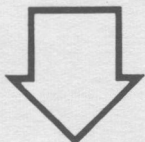
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You asked for it, you've got it.

March, 1968

For quite some time I have heard, over and over again, that the big three ham magazines simply ignore FM'ers. It appears sideband and contests are just about the only things worth reporting. Reading only these publications, you would think that FM is a small group using old surplus junk! The FM'er is more, wants more, needs more and demands more than this!

The sophisticated operation on the FM channels cannot be matched by anyother mode. With the continuing growth of FM in areas such as repeaters, UHF remote stations, and amateur automatic telephones, the FM'ers want to get all the technical and operational information they can. You asked for it and now you got it! FM the national FM'ers' journal is your magazine, and it's devoted entirely to amateur FM.

Now that we have come this far in a combined effort to better FM, why stop here? As reported by Tom Burford (K7TDQ) in last month's edition, the next annual SAROC funfest will be combined with a gigantic FM convention. This will be our annual FM get-together, and should be supported by all active FM individuals, groups, and formal organizations.

The next step, now, is to form a national FM Association, with each local club president as a delegate. I don't think it really has to be explained, how this could benefit our FM operation. United; we can race forward! As individuals we stand still!

Up to this time, it has been surprising what cooperative efforts have evolved, as for instance, the international use of 52.525, 146.94 and 432.9 MHz as calling channels. More and more repeaters throughout the country are operating on the national mobile repeater channel of 146.34 MHz input to 146.76 MHz output. It is really enjoyable while traveling across the country to meet new friends by working through compatible repeaters.

Why not drop us a line and express your opinions on these topics. You might also tell us what you'd like to see in your magazine.

Michael Van Den Branden, WA8UTB
Managing Editor

FM

The National FM'ers' Journal

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converting the nicic receiver
fm bandwagon-look who's aboard!
tone signaling and loads rpt. control

Donald L. Milbury
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THE Fine Art OF RECEIVER ALIGNMENT

If it's a sick GE
 you can HEAL IT
 ...if you do it RIGHT!

by

DON MILBURY W6YAN

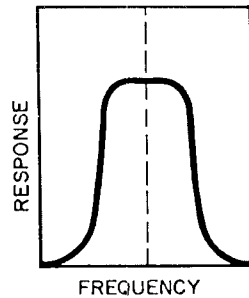
Aligning an FM receiver is a great deal more complex than getting the oscillator on frequency and peaking the various stages to an on-channel signal. Yet this is precisely what many amateurs -- and, unfortunately, many commercial service technicians -- actually do.

When an FM receiver is tuned up using this procedure -- we'll call it the "tweak" method -- the technician is making a number of raw assumptions which may or may not be valid. First, he's assuming that the low i-f's and the discriminator are correctly aligned to their respective frequencies. Second, he's assuming that the sealed bandpass filter is properly tuned to its design frequency. The latter can generally be a safe assumption, even though it is not uncommon for these filters to change or shift a bit in frequency as a result of excessive vibration or shock or other abuse.

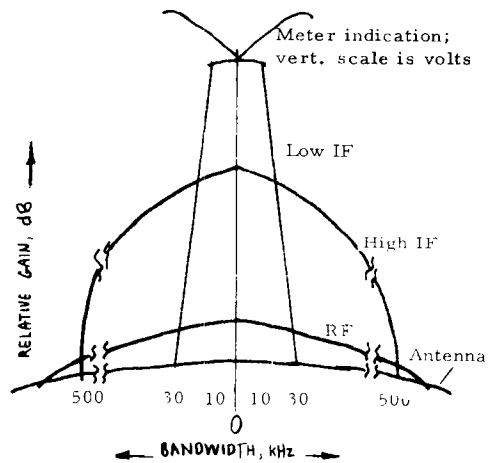
What happens when the tweak method is used for tuneup? It is, admittedly, a quick-and-dirty process by which a receiver can be made to operate. The brutal truth, however, is that the primary receiver qualities of selectivity, sensitivity, and stability are interrelated. The tweak method is an optimum compromise of the three based on the initial setting of the second converter and the low i-f circuits.

Selectivity (and gain, of course) is broadly determined by the number and state of the tuned circuits in the receiver chain, from the antenna, itself, to the discriminator. Each frequency-sensitive element adds somewhat to the selectivity and affords at least some degree of gain. An important point is that each of these elements must be centered on the frequency of operation. To assure proper tuneup of a receiver, the selective circuits (rf, high i-f, and low i-f) must be aligned so that desired signals can pass through the center of each selectivity

curve. Equally important, the configurations of the various curves must conform to their design shapes. The proper combination of these shapes will yield an overall response curve that looks like this:



The sketch below shows how the ideal composite selectivity curve is obtained. In the



(Continued next page)

sketch, the center line represents an incoming on-channel signal. The flowing V at the top is the discriminator slot. The low i-f passband is the steep-sided peak with the broad plateau across the operating frequency. The broader curve with the sharper arc in the frequency range of interest is the selectivity curve of the high i-f. The rf amplifier and antenna are shown as low broad arcs. The curves are plotted as bandwidth (horizontal) versus gain (vertical).

At this point, it would be wise to say that i-f alignment usually isn't necessary unless:

- A component has been replaced in an i-f filter;
- The circuits have been subjected to tweaking without proper test equipment.

Unfortunately, the latter is more usually the case with amateur FM equipment. No amateur should ever try to tune up an FM receiver unless he has a schematic diagram of his equipment so he will know where NOT to tweak. Even in commercial service, the most common source of i-f misalignment is unnecessary tweaking on the part of an incompetent or inexperienced serviceman.

Realignment is usually required if the i-f passbands are not centered on the incoming signal of interest, if the passbands are asymmetrical (not the same on both skirts), or if the bandpass is too narrow. The presence of high impulse noise on weak signals is one symptom of an off-frequency passband. This is due to the fact that the ringing frequency of the filters is not coinciding with the discriminator center frequency. An even more apparent indication of this type of misalignment is "chopping out" of signals or undue distortion of signals which are being deviated at a near-maximum level. The chopping-out effect is the sudden vanishing of a strong signal with each voice peak.

Off-frequency filters also usually produce a high discriminator "idle" reading. If an inexperienced tweeker has been at work, though, he has probably already compensated for this condition by changing the discriminator to get a zero indication -- and thereby throwing the receiver even further out of alignment.

So, what do you do when you're certain your receiver needs alignment? The first thing is to be doubly sure. If you've no doubts, then get a signal generator and start warming up the receiver. If your receiver is equipped with AFC, disable it. Set up the signal generator to produce a stable signal on the operating frequency, and keep it well below the limiter saturation point.

For units which use double-coil i-f transformers (such as GE and DuMont), the resistor loading method is perhaps the most effective means for obtaining a good receiver alignment. This procedure is a bit complicated but not too difficult. Remember to keep the input signal dead on frequency and below saturation. Tune each stage to the exact peak as described below, then repeat the entire sequence.

The response of an i-f transformer changes with the loaded Q of its resonant circuits. By loading one of the coils with a resistor, its response is lowered to a nonresonant point. The undercoupled coil can then be tuned for maximum deflection of a meter on the first limiter. If the coil is coupled to other coils immediately adjacent to it, both adjacent coils must be similarly loaded.

The value of the resistor must be low enough to produce a sharp peak during tuning, but not so low as to make precise tuning difficult. (The lower the resistance, the broader the peak.) Keep the resistor leads short enough to prevent the introduction of stray capacitance into the circuit; and peak one coil at a time.

There are other methods for alignment, but the above procedure is probably the most satisfactory for the amateur, where the preponderance of such test equipment items as oscilloscopes and sawtooth generators are the exception rather than the rule.

If the discriminator needs adjustment and you are set up with a crystal-controlled i-f generator of some kind, you're in business again. (The generator must be capable of holding a test signal to within 100 Hz of the low i-f frequency.) The procedure described here is not applicable to all discriminator circuits, but is ideal for receivers using Foster-Seeley discriminators (GE and DuMont again).

First, monitor the discriminator current with the proper test meter (0-50 uA for DuMont, and 0-2.5V for GE). If possible, disable the second oscillator to prevent receiver "garbage" from causing erroneous readings. Apply a low i-f signal to the first-limiter input and adjust the signal level to saturate the second limiter. Then tune the secondary of the discriminator transformer for a near-zero meter reading, and re-peak the primary.

Move the test signal 10 kHz above the low i-f and note the reading; then move it the exact same amount below the i-f. If the readings don't deflect the meter the same each side of zero, adjust the primary until equalization occurs. You'll have to rezero the secondary

(cont. on page 46)

HAM REPEATER SITES ...

Frederick W. Daniel
1776 Cordova (F)
Pomona, Calif.

HOW THE U.S. GOVERNMENT CAN HELP.

by

FRED DANIEL W6NQS

It would be a difficult task to estimate to any degree of accuracy the number of amateurs taking advantage of the U.S. Government's special land-leasing policy. But one thing is certain: the number is growing.

A few years ago the Forest Service (a branch of the U.S. Department of Agriculture) established a policy by which licensed amateurs could lease — at very low annual rates — choice parcels of accessible hilltop land for the express purpose of installing a remotely operated amateur radio station. From reports received from several lessee amateurs, the cost varies from one site to another, but it is never too much for the average ham group -- even if the group consists of but one person!

At one California site -- in the Angeles National Forest -- a 19-acre plot of prime land was turned over to the amateur radio community for the total annual lease fee of \$25 per participating amateur or group. The lessees were permitted to improve their property and erect the necessary towers and buildings to contain the remotely controlled equipment. Before they were permitted to construct their building, the Angeles National Forest ham groups were asked by the Forest Service to submit detail building plans for approval, including drawings and prints. Following this approval, official red tape was minimal and the building went up without Big Brother scrutinizing. A photograph of the facility as it appears today is shown in figure 1. Since the photo was taken from a passing plane, it doesn't show much detail. The sketch of figure 2 is a good likeness of the facility, however.

The Forest Service appears very willing to issue land to amateurs, and seems anxious to participate in any way that might prove benefi-



FIGURE 1. The tiny white structure adjacent to the snaking dirt road is the Radio Ranch repeater, located near Johnstone Peak in California's Angeles National Forest. The building is 10 x 15 ft (inside), and constructed of concrete block.

cial to the general public. Mr. Royal Mannion, a district forest ranger, has expressed a personal desire to contribute toward the general advancement of amateur radio communications. Although not an amateur himself, Mr. Mannion feels that every remote installation is a potential disaster communications central, and that he can serve the public by providing the means whereby an amateur radio emergency communications system can be exploited with the most efficacy.

Our Relationship

The amateur radio world has a good strong rapport with the Forest Service, and participating hams are eager to maintain this healthy relationship. As a result, most lessee groups

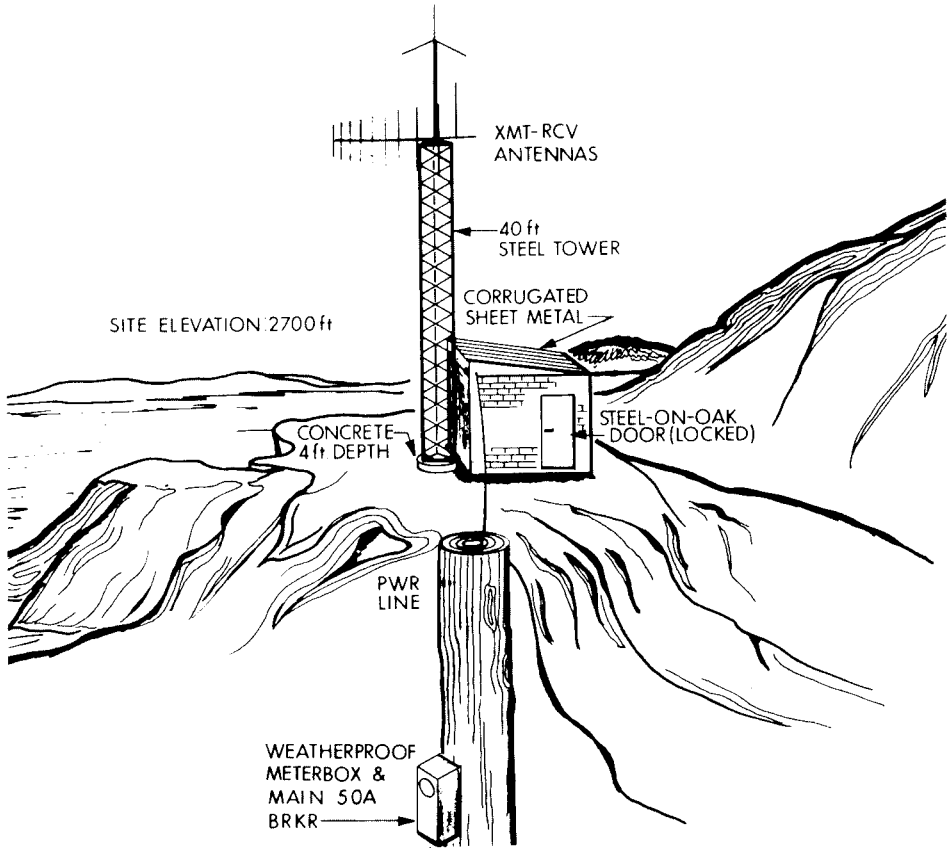


FIGURE 2. Sketch of remote site.

have adopted a general set of self-policing rules. Here are a few of the more typical ones: →

The government has conditions and rules, too. They are too numerous to list but they are not the least hard to live with. For the most part, the Forest Service's rules are based on the lessee's use of good common sense and sound judgment. A few of the typical fire rules are shown in figure 3. Figure 4 is a photocopy of a typical Forest Service amateur radio permit.

If you have your eye on a good spot of national forest land in your own area, it might pay off to check with the nearest USDA Forestry office. If there is none locally, write to:

U. S. Department of Agriculture
Forest Service
Washington, D.C.

- Stay away from the site unless absolutely necessary. When a visit must be made, don't go in a large group. (Most forest installations are in closed, high-fire-hazard areas; excessive visits make forest officials nervous.)
- Leave no gates or entranceways unlocked.
- Keep the site cleaned and the grounds policed. Remove all weeds and brush within 30 feet of building.
- Protect the forest; discourage trespassers. Report all violations to the nearest Forestry office.

