

# FM

The National FM'ers' Journal

VOL. II

NO. 4

IN  
THIS ISSUE

REPEATER DIRECTORY

TOUCHTONE

NI-CADS

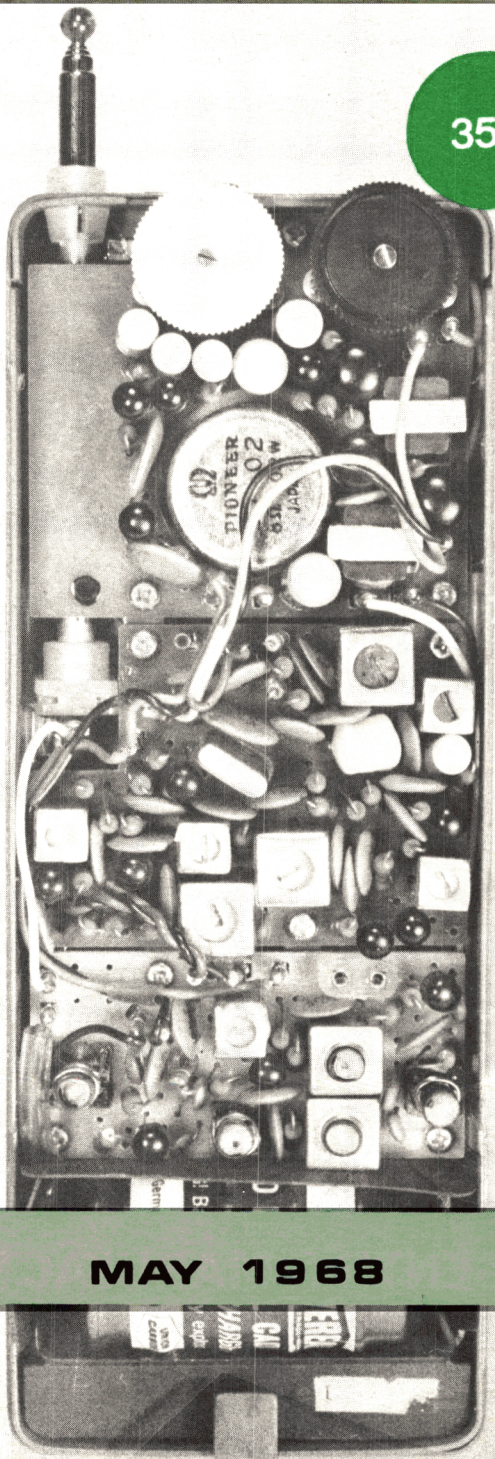
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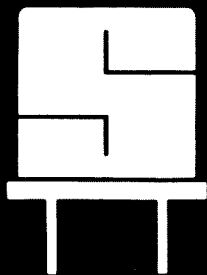
**EXPO**

**MAY 2, 3, & 4**

DETAILS ON PAGE

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**MAY 1968**

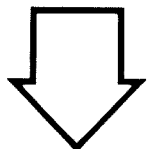
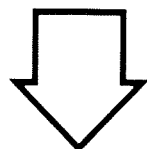
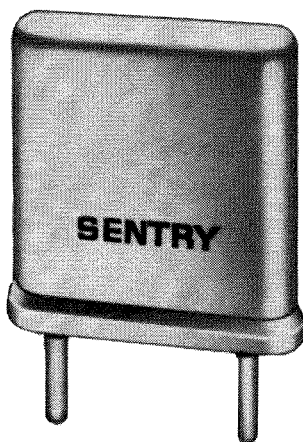


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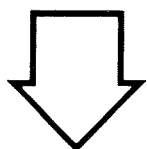
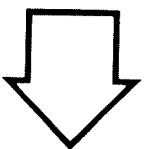


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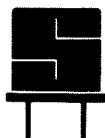
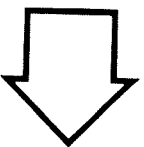
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# FM

The National FM'ers' Journal

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FM is a monthly publication devoted to the gathering and dissemination of information concerning amateur radio FM and material that is of particular interest to amateur FM operators; the promotion of FM as a recognized segment of amateur radio; and the exchange of information on a national scale between amateur FM operators and organizations.

FM is printed in Grosse Pointe, Michigan. Advertising copy that is ready for press should be mailed to M. Van Den Branden, 2005 Hollywood Avenue, Grosse Pointe, Michigan 48236. Articles and other copy for publication should be mailed to K. Sessions, 4861 Ramona Place, Ontario, California 91762. Advertising rates are available on request from either office.

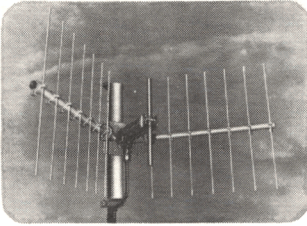
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NOTICE: As of June 1st, 1968 the rates will be as follows: 12 issues for \$3.00  
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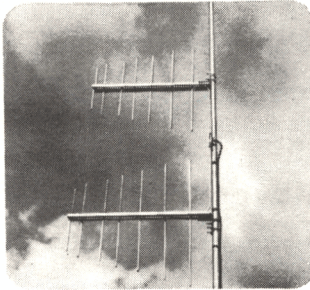
The April issue was missed because of the late publishing of the March issue being caused by the complete change in format. All subscribers will receive another months longevity. Thank you for your support.

# ANTENNAS

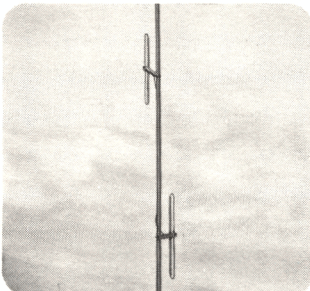
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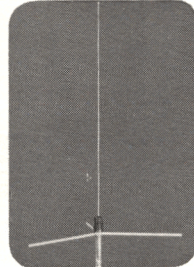
UNI-LOG 6 to 12 db gain  
132 to 470 MHz



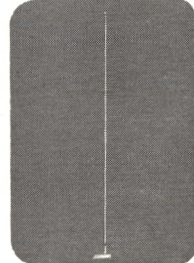
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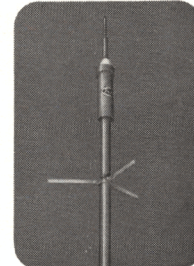
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## EDITORIAL



As an FM'er, do you care how the FCC and the ARRL look upon our remote and repeater operations? Do you have ideas on how you would like to see the amateur rules changed or new rules made? Do you have any suggestions on control techniques? Well, your ideas, suggestions and comments can have the floor at the National FM Repeater Forum, being held Saturday, May 4th, from 1300 to 1700. The meeting is being held in conjunction with the Garden State Amateur Radio Exposition, in New Jersey. See full page notice on page 19 of this issue.

Anyone who has any interest in amateur FM should not miss this exposition. Besides the FM Magazine booth, there will be a special FM booth with an elaborate, miniature, repeater and remote 146.94 MHz facility as a working display. Editor Ken Sessions and I will be present to listen to comments and ideas for improvement of your magazine, so that we can continue to upgrade its quality and content.

On the weekend of April 26 and 27, I am going to try to pull off a magic trick and appear in two places at the same time. I know of a lot of other hams who would like to do this same trick, because the Dayton Hamvention and the Michigan ARRL Convention are running concurrently. Which one to attend? This is a big question for the Michigan amateur. Dayton has had its Hamvention for 17 years now and pulls a giant crowd from the eastern and central states. On the other hand, shouldn't Michigan hams support their own convention? Well, this is for the individual to decide for himself; both affairs will have something for the FM'er. I will be in Dayton Friday setting up a booth for the magazine alongside booths from 73, CQ and Ham Radio magazines. Glenn Pohl, K8IYZ will be setting up in Lansing; he will be representing the FM Magazine for us there. Where-ever you go, please be sure to stop by and say hello!

Another meeting of interest to the FM'er will be the Annual Angola FM picnic. Dates for this event are unknown to date. Next January, ofcourse, will be the big 2nd National FM Convention in Las Vegas, Nevada. As soon as details are available on this we will pass them along.

We are all looking for FM to make a bigger mark in the ham radio world. Mass attendance of FM'ers at conventions is one way of achieving this end in a hurry. The "big boys" have already stopped ignoring us. Now let's make them sit up and take notice!

Michael Van Den Branden, WA8UTB  
Managing Editor & Publisher

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# FM Pocket Receivers

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- Adjustable squelch.
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- Tiny antenna that telescopes out for enhanced signal pickup.
- Designed for use with conventional dry cell or rechargeable nickel-cadmium battery. (Battery can even be charged without removing it from unit.)
- Easily set up on the desired operating channel.
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ALL UNITS ARE FULLY OPERATIONAL AND COME EQUIPPED WITH A PLUG-IN OSCILLATOR CRYSTAL FOR THE ADJACENT COMMERCIAL BAND. (ACTUAL FREQUENCY MARKED ON EACH UNIT.)

## COMMUNICATIONS

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# Putting the NINIC Pocket Receiver on Channel

Photos by Bill Carpenter WA6QZY

by Don Milbury W6YAN

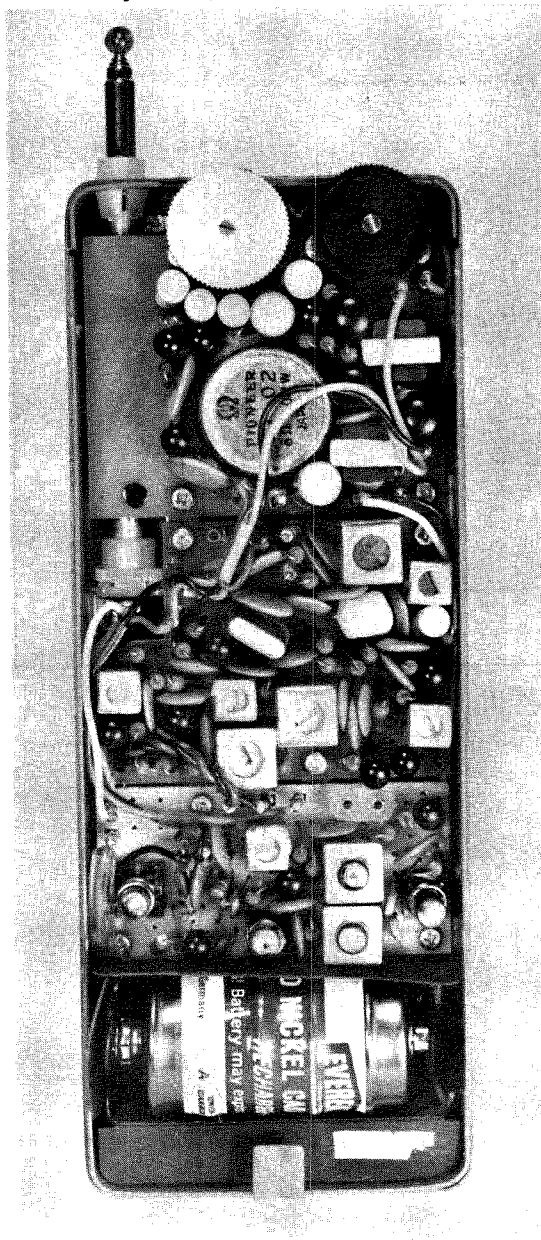


FIGURE 1. PHOTO OF OPEN UNIT SHOWS MODULAR CONSTRUCTION AND LAYOUT.

Most of us who operate repeaters or remotely controlled base stations wish for things like tiny walkie-talkies and pocket receivers from time to time. A repeater output greatly enhances the capability of any miniature communications equipment. A walkie-talkie through a repeater packs the same punch as the repeater output, and the punch usually comes from the top of a hill or mountain. To be really handy, the transceiver would have to be small enough to be carried anywhere (pocket tuckawayable), and punchy enough to develop a kicky signal from any line-of-sight range. Unfortunately, the cost for such a unit is prohibitive for us poor folk.

But there are units that do fill the bill quite nicely. GE makes one. It's transistorized and uses integrated circuitry for added miniaturization. It puts out more than a watt. It's no bigger than two packs of cigarettes. But it costs nearly a thousand dollars.

A pocket receiver is the next best thing. A good miniature FM receiver is small enough for the pocket yet sensitive enough to allow monitoring of the local repeater output from anywhere within the repeater's general range. And to be fully useful as a monitor, it must have a tunable squelch so latent band noise can be eliminated during the no-signal state. GE makes one of these, too. It's called the Message Mate. It's a highly sensitive unit made for high-band paging systems. But it costs more than \$200.

So it's pretty understandable that I became pretty excited when I saw

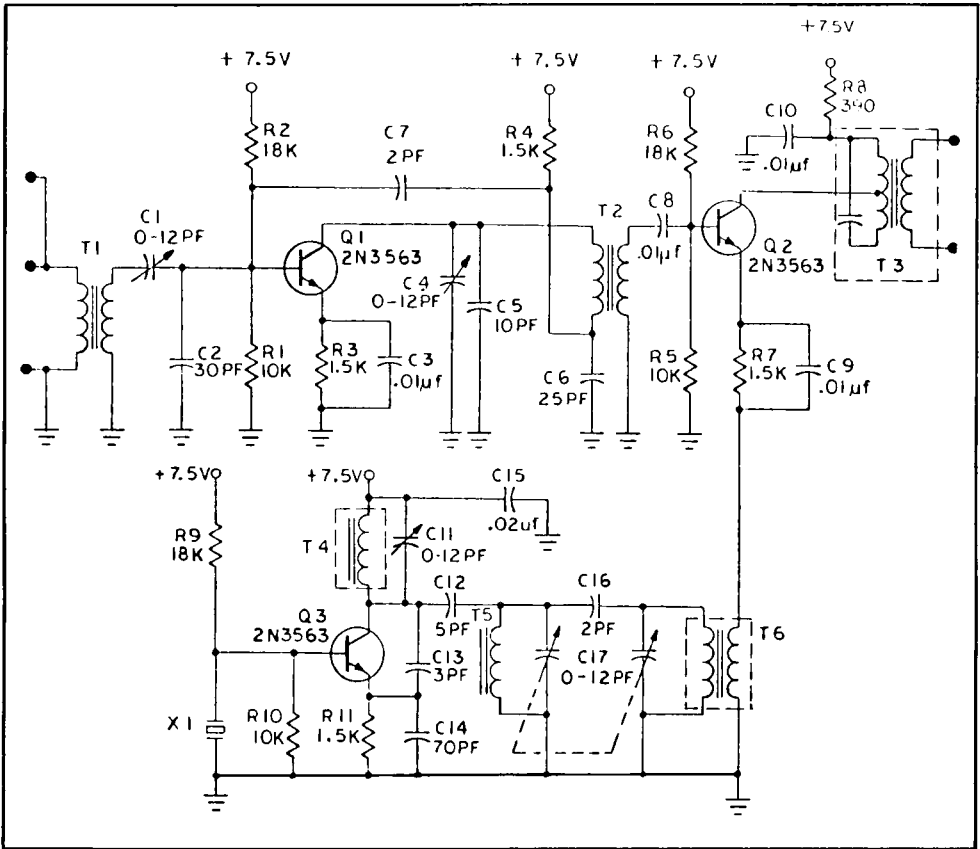


FIGURE 2. 150 MHz OSCILLATOR MODULE, NINIC POCKET RECEIVER

the Mann Communications ad in the March issue for the \$74.95 Ninic pocket communications receiver. I had to have one! Here's my reasoning:

In my locality, 146.82 MHz is the primary channel. A group of us established a hilltop 146.70 MHz transmitter which is fed all the 146.82 MHz signals heard by a local receiver. If an operator were to crystal up a two-meter mobile unit to transmit on .82 and receive on .70, the mobile would be extremely valuable around town, but totally worthless out of the general repeater area. Similarly, the operator would be out of luck if the .70 transmitter were to malfunction or be forced to shut down for some reason.

