FEEDBACK

THE OFFICIAL NEWSLETTER OF THE

GEORGIAN BAY AMATEUR RADIO CLUB

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JUNE 1993

GBARC 20th ANNIVERSARY

GBARC

The Georgian Bay Amateur Radio Club ,founded in 1973, is based in Grey and Bruce counties. The club meets at 7:30 P.M. sharp on the second Tuesday of each month, except July and August, at the Billy Bishop Airport.

NET SCHEDULE

Sunday 09:30 hrs 3.783 Mhz SSB

WEDNESDAY 20:30 HRS 3.670 Mhz CW

CLUB OFFICERS

President_____VE3XOX Bob Vary

Vice-President_____VE3IJD Gene McDonald

Treasurer_____VE3HIP Ian Trenholm

Secretary_____VE3MWU Nick Klassens

Technical-Director_____VE3HIO Rick Slack

Program-Director_____VE3UWW Jerrine Verkaik

Bulletin Editor_____VE3TSA Tom St.Amand

FEEDBACK

The official bulletin of the Georgian Bay Amateur radio club, published monthly, except July and August. Contributions of articles/letters are encouraged and should be sent to

Tom St.Amand, VE3TSA,

1232 3rd Ave. East, Owen Sound, Ont.

N4K2L5

DUES

$25.00 per year

This Issue:

UPCOMING EVENTS

NEXT GBARC MEETING
JULY 13th 1993

BREAKFAST MEETINGS:
JUNE 26th 1993

JULY 10th & 31st 1993

FIELD DAY

JUNE 26th & 27th 1993

MEMBERSHIP

VE3AEO TED	VE3MVS MERV
VE3AUB JACK	VE3MWU NICK
VE3BFV JIM	VE3NEM TOM
VE3BIS DICK	VE3RHJ BRAD
VE3BZC ROSS	VE3RLW ROB
VE3CC CY	VE3RVG GERRY
VE3CAH CAROL	VE3TDF PAT
VE3CRV JIM	VE3TDV DOUG
VE3CUV ROSS	VE3TFQ JIM
VE3DIQ BILL	VE3TFV KEN
VE3DKF JIM	VE3TSA TOM
VE3DQC DAN	VE3TTV HENRY
VE3DTS JACK	VE3TUK RUSS
VE3DXO DAVE	VE3TUM RICK
VE3EBM ROY	VE3TUP KLAAS
VE3FFN WALTER	VE3TUQ AUBREY
VE3GDH DEREK	VE3TUS BARRIE
VE3HGL HAROLD	VE3TWI OKKE
VE3HIO RICK	VE3TWJ DAVE
VE3HIP IAN	VE3TWK JACK
VE3HMZ BILL	VE3TWL CATHY
VE3HXX IAN	VE3TXB JOHN
VE3IJD GENE	VE3TYL JIM
VE3IEV JOHN	VE3UIC JASON
VE3ILO BERT	VE3UUL JOHN
VE3INP JOHN	VE3UWD HENRY
VE3IOD GARY	VE3UWW JERRINE
VE3IXG DOUG	VE3UWX MORRIS
VE3IXR MURRAY	VE3VTO DON
VE3JLZ JACK	VE3WNW BILL
VE3LKD BOB	VE3WWS VIHLO
VE3LPD LAVERNE	VE3XOX BOB
VE3LPT MOE	SWL STAN
VE3MTG LARRY	N5ZIK JACK
VE3MTV NORM	

MINUTES OF THE LAST GBARC MEETING

MINUTES OF GBARC MEETING , MAY 11TH,1993. Meeting opened at 7:35 P.M. with 29 members and 2 guests present. Guest were Steve Sharpe, VE3XKM and Gerry Banks, VE3UWZ. Minutes of Apr.13 meeting accepted as recorded by Cy,CC and 2nd by Bob,LKD. Treasurers report show balance of $ 775.54 in club account and $ 357.27 in student account. No outstanding invoices to be paid.