JOHNSTONE RADIO SITES

The following fire plan will become a part of the above designated permit:

1. All federal, state and county fire regulations and ordinances pertaining to the operation of a radio relay site shall be complied with by the permittee.
2. All internal combustion equipment shall be equipped with an approved spark arrester.
3. All buildings and structures shall be cleared of all flammable and combustible material for a distance of 30 feet.
4. A 5-lb. dry chemical or 20-lb. CO² fire extinguisher shall be placed on the inside at all buildings.
5. No smoking will be allowed except in designated areas. The designated area for your site will be the interior of building only.
6. No open fires will be permitted.
7. A permit shall be obtained for all welding and/or cutting operations.
8. In the event of fire on the area, or adjacent thereto, the permittee shall immediately notify the Forest Service and take reasonable action to suppress all such fires and to remain with the fire until relieved by the Forest Service.

FIGURE 3. Typical Forest Service fire rules for amateur leasing

<p>U.S. Department of Agriculture Forest Service</p>	<p align="center">JOINT OCCUPANCY</p> <p align="center">SPECIAL USE PERMIT</p> <p align="center">Act of June 4, 1897, or February 13, 1893 This permit is revocable and nontransferable</p>	<p>NAME OF PERMITTEE SESSIONS, KENDALL W., JR., ET AL.</p> <p>DATE OF PERMIT October 26, 1955</p>	<p>KIND OF USE Radio, TV, Antenna Site</p> <p>FILE CODE 2730</p>
<p>REGION 5</p> <p>STATE California</p>	<p>COUNTY Orange</p>	<p>PERMIT OFFICE Angeles</p>	<p>PERMIT OFFICER Mt. Baldy</p>
<p>Permission is hereby granted to KENDALL W. SESSIONS, JR., and FREDERICK W. DANIEL, 1561 Remona Place, Ontario, California hereinafter called the permittee, to use subject to the conditions set out below, the following described lands or improvements:</p> <p>Joint use of a site located in the Richard F. Bowen, et al, building which is on National Forest land on Johnstone Peak in the SW 1/4 of Section 23, T. 1 N., R. 9 W., S. 28 M.</p>			
<p>This permit covers space in _____</p>			
<p>The Richard F. Bowen, et al building and antenna equipment required for the purpose of installing, operating and maintaining an amateur radio station.</p>			
<p>The exercise of any of the privileges granted hereby constitutes acceptance of all the conditions of this permit.</p>			
<p>1. In consideration for this use, the permittee shall pay to the Forest Service, U.S. Department of Agriculture, the sum of <u>Six and 25/100</u> Dollars (\$ <u>6.25</u>) for the period from <u>January 1, 1955</u> to <u>December 31, 1955</u>, and thereafter annually on <u>January</u>, 1955, to <u>December 31</u>, 1955, and thereafter <u>twenty-five and 00/100</u> Dollars (\$ <u>25.00</u>). Provided, however, charges for this use may be made or readjusted whenever necessary to place the charges on a basis commensurate with the value of use authorized by this permit</p>			
<p>2. Construction or occupancy and use under this permit shall begin within <u>1</u> month; or, construction, if any, shall be completed within <u>3</u> months, from the date of the permit. This use shall be actually exercised at least <u>365</u> days each year, unless otherwise authorized in writing.</p>			
<p>3. Development plans, layout plans, construction, reconstruction, or alteration of improvements; or revision of layout or construction plans for this area must be approved in advance and in writing by the forest supervisor. Trees or shrubbery on the permitted area may be removed or destroyed only after the forest officer in charge has approved, and has marked or otherwise designated that which may be removed or destroyed. Timber cut or destroyed will be paid for by the permittee as follows: Merchantable timber at appraised value; young growth timber below merchantable size at current damage appraisal value; provided that the Forest Service reserves the right to dispose of the merchantable timber to others than the permittee at no stumpage cost to the permittee. Trees, shrubs, and other plants may be planted in such manner and in such places about the premises as may be approved by the forest officer in charge.</p>			
<p>4. The permittee shall maintain the improvements and premises to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the forest officer in charge.</p>			
<p>5. This permit is subject to all valid claims.</p>			
<p>6. The permittee shall comply with the regulations granted by this permit, shall comply with the regulations of the Department of Agriculture and all Federal, State, county, and municipal laws, ordinances, or regulations which are applicable to the area or operations covered by this permit.</p>			
<p>7. The permittee shall take all reasonable precautions to prevent and suppress forest fires. No material shall be disposed of by burning in open fire during the closed season established by law or regulation, without a written permit from the forest officer in charge or his authorized agent.</p>			
<p>8. The permittee shall exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with this permit, and shall pay the United States for any damage resulting from negligence or from the violation of the terms of this permit or of any law or regulation applicable to the national forests by the permittee, or by any agents or employees of the permittee acting within the scope of their agency or employment.</p>			
<p>9. The permittee shall fully repair all damage, other than ordinary wear and tear, to national forest roads and trails caused by the permittee in the exercise of the privileges granted by this permit.</p>			
<p>10. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise herefrom unless it is made with a corporation for its general benefit.</p>			
<p>11. Upon abandonment, termination, revocation, or cancellation of this permit, the permittee shall remove within a reasonable time all structures and improvements except those owned by the United States, and shall restore the site, unless otherwise agreed upon in writing or in this permit. If the permittee fails to remove all such structures or improvements within a reasonable period, they shall become the property of the United States, but that will not relieve the permittee of liability for the cost of their removal and restoration of the site.</p>			
<p>12. This permit is not transferable. If the permittee through voluntary sale or transfer, or through enforcement of contract, foreclosure, tax sale, or other valid legal proceeding shall cease to be the owner of the physical improvements other than those owned by the United States situated on the land described in this permit and is unable to furnish adequate proof of ability to redeem or otherwise reestablish title to said improvements, this permit shall be subject to cancellation. But if the person to whom title to said improvements shall in any manner above provided be qualified as a permittee and is willing that his future occupancy of the premises shall be subject to such new conditions and stipulations as arising by permit to him (it) in the opinion of the issuing officer or his successor, issuance of a permit is desirable and in the public interest.</p>			
<p>13. In case of change of address, the permittee shall immediately notify the forest supervisor.</p>			
<p>14. The temporary use and occupancy of the premises and improvements herein described may be subject by the permittee to third parties only with the prior written approval of the forest supervisor but the permittee shall continue to be responsible for compliance with all conditions of this permit by persons to whom such premises or improvements may be sublet.</p>			
<p>15. This permit may be terminated upon breach of any of the conditions herein or at the discretion of the forest supervisor or the Chief, Forest Service.</p>			
<p>16. In the event of any conflict between any of the preceding printed clauses or any provision thereof and any of the following clauses or any provision thereof, the preceding clauses will control.</p>			
<p>17. This permit is accepted subject to the conditions set forth above and to conditions _____ attached hereto and made a part of this permit.</p>			
<p>DATE OCT 26 1955</p>	<p>APPROVED AND AUTHORIZED SPECIAL AGENT IN CHARGE GEO. A. COOPER, Regional Forester</p> <p>BY _____</p>		

FIGURE 4. Photocopy reduction of forestry permit.

THE TRANSISTORIZED POWER SUPPLY

If someone were to ask you to name the chief advantage of a transistor pack over a vibrator power supply for mobile use, how would you answer? If you were to cite efficiency as a prime advantage, you'd be wrong! The little-known fact is, a transistor supply is typically no more efficient than a well designed vibrator supply of the same overall rating.

The conversion efficiencies of both standard supply types are generally in the vicinity of 70%. Conversion efficiency percentages in the high nineties can be attained with transistors, of course, but such supplies are not generally available because of their inherent extra cost. They require employment of more than one transformer in the switching circuit.

The transistor supply is still superior, however, for a number of very sound reasons. To name but a few: simplicity of design, miniaturization of circuit, longevity of components, availability and economy of transformers, inherent circuit protection, and enhanced reliability under the most adverse of environmental conditions.

Design Simplicity

The average transistor power supply (referred to industrially and commercially as a dc-to-dc converter) employs a very simple switching circuit which comprises nothing more than two inexpensive transistors, a couple of resistors, and a special transformer with an added feedback winding.

Since there are no moving parts, very high switching speeds can be attained; the

higher the speed, the less filtering is required. Switching frequencies of 5 kHz are by no means uncommon. Motorola's MOTRAC series of commercial FM units uses power supplies with a 5 kHz switching frequency.

Miniaturization

The components of a medium-power dc-to-dc converter are usually small enough to allow mounting on an already existing chassis. (See "Duplexing Your 450 MHz Mobile," by Jim Mann, this issue.) This is a particularly attractive feature when the mobile equipment is a trunk-mounting unit. There is usually ample space on the power supply chassis of a trunk-mount rig to accommodate at least an add-on receiver supply, even without modification of the unit's built-in vibrator power source. The existing chassis normally provides an excellent means for dissipating the excess heat generated by the power transistors because of the large surface mass. If a special chassis is required, it can be made quite small. It must be borne in mind, however, that power transistors must have adequate heat protection. Thus, a small chassis usually means that an external heatsink must be employed.

Miniaturization is also enhanced by the increased switching speed. As the ac supply frequency increases, the transformer size requirements diminish. At a switching frequency of 5 kHz, the size of a medium- to high-power transformer is impressively tiny indeed. A transformer capable of delivering 200 watts will fit nicely in the palm of your hand and will easily weigh less than a pound!

Since filtering requirements are also reduced, capacitors on the secondary can be made smaller. In most cases, filter chokes and other reactor devices can be dispensed with entirely.

Longevity

The prime disadvantage of a vibrator as a switching source is that it is a mechanical device. A vibrator reed may operate without significant degradation for several million cycles; eventually, invariably, inevitably, however --- it fails. The constant make/break under load causes unavoidable pitting and arcing, and the contacts simply wear out.

The transistor is infinitely superior in this respect: it has no moving parts. Transistors cause switching by alternate electrical conduction, so they are, in theory, able to last indefinitely.

Not being magic, of course, transistors are subject to failure just like any other circuit component, but failure of a transistor in a well designed circuit is almost always indicative of a serious problem elsewhere.

Availability/Economy of Transformers

There is less mass to a transistor transformer than to a comparable vibrator transformer. The reduction in core mass is made possible by the increased operating frequency. It goes without saying that a ten-ounce transformer will be less costly than a two-pound equivalent. Mass production of high-frequency transformers has resulted in lower costs; and increased competition among the manufacturers is likely to keep them down for a long time to come.

Circuit Protection

A direct short circuit in an unfused vibrator supply would very likely cause irreparable damage to the vibrator and perhaps the transformer. The transistor supply, on the other hand, has the unique capability of "sensing" a short circuit. When a dead short occurs in the secondary of a transistor power supply, the semiconductors in the primary simply cease to oscillate; and without oscillation

there is no switching. When the short is removed, normal oscillation resumes.

It is true, of course, that transistors can be destroyed under some circuit conditions. A partial short, for instance, which causes excessively high current drains for short periods, can cause junction breakthrough on the transistor. If such a problem is suspected, however, transistor destruction can frequently be averted by carefully studying the transistors during operation. With medium-power converters, indications of abnormal operation are: (1) The heatsink temperature rises to the point where it cannot be touched for more than a few seconds at a time, and (2) the "singing" frequency of the transformer shifts or decreases appreciably with no external changes in input voltage or output load.

Reliability

Much of the preceding discussion has included facts which bear out the inherent reliability advantage of a transistor supply. But there is yet another area of reliability which should not be overlooked: the ability of transistors to withstand virtually every climatic and vibration environment likely to be encountered in mobile service.

Winter and summer are without meaning to the sturdy transistor, which requires only an adequate sink to keep its own junction temperature to a comfortable level. Because of today's advanced technology, the transistor is likewise impervious to physical shock. An impact that would render a vibrator totally useless wouldn't be likely to even cause the average transistor to so much as skip a beat.

Application

The numerous advantages notwithstanding, a transistor supply doesn't usually offer enough of an edge to warrant modification of an existing piece of equipment to incorporate it in the unit. There are occasions, however, where addition of a transistor supply is the only logical solution to an existing problem. Jim Mann's article in this issue is a case in point.

DUPLEXING YOUR 450 MHZ MOBILE

by

Jim Mann WB6JAJ

Duplex operation is a near necessity for the 450 MHz repeater user. Without it, the operator has no indication as to when he's "making it" or when his signals are marginal in the repeater. A 450 MHz mobile as an access to a two- or six-meter remote base station loses much of its effectiveness when the control operator can't hear his own "talkback" signals as he is transmitting.

The duplex capability is the final finishing touch on the 450 MHz repeater system which includes an automatic telephone patching device as an operational function. Without duplex in this service, the radio operator finds himself explaining the principles of his operation with nearly every telephone call so his party won't speak at the wrong time -- thus going unheard.

What is duplexing? In the strictest sense duplex operation is transmitting on one frequency and receiving on another. What this article is about, however, is simultaneous duplex, or receiving on one frequency the repeated signals that are being transmitted on another at the same time. A completely duplexed unit allows "telephone" type operation, whereby each

person can hear what the other transmits at any time. With repeaters, this does not allow telephone operation between repeater users, but it does allow it be-

tween any of the mobiles and the repeater base station. And between any of the users and the base telephone when an automatic phone patch is incorporated into the system.