An ideal solution would be one whereby FM'ers with single-channel radios could be provided with a means for copying .70

on an auxiliary or secondary receiver. Such a scheme would also prevent a repeater from causing the kind of interference mentioned by Mr. Anderson in his very controversial anti-FM Autocall column. (FMB, February 1968)

The perfect "auxiliary" receiver to complement a single-frequency mobile unit by monitoring a repeater output is a sensitive pocket receiver. And the Ninic has proved that it can do the job nicely.

#### A LOOK AT THE NINIC

The Ninic is a stable, crystal-controlled dual-conversion superheterodyne FM receiver with a sensitivity of about a microvolt for 20 dB of quieting. The unit is inherently noisy, and it takes a signal of greater than 10 microvolts to give complete quieting. The ad said the



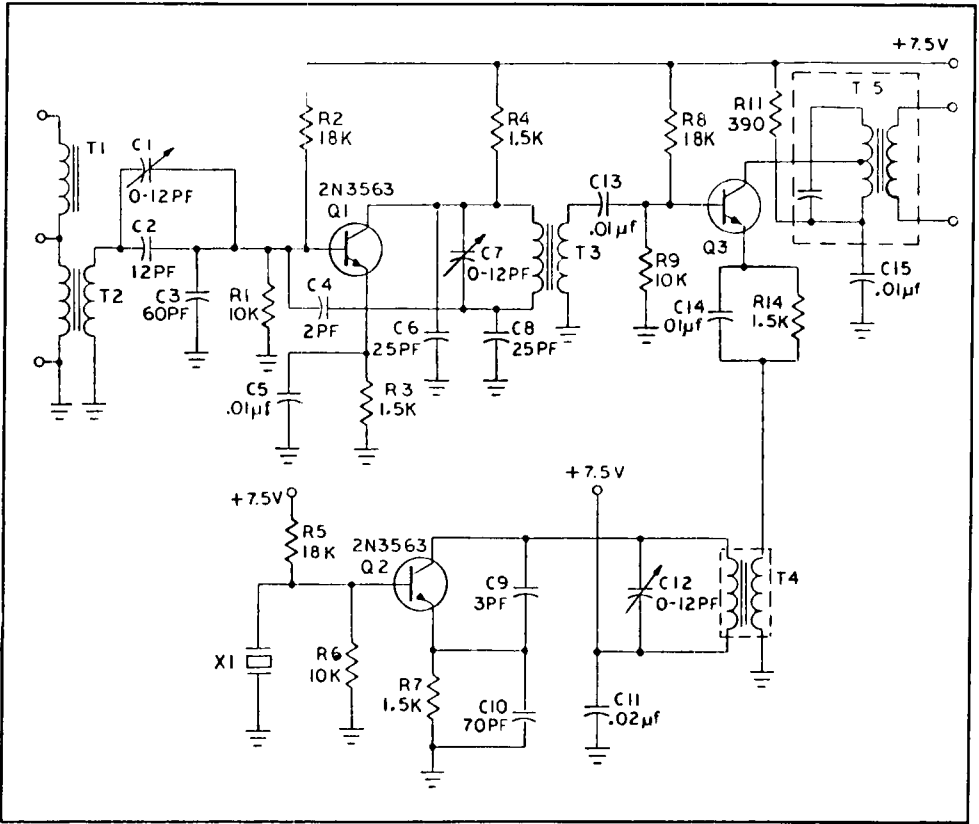


FIGURE 3. 50 MHz OSCILLATOR MODULE, NINIC POCKET RECEIVER

unit had a sensitivity of 0.3 microvolt. This proved to be true, but there was practically no quieting at that input level.

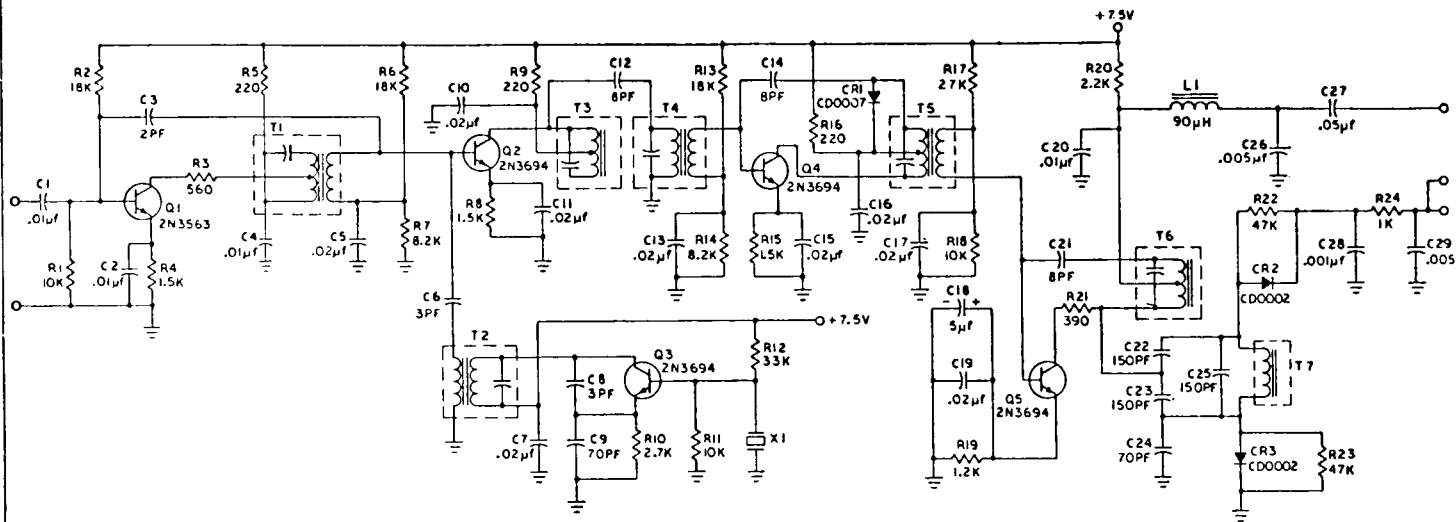
The Ninic comes equipped with one crystal for the converter and another for the oscillator. The oscillator crystal puts the operating frequency above 150 MHz, but the fact that it is supplied with the receiver greatly simplifies tuneup and checkout; it's always more comfortable to check out a receiver on its original frequency before attempting to set it up on a new channel. The originally supplied crystal allows individual operating characteristics to be observed so you'll know what to expect in the way of performance when the receiver is properly tuned to the new frequency.

The Ninic is comprised of three discrete modular circuit boards, as illustrated in

the photo of figure 1. The smallest of the three is the oscillator module, positioned immediately above the battery.

The low-band (six-meter) receiver is identical with the high-band unit pictured with the exception of the oscillator module. The oscillator leads are connected with plug-in pins. A low-band unit can be changed to the high-band version (and vice versa) by unplugging the terminal pins, removing the hold-down screws, and inserting the appropriate oscillator module.

Figure 2 is a schematic of the high-band oscillator. While the supply voltage is shown to be 7.5 volts, the receiver works well with any supply voltage of 6 volts or more. The nickel-cadmium cell in the unit pictured provides 6.25 volts and is more than adequate to allow squelch-



## NOTE:

No I-F adjustments are necessary. Adjustments of the slugs and transformers is not recommended. The I-F circuits have been factory-aligned.

FIGURE 4. CRYSTAL-CONTROLLED I-F MODULE OF NINIC POCKET RECEIVER

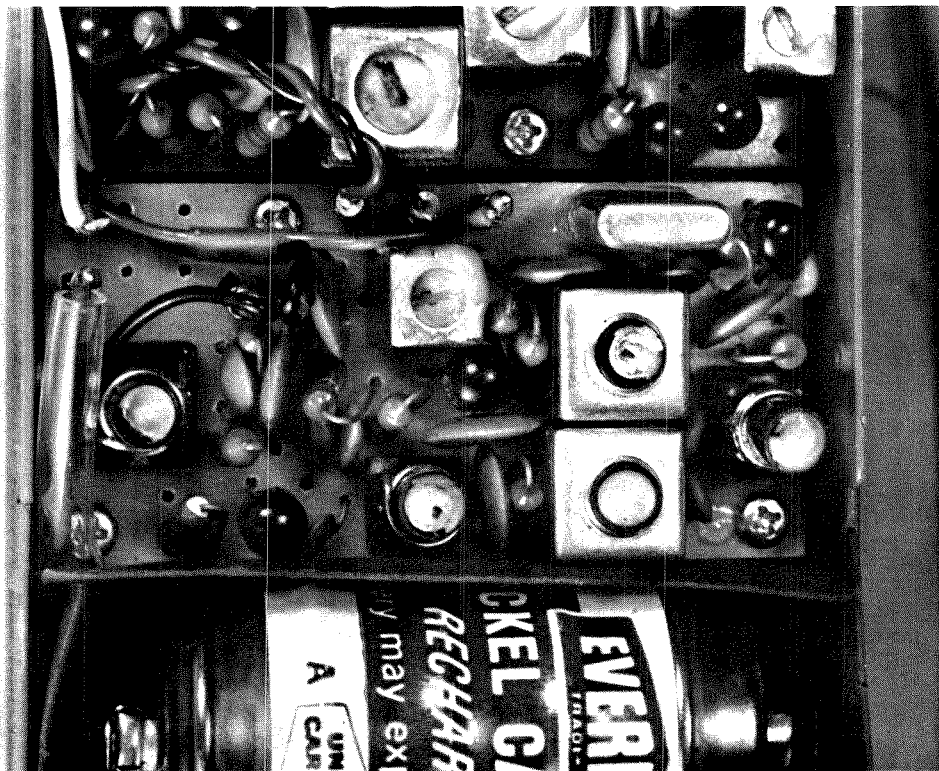


FIGURE 5. PHOTO SHOWING CLOSEUP OF OSCILLATOR MODULE  
(NOTE THAT VARIABLE CAPACITORS ARE ON BOTTOM SIDE.)

breaking on signals better than 0.3 microvolt. The schematic for the low-band oscillator is shown in figure 3.

Figure 4 is a schematic of the crystal-controlled IF module. This is the center circuit board in the photograph of figure 1. As noted earlier, this module is the same for high-band or low-band receivers.

#### TUNEUP

If you're thorough, you will by now have noticed what appears to be a discrepancy between the schematic of the oscillator and the module itself. The schematic shows a number of variable capacitors in the oscillator for tweaking the thing on its new frequency, but even the closest examination of the oscillator won't reveal even a hint of a tunable capacitor. When I saw this apparent disparity, I merely shrugged and muttered some under-the-breath comment about radios made in Japan. And I started the tuneup

procedure by adjusting the wax-filled slugs in the coils and transformer cans.

The receiver had all the earmarks of a unit that could be set to any frequency in the two-meter band. I noted that most of the slugs were nearly all the way out. This seemed almost a sure indication that the frequency could be lowered a great deal without modification of the circuit. Then, when two of the slugs bottomed out, I became suspicious. The tuning range of the oscillator was nowhere nearly as broad as it looked to be.

The capacitors in the schematic simply had to be on that board somewhere. In desperation, I disconnected the test leads and interconnect pins and pulled the oscillator module out of the receiver. There they were! All the miniature tunable capacitors were protruding from the underside of the oscillator board. This layout makes the tuneup somewhat more

difficult from the standpoint of convenience because the oscillator cannot be adjusted while it is mounted in the receiver. The interconnecting leads to the oscillator can be reconnected to the board after it has been removed, however. The board must be placed vertically and situated immediately adjacent to the IF module so the leads will reach. Fortunately, the oscillator is stable enough so the tuning won't change after the unit is remounted.

Before discussing the tuneup procedure, it might be wise to describe the crystal-ordering particulars. Since Sentry Manufacturing Company advertises regularly in FM -- and their crystals really are of the quality we FM'ers have come to expect -- I decided to ask them to assign a specific order number to the Ninic oscillator crystal. They did do this for the two-meter unit, but because of a lack of information at the time they could not

provide correlation data for the six-meter version.

To order a two-meter crystal, give Sentry the two-meter operating frequency desired, specify crystal holder SCM-18, and mention that the receiver is the Ninic.

To order a six-meter crystal, specify crystal holder SCM-18 and refer to the crystal oscillator circuit shown in figure 3 of this article. The Sentry people subscribe to FM and can correlate the data from their copy. The first six-meter crystal order will probably take a day longer to process than subsequent orders because of the time required to correlate the data the first time through.

Here is a complete step-by-step tuneup procedure:

#### Frequency Adjust (Figure 5)

1. After inserting the proper amateur

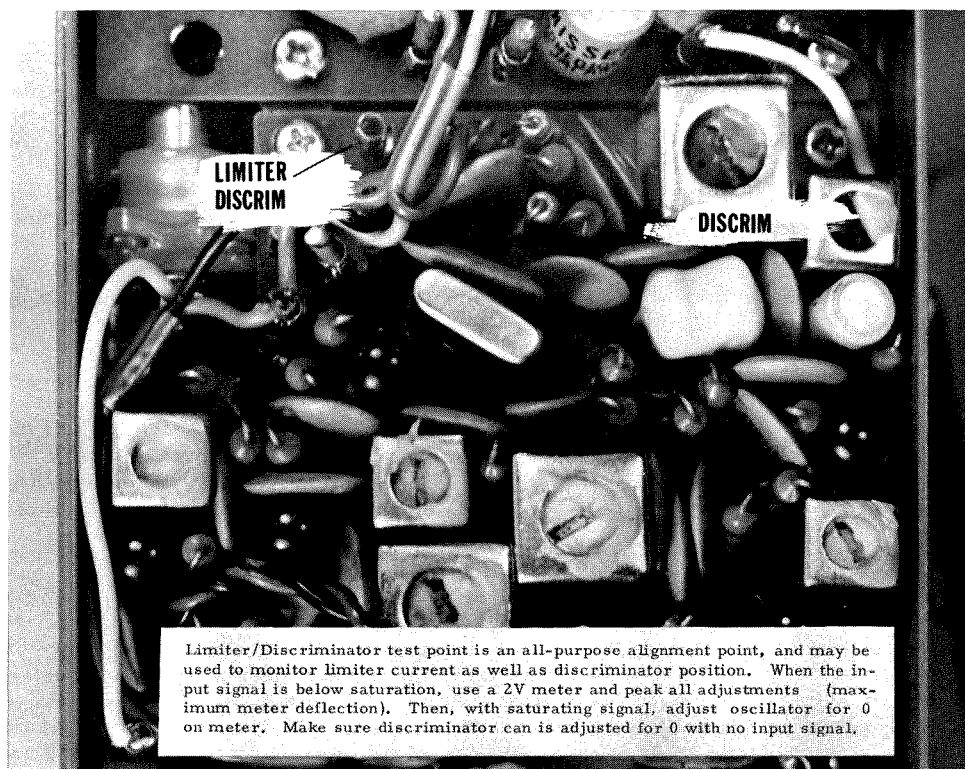


FIGURE 6. PHOTO OF NINIC I-F MODULE

crystal (Sentry SCM-18) remove the three hold-down screws.

2. Unplug the lead covered with transparent polyvinyl tubing (extreme left in photo of figure 5).
3. Gently lift the lower edge of the board (the end next to the battery) as if opposite edge were hinged.

**NOTE**

The oscillator will now be positioned perpendicular to the receiver so adjustments can be made from either side of board.

4. Carefully remove the wax from the two transformer cans located below the crystal (see photo).
5. Using a jeweler's screwdriver, turn both slugs clockwise one complete turn. (On six-meter unit, turn slugs counterclockwise one turn.)

**NOTE**

The slugs of all transformers are held in place by tiny one-piece rubber-band segments. If tuning is difficult or if the slug has a tendency to edge back toward the original setting, remove the slugs completely and lift out the rubber-band sections. Then replace the slugs and set as described in 5.

6. Leave the polyvinyl-jacketed lead disconnected. This lead attaches to one of the pins on the base of the receiver and allows for the connection of an external antenna.
7. Connect the output of a signal generator to the antenna lead to produce a saturating signal on the receiver. The squelch should be fully opened.
8. Turn on your base station receiver (or any receiver known to be on the same frequency that you're zeroing.