OLD BUSINESS: Two more signatures are required on the club incorporation papers. Secretary Ian agreed to obtain these signatures;. Jim CRV and Jim BFV tomorrow and return them to the lawyers office. Gene reported on flea market plans for 29th . Several vendors from out of town, as well as 10 or so members indicated they wish to set up a table. Tom TSA has made up signs for direction on telephone poles, as well as signs on the site. Tom also agreed to bring in a p.a. system for announcements. Tom also printed up stickers to be given out at the door when admission is paid or table rented. If a table is rented at $ 2.00 ,this includes admission. Free coffee included with admission .Tables available at 9:00 a.m. for set up and doors open at 10:00 for sale to public. Work committee group are : Coffee arrangements Jim TYL and Nick MWU. Door for tickets & table rental are Roy EBM and Bob LKD. Ian HIP and Ross BZC will help set up tables and make arrangements to meet with the city official and pay the deposit. Other members agreed to put up signs on the main roads coming into Owen Sound and take them down as well when they go home. Ian HIP to get tickets for door prizes and try to get local radio merchants to donate prizes. Tom TSA will bring a p.a. system.... Left overs will be trashed. Club members themselves are not interested in setting up a b-b-q for hamburgers ,however Ian will speak to a student abt this. Left overs will be trashed.

Election of Club officers for the year l993-94. By Rick HIO. By Acclamation

President: Bob XOX

V-Pres. : Gene IJD

Secretary : Nick MWU

Treas: Ian HIP

Bulletin Ed..Tom TSA

Tech.Dir: Rick HIO

Program Dir.. Jerrine UWW with TED AEO to assist.

Gene, IJD gave report re: club assist local Family "Y" with communications on a car rally to raise funds for the Y renovations. As no info. was received, Cy ,CC agreed to follow through re the car rally group. Cy's son-in-law is the clubs president. Ian , HIP will get the last two remaining signatures on the club incorporation papers and will take into the lawyer tomorrow. A welcome to guest Steve Sharpe, VE3XKM and Gerry Banks VE3UWZ, was extended by pres. Bob.

NEW BUSINESS: Field day dates are June 26,27th,at Gene IJD QTH in Tara. A field day committee was made up of Gene IJD,Bob XOX,Tom TSA, Brad RHJ,Rick HIO,Jack DTS and Larry MTG. Gene IJD to arrange for the port-a-potties. VE3OSR and 52 for talk in. Stations will be set up for cw and phone. It was decided that a pot luck supper would work best for supper. Some to bring salads,others fruit, hamburgers, etc. Lots of room for tents,etc for members to relax after supper for those that are driving home later Saturday.

Move to adjourn by Larry,MTG , 2nd. by Henry UWD.

Winner of 50/50 draw was Nick MWU.

A SIMPLE ALL-BAND HF ANTENNA

by Brad Rodriguez, VE3RHJ

When I moved to my present QTH I decided I wanted antennas for ALL the HF bands. Actually, I wanted ONE antenna, so I wouldn't have to pay for multiple feedlines. My limited budget restricted me to wire antennas. I had heard enough hams cursing antenna traps to be suspicious of them, and I didn't want to bother with antenna tuners. So when I saw an ad in QST for a no-tune, coax-fed, all-band, trapless wire antenna -- made in Canada, no less -- I rushed to buy it!

The Garant GD-9 was my first exposure to the off-center-fed (OCF) dipole, sometimes inaccurately called a "Windom" antenna. I immediately started reading up on the subject, and QST obliged me by running both a product review of the Garant antenna and a technical article about OCF dipoles. I was surprised to learn how easily I could have built this antenna myself!

The off-center-fed dipole is an ordinary half-wave dipole antenna, but instead of being fed at the center, it is fed one-third of the way from one end. You may know that a center-fed dipole will resonate on all the odd harmonics. For example, a 40-meter (7 MHz) center-fed dipole will also work on the third harmonic on 15 meters (three times the fundamental frequency, or 21 MHz), the fifth harmonic (35 MHz), and so on. The wonderful thing about the OCF dipole is that it resonates on the EVEN harmonics. So if you cut it for 80 meters (3.5 MHz), it will resonate at the following frequencies:

Harmonic	Frequency	Band
2nd	7 MHz	40 M
4th	14 MHz	20 M
6th	21 MHz	15 M
8th	28 MHz	10 M

It turns out that it also resonates at 18 MHz (17 meters) and 24 MHz (12 meters)...I'm not sure why. As an added plus, the OCF dipole is more broadband than the center-fed. But there are two gotchas: First, the feedpoint impedance is something like 300 ohms, so if you want to use 50-ohm coax you need a 6:1 balun. (I suspect this is why Garant Enterprises could charge so much for their kit.) Second, at 21 MHz the feedpoint impedance is a few thousand ohms! This is easily corrected by adding a second OCF dipole in parallel, cut for 21 MHz. Better still, cut it for 10.5 MHz and you get the 30 meter band, too. The two OCF dipoles can be connected in parallel at the balun, and only one feedline is required.