(Continued next page)

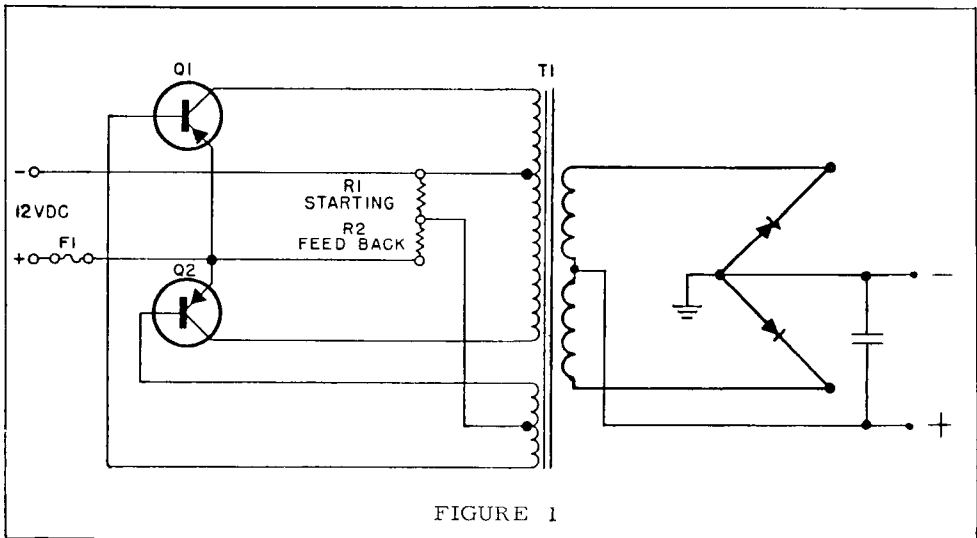
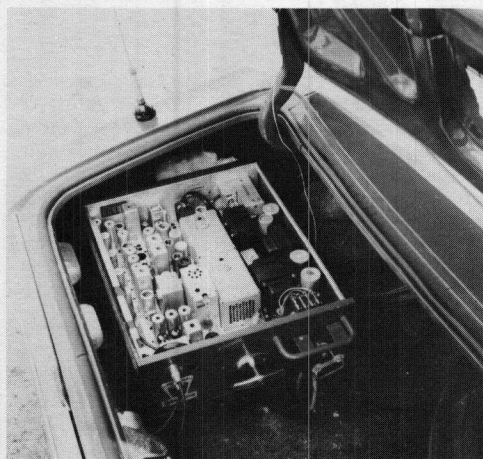


FIGURE 1

How do you duplex a 450 MHz FM mobile? Since the integral vibrator supply of the stock unit is inevitably unable to handle the added load of the receiver during transmit, the only logical course of action is to build up a transistor supply to power the receiver on a continuous basis.

When the added supply has been incorporated, there remains but one stock lead to reroute (if the 450 MHz unit is a Motorola T44 or a GE Pre-Progress Line MC306).

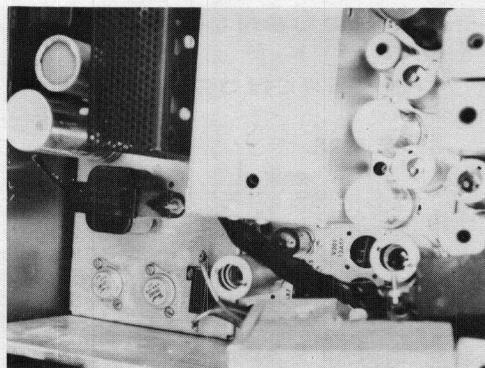
Another feature of these units is the fact that sufficient room exists on the power supply chassis of both to readily accommodate the T-supply.



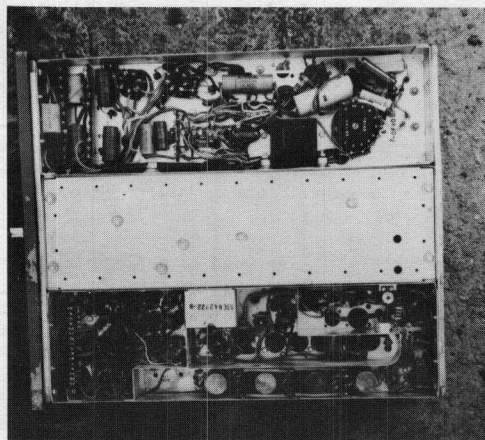
Obtaining a good circuit should be no problem, regardless of the transistor types your junkbox is stocked with. There is little difference between circuits except for the values of the starting and feedback resistors. Figure 1 is a typical circuit using a Triad TY82 toroidal-core transformer. In this circuit, the output is more than adequate to power any FM mobile communications receiver. Additionally, all Triad TY-series transformers come packaged with at least two basic supply circuits and a wide list of usable transistor types.

Figure 2 is a photograph showing a naked Motorola T44 trunk-mounting mobile unit. The T-supply is installed on the power supply chassis immediately below the tone encoder unit (shown as a projection from the back wall of the mobile unit).

As shown in the closeup photo of figure 3, only the transistors need be mounted above the chassis. The chassis surface itself serves as an excellent heat dissipator for the transistors. And the installation is not esthetically displeasing. Even the most conservative FM'er shouldn't balk at this modification.



When the flat Triad TY82 is used, there will be plenty of room on the underside of the chassis for mounting this as well as the other circuit components. Figure 4 shows the guts of the supply in the chassis of a T44. Silicon diodes are used for rectification to keep the size down and allow ample leeway for choice in component placement.



Selection of Transistors

Many so-called "experts" say there is no need to match the two transistors used in a switching circuit. They're just plain wrong! While the parameters of a given transistor type need not be matched, it is not a good policy to use two different transistor types. The operation can result in

(Continued on page 17)

THE FREQUENCY INDEPENDENT BEAM

by

Ken W. Sessions, Jr. K6MVH

The fellow who originated the all-band inverted vee configuration was on his way to discovering the secret of the logarithmic beam, that magic radiator so often used in today's commercial and military applications. But it was Rumsey who conceived of the "frequency-independent" concept; and his work was instrumental in reducing theory to practice by Isbell, DuHamel, and others.

There are two commonly applied methods for broadening the resonant-frequency range of an antenna. The first is the well known Q reduction technique, where the effective Q is lowered by increasing the diameter of the antenna elements. This process is a valuable spectrum widening procedure, but the ultimate bandwidth in never really unlimited.

The second method is called reactance compensation, whereby an added reactive network serves to cancel antenna reactance over an even wider range.

Both processes are used to achieve one purpose: to provide a uniform input impedance match irrespective of input frequency. So neither process, by itself, can be used to provide a constant gain and performance curve over a given frequency range. The result is merely an antenna that remains reasonably well matched, even though the gain and radiation pattern continue to vary with frequency.

Rumsey's approach was a slightly different tack to the problem, and his frequency-independent antenna designs resulted in arrays of the log periodic variety, which had the capability of providing nearly flat performance over a wide spectrum as well as a uniform input impedance.

In the strictest sense, of course, there are no antennas that are fully resonant at all frequencies. Overall antenna size governs antenna bandwidth; and, since a given frequency range depends on the size of the particular elements, it would be impractical to design an antenna with massive elements (approaching infinity) for the lower frequencies and infinitesimal elements for the very high frequencies. Thus, a frequency-independent antenna is constructed

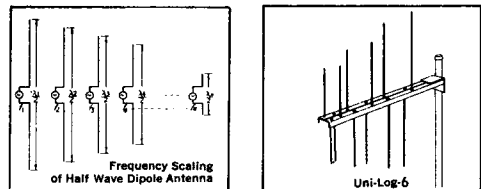
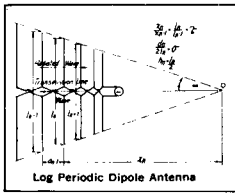


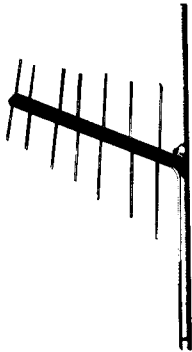
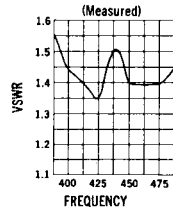
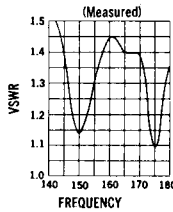
FIGURE 1. Sketch (left) shows theory of log periodic beam. At right is PRODELIN INC's Uni-Log-6 array.

to give optimum performance over a realistic operating range -- somewhat less than the 10:1 bandwidth ratio of the traditional log periodic.

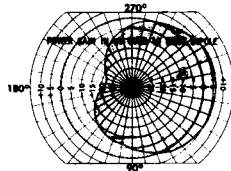
Oddly enough, there is little mysticism about the operational theory of a logarithmic beam antenna. In its simplest form, the log array is a row of ordinary dipoles, each of which is cut for a higher frequency than the preceding dipole. As with the inverted vee, the proper antenna (or dipole) responds to its own wavelength of resonance, while the other elements on the boom act as directors and reflectors. And the input impedance remains very close to 72 ohms, regardless of which dipole is excited. (Prodelin's commercial log periodic, the Uni-Log-6, has a 50-ohm balun built in as an integral part of the antenna assembly.)



VSWR vs. FREQUENCY (Typical)



HORIZONTAL RADIATION PATTERN (Measured)



VERTICAL RADIATION PATTERN (Measured)

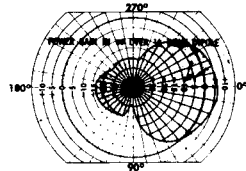


Photo and operational data on Uni-Log-6
 --Courtesy Prodelin, Inc., San Carlos, Calif.

REFERENCES

1. Rumsey, V. H., "Frequency Independent Antennas," University of Illinois Antenna Laboratory, Technical Report 46
2. Isbell, D. E., University of Illinois
3. DuHamel, R. H., Collins Radio Company

Also Cited: Prodelin Inc., Gen Catalog 644, "Antenna and Transmission Line Systems" Issue 2.

The nonresonant dipoles which serve as parasitic elements (while one dipole radiates) are cooperative for several reasons. The feeding of the dipoles alternates along a two-wire line (which can also be the boom) so that those adjacent to the radiating dipole are 180 degrees out of phase with the radiator. The elements which are shorter than one-half wavelength at the operating frequency present a high capacitive reactance to the two-wire feedline and absorb only a very small amount of the energy on the antenna. Elements longer than one-half wavelength present a high inductive reactance and likewise absorb only a negligible amount of the energy. The radiating dipole, however, appears as a good impedance match

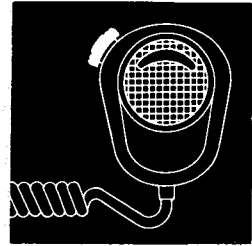
to the 72 ohm line, so it absorbs the bulk of the available energy. The shorter elements then act as directors while the longer adjacent element takes on the role of reflector (whose mass is reinforced by the other longer dipoles).

In commercial arrays, the dipole lengths are arranged so there is a constant ratio between all adjacent dipoles. Similarly, the elements are spaced according to a constant determined by wavelength. While the mathematics involved in determining the ratios can become horrendous, application of the established ratio into a practical antenna design is no more difficult than calculating spacing and element lengths for any other type of array.

The business of war

AM-FM

THE
CONFLICT



When an AM net and an FM channel compete for a particular two-meter frequency, what happens? Who gives?

Take the case of RACES (146.84) and FM channel 14 (146.82): The AM'ers who check into their once-a-week net on 146.84 MHz vehemently defend the right of the net to exist there. After all, the net has been active on that frequency for a longer time than most of them can remember. Prior rights, they say. It's a RACES-assigned frequency; who would dare raise question?

The channel 14 FM'er is crystal-controlled (to a very close tolerance) on 146.82 MHz, and he monitors 12, 15, perhaps 24 hours a day. At least once each week he suffers through the erratic squelching, garbled voices, and call-less carriers that stagger across his sacred channel as the AM'ers check into their .84 net. He watches his bobbing, frenzied discriminator from time to time during check-in and sees the scary amount of spectrum the individual AM stations consume, taken collectively. With disdain that nearly always turns to hot agitation, he notes that the AM'ers may check in anywhere between .81 and .87. But from experience, he knows each AM'er will swear he's on 146.84 MHz. The FM'er has tried to explain the telling honesty of a discriminator meter to the AM'er in the past, but he's long since given it up as hopeless. The AM'er is crystaled on. And crystals just don't lie!

So, this is the biggest point of contention: To the AM'er, 146.84 is wherever the signal is when the crystal is cut for .84 operation. To the FM'er, 146.82 is wherever the signal is when his discriminator meter reads zero. In all fairness to the FM'er, it should be pointed out that his version of .82 is very likely to be within four or five hundred hertz of the actual channel, whereas the AM'er's version of .84 may or may not be within ten THOUSAND hertz of the real .84.

The FM'er's "transmit" crystal probably cost him around six dollars. It was specially ground for the circuit in which it is used. The crystal manufacturer calculated circuit capacitance

and other factors to make sure the crystal would put the FM'er dead on channel. The AM'er's crystal was cut without regard to the inherent capacitance of an oscillator circuit. As likely as not, it was originally a military crystal intended for use in a 20 pF circuit. Or a commercial crystal intended for use in a 5 pF circuit. Most AM'ers aren't even aware of the differences; they'd be hard put to tell you the load capacitances of their own oscillators. And how many AM'ers are aware that there may be precious little relationship between the VFO zero-beat indication and the actual transmit frequency.

The AM'er knows RACES is on 146.84 MHz practically everywhere in the state. So the FM'er is of course in the wrong and probably knows it. The FM'er, on the other hand, operates on a standard FM channel reserved across the nation for FM; he's pretty sure the AM'er knows it. And there's an impasse.

One AM RACES group experienced severe interference from nearby high-power FM stations operating on 146.82 MHz. The RACES group reacted in a businesslike way by discussing the problem with key FM operators. The outcome was a tentative agreement between the two factions: The AM'ers would check in once each week on their net and operate well away from the FM channel at all other times. In return, the FM'ers using the popular .82 channel would stand by during the RACES net and would resume normal activity immediately thereafter.

The system worked for a while. Activity began to increase near exponentially on FM, however, and many of the .82 newcomers weren't aware of the treaty. Theirs was a 24-hour-a-day operation, and it would have seemed preposterous to suddenly shut down so that an adjacent AM net could convene. Then, too, many of the AM'ers likewise forgot or weren't informed of the truce. They'd arrive on net a half-hour early and ragchew until check-in time. And after that, many AM'ers just didn't see the point of QSYing. Weren't they there first?

AM - FM: the conflict (Continued)

The conflict began to ripen. AM'ers and FM'ers alike were feeling the sting of the others' interference. The AM'ers would retaliate by bringing 146.84 MHz a little closer to 146.82. VFO's handled that job nicely; a wee nudge -- and zap! no FM channel!

The FM operators retaliated, too. During net time, stations who normally loped along well enough on minimum power simply upped their output levels. The several FM'ers who used remotely controlled hilltop stations made a special point of being extremely active during the RACES net.

Bitter words were often exchanged between operators of the two modes, but nothing was solved. Then the AM'ers began to buckle under from the added pressure of increased FM activity and the higher power. So another retaliatory gesture was set in motion.

Which brings us up to the present. The AM RACES group plans to QSY to a frequency well clear of all FM channels. But they wish to bequeath a memento that will serve as a constant reminder to FM'ers that they were there. The AM'ers are making a bid to establish a teletype net on 146.84 MHz.