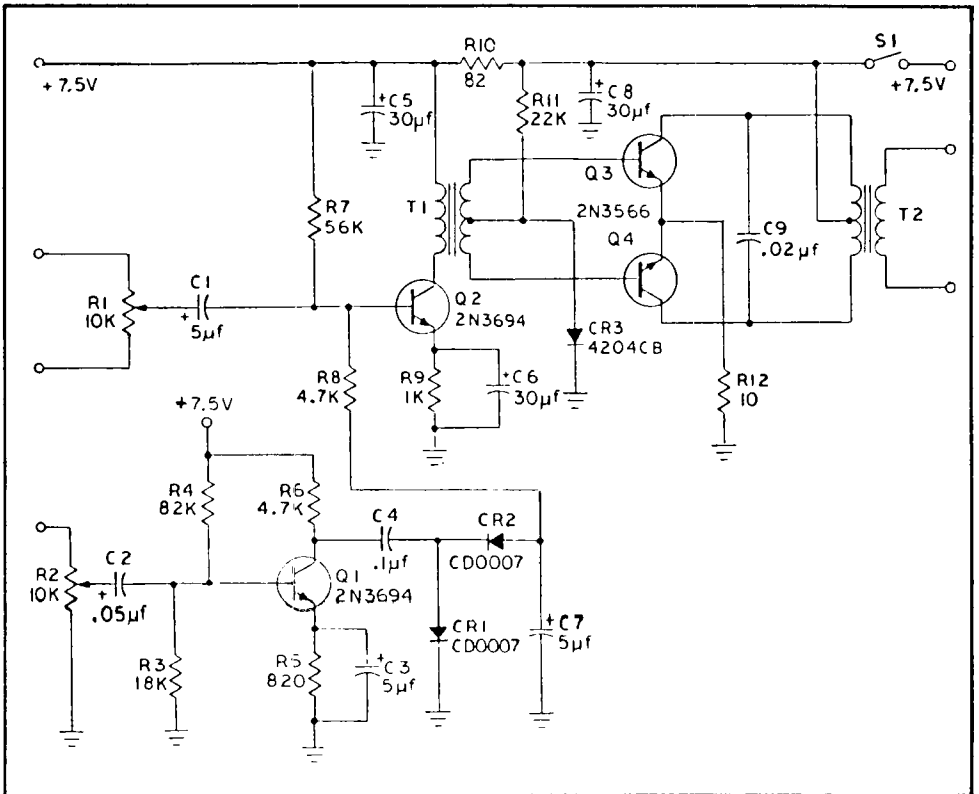


FIGURE 7. AUDIO AND SQUELCH MODULE, NINIC POCKET RECEIVER

9. Connect a discriminator meter to the base station receiver so it will be in plain view while you're making adjustments on the Ninic.

#### NOTE

The signal generator output must be high enough in signal strength to be copied on the base station receiver. The base station receiver audio gain should be all the way down.

10. Gradually adjust the signal generator frequency for a zero indication on the base station discriminator meter.
11. Adjust the frequency trimmer capacitor (located in corner on bottom of board below previously adjusted transformers) until presence of the saturating signal is indicated.
12. If the signal can't be brought in as described above, set capacitor to center of its range and adjust transformer slugs one additional turn. Then repeat step 11.
13. With the receiver saturated as described in step 12, decrease the signal gradually for a popping indication (about 10 dB quieting on the Ninic).
14. Adjust the antenna capacitor for maximum quieting. (This capacitor is located below the open coil at the extreme left.)
15. Reduce signal and readjust capacitor for maximum quieting. Note position of capacitor. If fully open or meshed

the antenna coil must be adjusted. Continue adjustment until antenna tuning capacitor provides the best signal near the center of its range.

16. Adjust all other oscillator board capacitors for maximum quieting, but remember to reduce the input signal each time it reaches saturation.
17. Observe all capacitors. If any are fully open or closed, a readjustment of the corresponding coil is necessary.
18. When receiver has been fully tuned, reset all coils with wax. Use an ordinary birthday candle and allow the melted wax to fix the slugs in their new positions.

#### Final Comments

The discriminator adjustment is in the upper righthand corner of the IF module. Figure 6 illustrates this and also shows the first-limiter monitoring point. When monitoring for limiter current, set meter to either the 50-microamp scale or a 0 - 2 V dc scale (20,000 ohms per volt).

Figure 7 is a schematic of the squelch and audio circuitry. There are no adjustments to be made on this board; the circuit is included only for reference. (The Ninic does not come with schematics; the originals from which those in this article were obtained were probably the only set in existence.)

## DID YOU KNOW?

MAYDAY is an Americanized spelling on "m'aidez," a French expression meaning "help me." M'aidez, of course, is pronounced MAYDAY. The word first gained acceptance as a distress call during World War I. The advent of radio caused usage of the word to spread, though few were aware of its etymology.

All right -- so you knew it already. But did you know that advertisements in the classified section are free to regular subscribers of FM Magazine?

# TOUCHTONE

## How to use it for FM control

by Gene Mitchell K3DSM

The purpose of this article is to give FM'ers a basic understanding of Touchtone operation so that they might experiment with the possibilities of using it in conjunction with FM remote control applications. Touchtone is Bell Telephone's system for telephone dialing at a considerably increased speed.

### The Touchtone System

Two tones are dispatched to the central telephone office for each digit selected (corresponding to a dialed digit). The lost time of waiting for the 10 pps pulse train after each dialed digit is regained because the system does not require the sequential transmission of a single series of contact breaks.

Many Touchtone dials have been made available to the surplus market, ranging from the standard 10-button dial to the 12- and 16-button military and computer versions. Figure 1 shows the 25A3 10-

button dial with seven leads terminating at the connector. These leads may be used as shown to convert the system to two-wire operation in an arrangement similar to a transistor-microphone interconnection scheme. The supply voltage is fed to the dial over the same path as the output of the tones. Figure 2 shows a method by which the Touchtone dial might be used with an FM transmitter.

In the sketch of 2a, the transmitter mike amplifier is shown along with the input connector. Operating voltage is 9-12V across the dial. If you have Touchtone telephone service, a phone patch might be used to make use of Touchtone rather than obtaining a separate dial or telephone. Figure 2b shows the matrix pattern of the tones, including the fourth column (HG 4, 1633 hertz), used on 16-button dial units.

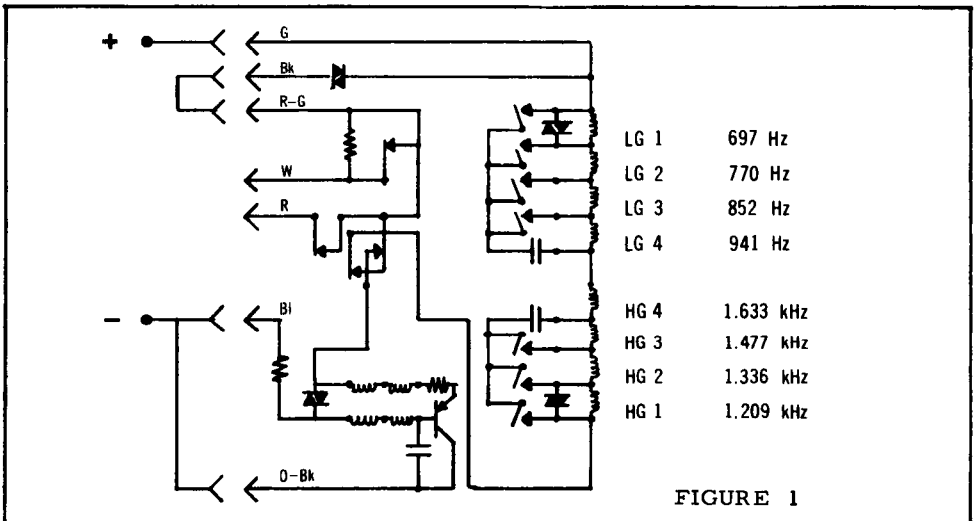
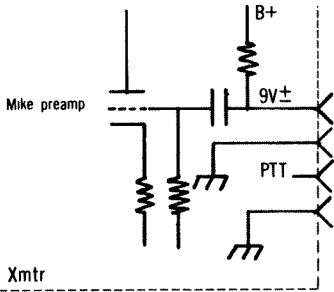


FIGURE 1

FIGURE 2



2a

TONE MATRIX, TOUCHTONE DIAL

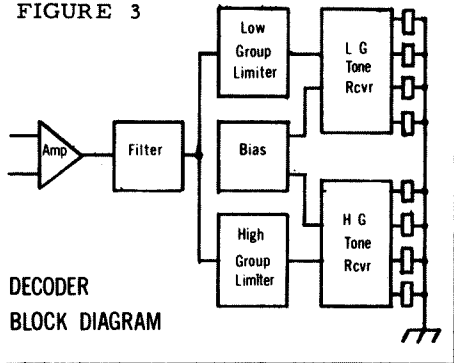
1	2	3	F0	← LG 1
4	5	6	F	← LG 2
7	8	9	I	← LG 3
*	0	A	P	← LG 4

↑ HG1    ↑ HG2    ↑ HG3    ↑ HG4

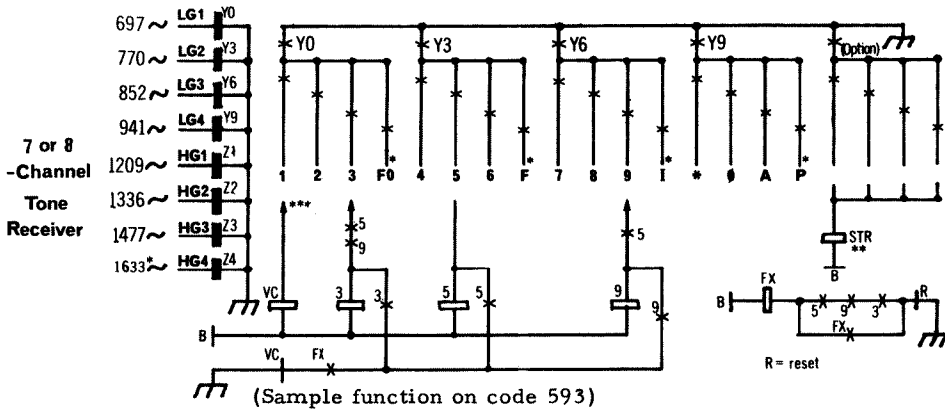
2b

The block diagram of the tone receiver shown in figure 3 is one used by the phone companies. Since FM amateur application does not require such tolerances as Bell or the other big names, it may be possible to successfully simplify the tone receiver. The entire unit shown -- up to the decoder -- is one of three basic designs used. The decoder (figure 4) is my own design. Since it may require only a few digits for individual applications, it is possible to eliminate many of the tone frequencies used to simplify construction. Some of the parts used (e.g., transistors and the toroids and capacitors for tone detection circuitry) have no part numbers; this makes some of the values

FIGURE 3



DECODER  
BLOCK DIAGRAM



- \*Used only on 12- or 16-button Touchtone dials.
- \*\*Used when steering circuit is necessary - provides output on any digit.
- \*\*\*Unused digits are strapped together and to VC relay.

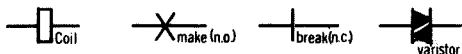
FIGURE 4



almost impossible to acquire. However, with some experimentation and variation to the circuit, it should be possible to determine what is necessary to make it work. The relays (Y0 - Y9 and Z1 - Z4) are Western Electric 295A reed relays with a coil resistance of 525 ohms. These relays have 6-pole-single-throw output.

It is possible -- and practicable -- to use other relays and provide the necessary 4-pole contacts needed on the high group and single-pole contacts needed on the low group. The decoder shown is set up for all eight tones (16-button dial).

Symbols used in the decoder for relay coils and contacts are standard in the telephone industry:



The sample code shown in the decoder (593) may be changed to fit applications necessary by rearranging the counting relays. Relay 5 operates on proper tones, giving a partial path for the final function and the last digit (9). Relay 9 must operate next to give more of the path to the final function and the next digit (3).

After relay 3 operates, the final function relay operates and holds until released by another function or digit (such as 1).

If the tone receiver contains all of the tones or at least a 10-digit output, the unused digits can be strapped together to operate the VC relay which will drop any of the counting relays should someone start random dialing to trip the function.

With the arrangement shown, no digits can repeat. If this is desired, a steering circuit must be added to prevent the first digit-to-be-repeated from operating the next relay of that number. A code such as 353 can be used designating the second 3 as 3' (3 prime). It would be wired to operate only after the 3 and 5 relays are up.

By application, you might want to wire a timer to the tone receiver so that it only looks for the tone signals in the first 10 seconds after the receiver's carrier-operated relay has been operated.

The Main Line VHF Association (Philadelphia area) intends to include the Touchtone receiver in its 146.34 - to - 146.94 repeater. Selective signaling and a Touchtone-to-Secode converter are also planned.

For the information of prospective Touchtone builders, circuits are provided herein for the various functions shown in the block diagram. These schematics are shown in figure 5.

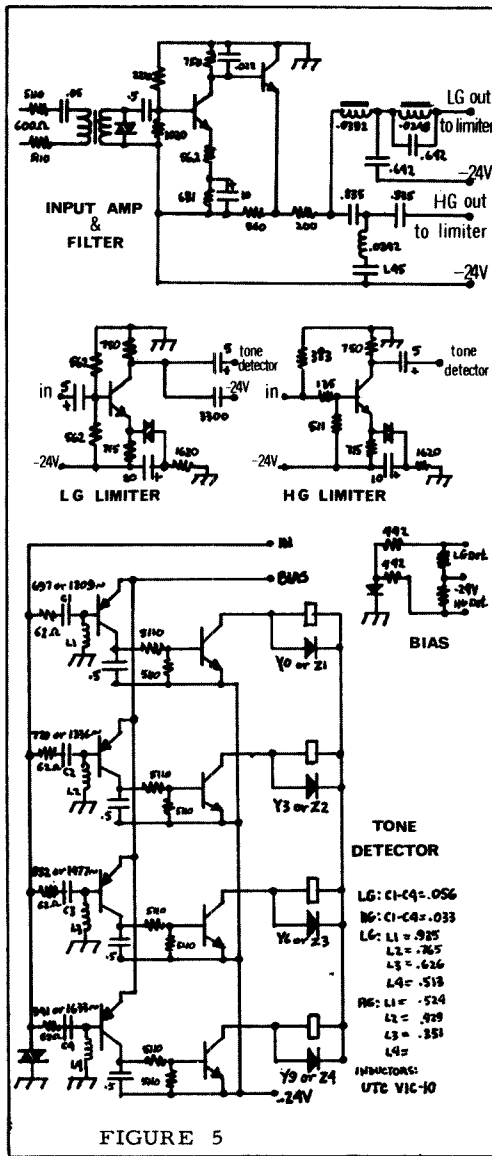


FIGURE 5

## What happens when a 7-dollar crystal is mated to a junkbox oven?

# CHECKING CRYSTAL OVENS

by Jim Lev K6DGX

Frequency stability is of the utmost importance to the serious FM operator. This article is intended to help you achieve the highest stability your equipment is capable of -- commensurate, of course, with the grade of crystal you use.

It is a waste of money to buy top-grade commercial-standard crystals only to put them into an oven of unknown or doubtful condition. Why risk damage to an expensive crystal or tolerate transmitter or receiver drift up, down, and around because of a faulty oven? I am employed by a Los Angeles area two-way communications service center where I build and service repeaters as well as mobile telephone equipment. With two or three thousand bases and mobile units in service (quite a few of these are on 450 MHz operating through narrow-band repeaters), we certainly cannot afford to take chances with junkbox ovens!

The method we use to check out crystal ovens is quite simple and more than adequate. First, get a YSI precision thermistor (approximately \$4.95). This device comes complete with a graph of resistance versus temperature and covers a broad range from -80 to -150 degrees Celsius at a tolerance error of plus-or-minus 1%. It has a resistance of 3000 ohms at 25 degrees and is small enough to mount inside an old F-605 crystal case. (In case you've no local supplier, the device may be ordered from Newark Electronics

Corporation; their stock number is 29F203.)