The result looks something like Figure 1, which shows my installation. Since I have a lot of room, I cut the "main" dipole to dimensions (a), giving me coverage of all the HF bands. If you have only 135 feet, cut to dimensions (b), and all you lose is 160 meters. It should be o.k. to bend the "ends" to fit in limited space, just like any dipole.

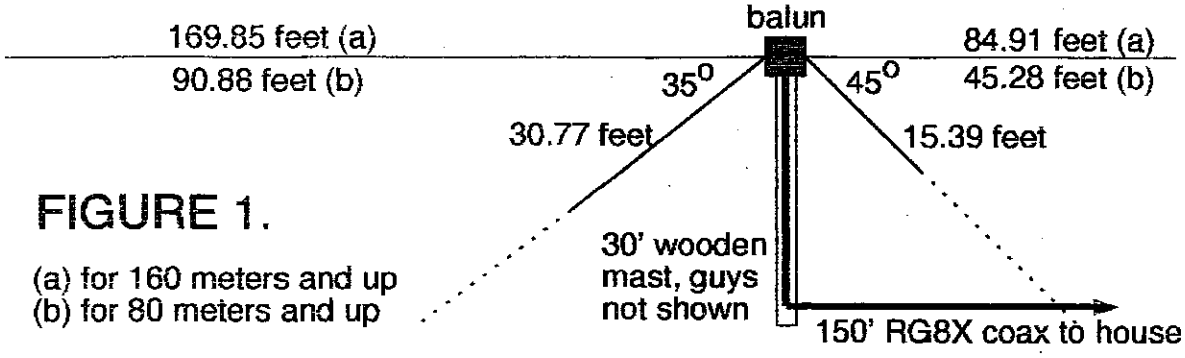


FIGURE 1.

(a) for 160 meters and up
(b) for 80 meters and up

It seems to be important to keep the two dipoles separated. I do this by running one dipole horizontally and the other as an inverted V (as shown), but you could also run both dipoles horizontally in different directions. Another very important tip is to raise the feedpoint as high as possible, since the center of the dipole is where most of the radiation takes place! When I first put this antenna up, I supported it only at the ends. The center drooped to about 8 feet above ground, and signal reports were terrible. Raising the feedpoint to 30 feet on a wooden mast (per the ARRL Antenna Book) dramatically improved performance. For really tight lots, put up a tall mast and run both dipoles as inverted V's, one east-west and one north-south (or whatever fits).