An objective observer would smile with grim amusement to witness the continuous battering of these immovable objects and irresistible forces. But some of us, as part of the immovable, can't help but balk a bit.

What can we do to end this inanity?

We could insist that .84 operators adhere to their assigned frequency within a couple of kilohertz. This would alleviate the problem entirely for some of us and reduce it substantially for others. But the plain fact remains: Most AM'ers don't realize that a crystal is no guarantee of even being within 10 kHz of the frequency for which it is marked. Or that a zero-beat of a VFO is no certain indication of transmit frequency.

We could encourage FM'ers to maintain the lowest power level necessary to communicate (in keeping with FCC regulations) and try to uniformly keep deviation to no more than 10 kHz. It is a fact that many AM'ers don't buy the story that FM'ers are always on channel. The AM'er who listens to the FM'ers on the channel has to tune for nearly every station who transmits, so he's pretty fairly sure there is a great deal of discrepancy from one FM signal to the next. The AM'er doesn't realize

Duplexing Your 450 MHz Mobile
(Continued from page 13)

an output waveform that is unbalanced to such an extent that the audiofrequency tone generated by the transformer becomes overcoupled from the transformer to the adjacent circuitry. The result of this is an irrepressible, loud, and irritating whine. Unmatched transistors also can result in overheating during one of the operational half-cycles. If the heat-sink is incapable of coping with the excess, the added heat causes an exponential temperature rise similar to thermal runaway -- and the transistor is soon destroyed. A sound approach would be to use any transistor that will operate without overheating, but keep both transistors the same.

Modification of Unit

As noted previously, incorporation of a separate receiver supply involves nothing more than disconnecting one lead and reconnecting it elsewhere. This is true for the Pre-Prog as well as the T44. Then, in the event of T-supply failure, the unit can be returned to stock operation in no longer than it takes to resolder a lead.

The receiver high-voltage lead must be disconnected from the stock supply. In both the GE and Motorola units described, receiver B+ is routed through a push-to-talk relay. To keep the receiver operating continuously, the receiver B+ lead on the output of the relay should be moved to the B+ terminal of the added supply. This can be accomplished on the MC306 (Pre-Frog) by removing the receiver lead from pin 11 of the power connector on the strip, and replacing it with a lead from the transistor supply output. The equivalent location on the T44 receiver strip is pin 1.

that the reason he must tune is that he is slope-detecting, and that if the deviation of two FM stations is not the same, there will appear to be a difference in operating frequency.

We can all increase our deviation to 15 kHz, step up our power to the maximum legal limit, and employ high-gain antennas aimed at the key teletype facilities.

We can do a lot of things, but no one thing has any real promise of being the solution to the problem. Why don't you help us. If you have an idea for a workable solution, mail it to FM Bulletin, and mark "AM/FM Conflict" on the flap.

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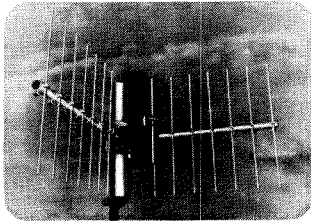
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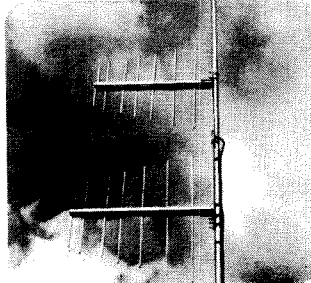
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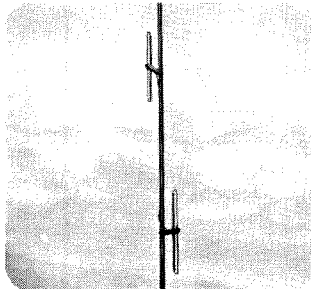
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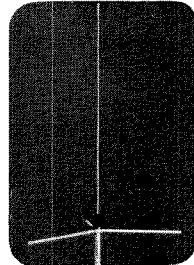
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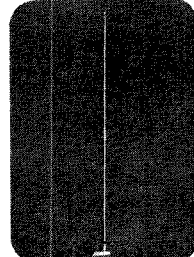
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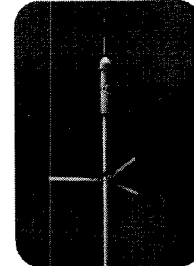
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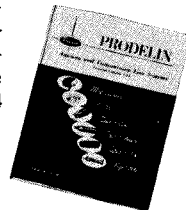


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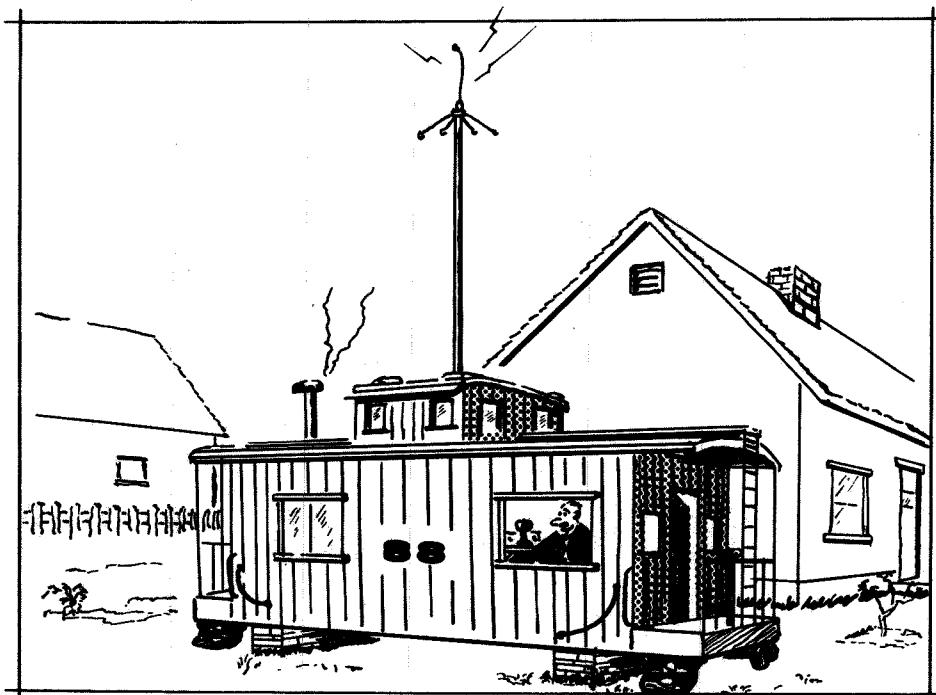
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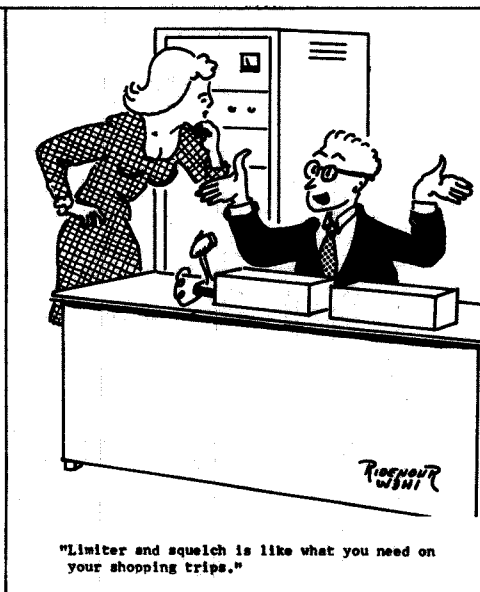
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		FSTRU 140 BR 60 watts ...	250
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GE HIGH BAND Fifty watts 2M	6 meters	FSTR 140 BY 60 watts ...	\$200
		FSTR 140 BR 60 watts ...	250
		FSTR 520 BR 250 watts ...	475

6M LOW BAND Fifty watts	MOTOROLA * * * *		
F1-16N \$250	DESKTOP	In OUTDOOR HOUSING	HIGH BAND
	L44AAB 450 MHz 15-18W	Model J44AAB 450 MHz	FSTRU 80 BY 30 watts
GE 450 MHz	\$174⁹⁸	\$ 200	\$166
F1-42N 15Watts \$249⁹⁸			

RCA Base station	15 - 18 watts out Model CSU 15	\$ 174⁹⁸
-------------------------	-----------------------------------	----------------------------

GE MA/E 33 6/12 volts

Includes control head, microphone, speaker, and cables.

30 WATTS

\$ 174⁹⁸

Motorola W43 D 6 volts

3-FREQUENCY TRANSMIT & RECEIVE
No accessories

25 watts of RF

only **\$74⁹⁸**

TWO METERS

GE MA/E 36 6/12 volts

Includes control head, microphone, speaker, and cables.

60 watts **\$ 200**

Motorola

FMTRU 41V

41V

Specify 6 volt or 12 volt unit
Includes control head, microphone, speaker, and cables.

DASH MOUNT or TRUNK MOUNT

6 volt

\$49

10 watts out

12 volt

\$59

GE WTA/E 33 6/12 volts

No accessories

30 WATTS

Single-frequency unit... **\$ 110**

Four-frequency unit ... **\$ 136**

Motorola

FMTRU 80 D

TRUNK MOUNT

25 WATTS

NO CRYSTALS

6V

\$ 70

15" HOUSING

Includes control

head, mike, spkr, and cables.

12V

\$ 84⁸⁸

GE PACER 15 watts

150 MHz Includes accessories

12 volts **\$124⁸⁸** Very popular...
...easy to install

Motorola 50 WATTS FMTRU 140 D

TRUNK MOUNT

NO CRYSTALS

15" HOUSING

Includes control head, mike, speaker, and cables.

6V **\$80**

12V **\$90**

GE 4ES20A2 6/12 volts

1 WATT UNIT No accessories

SPECIAL - LOW PRICE: \$ 29⁰⁰ each

Motorola T33G-1

6/12 volts TRUNK MOUNT

No crystals. Includes control head, microphone, spkr, cables

10 watts

\$85

RCA CMCT 30 30 WATTS L.D. UNIT 12 VOLTS

TRANSISTOR POWER SUPPLY

Includes control head, mike, speaker, cable.

SUPER SPECIAL LOW PRICE! \$ 150⁰⁰

RCA CMC 60 B-1 6/12V 60 WATTS

Includes control head, mike, speaker, and cables.

Very clean!

\$125

ITT 5 freq mobile telephone unit
 12 volts - 25 watts
TRANSISTOR SUPPLY! very clean!
 Includes Cinderella head, cables, and antenna.

K30 HA
\$325
 without accessories \$225

ITT 4 freq x 25 watts
TRANSISTOR SUPPLY
 MT600 No Accessories

VERY CLEAN!
\$90

MORE TWO METERS

ITT 2 FREQ 25 WATTS
 MT600 FRONT or TRUNK MOUNTING
 T-Power 12 volts * No access.

\$75

ITT T-Power 12 volts
 MT600 4-Channel phone
 Includes decoder. No cables or head.

\$140

ITT 2-CHANNEL TELEPHONE
 MT600 Includes decoder; no cables or telephone head.
 T-Power 12 volts

\$125

ITT Single frequency * 12 volts
 MT600 FRONT MOUNTING
 T-Power No accessories

K30 H **SPECIAL LOW PRICE \$95**

16-18 watts **CMU 15B**
 Includes control head, mike, speaker, cables.

Without accessories: **\$64.98**

RCA 16-18 watts **CMU 15A-1**
 Includes control head, mike, speaker, cables.

6/12V **\$74.98**
 Without Accessories: **\$49.98**

450 MHz

16 watts **PROG LINE**
 Includes control head, mike, speaker, cables

6/12V **\$200**

GE ME 42

GE 16 watts
 PRE-PROG 4 ES 14A1 **\$75**
 Includes control head, mike, speaker, cables.

Without accessories: **\$50**

MOTOROLA T44 AAV 6/12V
 up to 20 watts output
 Includes control head, mike, speaker, cables.

Without accessories: **\$70**

See also **BASE STATIONS** listing for other 450 !

MOTOROLA T44 A6A 6/12V
 up to 20 watts output
 Includes control head, mike, speaker, cables

Without accessories: **\$60**

Many other items available that are too numerous to list herein.
 Late model equipment available in limited quantity; call for quote.
 For the convenience of out-of-town buyers, we maintain one number that is answered only by Jim Mann or Bob Cranhold: (213) 342-0375



**Up-to-the-minute reports on
FM action throuth the U.S.**

KANSAS

Ron Tremblay (WAØPSF), secretary/treasurer of the Central Kansas Amateur Repeater Club, reports the existence of an open repeater with .34-to-.94 capability. He says similar repeaters are operational in Kansas City, Wichita, Tulsa, and Omaha. Tremblay's group is currently considering plans for a Salina-to-Wichita repeater link.

Roy Bassett (WØWIZ) says there are about 50 active two-meter FM'ers in the Topeka area. A 146.34-to-146.94 repeater is under construction and will be completed before long. Activity in the area should expand considerably after the unveiling of the new machine.

UTAH

What may prove to be the first operational FM repeater in Utah is nearing completion. Earl Lagergren (K7OEP) reports of a group venture in Salt Lake City to put a .34-to-.94 system on the air. He says it is a combination AM/FM repeater, and the AM portion is already operating. (See Letters.)

FLORIDA

According to Travis Jarman (WB4IES), there is an association in Tampa which is initiating the installation of a repeater using the conventional .34 input and an output of 146.76 MHz. The unorthodox output, he says, is to prevent interference with "direct" heavy traffic on 146.94 MHz. The repeater group calls itself the Tampa Repeater Association, and has applied for a station license with remote control authorization.

PACIFIC NORTHWEST

Phil Ferrell reporting

SEATTLE REPEATER

Input: 146.76 MHz (normal)
146.34 MHz (priority)
Output: 146.58 MHz

There are three suggested operational modes listed in order of increasing complexity:

Mode 1 Ignore the whole thing; you'll never know it's there since there is no sign of repeater operation on the primary channel (146.76 MHz).