Next, unsolder an old crystal holder and mount the thermistor inside. Be certain that it is freely suspended and does not touch the walls of the case.

After installation, resolder the crystal holder together. The device may now be plugged into an oven that is to be tested.

### How to test

Connect an ohmmeter across the appropriate oven pins. It is best to use a good electronic voltmeter in the X10 range.

Apply power to the unit and allow the oven to warm up and stabilize. (This may require five minutes.) By use of the graph supplied with the crystal, determine the center temperature in degrees Celsius (centigrade) and the overall temperature drift caused by the oven cycling. Compare this center temperature with the value expected of your oven; most ovens are 85-degree types, but you may run into an occasional 75-degree type or other "oddball" unit.

Normally, the center temperature of a good oven will be within 2 or 3 degrees of the value specified, and the overall drift will be less than 3 degrees.

So check those ovens. But from now on, be wary of friends bearing gifts: There should be a sudden surge in the availability of bogus ovens!

... K6DGX

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**FRIDAY: 2-9 PM**

**SATURDAY: 9 AM - 5 PM**

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A program for OMs, XYLs and YLs alike (!) together with a superb top sirloin of beef dinner at the luxurious Champagne Towers, Rt. 17, Lodi, N.J. "Plush dining without tuxedo." Hospitality rooms and adjacent accommodations will be available for those traveling to the event.

Don't wait!! Banquet reservations must be made by April 21. Tickets at \$7.95 -- YLs and XYLs at \$6.95. No tickets will be sold at the door. Write: East Coast VHF Society, Inc., P. O. Box 1263, Paterson, N.J. 07509 or call Jack, K2HHS at 201 778-2416.

# **EXPO**

**Garden State Amateur Radio Clubs Inc.  
Box 73; Paramus, N. J.**

# NI-CADS - HOW NOT TO RUIN THEM

## The care and feeding of nickel-cadmium batteries ...

by Ken W. Sessions, Jr k6mvh

There is a great deal of misunderstanding about the charging requirements of nickel-cadmium (or ni-cad) batteries. Manufacturers of such power packs also supply special chargers that "must" be used "exclusively" to avoid damage to the cell.

Many manufacturers of tiny transceivers and pocket communications receivers supply ni-cad batteries with their equipment that likewise "must" be used if their guarantees are to remain valid.

Ni-cad batteries are supposed to be the toughest and best available; they're by far the most expensive. So what is it about them that requires such delicate attention? Why can't any charger be used for ni-cad power sources? The truth of the matter is that two important rules governing use of a ni-cad battery must be observed at all times: (1) Don't overdischarge and (2) don't overcharge.

### Overdischarging

Overdischarging can be defined as discharging a cell to the point where it cannot again be fully energized. It isn't easy to know when a nickel-cadmium battery needs charging, because it should be charged while there is no noticeable drop in output energy. A battery's output capability (or energy storage capability) is called its "depth of charge." A 100% depth of charge is a term applied to a fully charged -- usually new -- battery.

Once a battery has been discharged, it will never again regain the 100% depth of charge of its original state, although the level may be imperceptibly below that point. With a nickel-cadmium battery, the further the depth of charge is eaten away during use, the lower the final depth of charge after reenergization. A good rule of thumb is to never allow a nickel-cadmium battery to be used past the 40% depth-of-charge point. An even better rule is to keep the depth of charge above 80% at all times. In terms of voltage, the point at which a ni-cad battery should be charged is the point at which the per-cell voltage drops to 1.1V under load. (The fully charged cell will measure 1.25V under the load for which it was designed.)

How do you determine the cell voltage of a particular battery? Simple. Measure the minimum-load voltage of the battery when it is fully charged, and divide that number by 1.25; the result will equal the number of cells in the battery. Thus, a 6V ni-cad will measure 6.25V at full charge and will contain five individual cells.

If the depth of charge is kept above 40%, a ni-cad cell is easily brought back up to the "95 plus" percentage point time after time (although each charge is slightly -- almost immeasurably -- less than the preceding one). And if the depth is maintained above 80% the charge-discharge cycles can be repeated numberless times while the battery remains in a like-new condition. If the battery can be considered "discharged" at 80%, the fluctuation of potential on the battery is minimized, remaining pretty much the same whether the battery is being charged or discharged.

On the other hand, if the energy from a nickel-cadmium battery is completely expended, it stands a good chance of being permanently damaged. At best, over-discharge can prevent the cells from being recharged fully. The battery's efficiency -- even at a 70% depth of charge -- will diminish to the point where the charge is lost at an increasingly rapid rate. A vented ni-cad battery (often improperly called a wet cell) offers a little better rejuvenation potential at full discharge than a nonvented (sealed) battery because of the suspension of the electrodes and the inherent capability of the vented battery to eliminate gases and accept new electrolyte. But even the vented battery is heavily penalized by overdischarging. A completely depleted cell may be brought back up to an 80-85% depth of charge again and again after a single overdischarge, but that important top 15% may never again be attained.

### Overcharging

The most important parameter of a ni-cad battery is its milliampere-hour rating. It is almost impossible to provide a proper charge without having at least a fair idea of what the rating is.

The milliampere-hour rating does not stipulate how many milliamperes of current the battery will provide for one hour. Nor does it tell how many hours the battery will last at a 1mA drain. The rating is based on this ratio, but the actual figure is calculated to show overall energy output capability to a specified end-point (usually 1.1V per cell) over a 10-hour period. The 10-hour figure is used because the battery's capacity depends on rate of discharge. Because of heating and internal losses, a 100 mA-hour battery wouldn't have the capability of producing 100 mA for a full hour. Yet, it would be likely to produce even more than 1 mA for 100 hours. Thus, the 10-hour standard has been accepted by the battery industry as an inflexible value.

Time is also an important factor in determining length of charge to attain proper energy storage. For practical purposes, the longer the charging time (or the lower

the charging current), the higher the resultant depth of charge. Of course, this is only true to a point because there is a practical limit on the depth of charge which can be attained in any case. Generally, an ideal charging time will be more than 10 hours and less than 20.

One might logically deduce that a 250-milliampere-hour battery can be charged with a constant current of 25 mA for 10 hours, 2.5 mA for 100 hours, or 250 mA



for 1 hour. The high current rate of the one-hour charge would be as bad on the battery as the high-current discharge rate. Such a high charge rate would almost certainly cause gassing that would wipe out the battery. Another rule of thumb can be applied here: Don't allow the charging current to exceed 10% of the battery's milliampere-hour rating, but extend the time period by 50%. Instead of charging a 250-milliampere-hour battery at 25 mA for 10 hours, allow it to charge at the 25 mA rate for 15 hours. This will assure that the expended energy is replaced and will allow for various losses and other anomalies.

The lead-acid battery that starts the car each morning is a tough old brute that can be mistreated and manhandled. But even this old workhorse is cheated of longevity when it is given a one-hour charge at its full ampere-hour rating. The ni-cad suffers a great deal more from abuse

by overcharging than the lead-acid type. Two or three severe overcharges will destroy a battery or cell that might otherwise have lasted for thousands of charge-discharge cycles.

One other thing to remember: A battery is only as capable as its weakest cell. You may be able to get by with damaging only one cell of a 12.5V battery during a heavy charge. But the battery is just as useless as if they'd all been destroyed.

**Gassing**



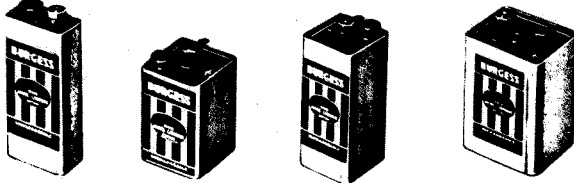
Nickel-cadmium batteries generate gases during the last few hours of charging and during most of the cycle during an overcharge. Hydrogen forms at the cadmium electrode and oxygen forms at the nickel electrode. Vented cells have removable ports to allow these gases to be freed along with the electrolyte fumes during the charge cycle. But in the sealed ni-cad -- the type used in most miniature electronic applications -- the gases must be accommodated or used in some way to avoid destruction by overpressure.

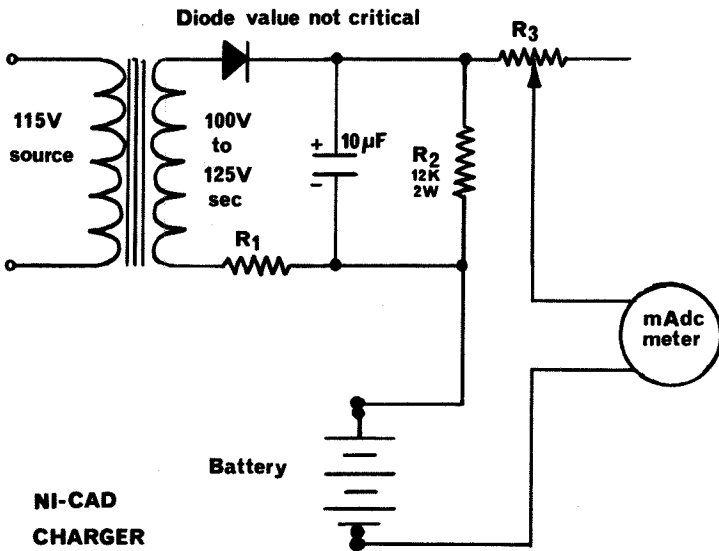
Burgess ni-cad batteries are designed so the cadmium electrode has an excess ampere-hour capacity. This feature causes the positive nickel electrode to become fully charged first so it will begin to generate oxygen. The oxygen travels to the surface of the negative cadmium electrode where it reacts to form cadmium oxide. The overall effect is to keep the cadmium electrode oxidized at a rate just sufficient to offset the input energy, and the cell is maintained at a reasonably stable equilibrium at full charge.

But even with this precautionary measure, overcharging can damage the cell. High-rate charging can cause oxygen to be produced at a faster rate than it can be used at the cadmium electrode. This can cause pressure buildup to the point where the seal is ruptured.

**Charging**

Knowing the milliampere-hour rating of a ni-cad battery is extremely important if its life is to be protected. If there are no clues provided on the battery case, the

<p>BURGESS 6V sealed nickel-cadmium batteries for 150 to 450 mA-hr class.</p>	 <p>1 inch dia      1 inch dia      &lt;2 inches dia</p>
<p>BURGESS 12V sealed nickel-cadmium batteries for 150 to 450 mA-hr class. Lengths are double those of 6V units of same class.</p>	
<p>BURGESS &gt;1.2V single- cell units for 1.5 to 4.5 ampere-hour class.</p>	



**NI-CAD  
CHARGER**

CHARGE CURRENT	R <sub>1</sub> VALUE	R <sub>3</sub> VALUE
2 - 15 mA	1K ohms, 10W	50K ohms, 10W variable
15 - 40 mA	1K ohms, 10W	5K ohms, 10W variable
40 - 150 mA	250 ohms, 10W	1K ohms, 25W variable
150 - 250 mA	100 ohms, 10W	250 ohms, 25W variable

rating can usually be determined within a fair margin of error by estimating. A standard D-size 6V cell (the size of a conventional flashlight battery) will have a milliampere-hour rating of approximately 250. Using the 10% rule, it can be seen that the basic charge rate is 25 mA; and by application of the "plus 50%" time rule, the proper charge period is 15 hours.

Trickle-charging may be employed if the battery is used at low drain rates. A general rule for trickle-charging is to maintain the charge level at 10% of the standard charge rate, and keep the battery under this charge during all periods of nonuse. The trickle-charge current for the D-size battery is 2.5 mA.

A very simple battery charger can be built up readily with run-of-the-junkbox parts. If the battery is not to be in use during a charge, a half-wave rectifier will be adequate. The diagram above shows a simple rectifier circuit and lists the component values for various charging currents.

**Data Sources**

Martin G. Klein, Manager  
Electrochemical Department  
Electro-Optical Systems, Inc.  
Pasadena, California

Burgess Engineering Manual  
Burgess Battery Company  
Freeport, Illinois



249 Route 46 Sudd - Brook N J 07662  
Phone 201 489 9000

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Unit has two dual freq. transmitter strips and a dual freq. receiver. Two TX chassis allow unlimited transmitter freq. separation over entire 2 meter band. Your repeater problems are over \$158.00  
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|--|-------|
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| T-44A6- 6/12 volt - vibrator supply      | \$58. |
| T-44A6A-6/12 volt - vibrator supply      | \$68. |
| T-44AAV-6/12 volt - vibrator supply      | \$88. |

With the conversion data in the schematic digest seen above, you can be on 432 MHz in no time!

# FM Radio and Public Service

## AREC GROUP KEEPS ACTIVE IN CITY GOVERNMENT RADIO

by Jack Bankson WA6JXG

### PART II

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, then clears the channel. This type of operation keeps the channel free from the clutter generally caused by the passage of formal traffic. In short, we use a "police dispatcher" style and it works great!

The AREC in the East San Gabriel Valley provided communications for two different July 4 parades in 1967 in two different heavily populated cities. Two teams of mobiles and a single base station were used. These FM units, operating on 146.82 MHz, handled all parade communications so that the police channels would be free for emergency use.

An interesting side note was the fact that two of the mobile units in one of the parades were "created" in no more than a few minutes with what we refer to as our 'quickie-mobiles.' Quickie-mobiles are merely front-mount 41V Motorola units that have been outfitted with a power cable that plugs into any 12-volt cigar lighter. The antenna is a two-meter whip that spring-clips onto the rain gutter above the door.

The same AREC group also provided parade communications for the American Veterans' Day parade on November 11th. There were ten mobile units along the parade route and formation area. The net control station was located adjacent to the judges' stand.

To publicize our net, we asked permission to follow the last entry in the parade. The ten AREC cars were quite impressive

as they paraded two abreast past the judges; each mobile sported a neat sign on the doors that credited AREC.

The parade was complicated by the fact that traffic control for the event was being handled by the Los Angeles County RACES network. There was no need for liaison between the two groups, although some of our AREC mobiles were prepared for this contingency.

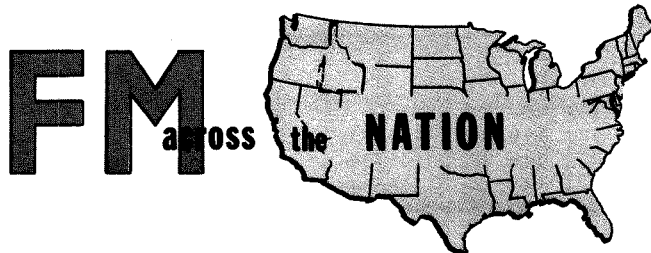
Much necessary information was passed through the FM circuit; e.g., changes in lineup, lost celebrities, timing difficulties, etc. The spectators at the reviewing stand were given a block-by-block report of the parade's progress.

On December 2nd, 17 FM'ers used 146.82 MHz to furnish communications for a Christmas parade in Covina, Calif. Amateurs from as far distant as 60 miles participated. Responsibilities of the group included the passing of information relevant to lineup, road flare requests, and searching the line of march for parents of children who were injured in a minor accident.

For the Christmas parade, AREC vehicles were at the beginning and end of the parade route as well as at strategic points along the way. This was the second time our well-practiced AREC group participated in this annual event, and parade officials made a point of inviting us to be there next year.

While most AREC nets across the country were preparing for the SET Saturday, December 27th, our AREC group provided communications for the city of Baldwin Park during their twelfth anniversary parade. Twenty-three amateurs were successful in linking police, ambulance, and first aid services with local government vehicles.

The AREC group even provided wireline remote control on the police channel, using a Motorola P-8270 Consolette. This allowed the police command post to have access to his squad cars from the AREC operating station. To our chagrin, a CB group handled the parade lineup, but it worked to our favor in the end: AREC FM mobiles did such an outstanding job during the parade that there is little doubt  
(cont. on page 42)



## U. S. REPEATER DIRECTORY

REPEATER	INPUT	OUTPUT	LOCATION (AREA COVERED)
<b>ARIZONA</b>			
W7AJU	146.34	146.94	Mingus Mountain (Prescott area)
W7DAR	146.34	146.94	Pinal Peak (Globe area)
<b>ARKANSAS</b>			
	146.34	146.94	Little Rock area
<b>CALIFORNIA</b>			
W6FNO	146.82	146.70	San Gabriel/ Los Angeles area
W6SMU	146.12	146.70	San Fernando/ Los Angeles area
W6AEX	146.85	144.20	Mt Vaca/San Francisco area
W6GDD	146.34	146.94	Mt Vaca/ San Francisco area
WB6AAE	146.80	146.20	Grizzly Peak
W6CX	146.94	147.80	Walnut Creek
K6IXA	146.94	146.34	Modesto
K6JIM	147.70	146.00	Central Valley area
WB6TSO	146.80	146.20	San Luis area
W6NCG	146.71	146.85	Meadow Lakes
WA6YCZ	146.71	146.85	Mt Umunhum
W6DOO	147.71	146.85	Mt Allison
W6AQU	147.71	146.85	Mt Toro
WA6VFO	147.18	146.52	Mt Lukens (Los Angeles area)
WA6MPV	146.90	145.12	Mt Wilson (Los Angeles area)
WB6GUA	146.94	146.44	Hauser Peak (Los Angeles area)
WB6DSL	146.34	146.94	San Diego area
<b>CAROLINAS</b>			
	52.76	52.525	Columbia, South Carolina
	146.34	146.94	Columbia, South Carolina
<b>CONNECTICUT</b>			
W1VVK	146.34	146.94	Avon district
W1LRC	146.34	146.94	Danbury area
W1HPH	146.76	146.88	Monroe area
	146.76	146.94	Monroe area

REPEATER	INPUT	OUTPUT	LOCATION (AREA COVERED)
COLORADO			
	146.34	146.94	Cheyenne Mountain
	146.88	146.94	Denver area
	146.34	146.94	Denver area
FLORIDA			
W4RKH	146.34	146.94	Ft Walton Beach
	146.34	146.76	Tampa area
K4HYE	146.34	146.76	Miami area
INDIANA			
	146.94	52.525	South Bend area
ILLINOIS			
K9KGO	146.34	146.94	Petersburg area
KANSAS			
W0DKU	146.34	146.94	Wichita area
	146.34	146.94	Topeka area
	146.34	146.94	Salina area
	146.34	146.94	Canton
KENTUCKY			
	146.34	146.94	Owensboro area
MASSACHUSETTS			
KIIZM	146.34	146.94	Wooster
	146.34	146.94	North Adams
W1BL	53.54	50.50	Princeton
WICDO	146.34	146.94	New Bedford
WIVAK	146.34	146.94	Falmouth
	146.34	52.92	Falmouth
MICHIGAN			
W80YE	146.34	146.76	Detroit
MISSOURI			
	146.34	146.94	Kansas City area
	52.70	52.525	Kansas City area
W0CJW	146.34	146.94	St. Louis area

REPEATER	INPUT	OUTPUT	LOCATION (AREA COVERED)
NEBRASKA			
	146.34	146.94	Omaha
NEVADA			
K7UGT	146.94 146.34	146.34 146.94	Virginia City area Las Vegas area
NEW HAMPSHIRE			
W1ALE	146.34	146.94	Concord area
NEW MEXICO			
WA5DMQ	146.34 146.34 145.50 146.34	146.94 146.94 146.50 146.94	Alamagordo area Roswell Roswell Albuquerque
NEW YORK			
W2GHR	146.34	146.94	Manhasset
W2OQI	146.34	146.94	Long Island
K2GUG	146.34	146.94	Buffalo area
OHIO			
W3LGL	146.34 146.34	146.94 146.76	Delaware Lorain
OKLAHOMA			
	146.34	146.94	Tulsa area
OREGON			
W7DET	146.76 146.76	146.58 146.94	Portland area Newport area
PENNSYLVANIA			
WA3BKO	146.34 146.34	146.76 146.76	Philadelphia area State College
TEXAS			
W5YUO	146.16	146.76	Fort Worth
W5OZW	146.34	146.94	Fort Worth
	53.05	53.15	Fort Worth
	146.22	146.82	Dallas
	52.85	52.95	Dallas

REPEATER	INPUT	OUTPUT	LOCATION (AREA COVERED)
TEXAS (Continued)			
	146.28	146.88	Houston
	146.34	146.94	Tyler
	146.34	146.94	Austin
	146.34	146.94	San Antonio area
	146.34	146.94	Port Arthur area
TENNESSEE			
	146.34	146.94	Chattanooga
UTAH			
	146.34	146.94	Salt Lake City area
VERMONT			
WIJTB	146.34	146.94	Killington (linked to Manhasset, New York)
<p>This directory will be updated and released after three months.            Corrections, additions, and deletions should be addressed to FM,            2005 Hollywood Street, Grosse Pointe, Michigan 48236.</p>			

## SOUTH CAROLINA REPEATER SOCIETY

by John Harrison W4TYS

In November 1967, a meeting was held in Columbia, South Carolina to determine the feasibility of operating an amateur six- and two-meter FM repeater in the central South Carolina area. As a result of this meeting came the Carolina Repeater Society.

The purpose of the group is to obtain a club license and to construct, operate, and maintain an amateur FM repeater. As planned, the repeater will have both inband and crossband capabilities, with primary outputs on 52.525 and 146.76 MHz. Alternate outputs will be 52.64 and 146.76 MHz. Selection of the output frequencies as well as the crossband control will be effected by the controlling trustee.

Repeater access frequencies will be 52.76 and 146.34 MHz.

Normally, the repeaters will be under the control of the trustee who will have radio on/off and function changing control from the 450 MHz band (with tone signaling).

The six-meter repeater is now in operation by special temporary authorization granted to the trustee by the FCC pending modification of license.

Progress is somewhat slow in the application for the club call; however, operating should be no problem, as we will continue to use the trustee's call until the modified license is obtained. Information on the repeater or its operation may be obtained by writing Carolina Repeater Society, Box 3163, Columbia, South Carolina.

# Arizona Reporting

## Amateur Renders Service, and Saves State the Expense of Needless Search

### ARIZONA REPEATER ASSOCIATION NEWS

by Mary V. Brown, correspondence sec'y

A club member, Ted Murray (K7KEQ), decided to make a test at the repeater site. He used a Progress Line GE unit set up on 146.34 MHz. With this receiver, he was making checks with any stations who wanted reports from the repeater location. Then, the unexpected happened: At 8:20 AM, he received an emergency call from WA7FIZ, who lives to the west of Buckeye, Arizona.

An Arizona Fish and Game Reserve employee had been missing for more than a day out on the desert.

The Fish and Game employee, Mr. Tom Rickel, had had car trouble the day before, we found out, and had been left with no means for transportation other than his own two legs.

Rickel began walking at noon in a direction he figured most likely to lead him to civilization. After thirteen hours of walking in the desert, Rickel came to a remote sheep camp, where he slept until morning.

Early in the day, he began his trek again. Luck was with him; he eventually found his way to another sheep camp, where he managed to get a ride which took him to the home of the club secretary.

K7KEQ called Rickel's wife to assure her that her husband was OK -- tired, but very much alive. Then he made a quick call to the Arizona Fish and Game Reserve -- just in time to prevent the Reserve from launching an all-out air search for the missing employee.

The incident showed us just how important a repeater can sometimes be, and illustrated the need for a means of interconnecting the various radio-equipped outposts. But most important, it served

as additional proof that amateurs are ever anxious and willing to serve the public.

### PROBLEMS

The Arizona Repeater Association had encountered its share of problems before even becoming a fully licensed facility. The four-month agreement with K7STA and K7JNK to use their repeater (W7AJU) was nearly over when the club unanimously decided to acquire and use its own equipment. W7DTL donated a transmitter as well as the antenna and the various hardware items needed to complete the installation. When all the sundry details were ironed out and we were ready to finally make the installation, the Park Board issued a refusal to allow "foreign" installations in a city park (our proposed site). Christmas came and the new year started with still no go-ahead from the Board. So the club began the arduous search for another promising location. But Fortune smiled on us. Senator Barry Goldwater had been told about our plight, and -- good ham that he is -- moved to help us. In February, we were given an official all-clear.

With excitement renewed, members feverishly began the task of putting up the antennas and performing the detail preinstallation footwork. The underground cables had been in since late 1967, so the KOOL TV tower was tackled by ropes, wires, and beaming men.

Of course they had the usual shower of minor problems -- like not enough nuts and bolts, tower workmen forgetting certain tools and requiring numerous send-ups, uncomfortable winds, the threat of rain...

(Continued)

# the canadian scene ...what's going on in the north?

REPEATER SUPPLEMENT (by VE3AL)

The repeaters listed here are too late reported for entry in the April directory but all are in inactive use by Canadian amateurs and many are used by operators on both sides of the border.

Buffalo	146.34 to 146.94	WB2TLJ
Toronto	146.46 to 147.06	VE3RPT
	146.58 to 147.18	VE3MOT
Fonthill	146.22 to 147.24	VE3NRS
Quebec	146.70 to 147.50	(RTTY)

## CENTRAL CANADA

by Gordon McKone VE4KF

Around Winnipeg, the FM activity is centered around 147.33 MHz. This frequency was "copied" from Vancouver. An unfortunate occurrence is the fact that something was lost somewhere in the translation; Winnipeg operators found out later that Vancouver's prime channel was 147.333 (rather than 147.330).

There are about 20 stations in operation; the equipment consists mostly of 5V's and Marconi DT45's. (Marconi is a brand most US amateurs have never heard of, but it's almost as popular in Canada as GE is in the States.) A few Motorola transistor-powered units are in operation and later models of equipment are steadily becoming more available.

It's too bad that 147.33 MHz was adopted as a prime channel in Western Canada; this could have been avoided if the leading magazines were a little quicker to respond to the FM action. Some early leadership and dissemination of information on the parts of the major magazines would have simplified the development of FM and spurred its growth. (Ed. Note: FM activity is being recognized now; there are articles on FM in the April issues of 73 and CQ, and an editorial about FM in the April issue of Ham Radio. Also, Ham Radio will carry an FM feature in its June issue, the editor says.)

The terrain in Central Canada is flat, and there are no hills or vantage heights to

speak of. Consequently, no repeaters exist, although the DOT (Department of Transport, Canada's equivalent to the US' FCC) has established a less restrictive policy on repeaters and remote control than that currently in force in the US.

## SOUTHEASTERN CANADA

by Larry Kayser VE3DAK

The VE3SSM repeater in Saulte Sainte Marie is running full time repeating 146.34 to 146.94. While the power output is low, the system is growing and it seems to work better every day. The standard channel of 146.94 is being monitored 24 hours a day. We in this area are anxious to have itinerants call in and we are making an effort to get the tourist bureaus to pass out information. Deployment of the repeater to a suitable hilltop awaits the first weekend in May.

We need a bit of help with a Motorola Sensicon receiver; it has a bad squelch tail, and we want to shorten it. Does anyone have a tried and true method for accomplishing this and for making the receiver instant-acting in the squelch?

I have been reading of several recommendations to avoid 146.94 with the repeater; some people have obviously found the frequency overcrowded. We do not have this problem locally, and so we are in a quandary as to which route is the best to take.

As we see it, it is essential to have a common international calling frequency. This is the one all itinerants should have and the channel all small-area systems should monitor. I can see lots of reasons to use other channels for ragchewing or other activities, but I am of the opinion that we must maintain a common entrance, and this should be 146.94 MHz. Now if we just monitor any arbitrarily selected frequency, we limit communication to our own local area and ignore the transient operators entirely. There are those who'd solve the problem by making less dependence on repeaters and spending more time and energy toward upgrading the home station. (Continued page 40)



# This Business of Uniting

"...If there is not a 90% participation, the whole idea should be abandoned!"

From the letters we receive, there seems to be one major theme that is echoed from coast to coast: FM needs a nationwide organization with a centralized voice. Many individuals and groups have suggested that FM Magazine act as a national outlet, and nearly all correspondents have offered proposals for bringing the organization into being.

First, let me say that we of the FM staff fully agree with the need for a national FM body. Organization of FM activities such as conventions, repeater links, national projects, etc., would be simplified with a well defined body of members; then, too, FM participation in general amateur radio conventions and expositions would be made easier. There are a number of amateurs in high places who doubt the existence of FM operators in any significant number. These "key people" would be a lot more likely to listen if they knew the voice was that of a very healthy segment of the amateur society.

There are a number of benefits to be gained by forming a national FM group, but I just want to mention one more — and this is probably the most important of all: FCC rules are frequently not too applicable to FM operation — particularly where remote control is concerned. A national FM group with a solid, centralized voice could play an extremely important role in making the changes needed to include consideration of the FM'er in rulemaking.

We FM'ers who operate through repeaters and who control remote radio equipment frequently ponder such points as the legality of phone patches, the necessity for fixed-station monitors, the inter-

pretation of a 3-minute identification ruling, and the restrictions of mobile repeater control. We want the rules to be better defined. We want the rules to be changed where they impede technological progress. And we can do it if we are organized!

Proper administration of a national body will take a lot of time. As it happens, Mike Van Den Branden and I have full-time jobs and use our spare time to produce this magazine. We both have families that already feel the sacrifice of the never-ending time squeeze. We are not strangers to hard work, but we rarely have an excess of that precious commodity called free time. It is for this reason that we feel we'd be doing FM an injustice by chairing a national FM organization. But we'd be happy to allow FM Magazine to serve as the voice if a suitable chairman could be found.

The chairman would have to religiously submit reports, letters, and information to FM each month. And to be a successful representative he'd have to be in love with FM radio. He couldn't pass up a national FM convention or any major FM gathering. This means he'd have to be willing to spend his own money if funds weren't available.

Here's how I see the organization: Each FM association in the U.S. must participate by naming a delegate and paying a small annual membership fee. If there is not a 90% participation, the whole idea should be abandoned. The delegate from each local "association" would be the contact man for news and reports from the national body (for want of a better title, let's tentatively call it the National

League of FM Associations). The delegate would also be responsible for supplying the NLFMA chairman with suggestions for FCC rule changes, local data of national scope, and any other information of general interest to amateur FM.

Items of importance or major significance will be publicized in FM. Controversial issues will be objectively stated in the pages of this journal. Where possible, both sides of an issue will be presented by subjective observers without editorial interference.

The FM Magazine will be the journal of the NLFMA, serving the FM community in much the same manner as QST strives to serve amateur radio in general.

Well, that's our case. Are you for it or agin it? Lack of a response indicates apathy. Show us you care. Whether you like the idea or not, let us know what you think. And if you know someone who is uniquely qualified to chair a national FM organization, tell us about him.

We'll feature personality sketches and perhaps personal history resumes of prospective candidates for the position of NLFMA chairman. Then, to name the officer, each FM association would be entitled to one vote -- to be placed by the appointed local delegate. We all know of at least one person we consider a particular credit to FM; someone especially respected by his peers; someone who selflessly makes contributions of time, labor, or material to help others; or someone especially qualified by virtue of any of a dozen favorable traits.

I personally know of several such men. In California, there's Jim Lev (K6DGX) and Jack Bankson (WA6JXG) and Robert Kelty (whose call I don't even know). In Nevada, there's Tom Burford and Mike Blain. Across the continent, there are many, many others: Gordon Pugh and Bob Pederson (K2IEZ) to name but two.

How about it?

# FM Service Center

A NEW FEATURE

FM readers often ask why more special service features aren't included in their "journal." Since a great many of the active amateur FM operators are two-way service specialists, they reason, there must be a lot of valuable tuneup information, technical shortcuts, and service tips floating around unpublicized.

Although many of the service technician's practices are done so frequently they may be second-nature to him, they might well be of immense help to the FM newcomer or to the FM'er whose vocation may be in some other totally unrelated field.

The idea seemed logical enough, so a few feelers were put out. We asked around, and found that our readers -- as usual -- were right. A great many FM amateurs are two-way servicemen. And they are rich with labor-saving and money-saving ideas on FM radio maintenance.

So, in order to share these helpful tidbits of wisdom with others, we decided to incorporate the "FM Service Center" as a monthly column, where we could feature the fresh, novel, and useful ideas of the experts.