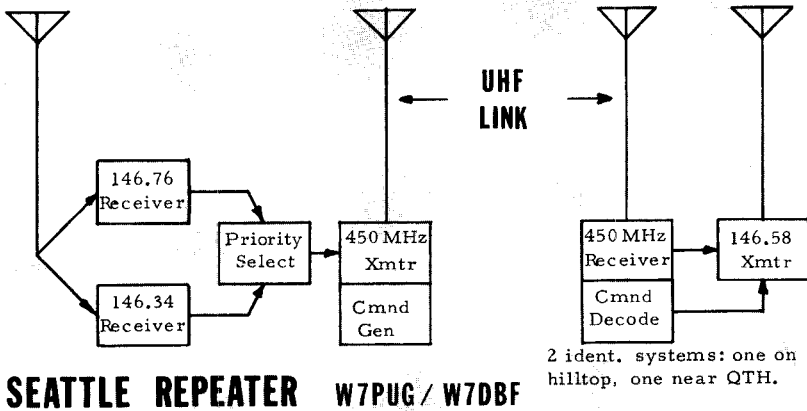
Mode 2 Convert your receiver to two-frequency operation with .58 as the second frequency. It can sometimes enhance your .76 receiving capability, particularly in mobile service.

Mode 3 In addition to the receiver conversion, also convert your transmitter to two-channel operation with 146.34 MHz as the second frequency. Transmissions on .34 have automatic priority access to the repeater audio circuit regardless of strength of incoming signals on 146.76 MHz. Transmitting on .34 and receiving on .58 allows repeater-augmented communications on a second channel with automatic monitoring of .65 between transmissions. Those equipped for Mode 1 will be totally unaware of any out-of-the-ordinary operation.

Hours of operation will be set for the convenience of users, subject only to interruption for maintenance as may be required periodically -- The system will also be shut down tempor-

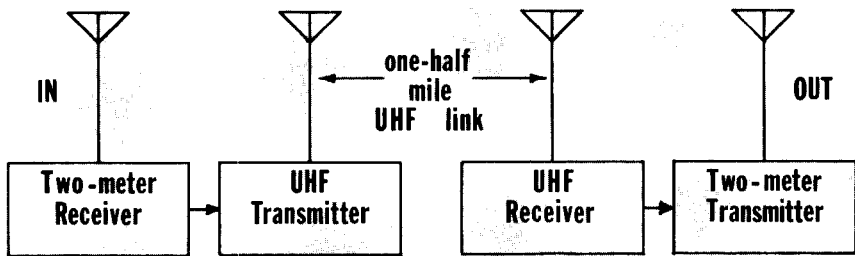
arily should it be misused by excessive on-compatible with a similar repeater in Portland the-air tests, objectionable transmissions, and operated by W7DET et al (qv). similar distressing occasions.

The control scheme is depicted pictorially in the sketch below. Separate receiving and transmitting sites eliminate desensitization problems. The system is



In addition to the Seattle repeater, semicompatible machines exist in Vancouver, B.C. (.34 in; .58 out) and Portland, Oregon (.76 in; .58 out). Much technical development and experimentation is prevalent in these areas (e.g., two-wire retransmissions, preamps, T-power, integrated circuit applications, multichannel switching, high-fidelity retransmissions of audio, etc.).

Portland Repeater W7DET/WA7ANG



PORTLAND REPEATER

Input: 146.76 MHz
Output: 146.58 MHz

Receiver Site:

Call: K7UGN
Antenna elevation: 1350 ft
Antennas:

Omnidirectional collinear, &
10-element vertical beam

Receiver:

Motorola Sensicon (with Parks preamplifier)

Control:

Radio

This facility continues as a remotely controlled station transmitting on 146.76 and 146.34 (50 and 600 watts out) using 450 MHz control & link audio.

Transmitter Site:

Call: WA7ANG
Antenna elevation: 1300 ft
Antennas:
Omnidirectional collinear
(350 ft up KATU tower)
Transmitter:
Motorola 30D
Receiver:
Motorola 30D with Parks preamplifier

WA7ANG also operates as local station receiving on .76, transmitting on .76 and .58. 'ANG also has manual control of the repeater.

PENNSYLVANIA

The Main Line VHF Association of the Philadelphia area met on 5 November at the studios of WFIL to discuss the future of the two-meter inband repeater (146.34 in, 146.76 MHz out) planned for installation in that area. The repeater was put into operation on the afternoon of the meeting as a demonstration and test.

The repeater is somewhat different from the run-of-the-mill machine in that the receiver is separated from the transmitter by nearly seven miles. The receiver is located in Newtown, Pa., while the transmitter operates from Merion. A 450 MHz link spans the distance on 450 to interconnect the two repeater portions.

ARIZONA

Cochise Amateur Radio Assn.

by William Moyes WA2WKK

The Cochise Amateur Radio Association was formally organized on 14 December 1967 at Sierra Vista, Arizona. The Association will sanction operation on 146.94 MHz with wide-band frequency modulation.

The long-range goals of the Association are: to provide 24-hour monitoring service, to establish a remote or repeater station on one of the nearby mountaintops, to provide amateur radio communications in the public interest, and to be prepared to render service to any civil agency upon request.

Officers are Robert Kelly (W7EZA), president; Raymond Shaefer (W7ELQ), vice president; and William Moyes (WA2WKK), secretary-treasurer.

The Association is actively recruiting applicants in the Fort Huachuca area, Cochise County, Arizona. In addition to recruiting new FM'ers, members of the Association are giving instructions to anyone interested in obtaining an amateur license. Anyone interested in more data should contact William Moyes, 2933 Mockingbird Drive, Sierra Vista, Arizona 85635.

**What's happening in
YOUR State?**

Thirty representatives from various outlying areas attended the 5 November meeting, and officers were elected by attendees. Jonathan Balch (W3AES) was elected president, William Winter (K3JPB) was named vice president; Gene Mitchell (K3DSM) and Roy Mc Kibbon (K3DCD) were elected treasurer and secretary, respectively.

FM IN CANADA

...by Larry Kayser VE3DAK

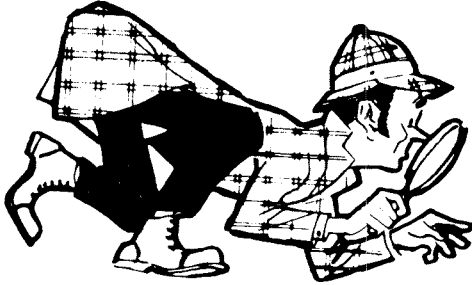
Western Canada (Winnipeg west) is mostly on 147.33. (I had a wonderful time on this channel over the holidays.) There are about 30 active stations in Winnipeg. From conversations with various individuals, I have learned of FM action in Regina, Calgary, Edmonton, and Vancouver. To the east, I have only heard of activity in Southwestern Ontario, but from VE3CUA has come a report of activity around Ottawa (the capital city). According to his report, they use the repeater exclusively (146.46 in, and 146.94 MHz out). Activity around their repeater (VE2CRA) is growing quite rapidly.

Locally, things have been a little slow (by FM standards). The W's on the other side of the river started on 145.3 and 145.8 MHz. Fortunately, these were subsequently dumped because we VE's couldn't join them (our regulations are different from theirs). We are now settling on 146.34 (input) and 146.94 MHz (output). At least two repeaters are currently under construction.

I'm not too sure about activity in Montreal. Perhaps some kind soul there who reads the Book (doesn't everyone?) can give us a report from that area. East of Ottawa, however, there is at least some FM action. I expect a report from there by the next issue.

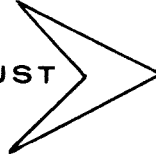
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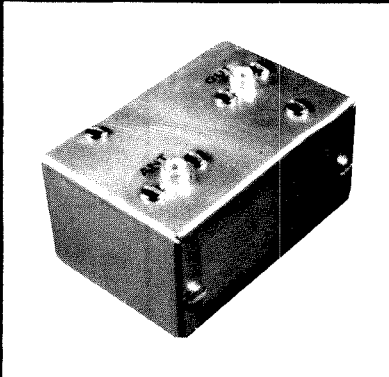
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R. KOREN - W8GHO
107 MOOREWOOD AVE.
AVON LAKE, OHIO 44012

FM Radio and Public Service

Test Proved That LUCAS COUNTY was Set for SET

by Mark Schnabel WA8SAE

At 2 o'clock on the afternoon of January 28th, our disaster communications chairman, Jim King (K8DPE), announced that a train had derailed near Scott Park in South Toledo. The members of TEAR (for Toledo Emergency Amateur Radio service) immediately swung into action.

At Red Cross headquarters, Ed Brown (K8ZCS) had started operation on six and two meters FM. Although most of the operation was on six meters, a two-meter FM link was used to coordinate operations on 160 meters at AREC headquarters.

Two of the local public service agencies were also on hand to help. The Red Cross and the Red Cab of Toledo had their mobile units dispatched to the area hospitals. The mobile units were relieved a short time later by amateur mobile operators on six meters. The hospital-based mobiles were equipped with modified control heads so that they were able to plug into extended local controls and take their mikes into the hospitals. The system proved its worth to the hospitals in terms of time saved and enhanced radio accessibility.

Twenty-two stations on FM took part in the test along with twelve stations on 160 meters. All agreed that this SET (for Simulated Emergency Test) was one of the most successful ever held in Lucas County.

While the Red Cross served refreshments to all participants following the test, there was talk about having a future unannounced SET. There's no way of knowing when and where -- or even IF -- but one thing is certain: It pays to be prepared!

AREC GROUP KEEPS ACTIVE IN CITY GOVERNMENT RADIO

by Jack Bankson WA6JXG

We who use wide-band FM know that it is THE mode for local communications. We also are aware that FM'ers have learned how to operate on a crowded channel. This knowledge and information is put to good use in public-service communications. And we must remember that use of amateur radio in the public interest is the primary reason amateurs are allowed to use valuable spectrum anyway.

Public service communications does not have to be comprised of boring traffic nets and other similar activities so often choked with AM-type ritual. There need be no drawn-out rollcalls, time-consuming check-ins, and like that. Let me tell you about OUR net...

The East San Gabriel Valley Amateur Radio Emergency Corps near Los Angeles is a high-band FM network made up of about thirty mobile units and as many base stations. We use the standard channel of 146.82 MHz, and are recommending it as a national public service communications channel.

We have provided communications for many local communities and are held in the highest esteem around Southern California. We can do what most hams cannot because we are all using the same mode, we're on the same frequency, we're not bothered by "skip" conditions, and -- most importantly -- we know how to operate without all the hammy jargon.

On operations where there promises to be heavy air traffic, we arrange with the FCC in advance to allow us to communicate without using our amateur calls. Participating amateurs are assigned unit numbers. When one of them must use the frequency, he says what he has to say, identifies with his unit designation,

(cont. next month)

catalog

BY GREGORY



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GREGORY ELECTRONICS CORPORATION is headquarters for quality certified used two way mobile communications equipment. All radios whose unit sales price exceeds \$45.00 are thoroughly checked on our test benches. Equipment under \$45.00 is not subject to checkout, but will be physically complete.

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TERMS: 25% with order, balance on delivery. Prices are FOB our warehouse and all equipment is subject to prior sale.

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We will refund your purchase price within 5 days of receipt of merchandise, if not satisfactory--except for crystals and tuning.

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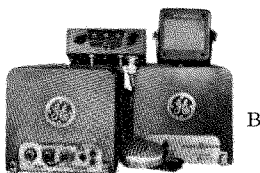


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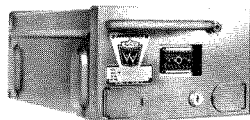


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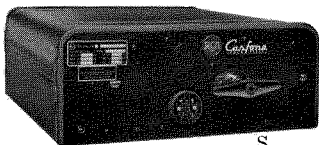
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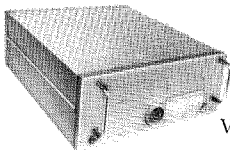
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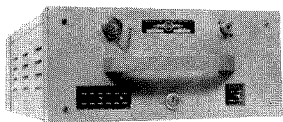
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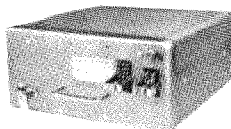
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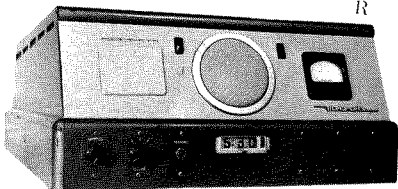
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T



C



R

Note: Accessories consist of speaker, microphone, cables and control head. Fuse block and relay will be included if available. No crystals or antenna are included unless specified. Base Stations and Remote Control units are sold MINUS microphones. Photos of most units are indicated by letter reference.

30-50 MC MOBILE UNITS

MOTOROLA 30-50 MC T51G SERIES, 50 Watt Dynamotor Power Supply
TX narrow banded RX wide band.....\$ 98.
See H In lots of 10.....\$ 88.

T51G SERIES VIBRATOR Power Supply TX narrow banded
RX wide band.....\$138
Fully narrow banded (TX & RX).....\$168
T51GGV VIBRATOR POWER Supply TX Narrow banded RX wide band.....\$168
Fully narrow banded (TX & RX).....\$198
Above prices include accessories
(Less accessories, deduct \$30.00).
To tune unit to desired frequency including new antenna add \$45.00.

MOTOROLA FMTR80D - 6 or 12 Volt See I
30 Watts wide band.....\$ 48
Transmitter narrow band.....\$ 58
Fully narrow banded.....\$ 68

MOTOROLA FMTR140D - 6 or 12 Volt See I
60 Watts wide band.....\$ 78
Transmitter narrow band.....\$ 88
Fully narrow banded.....\$ 98
Complete with accessories
(Less accessories deduct \$20.00)

Special
MOTOROLA X51GGS 40-50 MC., 50-60 Watt, (Dual Front End) 3 frequency RX, 2 frequency TX, Tx narrow band, Rx wide band, complete with accessories.....\$128
Lots of 10.....\$110
Same as above, fully narrow band.....\$158
Lots of 10.....\$140.

The receiver has a transistorized power supply. The transmitter uses a Dynamotor.
15 Watt power speakers available at \$10.00 extra.