All information appearing in this column will be contributions from authorized two-way communications specialists who hold a second-class commercial license or higher. At present, there are no funds available in FM's budget to pay contributors, but compensation is planned for the future.

If you're a two-way man and you know a better way of doing a tedious job or have any information you think will be helpful to the FM amateur radio operator, why not share it? Mail your idea along with sketches, photos, schematics, or any other supporting data that might be necessary to FM Service Center, in care of FM Magazine, 2005 Hollywood Street, Grosse Pointe, Michigan 48236.

# FM BANDWAGON

LOOK WHO'S ABOARD!

A SPECIAL REPORT ON FIRMS MANUFACTURING MOBILE & BASE STATION FM EQUIPMENT FOR AMATEUR APPLICATIONS.

## AEROTRON

Aerotron offers a complete line of 2 meter FM equipment, as well as UHF radio-telephones and portable equipment for both 2 & 6 meters. With its acquisition of AMECO, Aerotron also offers a complete line of AMECO converters and other amateur radio equipment.

## COMCO

Communications Company Incorporated (COMCO) produces a line of two-way radio equipment which includes a wide variety of models for 6 & 2 meters, plus 450 MHz.

## COURIER

Courier Communications offers a 6-meter, single-channel, 18-watt unit for base and mobile applications.

## DUMONT

The DuMont Mobile Communications Division of Ling Temco Vought, manufactures FM equipment for mobile as well as base station use. In recent months, DuMont also introduced two new portable 2 meter and 6 meter FM transmitter/receivers. GONSET...Yes there is now an FM "Gooneybox". The G-151A Communicator provides 4 channels with 36 watts output for base or mobile operation. The Gonset Comtron 960A base is becoming a popular item with 2 meter FM amateurs.

## FARINON

Primarily a manufacturer of multiplex and microwave equipment for point-to-point communications, Farinon does supply mobile base stations for both the 2 meter & 450 MHz bands plus a variety of control and terminating equipment.

## FISHER

Fisher Research Laboratory manufactures a 2 meter transceiver.

## GENERAL ELECTRIC

A complete line of FM two-way radio equipment is available from General Electric. In addition to its MASTR Progress Line, the new Royal MASTER Line of mobiles and base stations. GE provides portable units, dial pagers and terminals, tone encoders, tone equipment, and a full line of accessories. This outstanding line includes a 70 watt mobile and a 250 watt base for 450 MHz.

## HALLICRAFTERS

Hallicrafters manufactures an extensive line of FM radio equipment. The company features a wide selection of radios in all frequency ranges and a complete line of accessory equipment of their radio products. Their "Command Line" of FM radios features matched mobiles and base stations for both 6 and 2 meters. Also supply antennas and a selection of portable transceivers to fit most all amateur needs.

## HAMMARLUND

Hammarlund Manufacturing Company manufactures a wide range of communications equipment for private, commercial, and military use. The company provides a selection of mobile and base station equipment for amateur use. The company also offers portable and remote-control units and amplifiers. The HFM-30 recently announced, is a transistorized base mobile unit for 2 meters.

## JOHNSON

The E. F. Johnson Company, a very late starter in the FM field, has announced the introduction of an FM radio during 1968--no other details are available at this time.

## KAAR

Manufacturers of a wide range of mobile and portable two-way radio equipment and accessories, Kaar Electronics Corporation also supplies repeaters, antennas, amplifiers, base-station equipment. In addition, Kaar offers encoders, decoders and tone equipment. Kaar also provides "packages" of their equipment for provision of complete FM systems.

## KEL

Kel Corporation manufactures a portable FM unit for 2 meter operation. The solid-state unit operates on several channels.

## MICRO COMMUNICATIONS

Micro Communications Company, a subsidiary of Radio Specialists Company, manufactures a portable 450 MHz transceiver, which they claim is easy to maintain. It uses flat plug-in modules using extender boards for accessibility.

## MOTOROLA

One of the largest FM radio equipment manufacturers, Motorola supplies a complete line of base stations, mobiles, portable units, and associated equipment. With equipment for 6 meters, 2 meters and 450 MHz, Motorola makes radio equipment to fit most any need. The MOCOM series has caught the fancy of FM'ers desiring the sharp appearance of this line. The all solid state Motran series has contributed to keeping Motorola a leader in FM communications.

## PEARCE-SIMPSON

An FM two-way radio for the 6 meter range, in addition to 2 meter equipment.

## PLECTRON

Plectron Corporation offers a wide line of 2 meter FM receivers and tone alerting systems. In addition to encoders, decoders, and antennas, Plectron manufactures a selection of mobile and portable receivers in the 6 and 2 meter ranges.



(cont. next page)

**VEHICULAR GAIN ANTENNA**  
(Communication Prod. Co.)

consists of a 5/8 wavelength radiator and an integral base loading coil fabricated of 17-7 spring tempered stainless steel. This antenna produces 2.5 db gain in the 2 meter band.

#551-509 fits G.E. type base \$8.25  
#251-509 Comp. with mount \$16.50



**Rooftop Whip for 2 Meters**  
(Antenna Specialists)

Easily the most popular professional antenna mobile antenna in the world. Snaps into a single 3/8" hole for extra fast installation. Solderless lead connection at antenna.

Power rating 100 watts.

#ASP201 Whip Antenna SPECIAL \$3.35



**Mobile Gain Antenna**  
(Larsen Elect.)

Here's an antenna that will be sure to poke out a strong sig. 3 db +, No coils to tune, Stainless steel const. VSWR 1.3 to 1. Mounts on existing GE type base, listed above. Order both for comp. system.

#LA-150 for type ASP-201 base \$22.50  
#MO-150 for Motorola type base \$22.50  
#FO-150 with PL-259 base for Portables, etc. \$24.50



Cash or Check with order. NO C.O.D.  
We pay postage on orders over \$10.00  
Orders under \$10 add 50¢  
Mich residents Must add 4% Sales Tax

**VHF ASSOCIATES**

P.O. BOX 3321  
JEFFERSON STATION  
DETROIT, MICHIGAN 48214



**PYE**

Pye Telecommunications Limited of Cambridge, England, manufactures a broad line of 2 meter and 450 MHz portable and mobile FM two-way radios, many of which are marketed in the USA.

**RCA**

RCA manufactures a complete line of "Super Series" solid-state mobile and base station equipment in the 6 meter, 2 meter and 450 MHz bands to meet amateur requirements. Accessories and a wide selection of individual equipment are also available.

**REACH ELECTRONICS**

Reach Electronics manufactures a line of mobile encoders and decoders, pocket pagers, and dial access encoders.

**SONAR**

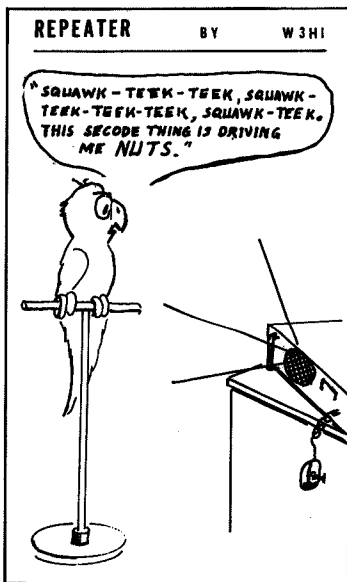
Sonar Radio Corporation offers a line of FM amateur equipment in the 6 meter and 2 meter ranges. In addition, Sonar manufactures amplifiers and remote-controlled transmitter/receivers.

**UNIMETRICS**

Unimetrics, Incorporated, manufactures a wide line of equipment, including monitor receivers, 2 meter FM portable transceivers, pocket pagers, and closed-circuit TV cameras. Unimetrics also supplies a wide variety of accessories.

**WABCO**

The Signal & Communications Division of Westinghouse Air Brake Company (WABCO) produces a line of 2 meter FM equipment, primarily for railroad communications. The line includes a 5 pound 1.5 watt portable called the Carryphone.



# FM

IN



BY BYRON H. KRETZMAN

W2JTP

Editors Note: Byron Kretzman is one of the foremost authors on the subject of FM. As can be seen in the 1st included here, he keeps active informing the rest of the amateur world about what we're doing on the wide-band FM channels. We're looking forward to seeing some of his material in our own FM Magazine.

The list below includes all articles pertaining to FM that have appeared in CQ Magazine during the past five years. Each entry is accompanied by a few words of comment from the author.

"A New VHF Operation: FM," CQ, August 1963, page 74. A primer for the uninitiated.

"A Test Set for FM," CQ, November 1963, page 74. This plugs into the metering sockets on Motorola -80D and -140D transmitters and receivers.

"Five Half-Waves in Phase on 144 Mc," CQ, March 1964, page 80. A gain antenna for 146.94 that doesn't cost a fortune to build.

"A Preamplifier for 2-Meter F.M.," CQ, September 1965, page 26. An inexpensive silicon transistor and a fruit juice can input filter are combined.

"Putting the Motorola FMTRU-80D on 2-Meter F.M., Part I," CQ, February 1966, page 65. First part of a 2-part article to make a 6-volt mobile into an a.c. powered base station.

"Putting the Motorola FMTRU-80D on 2-Meter F.M., Part II," CQ, March 1966, page 33. Second part which includes construction details on building the a.c. power supply on the dynamotor chassis.

"F.M. Mobile Techniques," CQ, May 1966, page 50. Although a censored 10-signal list was included, ordinary "hammy" hams didn't like this one.

"An I.F. Test Oscillator for F.M. Receivers," CQ, June 1966, page 32. For 455 kc, this uses a surplus FT-241 crystal; extremely useful.

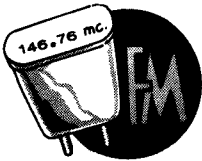
"Tailored Antenna Coverage for 2-Meter F.M.," CQ, September 1966, page 23, A sequel to the five half-waves in phase of CQ, March 1964.

"A 5/8-Wave Vertical Antenna for 1440," CQ, March 1967, page 49. Repeater control up-links and down-links need antennas -this does very nicely.

"Microwave and the Amateur," CQ, August 1967, page 53. Basic fundamentals in broad terms; interesting background for the FMer.

"The J-Antenna on 6-Meters," CQ, November 1967, page 29. Shades of 5-meters; or, why spend money on commercial antennas for 6-meters.

Just so the boys (?) up in the Ivory Tower in Newington do not feel slighted, before next month's deadline it will be my pleasure to provide a similar list (except for the author's comments) on these FM articles that have appeared in QST. (Believe it or not, the list is quite impressive.



**CHRONICLES  
OF SEVEN-SIX**

By Ken Sessions

**VI. FALL OF THE EMPIRE**

The bottom fell out of the Organization when it was at its peak. Newsbeat, the "Official Voice of Seven-Six," was finally silenced by the Federal Communications Commission. Newsbeat more or less held the seven-six group intact with its nightly 15-minute transmissions of important bulletins regarding movements of the SSSS, new appointments, etc.

The newscast was demolished in October, 1965, probably as a result of a transmission which took place immediately preceding the August Jamfest. This particular transmission was designed to call particular attention to the big picnic which had been publicized heavily during the preceding weeks.

Before discussing the FCC's objections to the newscast, the success of the seven-six Jamfest warrants mention.

The pre-Jamfest advertising campaign was very effectual. From July through August, at the close of each nightly news broadcast, details of the Jamfest were aired. And on Sunday, August 29th, the seven-six world turned out. They came by mobicade from Oxnard and Santa Barbara, and individually from Los Angeles and outlying areas. The agenda was simple: free beer and pop, and a few contests. What really sparked their interest was the Kapture Kontest. Seven-sixers have an insatiable craving for omnipotence. Everyone wants to be heard over every other station. On AM, when two stations vie for one frequency, the result is an annoying heterodyne. But FM is different. Heterodynes are rare--nearly non-existent. The stronger station captures out the weaker. The winner of the Kapture Kontest

er. The winner of the Kapture Kontest was to receive a mobile gain antenna and be dubbed Mobile Jammer King.

The rules were clear and simple. Mobiles positioned themselves in whatever way they desired in a given area, and were to transmit their call letters for 10 seconds when given the signal. Judges were placed about 300 yards from the mobiles, and were provided with walkie-talkies for monitoring. At the end of the match, the winner's car would be inspected for compliance with the single provision--no gasoline-driven generators permitted.

There were more than 30 participants in the elimination run, and only 3 operators were heard: K6CHR, W6CJJ, and WA6UGG. The next run eliminated Paul (CHR), but Walt (CJJ) and Steve (UGG) were still heard. On the last run-through Walt alone was heard. Steve lost by default when his transmitter died. Both rigs were inspected. Walt was running 150 watts in his Ford van to a rooftop gain antenna. Steve was running 250 watts output with an extremely unreliable lashup he'd "glued" together especially for the occasion.

The seven-six world didn't know it at the time, but the FCC wasn't smiling on the goings-on. The monitoring station in Santa Ana had been alerted by outraged AM'ers who resented the seven-six modus operandi. As a result, the FCC representatives began to catch the seven-six 11 O'clock report.

FCC Form 713  
October, 1964

UNITED STATES OF AMERICA  
FEDERAL COMMUNICATIONS COMMISSION

Santa Ana Monitoring Station  
P.O. Box 5186  
Santa Ana, Calif., 92704

**OFFICIAL NOTICE OF VIOLATION**

The facts set forth below indicate that you have violated the requirements of law or treaty. This Notice is issued in accordance with Section 1.89 of the Commission's Rules.

Within 10 DAYS from receipt of this Notice, a written answer in DUPLICATE shall be addressed to "Federal Communications Commission" and SENT TO THE ADDRESS ABOVE. DO NOT address your reply to an individual.

**MAKE CERTAIN THAT YOUR ANSWER:**

- Is dated and signed by licensee or an officer of the licensee
- Is identified as a reply to this notice
- Fully explains each violation
- Does not refer to a reply to another notice
- Specifically describes the action taken to prevent continuation or recurrence of each violation listed below

An X indicates that the reverse side must be completed by operator and submitted with your answer. An extra copy is enclosed for this purpose.

Warning: The rules violations marked with an asterisk (\*), if repeated or willful, as well as your failure to reply to this notice, may result in the revocation of monetary forfeitures. (See Section 510 of the Communications Act) Any of the rules violations repeated or willful, may result in the revocation of your station license or suspension of operator license. (See Sections 312 and 323(a) of the Communications Act.)

1. NAME AND ADDRESS OF LICENSEE: Kenneth W. Sessions 1861 Ramona Pl. Ontario, Calif.		2. LOCATION OF STATION: Ontario, Calif.		3. CALL SIGN: K6MNH	
4. DATE OF IRREGULARITY: 8/27/65		5. HOUR OF IRREGULARITY: 11PM to 11:15PM EST		6. FREQUENCY: 146.76Mc.	

7. CLASS OF STATION:  
Amateur

8. ASSESSMENT BAND:  
146.76Mc.

9. VIOLATION:  
 \* One way communications. Broadcasting of information in one way communications with subject matter having no direct interest to the Amateur Radio Service as such. The transmissions recorded does not constitute an exchange of communications with other amateur stations, and a majority of the talk is speculative gossip rather than real information.  
 \* Non-compliance with Section 97.99 and 97.91(b) of the Federal Communications Commission Rules and Regulations.  
 (a portion of intercept attached)

George W. Dillon, Issuing Officer  
W. J. [Signature], Santa Ana, Calif., Engineer in Charge - Location

OCT 11 1965  
DATE MAILED/SERVED

The knowing and willful making of any false statement in reply to this NOTICE is punishable by fine or imprisonment under Title 18, United States Code, Section 1001.

F.C.C., WASHINGTON, D.C.

**LETTER A**

Intercept of K6MNH 146.76mc/s  
8/27/65 11PM to 11:15PM EST

It's 11 o'clock and time for the news. Stand by for K6MNH Newsbeat - the official voice of seven-six. Newsbeat is a nightly syndicated feature of the Pacific Coast Network, transcribed for distribution on such member stations of the Network as TDD and MYK. The news is presented not as a broadcast nor an entertainment medium, but rather as a private transmission directed to a small group of amateur radio operators comprising The Organization. Stations are advised that listening for entertainment is forbidden, and constitutes an offense against the United States of America. In compliance, non-seven-six type operators are requested to remove power from their receivers for the next few minutes, after which normal band activity will be resumed. Jamming, incidentally, which is often construed by the Santa Ana Geatapo as malicious interference, is also a forbidden function. RF muscles, thus, should not be flexed or displayed during this serious and informative time period. We'll bring you the news in a moment. Ever wish you were a General or perhaps an Advanced Class Licensee. Now you can pick the license you want, and pay only \$7.60. Make your check payable to Central Hall of Records. Better order several, as a call to fall back on when your license is revoked in a virtual necessity on seven-six. As a special introductory offer, with each order you will receive a beautiful hard-bound edition of the fun-packed FCC Rules and Regulations, Part 95. You'll get a laugh a minute as you browse through the immortal pages of this great work. Remember, quantities are limited, so order now.

And now, the news, with seven-six news ace, Kandid Ken:

"Good Evening, twisted terrorists and sadistic seven-sixers; this is Kandid Ken with the 11 o'clock report, a late wrap-up of refuse and garbage designed specifically to keep you informed as well as alarmed, terrified, and nervous.

"News headlines tonight: SSSS holds emergency meeting in Santa Monica after the ouster of News Service Station K6MNH, resulting in FCC's dismissal of preferred charges.

"Last night 45 men met behind locked doors at a remote spot in lower Santa Monica to decide the fate of the FCC officials who lifted the license of Ontario station K6MNH. The direct line to Washington was kept busy during the evening as negotiations were initiated to restore the station to his original position. After three hours of hot debate, the two powers reached an agreement, which reflected, in essence, that revoking of privileges in this case was tantamount to removing a citizen's freedom of speech. The smudge of lawlessness was thus removed from the K6MNH record and all privileges were restored.

"A new time schedule is currently being worked out for Newsbeat. The Governing Body has proposed the newscast be aired at 6, 9, and 11. Such a move would involve cutting the news to a maximum of 7 minutes to avoid tying up too much airtime. Another recommendation is to limit the newscast to 10 minutes at 9 p.m., and have it repeated at 11 p.m. from another facility, such as the Pacific Coast Network headquarters in the Valley. The latter suggestion appears to be the most plausible route. A few individuals have suggested rather pointedly that the news be deleted entirely so that more time is made available for such constructive pastimes as jamming and exorcism. All courses suggested will be carefully and judiciously considered."

14 October 1965

Federal Communications Commission  
Santa Ana Monitoring Station  
P. O. Box 5126  
Santa Ana, California 92704

Gentlemen:

This letter is a reply to an official Notice of Violation, dated October 11, 1965.

The notice cites me for violation of sections 97.89 and 97.91(b) of FCC Rules and Regulations, by stating that my transmission of 27 August 1965 was not in compliance with the referenced regulation.

Before making the subject transmission, I studied section 97.91(b) carefully, and concluded that my transmission was, indeed, legal. The rule states that it is permissible to transmit "information bulletins consisting solely of subject matter having direct interest to the amateur radio service as such." While I will concede that the content of my bulletins was not of a particularly serious nature, and was comprised largely of "speculative gossip", I also contend that the information may be classified honestly as "bulletins". I'm sure you'll agree that the "bulletins" would be neither appreciated nor understood by other than amateurs; hence, they should qualify as having a direct interest to the amateur radio service.

Please understand that I am not trying to minimize the seriousness of the charge. Rather, I am trying to show that the transmissions in question were not a willful violation under my honest interpretation of the regulation. If the FCC feels it is not in the best interest of amateur radio for the bulletins to continue, and that my interpretation of section 97.89 and 97.91(b) is not reasonable, I stand corrected.

In light of the taped subject matter documented by FCC officials, it is extremely difficult--and considerably embarrassing--for me to explain my position. I cannot deny that the copy I received with the violation notice was a direct transcript of one of my transmissions, but I want to emphasize that the transmission was not intended as a violation but resulted from my interpretation of section 97.91(b).

My "bulletins" weren't sober or serious, it is true, but I feel this is insufficient justification to consider them noninformative. In the citation, it states that my "bulletins" consisted of material that is not classified as "real information". I submit that the word "information" has a number of definitions and that this charge is the result of a subjective interpretation of what constitutes information.

The fact that 97.91(b) is interpreted by the FCC as allowing only the ARRL the privilege of one-way transmissions is sufficient, of course, to make me abandon any further such activities, even though I think the interpretation is prejudicial.

I am a devoted amateur radio hobbyist, and do not want to jeopardize my license privileges. As the father of seven children, I cannot afford any monetary forfeitures either; so I definitely don't want to incur the wrath of the FCC. I have discontinued the bulletins, and will not resume them unless I hear from you that they are officially considered as authorized one-way transmissions.

Respectfully,

Ken W. Sessions

This brings us back to the pre-Jamfest newscast which apparently triggered the FCC into action. As I look over the transcript of that news broadcast, I wonder if the abolishment came because of the FCC's sense of humor--or was it due to the lack of it?

The news transmission in question lambasted the FCC. During the newscast, I said the FCC had confiscated my license (untrue at the time, but the statement served to attract attention). I said they surrendered my license back to me under pressure from the SSSS. Needless to say, an FCC official at the Santa Ana monitoring station was listening. It took a while for the wheels to turn, but in October, I received this letter:  
(Letter A)

In retrospect, I think I might possibly have overdone it just a bit.

As required, I answered the charge with in the customary 10-day period, with the hope that the FCC boys would drop the charge and let me continue with the news. I wrote:

(Letter B)

That was some time ago. I haven't heard anything from the FCC since then, but their purpose has been served. The news is dead. The Organization is dying, and the sacred seven-six channel is going to the dogs.

With no power limits imposed by the FCB, stations are turning into monsters. Power begets power, and everyone wants to be The Unjammable.

As others increased power, so did I. I gave up newscasting and turned to chess by radio. But my nightly chess sessions with WB6IGZ were interrupted and obliterated more and more frequently. In retaliation, my tower was dressed with a 20-element beam; and for a few weeks I was immune to jamming. But other beams appeared, and I was downed again. The tower was raised to 100 feet, and my power was increased to 100 watts. Still I was ousted. Something would have to be done! Seven-six was smothering me.

NEXT MONTH:  
PART VII. TAKE TO THE HILLS

LETTER B



## ARIZONA (Cont)

Brackets to change and the flowing sands of time helped us to decide during the installation that we'd best call it a day and return on Sunday to complete the job.

Then, on Sunday, with the aid of a winch, ham ingenuity, and tight cooperation, the second antenna was finally anchored.

It was with utter exhaustion that the dirt-covered crew finally secured the coaxial cable to the tower. The week-end would be remembered by all of them until the sore joints and aching muscles returned to normal.

The club call is now the only hangup. Since it was applied for last November, it should be showing up any day now --- any day...

## CANADA (Cont)

But I think this philosophy is in conflict with the basic ideas which have led most of us to FM in the first place. Remote control of base stations should be our target -- not extension of coverage from homes which aren't on the highest hills around. It seems ridiculous to even consider FM as a preferred means of communication if we are simply going to substitute it without using its many inherent advantages over the other modes.

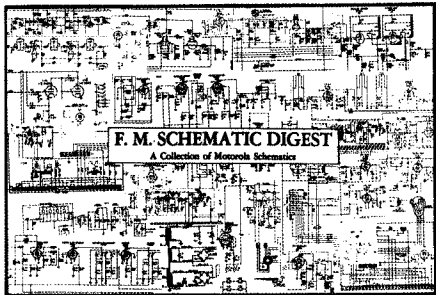
If a suitable hill or office building is in the area and locals are not making efforts to get equipment operating there, I think the operation is limited already to the point where AM or SSB might as well be in use.

What's happening in Winnipeg is a classic example of what can happen when there are no joint efforts to establish a repeater: The city sees little growth of FM, and there is no standardization of frequencies.

At the other end of the spectrum is Vancouver, where the growth is large and fast. In Vancouver the repeater is a community enterprise which provides excellent coverage and tends to continuously spark FM activity.


Contrary to expressed opinion, I think it is essential to take every advantage of every repeater and remote base station possible. This might not always apply to high-density areas, but it certainly does appear important to less well populated regions. As for myself, I would not have given FM a thought if it hadn't been for the range and coverage possibilities of repeaters and remote facilities.

It would be interesting to learn of information pertaining to activity in the Cadillac (Michigan) area. It would be nice if the people in my area could work in to a repeater in that area; with luck, it could allow us to establish reliable two-way contact with Chicago. I have an urge to get started on an ambitious project of this nature. A considerable amount of effort, cooperation, and maintained interest will be required, but such a project can be successfully accomplished if we try hard enough.



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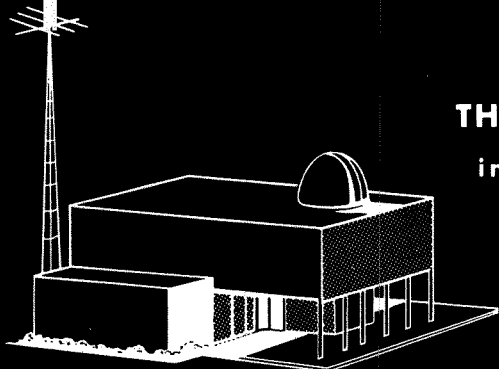
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Saturday, April 27, 1968

*at Convention-Designed*

## Wampler ARENA CENTER

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DAYTON 15, OHIO

**12 Minutes From Downtown Dayton**

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Among the many radio equipment manufacturers and parts distributors who will have their latest products on display during the Hamvention will be:

Aerotron (Gonset-Ameco), North Raleigh, N.C.  
Collins Radio, Cedar Rapids, Iowa  
Coston Electronics, Cincinnati, Ohio  
Cowan Publishing Co., Port Washington, L.I., N.Y.  
Design Industries, Texas  
E. F. Johnson, Waseca, Minnesota  
Evansville Amateur Radio, Evansville, Ind.  
Fallert's Engraving, Hamilton, Ohio

### FM Magazine

Galaxy Electronics, Council Bluffs, Iowa  
Ham Radio Magazine, Greenville, N. H.  
Hammarlund Manufacturing Co., Mars Hill, N. C.  
Heath Company, Benton Harbor, Mich.  
Hy Gain Electronics Corporation, Lincoln, Nebraska  
Kirk Electronics, Dayton, Ohio  
Mosley Electronics, Inc., Bridgeton, Missouri  
Organs & Electronics, Lockport, Illinois  
R. L. Drake Company, Miamisburg, Ohio  
Raytrack Company, Columbus, Ohio  
Spaulding Products Company, Frankfort, Indiana  
Squires Sanders, Morris Plains, N. J.  
Srepcu Electronics, Dayton, Ohio  
Stellar Industries, Inc., West Ithaca, N. Y.  
Sylvania Electric Co., New York, N. Y.  
Waters Manufacturing, Inc., Wayland, Mass.  
73 Magazine, Peterborough, N. H.

### Hidden Transmitter Hunt

A hidden transmitter hunt will be held at the Arena Center with the transmitter operating on about 430 mcs. A folded dipole 13-1/4" long connected in series with a germanium or silicon diode and a capacitor can serve as a receiver. Prizes will be awarded to the winners. Plan to participate. Write Dayton Hamvention for Rcvr/Ant diagram.

### Call-in Frequencies . . .

W8RXM/8, at the Arena Center site will monitor the following frequencies for directions and information:

3,995 Mcs.	50.4 Mcs.	28.6 Mcs.
52,525 Mcs. FM		145.2 Mcs.

### Flea Market

Giant Flea Market open all day Saturday for sellers and traders. Vendors must furnish their own tables. A Flea Market permit is required for sellers.

### Bus Transportation . . .

Free bus from Sheraton-Dayton Hotel, Holiday Aire Motel, Howard Johnson's Lodge, Imperial House Motel North and Dayton Motor Hotel to Wampler's Friday from 1800 to 2200 and Saturday from 0730 until after the Banquet. Special bus service for Ladies DXpedition. Bus service between local airports, listed Motels or Hamvention provided courtesy John Meyer Volkswagon. Contact Dayton Hamvention in advance.

### Parking . . .

Plenty of free parking is assured at the Arena Center. Self-contained trailers and camper units are permitted to park overnight in the arena parking area.

Deadline for advance registration is —  
Thursday, April 25, 1968

If requested advance registration tickets have not been received by Wednesday, April 24, 1968 they are being held for pick-up at the registration desk.

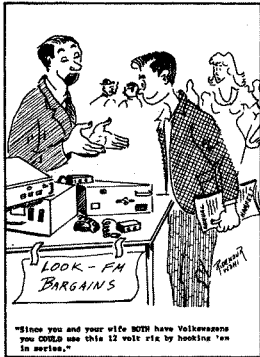
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**A TALK AND SLIDES ON**  
**INTEGRATED CIRCUITS &**  
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**JACK TAR HOTEL**  
 of Lansing, Michigan

**Public Service (cont. from page26)**

We'll be invited to provide the complete communications package next year.

Our part in the nationwide SET began at 3 PM and ended around 4:15. Our mission was to act as a communications link between 12 Red Cross offices in as many cities. This we did with varying degrees of success. An unfortunate but certain apathy was noticeable on the part of many of the Red Cross participants. In all, however, we handled 25 formal (written) messages. Which is not too bad a record for a group whose chief experience is in the "police dispatching" type of operation.

On Tuesday, February 12th of this year, the city of Baldwin Park had a school bond election. City officials familiar with the valuable services offered by our AREC group asked us to provide communications between the polls and the school-district office. As the results were tallied, the officials reasoned, the office telephone lines would be tied up, and the ensuing communications tieup might hamper processing and publicizing of election returns.

To expedite the flow of data from the polls to the central office, one FM unit was assigned to each polling place, and a net control station was set up in the school-district headquarters. As the votes were tallied, the information was relayed to the net control station by each applicable field assignee. Within 40 minutes after the polls closed, all data had been collected by the school board and the mobiles were secured. The appreciative school board made it a point to let us know we'd set a speed record in delivering the information to them. Their previous experience, which involved use of a telephone line, had taken, as much as several hours, they said.

Our AREC group has so impressed the Baldwin Park City Civil Defense officials that they have given us a spacious room in their building to serve as an AREC headquarters for our mobile FM network. Prominently displayed on the wall of this room is a letter to the AREC from Mr. Clifford Norby, Chief Administrative Officer for the city, in which he states that the city realizes it must share our service with other cities and that we are under no special obligation to Baldwin Park. Yet, the letter expresses appreciation for our civic interest in Baldwin Park and encouraged us to continue participating in the many city activities.

From our new AREC headquarters, we will at last be able to develop ties into the low-frequency networks, including the National Traffic System. We have applied for a club call for the headquarters station, and plans are being formulated for a radio-controlled remote station on a nearby mountaintop. With the influence Baldwin Park has with other public agencies, it is highly possible the AREC can acquire the choicest of locations for a remote station.

This is the story of just one public service communications group using wide-band FM. Are there other organizations doing what we are doing? What about sending monthly activity reports to the editor of FM. He's as much interested in reporting what goes on in FM as we are. One final parting note: When you send in those little activity reports and notes to QST, be sure to say FM at every opportunity. It seems that ham radio still doesn't know we're alive. ....WA6JXG

In looking through the FM Bulletin for articles on activity from the south, we decided that it's time the Carolinas were heard from. Less than two years ago there was no activity and very little VHF activity in the amateur bands. John Harrison (W4TYS), Frank Davis (WA4MWA), and I decided to try six-meter FM, since equipment had become available at amateur prices from a local power company.

We now have 15 base stations and 15 mobiles in addition to a repeater operating on 52.525 MHz. (Four of the base stations are manned by husband-and-wife ham teams.)

FM activity has also spread to 146.94; there are seven bases and three mobiles operating on this frequency.

Greenville, South Carolina and Charlotte, North Carolina are right on our heels with new stations springing up frequently.