MOTOROLA T41GGV 30-50 MC See Q
30 Watt vibrator power supply fully narrow banded complete with accessories.....\$128
Same as above, T41G series.....\$108
Add \$45.00 for tuning to desired frequency and new antenna

MOTOROLA 30-50 MC, FMTR41V Front or rear mount, 6 volt, complete accessories,
Narrow band transmitter.....\$ 58
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Rear or front mount, 12 volt See L
Narrow band transmitter.....\$ 68
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MOTOROLA T31BAT 30-50 MC Motorcycle "Dispatcher", transistorized receiver and power supply, 6 volt, 12 watt, complete with accessories including metal housing....\$ 88
T31AAt (Same as above).....\$ 68

MOTOROLA Dispatcher D21AAt 30-50 MC, partially transistorized, 12 volt, 1 1/2 watt.....\$ 78

GE 2-PIECE UNIT - 6 Volt or 12 Volt See B
4 ER6 - 4ET5, 30W 30-40, MC - 40-50 MC Wide Band.....\$ 48
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Complete accessories

4 ER6 - 4 ET6, 60W 30-40 MC - 40-50 MC Wide Band.....\$ 68
Fully narrow band.....\$ 88
Add \$45.00 for tuning and crystals to desired frequency, including new antenna.
Complete accessories

GE PROGRESS LINE 30-50 MC
 Vibrator Power 14" case complete
 with all accessories See C
 Fully narrow band (TX & RX)
 MA/E 13 6/12 V 30 Watts.....\$178
 (less accessories \$148.00)
 MA/E 16 6/12 V 60 Watts.....\$198
 (less accessories \$168.00)

GE 30-50 MC
 MC8 (4ES2D6) 30 Watts 6/12 Volt
 Vibrator TX narrow band complete
 with accessories \$ 68

GE RECEIVER
 4 ER6 30-40 MC, 40-50 MC, 6 or 12 Volts
 See D Less accessories
 3 Coil L F. \$ 28
 4 Coil L F. \$ 34

GE PACERS 25-50 MC
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 16 Watt 12 Volt complete..... \$108

GE 4 ES18 - Low Power Industrial, 1 Watt rear
 mt. makes excellent monitor RX - 30-50 MC
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 6 volt \$ 38
 12 volt..... \$ 44
 CMV2F5, 30 Watt, FNB, 6/12 volt
 vibrator power supply..... \$ 78
 CMV3E, 60 Watt, Tx narrow, Rx wide
 Dynamotor power supply, 6 volt..... \$ 44
 12 volt..... \$ 54
 CMV3F5, 60 Watt, FNB, 6/12 volt
 vibrator power supply \$ 88
 complete with accessories See M

RCA CMF55 25-54 MC., 6/12 volt, dual
 dynamotor, 55 watts, fully narrow banded,
 complete accessories. See S..... \$108

RCA CMF100 Dynamotor Power Supply, See S
 6/12 Volt, complete accessories, fully narrow
 banded.
 25 to 54 MC.....\$138

BENDIX MRT10 30-50 MC
 35 watt 12 volt vibrator power
 supply, complete with accessories..... \$ 38

BENDIX IV14AA - 6/12 Volt 30-50 MC
 vibrator P.S..... \$ 58
 25 Watt fully narrow band - complete
 accessories
 IV16AA - 6/12 volt 30-50 MC vibrator P.S.
 50 watt, fully narrow band complete
 accessories..... \$ 78
 Less accessories deduct \$20.00

20 WATT TRANSMITTER STATIONS

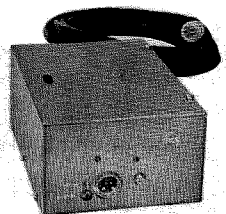
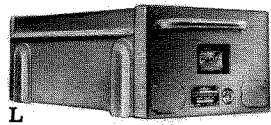
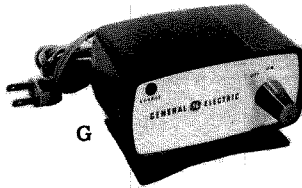
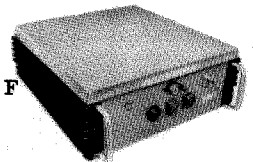
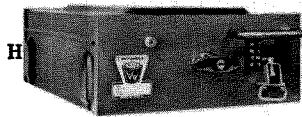
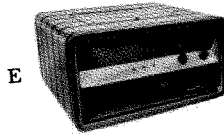
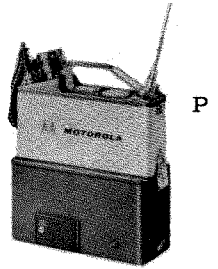
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 Fully narrow banded - weatherproof
 cabinet.....\$218
 Upright cabinet.....\$188
 Same as above, narrow band transmitter,
 wide band receiver.....\$168

MOTOROLA FSTR140BY, 60 Watt,
 Desk model, fully narrow band.....\$198
 Same as above, narrow band transmitter,
 Wide band receiver.....\$168

MOTOROLA L41GGB 30-50 MC., 30 Watt
 utility base station.....\$198

G. E. PRE-PROGRESS DESK MATE SIZE OR
 UPRIGHT CABINET, 50-60 Watts
 fully narrow band.....\$138
 Same as above, transmitter narrow band,
 receiver wide band..... \$118

RCA CSF60A DESK TYPE 60 Watts,
 Fully narrow banded..... \$138
 Wide band.....\$108



148-174 MC MOBILE UNIT

MOTOROLA 148-174 MC T43GGV See Q
 30 watt vibrator power complete with all accessories less crystal and antenna
 6/12 volt fully narrow band.....\$178
 Transmitter narrow band, receiver
 Wide band \$158
 Same as above T43G Series
 fully narrow band.....\$158
 Transmitter narrow band, receiver
 Wide band.....\$138
 Add \$40.00 for tuning to desired frequency and new antenna

MOTOROLA 150-170 MC See Q
 T33GGV 6/12 volt 10 watt complete with accessories, less crystals and antenna
 Fully narrow band.....\$ 98

FRONT OR REAR MOUNT

MOTOROLA 150-170MC - MODEL FMTRU41A
 10 Watt, Front or rear mount - 6 volt complete accessories - See L
 Narrow band transmitter.....\$ 58
 Fully narrow band.....\$ 65
 Front or rear mount - 12 volt
 Narrow band transmitter.....\$ 68
 Fully narrow band.....\$ 78

MOTOROLA FMTRU80D - 6 or 12 Volt See J
 30 Watts wide band.....\$ 48
 Transmitter narrow band.....\$ 58
 Fully narrow banded.....\$ 68

MOTOROLA FMTRU140D - 6 or 12 Volt
 60 Watts wide band.....\$ 78
 Transmitter narrow band.....\$ 88
 Fully narrow banded.....\$ 98
 Complete with accessories
 Less accessories deduct \$20.00

MOTOROLA FHTRU1 - 1 Watt Portable
 Less batteries, as is condition with hand set.....\$ 10

MOTOROLA FPTRU-1 150-170 MC., 1 Watt packet, Less batteries \$ 18

GE 150-170 MC 6 or 12 Volt
 4ES12A1 10 Watt complete with accessories.....\$ 38
 In lots of 10.....\$ 30

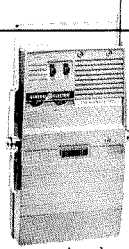
GE PROGRESS LINE 148 to 174 MC See C
 Vibrator power 14" case complete with all accessories fully narrow band.
 MA/E 33 6/12 V 30 Watts.....\$198
 (less accessories \$168.00)

GE PACERS - EG43SA6
 Transistorized power supply 15-15 watts, 12 v front mount.....\$108
 (Complete accessories, less crystal and antenna)

G. E. 150-170 MC
 4ES13 - 6 or 12 volt, 50 watts.....\$ 48
 4ES16 - 6 or 12 volt, 30 watts.....\$ 38
 complete with accessories

G. E. DT03
 150-170 MC. Five channel M. T. S. telephone unit with transistorized power supply, duplexer and decoder less accessories \$228

RECONDITIONED
 GENERAL ELECTRIC
 VOICE COMMANDER
 PERSONAL FM
 TRANSMITTER-RECEIVER



...a high performance, completely self-contained two-way FM Radio. Extremely compact and lightweight, the VOICE COMMANDER is simple to operate and easily hand carried.
 Except for the final stages of the transmitter, the VOICE COMMANDER is completely transistorized, 132 to 174 MC. See A

Including Brand New rechargeable Nickel Cadmium Battery Pack

Discount Prices
 1 unit.....\$148.00
 3 units 15% Discount.....\$125.80
 6 units 30% Discount.....\$103.60
 10 units 40% Discount.....\$ 88.80
 If crystals and tuning is desired, add \$45.00

BATTERY CHARGERS See G
 1 unit.....\$ 16.00
 3 Units 15% Discount\$ 13.60
 6 units 30% Discount\$ 11.20
 10 units 40% Discount.....\$ 9.60
 Voice commander monitor receiver only with dry batteries crystallized and tuned to your frequency.....\$ 79.00

If additional nickel cadmium batteries are required, they are available at a price of \$25.00 per battery pack.

Lapel microphones \$5.00
 All above prices are net

RCA CMC10 - 150-170 MC - vibrator power supply, 6 or 12 volts, 10 watts. Complete accessories, fully narrow banded.....\$ 68
 See W

RCA CMC20 - 150-170 MC vibrator power supply, 6/12 volt, 20 watts, complete accessories, fully narrow banded.....\$ 88
 See W

RCA CMC30 - 150-170 MC 6/12 volts, See S
 30 watts, complete accessories
 fully narrow band.....\$ 98

DUMONT - 30 WATTS, 12 VOLTS, 301E,
 Transistorized power supply, complete accessories.....\$ 88

150-170 MC BASE STATIONS

MOTOROLA FSTRU140BR-60 WATTS, UPRIGHT CABINET Fully narrow band.....\$178
 Transmitter narrow band, receiver wide band.....\$148

MOTOROLA FSTRU80-30 WATTS
 TABLE MODEL See R
 Fully narrow band.....\$168
 Transmitter narrow band, receiver wide band.....\$138

G. E. PROGRESS LINE PACER BASE, MODEL ZS 43
 15 Watts, fully narrow band.....\$148



450-470 MC MOBILE UNITS

- RCA - CMU15A, 6/12 Volts See S
Complete with accessories.....\$ 68
- RCA - CMU15B, 6/12 Volts See V
Complete with accessories.....\$ 88
- RCA - CMUE 12 Volts
complete with accessories.....\$158
with quiet channel.....\$183

- MOTOROLA - 450-470 MC Mobile Units - 15 to 18 Watts**
Complete Accessories See I
- T44A - 6 or 12 volts.....\$ 48
T44A6 - 6/12 volts.....\$ 58
T44A6A - 6/12 volts.....\$ 68
T44AAV - 6/12 volts.....\$ 88

TECHNICIAN'S SPECIALS

Offered at reduced prices on as-is basis. Repairs are necessary and/or parts may be missing. Less accessories unless specified.

- INDUSTRIAL RADIO P, S, 40**
1 watt 30-50 MC pack set less batteries... \$ 10
- RCA - CMV - Dynamotor Power Supply less accessories 30 watts, 30-50 MC..... \$ 25
- DUMONT - 150-170 MC 6/12 volts, 301B, with accessories..... \$ 38
- RCA - CMF40, 30-50 MC., 6/12 volt, 40 watt, less accessories (need work)..... \$ 45
- RCA - CMCT30, 150-170 MC., 12 volt Transistor Power, 30 watt (need work).... \$ 75
- RADIO SPECIALTIES PACKMASTER**
30-50 MC., 1 watt..... \$ 15
- FM Schematic Digest. A collection of Motorola Schematics covering much of the equipment manufactured in the 1950 era... \$ 4.95

- G. E. PROGRESS LINE TRANSISTORIZED PORTABLES**
132 to 148 MC, 148 to 170 MC,
1 watt, H31N with dry cell pack, as is, less batteries..... \$ 30
Same unit as above with Nicad Supply and Nicad batteries, as is..... \$ 50

BAM CORNER

- MOTOROLA W41G in 15" CASE, 12 volt, Wide band, dynamotor power supply, minus accessories, 6 meters, receiver 30-40 MC - transmitter 40-50 MC..... \$ 58 each
- G. E. 6 -METERS - MCS (4ES22D6) 30 watts Vibrator power supply, complete accessories less crystals and antenna..... \$ 58

- G. E. 6-METERS PRE-PROGRESS BASE STATION 60-60 watts**
Wide band..... \$ 98

- MOTOROLA FMTRU41V 150-170 MC See L 2 meters, wide band front or rear mount 6 or 12 volts..... \$ 48

- G. E. 2-meters 6 or 12 volt, 4ES12A or B 10 watt complete with accessories wide band..... \$ 38

- RCA - CMV1D 2 meters wide band, Vibrator power supply - 10 watts, as is with accessories..... \$ 28

Suggest: For UHF equipment check 450-470 column

ODD LOT CORNER

- 4ET5 - GENERAL ELECTRIC
6 V 30 watt 40-50 MC Transmitter.....\$ 8
60 watt.....\$ 12
- 4ET5 - GENERAL ELECTRIC
12 v 30 watt 40-50 MC Transmitter.....\$ 12
60 watt.....\$ 15

- GENERAL ELECTRIC 4ES14A1 - 450-470 MC, 6/12 volts, less accessories 12 to 15 Watts..... \$ 38
In lots of 10..... \$ 30

UHF 450-470 MC BASE STATIONS

- MOTOROLA L44AAB
Desk Type.....\$198
RCA - CSU15 - See E
Desk Type.....\$228
RCA - CSU15
Wall mount.....\$188

- G. E. PRE-PROGRESS -
Upright cabinet.....\$138

REMOTE CONTROLS

- MOTOROLA - P8270..... \$ 65
G. E. - 4EC14A..... \$ 65

- MOTOROLA FMT 30 D
6 v low band, 30 watt TX..... \$ 2

- CARTER CHANGE - A Volt, No. B-165V
Input 12 volts, 11 amps DC
Output 6 volts, 15 amps DC, complete with starting relay and switch..... \$ 8

- 450 MC PORTABLES RADIO SPECIALTIES
RSTRAN transistorized..... \$ 36

- MOTOROLA UHGGT, Clean, 30 Watts, 30-40 MC MINUS RECEIVER STRIP, transistor power supply, complete accessories.
Less crystals and antenna.....\$ 88
Minus accessories See N..... \$ 98

- MOTOROLA T41GGV, 30 Watts L. B. 30-40 MC vibrator power supply, clean unit, See Q Minus receiver strip, complete accessories..... \$ 68
Minus accessories..... \$ 38

- MOTOROLA T41G SERIES, Same as GGV,
Minus receiver strip..... \$ 58
Minus accessories..... \$ 28