Our sincere thanks to FM Magazine and to "The Tulsa Repeater Story" for much-needed guidance in the forming of our organization. Keep up the good work.

Ken Adams K4MOC  
South Carolina

Our club is deeply interested in the regulations of repeaters. And we would like to contact other clubs concerning the rule changes for repeaters which are being proposed in the near future, preferably before the ARRL convenes in May. Therefore, we are asking you to supply us with a list of addresses of all repeaters of which you have knowledge.

Adeline Havens K7RHI  
Secretary, Arizona Repeater Assn

SEE DIRECTORY THIS ISSUE. WE DO NOT HAVE ADDRESSES, HOWEVER

I've just seen... your answer to Autocall (FMB February 1968). I think you did better than I could have done myself. Although Andy didn't say so, he was complaining about the Wichita repeater. All the boys in the Topeka area complain about the Wichita repeater, although the Topeka repeater hasn't seen a total of 14 days operation in the last year. They do have a slight gripe because of the antenna radiation pattern of the Wichita repeater (although if they have a 1  $\mu$ V signal and 50W output they can work Wichita OK. The antenna pattern of the transmitter has a pair of bulges; one toward Topeka, the other toward Enid, Oklahoma.

Also, the receiving antenna is a Com Prod Stationmaster of the old style which flexes in the breeze, cutting the receiver gain somewhat. We intend to replace it with a DB 224 in the near future, so the gain will be more uniformly stable.

Five years ago, after having a bellyful of emergency nets that couldn't operate in an emergency, I started talking about putting together a repeater. I encountered antagonism, apathy, and almost no help. By devoting much effort, time,

# LETTERS

## FROM OUR READERS

and money, I was finally able to convince six hams that a repeater and FM equipment would make a good radio communications system.

In February 1965, I fell and broke a hip. While still on crutches, I did most of the assembly on the Wichita repeater, aided by WA5JDZ / 0, W0AOG, W0OEE, and two who became WA0LCZ and WA0FLY. It started operation in September of 1965 with three hams on 146.94 MHz. (We now have 75 amateurs in and around Wichita operating regularly.)

In the spring of 1966 we moved to our present location 450 feet in the air. Due to complaints (the Topeka boys and others) the equipment has been checked numerous times. The receiver gives 20 dB of quieting with an input signal of about 0.3 microvolt. We have made many tests for desensitization, which is almost nil.

We run about 65 watts input with 40 watts output. All equipment is GE Progress Line with standard GE shield kits for repeater operation.

Perhaps I should explain that I am a professional electronics technician making my living servicing GE and other makes of communications equipment. We have a Cushman CE-2B frequency and modulation meter / signal generator, and other comparable equipment which is used as needed to check the repeater. We also have a six-meter repeater up at the 450 ft level. (It's GE Progress Line, too. I get disgusted with all the Motorola publicity, but that's the way it goes, I guess.) Practically all transient mobiles have commented on how clean the audio is through the Wichita repeater. To understand why, check the audio flow diagram of brand "X" as compared with GE's Progress Line: GE takes audio from the discriminator, corrects for deemphasis, and goes in the mike circuit of the transmitter. No transformers; straight rf circuits & class A amplifiers. There is virtually no distortion (about 3% by test) from a quieting signal into the receiver, to the output of the transmitter.

The Wichita repeater has been down for service three times in 18 months. Two of the times were attributable to trouble with the automatic identification equipment. I don't know of any brand "X" repeaters that do as well.

Oh, well, enuff griping.

... Anyway, I have a 100% ham family; Gaye (WA0LAS), Peggy (WA0HYK), and Kitty (WA0QPK). We control the Wichita repeater from my home, and K0IFJ has access to turn it off if it is needed in an emergency.

I started to thank you for your answer to Andy Anderson and sure rambled.... The almost universal feeling in Wichita is "those that voted for him deserve him." And many ARRL members are just plain teed off. Oh, well, I had to fight people like him to start the repeater, and I expect more (fights).

I still think everything in your magazine is the finest EXCEPT the Chronicles of Seven-Six.

Don Chase W0DKU  
Editor, Techni-Chat  
4543 S. Elizabeth  
Wichita, Kansas

Please add my name to your subscription list. I have read several issues and like the magazine very much. The only real complaint I have is the Bulletin's tendency to look on FM as the one and only mode of communications. Obviously, I like FM or I wouldn't have as many rigs as I do (six meters and two meters, and a single sideband rig is in the works for six meters).

Reading the item from Autocall and your response, I must say I agree with your comments almost completely. You missed two good FM points: (1) For emergency use, especially in bad weather (tornadoes, etc.) static on 75 meters will make that band nearly useless; (2) With FM you are able to call with the assurance that a given station will hear you because he is listening on the same frequency.

However, when you say the FM'er is the only ham who experiments, etc., I must disagree -- not that some of the FM'ers don't experiment, because certainly some of them do; but I know fellows who operate strictly AM on six and two meters and who build, experiment, etc.

Anyway, it's not too important. I just don't like to see a blanket tag hang on a group when it's not completely applicable.

Doran Ditlow W4SEOW  
Rt 2, Grant, Mich

I DIDN'T SAY THE FM'ER WAS THE ONLY EXPERIMENTER. I SAID HE SEEMED TO BE THE ONLY ONE LEFT WHO REMEMBERS WHY HE'S HERE. OF COURSE THERE ARE AM EXPERIMENTERS. A LOT OF FM'ERS ARE EX-AM'ERS WHO EXPERIMENTED WHILE THE REST OF THEIR FRIENDS WERE GOING THROUGH THEIR DAILY BANDCHANTS. BUT YOU DON'T SEE TOO MANY AM REPEATERS CONTROLLED FROM 220 AM OR 450 AM. AND THAT'S A FACT!

## MORE LETTERS

Let me add my voice to those of others who think that the new format is great. I think the new name -- and dropping Bulletin -- was good; the logo is swell; two-color use is fine; and general makeup is something to be proud of.

There are a few things, though, that show through all the professionalism. All the articles are from California contributors, and represent a very specialized viewpoint. This fact has caused a buzz here, and perhaps in other areas as well. Do we really need pictures of Ken Sessions' mobile? Surely, it is far from unique. Does it have to be in the same issue as his article? There must be other contributors available. The more he says, the more we are sure that Ken is not Mr. FM.

I mention these things to you, Mike, only because I want to see you make good. I went through all the same feelings when I quit a very well paying job 10 years ago to make it on my own. I admit that I certainly don't have all the facts, but I am worried for you. The original idea of the Bulletin was yours, and it had all the earmarks of a winner simply because it was needed. We all liked your approach, and I was -- and still am -- impressed with your determination and clear thought. As short a time as a couple of issues back, the magazine had balance. There was a little something for everybody, so it was fun to read. But now we have the K6M VH Bulletin instead and, while it is "slick" physically, it's not fun. It's just a long editorial.

All this doesn't help you any, so let's see what we can suggest that would be constructive. First, I hope you don't give up any equity. I feel that the magazine has really great potential. Probably less than one percent of all the prospects for subscribers even know of its existence. Next, you'll have to deal with Ken Sessions. In spite of the fact that you feel you need him so much, I just do not believe an analysis would support that contention. I'm sure that there are others in this great land who can edit copy and write articles for you. This does not mean to say that you cannot accept material or editorial views from him, but the editorial views from him MUST be identified as such, and not run in the form of regular articles. Nothing will kill a ham book faster than taking one special viewpoint -- there will always be more nonsubscribers who disagree, anyway. A real editor, dedicated to service, will present all views in an equal manner. This can't offend anybody, and nobody wants his money back.

One way to get articles is to offer a year's subscription for all articles that you use, and invite submissions in the magazine. The subscription price, by the way, will have to be raised. Five dollars per year is certainly not too much for a specialized magazine in a nice format such as you have now. This will give you a bit more capital so that you won't have to work on such a short margin. If anything, Mike, you are moving too fast; the cost of the book has gone up out of proportion with income.

You must publish on time every month, even if you have only a 12 - page book. You have an obligation to the advertiser and to the subscriber; you can't expect five pages from Gregory, etc., every month. You will have to tailor the size to the ads you have, but PUBLISH!

I hope you will forgive me for spouting off, but I'm sure that you know I have only one objective, and that is to offer what help I can. My feelings won't be hurt if you throw this right in the wastebasket.

Dave Goodman, WA8UIT  
3305 De Sota Avenue  
Cleveland Heights, Ohio

I ALSO BEAT MY WIFE AND KIDS, KICK DOGS THAT DON'T BITE, AND SPEND GROCERY MONEY ON HAM GEAR.  
-Ken Sessions

YOU HAVE MADE SOME VERY GOOD POINTS, HOWEVER KEN IS DOING A GREAT JOB AND WITHOUT HIS HELP WE WOULD NOT BE PRINTING THIS AT ALL. WE NEED A LOT OF HELP FROM EVERYONE!  
Michael Van Den Branden

Just saw a copy of your publication and WOW! This is the magazine I have always wanted to see printed. A growing number of guys in the L.A. area are really tired of antiquated ham radio and the ridiculous stereotyped "ham operator."

I have been exclusively operating on 2 meters FM and my 450 MHz telephone repeater for almost 4 years. I really hope your FM magazine will continue to grow both in size and circulation.

(By the way) I wonder if you know of anyone on the east coast who has Western Electric or Touchtone instruments for sale? Such things are scarce in Southern California.

Tim Tison WA6HAH  
2691 Patricia Avenue  
Los Angeles

... Generally speaking, I do enjoy the contents of FM and especially the articles of a technical nature. I feel that I must, however, take exception to the "Chronicles of Seven-Six." Gee, this California group sounds like kind of an arrogant bunch. I'm not at all sure that their operation is in the best interest of amateur radio. It sounds as though this FCB (Frequency Coordination Bureau) was trying to usurp the authority of the FCC.

If this story is really on the level, I don't blame the FCC monitors for getting upset at the group... Thankfully, we don't have this exotic type of FM operation in the Omaha area. Here, we are delighted to have newcomers on the frequency and people here will help a newcomer to get his equipment working properly, etc.

John Snyder  
3221 So. 45th Street  
Omaha, Nebraska

YOU MEAN YOU PEOPLE ARE OPERATING OUT THERE WITHOUT OFFICIAL FCB SANCTION?

We had a meeting of the St. Louis Repeater Organization, and ...interest was expressed in the following areas: The fellows would like to have a list of the repeaters in operation across the country. I know that you could probably get some of this information from the people in Angola, but could you possibly publish such a list?

Also, how about some more information about who and what, pertaining to petitions to the FCC regarding explicit licensing or regulations pertaining to repeater operation, logging, etc.

A personal observation on "FMB Answers Autocall," you missed a misspelled word: "Frequency" is spelled "frequence" in the third paragraph. I agree whole-heartedly with your comments.

Allen Kempe K0SSL  
3666 Humphrey Street  
St. Louis, Missouri

LIST INCLUDED THIS ISSUE!

I think your magazine is great and I hope it continues to grow as much as it has in the past few months. We're trying to promote it as much as possible in the South Bend area.

We are in favor of a national FM association; we would like to see you and the ARRL work hand in hand. A nationwide organization could sure put pressure on the ARRL to look at FM. Any ideas on how we could get ARRL to publish more on FM? (Like reprints of your articles, publishing FM activities, dates, and times to give publicity to important events, etc.)

Do you know of any movies, slide shows, or similar graphic aids which could be used to promote FM or repeaters? It seems as if a slide show with taped narration would be excellent publicity and would encourage FM operation. Also, it would help clarify things for those who are familiar with FM but who are not too familiar with repeater operation.

Keep up the good work, and we'll keep promoting FM Magazine and working on a repeater.

Incidentally, we have an occasional repeater in South Bend (146.94 to 52.525 MHz and back), operation only on request. It's strictly low power and temporary. Plans call for a 146.96-to-146.88 MHz repeater, with input and output on six meters as well.

Phil Snider  
1622 Johnson Street  
South Bend, Indiana

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## FM Magazine

2005 HOLLYWOOD

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FOR SALE... Two GE all solid-state hiband, Voice Commander II with carrying cases and chargers...each includes NiCad battery....\$125.00 each. One set Int'l xtals...146.94 rcv... 146.94 and 146.34 xmt...all xtals for \$10.00...units are 2 freq xmt and 1 freq. rcv. Would consider swap for Nikon camera lenses. Gary Hoffssomer, W0QJC, RFD 4, Topeka, KS 66605...Phone 913- AM68771

WANTED...Motorola audio and squelch plug-in unit for R-394/U receiver. Tube line-up: 3-5678, 1-5672, 1-6AK6. Gordon Bean, K8MRS, 2313 Cooper Ave Saginaw, Mich. 48602

WANTED...Info, Schematics, Alignment procedure, Conversion data... I have a model 5000-10VR-C1 serial 6644 Link. It is on 156 MHz and is without power supply. Help me get this rig going and we will create another FM'er. Contact Jim Labadie, WB6LOY, at 1216 Primeaux Ave., West Covina, Calif. 91790

3 YEARS ACCUMULATION...2 meter FM (raw & converted), Motorola, GE, Comco etc. 5 base, 14 mobiles, 8 handie talkies (2 transistorized). All gear in excellent shape unless otherwise stated. Write Carlo V. Spatari, 402 E. 8th St., Ellensburg, Wash. 98926

FOR SALE...146.7 MHz crystal for Motorola type 80D receiver with 13 and 3.8 MHz IF stages. \$3.00 (new) Int'l Crystal. Ed Bruening, W8DTY, 1611 Creal Crescent, Ann Arbor, Mi. 48103

FOR SALE...Simpson 50 micro amp. meters, model 127 & Simpson 50 micro amp. meters, model 1212. \$6.50 ea. (new) Art Housholder, 1774 Farwell, Des Plaines, Ill. 60018 (827-3433)

FOR SALE OR TRADE... Motorola 41V 12v narrow band, tuned to 146.9 (no crystals) with controls and cables. Also Western Electric 106A signal splitter, all in excellent working order. Make offer. Stan Miln, K6RMR 2912 Overland Ave., W. Los Angeles, Calif. 90064

SWAP...Model 28ASR Teletype, want Motorola Hi Band station Monitor. Will answer all letters. J. Thomsen, W9YVP, 8280 S. Tennessee, Clarendon Hills, Ill. 60514 (312-323-3821)

WANTED...will buy, rent or borrow instruction manual and schematics for Link Model 6000-30VR-C1 Mobile FM Transmitter/Receiver. Contact Don Harris, WB2VLR, 3 Jonathan Road, Rexford, New York 12148

WANTED...Motorola "Permakay" IF Filter, Model No. TU540W..Motorola Dynamic Microphone, Model No. TU353A..RCA Test Oscillator, Model No. CX-9A..Dual Freq. kit for RCVR and XMTR of a Motorola Model No. T51GGV-310IA; RCVR Schematic, Model No. 63E854590-H, XMTR Schematic, Model No. 63E849934C. Contact: Richard Ahrens, W3WJC 3404 Reading Crest Avenue, Reading, Pa. 19605 Phone: (215) 929-3466

FOR SALE...Complete 2 meter AM station, Globe Hibander 6&2 xmitter, BC348 receiver, home brew 417A converter with 6cw4 preamp and power supply, Dow Key relay, Mike and Beam. The whole ball of wax just \$165.00 Ronald J. Smith, K9QAM, 7230 Evans Place, Clarendon Hills, Ill. 60514

FOR SALE...new Collins C-974/FRR-33 rack-mounted "Remote Switching Control", same as shown in middle of picture (with white tag on it) on page 4 of January '68 FM Bulletin. Tone impulses to operate the internal selector, to give a number of remote control functions in an FM repeater system, may be received from a dail at a remote position or a distant station, or may be developed locally, for testing purposes, by means of the dail on the panel. Has its own self-contained power-supply. With an 11 page reproduced instruction manual, a schematic, and a wiring diagram. \$55, F.O.B. John Longley, W2ANB, 1623 New Scotland Road, Slingerlands, New York 12159 Phone 518-439-2862

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