- MOTOROLA FMTR50D - 6 or 12 VOLT, See I
Minus receiver strip - less accessories..... \$ 15
AM receiver strip on 2.5 MC for above..... \$ 15

- LINK 6000 NW SERIES, Dynamotor Power Supply See T
25-50 MC 20F3 emission TX narrow band 12 volt 50 watt less accessories..... \$ 25
With accessories..... \$ 35

- SECODE MTS SELECTORS
Model 2134 G, Brand New... sealed carton... \$ 50
Lots of 10 - special price..... \$ 40

- CONSOLIDATED CONVERTERS, 100-150 MC AM or FM, Model 1247, 100-150 MC, 100-150 MC, PAL, New in original cartons..... \$ 18

- COMCO 278A, 118-174 MC AM (Presently on 121.9 MC), 4.5 watt..... \$ 38
With weatherproof aluminum case..... \$ 43
COMCO 678, 118-150 MC AM (Presently on 121.9 MC.), 10 watts.....\$ 48
COMCO 700, 225-400 MC AM.....\$ 38

- G. E. 72-76 MC Upright Base Station..... \$ 98

- RADIO SPECIALTIES 40-50 MC, 60 Watt, 12 volt, Dynamotor power supply (30 only).... \$ 25

PARTS AND ACCESSORIES

- ACCESSORIES FOR
GENERAL ELECTRIC PRE-PROGRESS LOW OR HIGH BAND
Speaker \$5.00 Microphone 5.00
Control Head 5.00 Cable Assembly 10.00
If purchased as set.....\$20.00

- ACCESSORIES FOR
MOTOROLA FOR MODELS SUCH AS FMTR, FMTRU, ETC.
Speaker \$5.00 Microphone 5.00
Control Head 5.00 Cable Assembly 10.00
If Purchased as set.....\$20.00

- ACCESSORIES FOR
MOTOROLA FOR MODELS SUCH AS T41, T43, T51, ETC.
Speaker, Twin V \$7.50 Microphone 5.00
Control Head 7.50 Cable Assembly 15.00
If purchased as set..... \$30.00

- MOTOROLA 15WATT POWER SPEAKER
TU433A 12 Volt..... \$15.00
Above in lots of 10..... \$13.00
MOTOROLA CONTROL HEAD WITH MICROPHONE MODEL P9022..... \$ 8.00
MOTOROLA WEATHERPROOF CASES FOR 15" MOBILES..... \$15.00

- MOTOROLA AND GENERAL ELECTRIC BASE
Station Microphones..... \$18.00
Used Low Band spring and base... \$ 3.00

- METAL HOUSING FOR G. E. TWO-PIECE PRE-PROGRESS TX AND RX..... \$10.00

- RCA CRYSTAL OVENS 12 VOLT,
Per Dozen..... \$36.00

- RCA QUIET CHANNEL "RC" CIRCUIT
For out-board installation on Fleetfone or Carfone..... \$15.00

- RCA CASES FOR CARFONELINE,
Specify Model..... \$10.00

- RCA L. D. CONTROL HEAD..... \$ 8.00

- RCA CARFONE CONTROL HEAD... \$ 7.00

- GENERAL ELECTRIC VOICE COMMANDER NARROW BAND
Miniature Transmitter Board 1 Watt FM 20.00

- GENERAL ELECTRIC CHANNEL GUARD WITH REEDS
For "Pacer" Mobiles..... \$25.00

- GENERAL ELECTRIC DYNAMOTORS
30 Watt, 12 Volt..... \$ 4.00
30 Watt, 6 Volt..... \$ 3.00
60 Watt, 12 Volt..... \$ 7.00
60 Watt, 6 Volt..... \$ 5.00

GREGORY ELECTRONICS CORP.

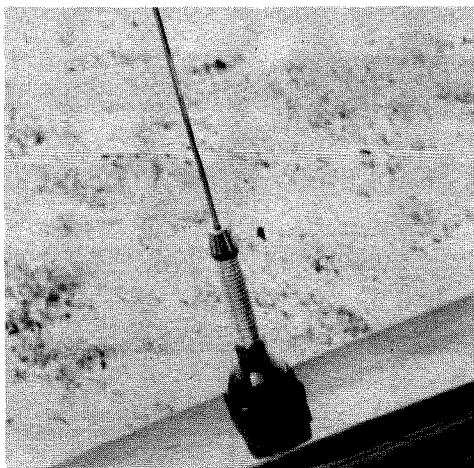
249 Route 46, Saddle Brook, N. J. 07662
Phone (201) 489-9000

know your

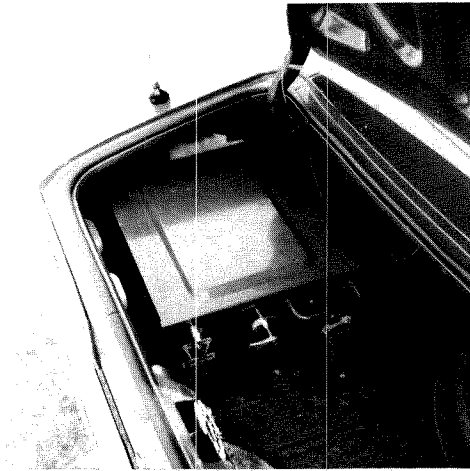
TOOLS & TECHNIQUES

THE NEW CAR INSTALLATION

Many of us hesitate to install our mobile equipment when we buy new cars. We're afraid to drill holes in the beautiful exterior, and we're even more reluctant to hang speakers and control heads under the dash. With a little care, however, there is really no need for such concern. The looks of a new car can be preserved even while the automobile sports the most complex of equipment. The car shown here is a 1968 Camaro fully equipped with 450 MHz control apparatus as well as two high-performance antennas for simultaneous duplex operation. Yet, none can deny it still retains all the sleekness and beauty one is entitled to expect from a new car.



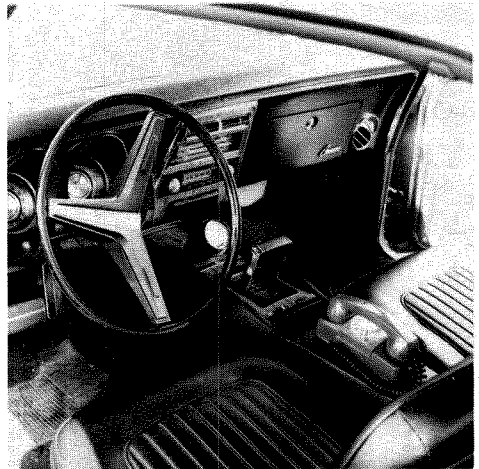
The antennas are symmetrically mounted on the rear cowls. There is some disadvantage in not having them roof-mounted, but this is partially compensated for by the reduced length of the transmission lines. Some receiver desensitization can be expected during duplex operation because of the oppositional proximity of the two antennas. This can be minimized by incorporation of a cavity in the receiver transmission line.



The 1968 Camaro is not famous for trunk roominess. With a unit as large as the Motorola T44, it's almost impossible to mount without additional braces, because the floor of the trunk is not flat. In the installation pictured, an angle-iron "table" was welded into one corner of the trunk. The table provides a level mount and keeps the unit up off the floor.

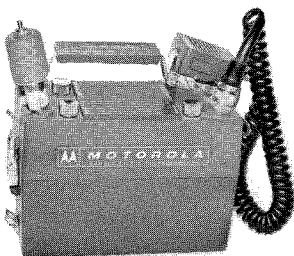
There is very little indication of a radio installation inside the car. The control head was dispensed with in favor of the conventional "Starlight" telephone unit. The ignition key turns the unit on, so there is no need for a power switch. The squelch is grounded to "full squelch" to eliminate the need for the control inside the car. The speaker is mounted up under the dash, completely out of view of the driver and passengers.

The telephone unit is mounted on the hinged top of a small compartment which houses an L-pad for controlling speaker level. The dial on the telephone is used to transmit digital tone commands for control of various remote functions.



In case you're wondering which repeater is controlled from the mobile unit, or whose call is associated with it, here is a photo of the operator. He is Ken Sessions (K6MVH), your editor.

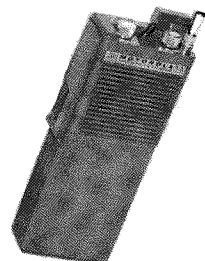
Too good for amateurs



MOTOROLA P31-DDC (LOW BAND) COMPLETE
W/ BATTERY & ANT. (like new) \$275.00
MODEL P21-DDC (LOW BAND) \$225.00

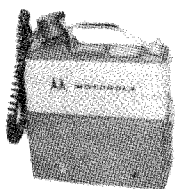
(add \$3.00 ea. for postage and insurance)

MOTOROLA H21DCN-3100AW (LOW BAND) \$195.00
(like new inside & out)
H21DCN-2 FREQ. (LOW BAND)
(less Ant.) \$195.00



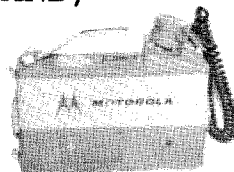
MOTOROLA TRANSISTORIZED POCKET RECEIVERS,
COMPLETE WITH BATTERYS (HIGH BAND) HO3ANC
\$85.00

MOTOROLA TRANSISTORIZED POCKET RECEIVERS,
COMPLETE WITH BATTERYS (LOW BAND) HO1ANC
\$85



5 WATT, MODEL P33BAM (HIGH BAND)
\$80.00

H23BAM, (mic-spkr) HIGH BAND LESS ANT. \$60
H23BAM, (handset type) HIGH BAND \$50
H21BAM, (mic-spkr) LOW BAND \$60



NEWSOME ELECTRONICS

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LETTERS

I am enclosing \$2 for a one-year subscription to FM. Would it be possible to obtain back issues? I am working with a group of people in the Utah area to put up a VHF repeater. The AM repeater is operational and the FM part is operational into a dummy load. The cavities for it are still being modified. The input will be 146.34 and output 146.94 (15 or 20 kHz deviation). Would you be able to put me in touch with a smart cavity and antenna man? This would help with the problem of antenna complexity with the dual repeater. Also, do you know of any standard frequencies for AM repeaters on two meters? It would be nice if a standard deviation could be condoned or sanctioned. It would also be nice if the deviation was wide-band (15 or 20 kHz) because 5 kHz offers no advantage over AM (and this can be proved mathematically).

Earl Lagergren K7OEP
Amateur Extra Class
3588 So. 2400 East
Salt Lake City, Utah

IF YOU HAVE SPECIFIC TECHNICAL QUESTIONS, YOU MAY ADDRESS THEM TO EDITOR, FM MAGAZINE. IF ANSWERS ARE NOT READILY AVAILABLE WE'LL PUBLISH QUERIES AND FOLLOW UP WITH PUBLICATION OF TECHNOLOGICALLY SOUND RESPONSES. IF YOU'RE HAVING RF PROBLEMS BECAUSE OF DUAL REPEATER OPERATION, KEEP RECEIVE ANTENNAS TOGETHER AND SEPARATED AS MUCH AS POSSIBLE VERTICALLY FROM THE TRANSMIT ANTENNAS. IT'S USUALLY BETTER TO MOUNT THE RECEIVING ANTENNAS AT THE TOP OF A TOWER AND THE TRANSMITTING ANTENNAS AT THE BOTTOM. IF POSSIBLE PLACE TRANSMIT ANTENNAS IN FRONT OF THE TOWER AT A DISTANCE DESIGNED TO GIVE YOU GAIN WHERE YOU NEED IT. (See "Two-Meter Ground-Plane as a Gain Antenna," K6MVH, 73 Magazine, January 1968.) PLACE THE RECEIVE ANTENNAS ABOVE THE

TOWER AND BACK FAR ENOUGH SO THE TOWER BECOMES A SEPARATING MASS BETWEEN THE TWO ANTENNA INSTALLATIONS.

STANDARD DEVIATION APPEARS TO BE BETWEEN 10 AND 12 KHZ. DEVIATION OF 5 KHZ AFFORDS A LITTLE BETTER CONCENTRATION OF RF ENERGY, BUT SUFFERS FROM HIGHER INHERENT NOISE, WHICH MORE THAN CANCELS THE ADVANTAGE OF NARROW-BAND DEVIATION. TO OUR KNOWLEDGE THERE IS NO FORMAL NARROW-BAND ACTIVITY ON ANY AMATEUR VHF BAND.

After reading a couple of issues of your magazine, I feel that anyone interested in FM ham radio or repeaters would be missing a lot if he didn't subscribe.

...I am...subscribing for a period of three years. Please begin with the January issue; I want to be sure to get the rest of the diagrams for the W8BCI xcvr. This rig sounds like a good club project.

I was very interested in K6MVH's article on phone operation on two meters. I have built up a phone patch for use by local mobiles. It does have the disadvantage of being controlled by a base station but it does occasionally provide a useful service... Keep up the fine publication.

Ron Tremblay WA0PSF
2050 Marc St.
Salina, Kansas

Please send me back issues since Aug. I first became acquainted with your magazine about two months ago when I saw it on the workbench of a friend. I immediately became curious. After reading it, I was quite impressed and therefore became a subscriber. I have been interested in FM theory, design, and construction for the past 15 years and have been using various FM equipment during

Letters (Continued)

this time. I have a Motorola 80D in one car that is designed and modified for six-channel operation. One of these channels is for remote-control/repeater operation. We have at least six in-band repeater systems in the Chicago area, and more fellows are jumping on the bandwagon all the time. Also, as time progresses, the repeater systems are becoming more and more sophisticated. Your magazine is most valuable both as a "clearing house" for FM material as applied to amateur radio and as a much-needed source of FM bibliography. Thank you and your group again for your sincere efforts to promote the (ham FM) cause.

Paul Edwards W9IQX
635 Signal Hill Rd.
No. Barrington, Illinois

Just read in QST where you are putting out a monthly FM magazine. Would you please send me a copy so I can see what you have in it and also send me rates for subscribing. Thanks.

Gene Mock W4RHD
7525 SW 134 St.
Miami, Florida

Can you provide an introductory copy of your new national FM'er publication? We have a new FM association and some of the members may subscribe if they can see some of the issues.

Walter Davis K6KZT
Lakewood FM Association
4434 Josie Avenue
Lakewood, California

Congratulations on a good magazine! Why don't you advertise in other publications? I only found out about your mag through another ham by accident. Now I am a subscriber.

Leith A. Mangels K2SBI

MAYBE THE FOLLOWING LETTER
WILL ANSWER THE QUESTION.

... We will give you the full page in our March issue (of ham radio). Afterwards, we will run the quarter-page ads for you. You have a good-looking ad and I expect it will pull well.

Skip Tenney
Publisher,
HAM RADIO MAGAZINE

Mr. Bill Smith, writing in QST's "World Above 50 Mc," mentions that you are publishing a monthly FM Bulletin. May I have the subscription price and, if possible, a back issue to see what the format is? Several of us in this area are becoming interested in FM operation on two meters, primarily for a MARS base support program. Since all but one of us are new to FM we need some basic technical information (such as how to convert our units). Hopefully your bulletin can provide this information.

Austin Wade
108 San Marco Blvd
Rapid City,
South Dakota

... I am quite interested in the subject matter covered by your publication. For some time I have been a member of the Grizzly Peak VH-FM Amateur Society which operates WB6AAE on both the two-meter and the 450 MHz bands. There are over 200 active VH-FM operators in this club... I know of at least 26 repeater groups located in Central and Northern California.

... I wish you the best of success with your publication; I am certain it will fill a very specific need in the amateur field.

David Bradley W6CUB
National Sales Manager
SBE (SIDE BAND ENGINEERS)

... My big complaint is about the guys who don't know how to operate. You've heard those that if you ask them a question that requires a one-word answer, they'll come back and hem around for another

Letters (Continued)

15 minutes until you both forget what you were talking about. Next biggest is about the fellows who think a rig should only be worked on if it quits; that modulation, receiver sensitivity, netting, etc., should be entrusted to the stars rather than checked periodically.

... If any FM mobiles are planning to visit in this area, they can almost always raise someone on the frequencies (52.525 and 146.94 MHz).

Bill Harris K9FOV
414 Bombarding Avenue
Lafayette, Indiana

A friend of mine, WØMDI, gave a copy of your publication to me and I found it most interesting... I didn't know there was a magazine such as yours until yesterday. Was very interested in the Roll-Your-Own two-meter handie talkie by Dan Harger. Please find check... and start my subscription with the next issue.

Roy Bassett WØWIZ
1015 W. Fifth
Topeka, Kansas

Just saw the note in QST about your bulletin and I decided to drop you a note and inquire... I would really like to get a copy, and am submitting the following information. (See FM IN CANADA, a supplement of FM Across the Nation, in this issue.)

Larry Kayser VE3DAK
47 Campbell Ave.
Sault Ste Marie
Ontario, Canada

Please enter my subscription for three years to the FM Bulletin. Your "rag" is one of the most enjoyable publications pertinent to the use of FM on the amateur bands... Congratulations on your publication and best wishes for continued growth.

Travis Jarman WB4IES
Tampa, Florida

Thought you might like to know that the response we've been getting from our one-page ad in January (back cover) far exceeded our expectations, and "pulled" better than any other publication we advertised in during that month. It's pretty obvious that we're all witnessing the opening moves of an amateur-wide trend toward wide-band FM.

I would like to thank readers of your magazine for their overwhelming support.

Jim Mann WB6JAJ
MANN COMMUNICATIONS
18669 Ventura Blvd
Tarzana, California

JIM HAS INCLUDED HIS COMPLETE CATALOG AS THE CENTER SHEETS OF THIS ISSUE. LET'S SHOW HIM WE FM'ERS BUY!

Please have the FM Bulletin sent direct to me here in Viet Nam. One thing about this place: there's never a dull moment! The night of my return to Chu Lai, our base was mortared and rocketed. Don't worry, though: Old 'RTV still has his 5 thumbs and 15 toes (or is it 15 thumbs and 5 toes?).

Sp/5 Barry Flint 19859976 (WA6RTV)
Co. A 523 Sig Bn, Americal Div.
APO San Francisco, California

A letter from Byron (Kretzman) suggests that I would find your FM Bulletin of interest. Can you put me on your mailing list... or at least send me a few copies so I can see what is going on?

Wayne Green
Editor, 73 Magazine
Peterborough, New Hampshire

CONSIDER YOURSELF ON THE MAILING LIST. A BILL FOR \$2 IS BEING SUBMITTED HEREWITH. INCIDENTALLY, YOU 73 FANS TAKE HEART: THE APRIL ISSUE WILL FEATURE A COMPREHENSIVE K6MVH ARTICLE ON FM OPERATION AND REPEATERS.

And MORE LETTERS!

Hope I'm not barking up the wrong tree, but a note in... QST seems to tell me I've found someone with an interest in wide-band FM... and someone who has information on what other enthusiasts are up to... In case your bulletin is concerned with nbfm, I won't go into details of operation... across Canada that I know of. But if my hopes are justified, let me know subscription rates and whether you are interested in data from the prairie provinces to the north. Hope to hear from you soon. The group on two FM here has been operating in a void far too long.

Jack Binkley VE4HI
353 Scotia Street
Winnipeg, Manitoba

Please renew my subscription for three more years. There was a time... I was ready to just let my subscription run out and to just forget about it! Things are sure looking up in the magazine now and the future looks great!

Re FMB ANSWERS AUTOCALL: In the FMB reply to Autocall on amateur FM operation one important point in favor of fixed-frequency FM operation was omitted; that is the very effective public service function that 6 and 2 meter FM amateurs have been providing nationwide. Each month the "Diary of the AREC" in QST lists 2 or 3 accounts of public service and emergency operations which were handled on FM. Many of these mention even the use of repeater operation.

The reason that FM on fixed frequency lends itself so well to public service activities is that most of the equipment has squelch-operated receivers which, in many situations, monitor the "party line" most of the day and night. When emergency calls go out from a mobile or fixed station, a lot of stations are already on frequency ready to help out. Portable and mobile equipment is available in large enough quantities to provide communications for such public functions as parades, boat races, road rallies, and many other public events which require point-to-point communications.

In many operations of this type, mobiles

SPECIAL OFFER for FM'ERS! expires June 1st

\$24⁸⁸
each

12 Wavelength
Gain Rooftop Antenna
136-174 Mc. ±
11" (Hole)

TWO METERS

**3 dB gain
mobile rooftop
antennas**

**ANTENNA SPECIALISTS
Model ASP 446**

146 148
Frequency in Mc/cycles

COM-SPEC

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and portables could be required to operate close together, which would overload most AM receiving equipment. In FM operation all the signals in the group have the same audio level (generally). This feature is important when some of the stations are operated from locations such as judges' stands, hospitals, and emergency control centers.

I feel (certain) that FM is being used for public service more than is being reported in QST. Any time FM is used for public service it should be reported, so that its full potential may be seen (by others). Why not also report these to the FM Magazine, and perhaps the editors will find a spot to put it in.

Stanley Briggs W8MPD
1885 Pinetree Road
Trenton, Michigan

I wish to thank you for publishing the article on a collinear antenna appearing in the Toronto FM Communications Association bulletin. The article was written last June and since then revisions have been incorporated. The lengths for the half-wave sections are as follows:

$$\frac{492}{146.94} \times \text{velocity factor}$$

The matching device shown in the article is definitely required for a low vswr. The device is fabricated from a 4-inch piece of 14 AWG copper wire centertapped to ground (cable shield) with a variable capacitor adjusted to about 30 pF. Condensation has proved to be a problem and, as a result, the variable capacitor has been replaced with a coaxial cable stub. (The stub works out to be 5 inches long.) For maximum protection, the stub should be sealed into an inert sheath such as urethane foam. The junctions of the quarter- and half-wave sections (high voltage points) are also sealed with the foam.

The antenna, totaling five half-wave sections, is then supported inside a thin plastic pipe. This pipe is available at many plumbing and electrical supply houses.

R. H. Lang VE3BXA
2387 Old Carriage Road
Cooksville, Ontario

We are all very pleased to see the continuing success of the FM Magazine as shown by an apparently healthy circulation, increasingly good articles, and attractive presentation. I hope that our 500 or so members who put their talents to work in a geography well suited to FM mobile relay activity and which is further enhanced by two major electronics industry centers have become as avid readers as myself each month. We appreciate your efforts sincerely --- editorial responsibilities and layouts prior to deadline are a skill somewhat divorced from amateur radio.

But there is always a fly in the ointment no matter how few people one tries to please. I refer pointedly to Chronicles of Seven-Six, the barracks-like running patter of the antics of a few who muddy the image of those of us a bit more serious about our resources and talents. Sadly enough, this is no satire. It does exist in that marvelous Disneyland-inspired community of Los Angeles. And what is

more, the exceptional talents of the author -- a highly capable professional technical writer/editor -- are diverted to this type of tomfoolery. May I personally request that we hear of other things in serio-editorial fashion, thereby in his more meritorious experiences (sic). I can personally attest that Ken Sessions is one who can keep a two-way radio singing along on appurtenances and attachments not normally associated with the devices and with an unbelievable application of electronic parts. Let's get on with this business of building, operating, and sharing our ideas through this publication.

I note we have achieved a fantastic level of recognition on page 286 of the 1968 edition of the perennial-sameness Handbook -- the amateur's bedside companion. Who would have thought there were, within our narrow boundaries, "ten or so hilltop-located unmanned repeater stations making extended range of VHF communications possible with normal equipment?" I lost count when passing 45 here in California alone.

Robert Keltly
Chairman, Calif. Amateur Relay Council
2661 Carol Drive
San Jose, California

LAST-MINUTE LETTER

I'm very impressed with the FM Magazine and I wish you much success...

I am building a 2-meter repeater for the Chattanooga area, and with several of the local fellows helping, we hope to have it going by fall on Signal Mountain.

If there are any back issues available, I would like to buy them. I also need information for remote control application to the FCC. I feel I have everything correct, but it always helps to have a backlog of information.

Milton Ridgeway K4EPM
4604 Crestview Circle
Chattanooga, Tennessee

FM Magazine

2005 HOLLYWOOD

GROSSE POINTE, MICH. 48236

The Fine Art of Receiver Alignment
Cont. from page 6....

and adjust the primary several times to make certain the discriminator is properly aligned.

Motorola receivers are somewhat different from GE, and call for a variance in the tuneup procedure. In future issues, alignment procedures for other receiver circuits will be described.

W6YAN

CLASSIFIED

This Classified Advertising Service is FREE to our subscribers. Send your non-commercial ads for a one issue run each to: FM Magazine, 2005 Hollywood Grosse Pointe, Michigan 48236. Include your Phone number and Zip Code. To avoid mistakes - type it!

FOR SALE....low band RCA CSF60A transceiver with xtals for 52.525, and complete manual. Meters on front panel for cathode current and 50 ua meter for limiter or the discriminator monitoring. Capable of three transmit & two receive freqs. \$100....also have a 12v. 60watt G.E. progress line power supply at \$15 Contact Jim Lorah, K3IJJ, 2532 Garfield Ave., West Lawn, Pa. 19609 Phone: (215) 678-1623

WANTED....Transmitter strip for 80D or 140D- high band- Please state condition & strip number, and price in first letter. Also have for sale a Motorola, low band, FMT-50D and FMAR-13V receiver; 50watts r.f. output; 110-ac. Also have a Motorola FMT-30D and FMAR-13V receiver; 30watts r.f. output, 12v dc. In high band, I have a Motorola FMTU-30D and Link #1906 rcvr 30 watts r.f. output, 110v ac. plus a Motorola FMTRU-5V, 15 watts r.f. output with 110v ac. All of the above are fully converted to 52.525 or 146.940 MHz and are complete with crystals. Contact Carl Morgan, K8NHE at 8632 Bacboa Dr. in Cincinnati, Ohio 45231

FOR SALE...Gonset 2 meter SSB w/linear ampl. AC & DC Supplies. Any reasonable offer will be accepted! I've got the FM bug.... C.J. Maish, WB6OWV at 426 St. Augustine Ave., Claremont, Calif. 91766

FOR SALE....High Power FM Base..... DuMont High Band base station in 3 ft. desk high cabinet; late model. Set up for remote control. Built-in wireline control panel and phone patch with amplifier, multiple

power output levels: 120w, 30w, 15w, 5w. Crystaled (with ovens) for 146.76 MHz, wide band FM. Receiver sensitivity: is 0.4 uv typical. Extremely selective. Has been used as radio-controlled remote station for past several years, so has built-in carrier-operated relay, off/on relays, etc. Brand new driver and 5894 final. Somewhat weatherworn, but in good shape. With complete set of four handbooks included. \$175 and you pay freight. (Pictures on request). Contact Ken Sessions, Jr. K6MVH 4861 Ramona Place, Ontario, Calif. 91762

FOR SALE.... (3) 50 watt G.E. mobiles Progress lines, with all accessories. \$65 Wide band on the above..... also have (1) 25watt wide band - low band - 2 freq. 4ET 22A13 transmitter strips. (1) 25 watt wide band, High band, 1 freq. 4ET20A2 and (1) 25 watt Narrow Band, High band 2 freq. with crystals ovens 4et20A12. The wide band units are \$12 ea. and the narrow band are \$17 ea. All are in good working order. Contact: Dick Wolf, W8GMS at 1963 Brainard re., in Lyndhurst, Ohio 44124

WANTED....to buy the first five issues of FM Magazine. Write Marcy, W4ID at 461- 3rd Ave., Eau Gallie, Florida.

FOR SALE....A limited number of back issues covering AUG, NOV., DEC., '67 and JAN., FEB., '68. 25¢ each. Dont wait, since they are going fast. Write to: FM Magazine, 2005 Hollywood, in Grosse Pointe, MICH. 48236

WANTED....A schematic for a solid state squelch relay (COR) for Motorola equipment. Contact...please...Milton Ridgeway, K4EPM at 4604 Crestview Circle, Chattanooga, TN 37415

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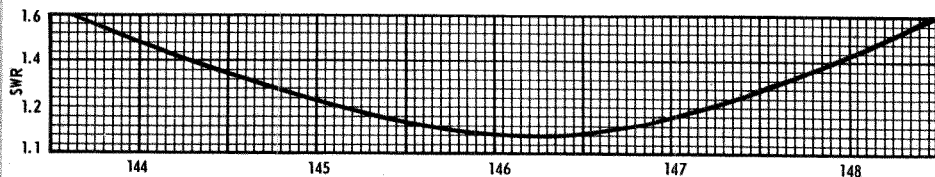
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