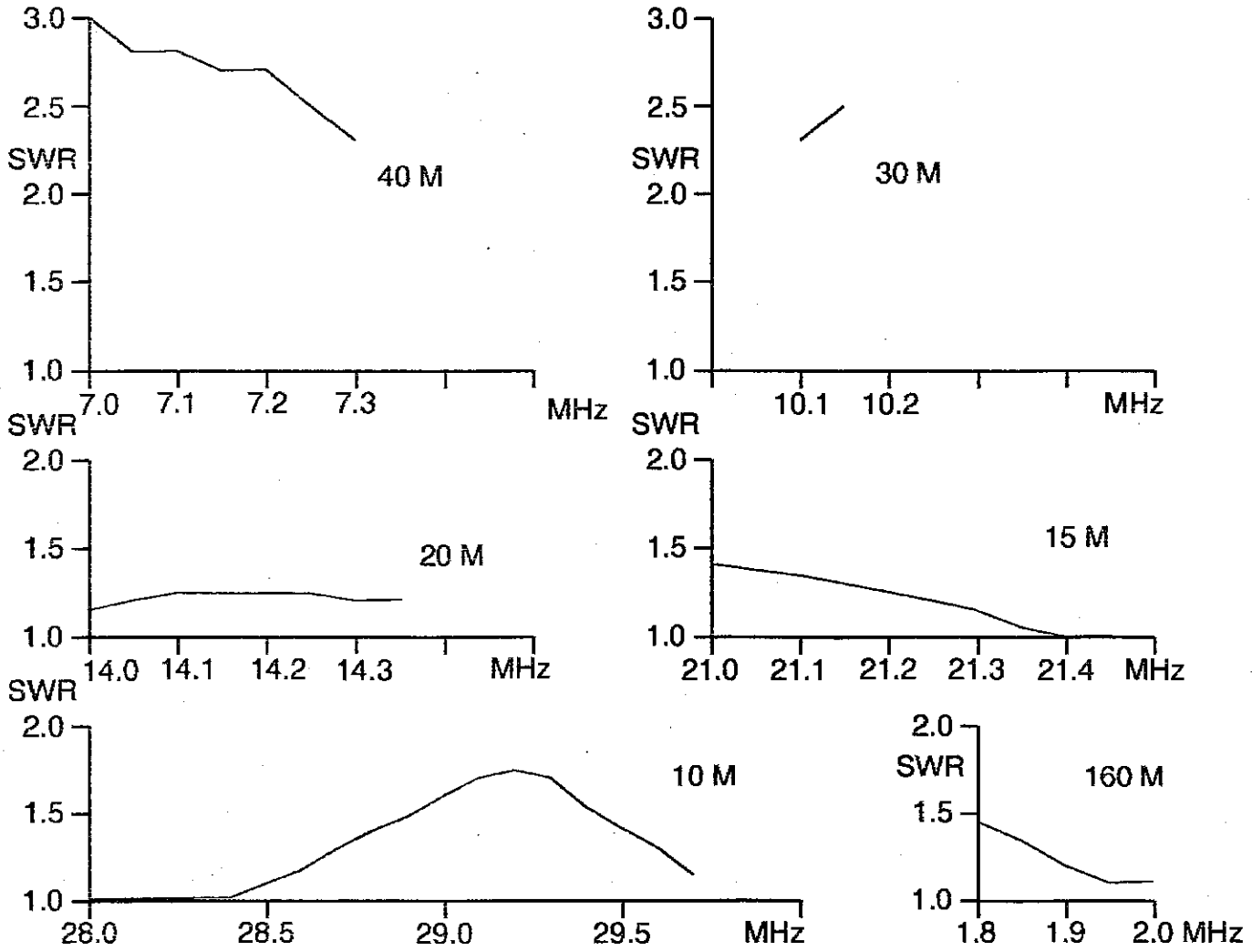


FIGURE 2. (80 meters is 1:1 SWR across the band.)

My SWR curves for this antenna, fed by 150 feet of RG-8X (50 ohm) coax, are shown in Figure 2. These readings were taken last October, and I'm suspicious of the 1:1 SWR I got all across 80 meters, but the other bands are comparable to what I measured on this antenna in June 1989. 40 and 30 meters have rather high SWR, which agrees with the Garant QST review. (Belrose & Bouliane got much better results with their OCF dipole.)

I think I could build this antenna "from scratch" now for a lot less money than I paid for the kit. I'd use a 4:1 balun -- which are

commonly available and inexpensive -- and a 75 ohm feed line, which many transmitters can match. Or I might use a 50-ohm feed line and live with the mismatch. Belrose & Bouliane report acceptable results with a 4:1 balun, although they recommend using a "current" balun and not the usual "voltage" balun. (Fortunately, in their QST article they tell you how to build a current balun.)

Be careful using multiband antennas like this one with a solid-state, "no-tune" transmitter. These transmitters often have broadband final amplifiers which will pass harmonics of your signal, and this antenna is great at radiating harmonics! I prevent this by putting a low-pass filter on the output of my solid-state transceiver. My tube rig, with a tuned final output circuit, is fine "as is."

I'm very satisfied with my OCF dipole. It's rugged: up 4 years, and hasn't blown down once. It's simple: four wires and a balun, no traps, fed with 50 ohm coax. It's easy to put up and easy to use. And it gives good performance on all the HF bands.

REFERENCES

Jerry Hall, "Garant Enterprises GD-8 'Windom' Antenna," Product Review, September 1990 QST. Contains some technical background.

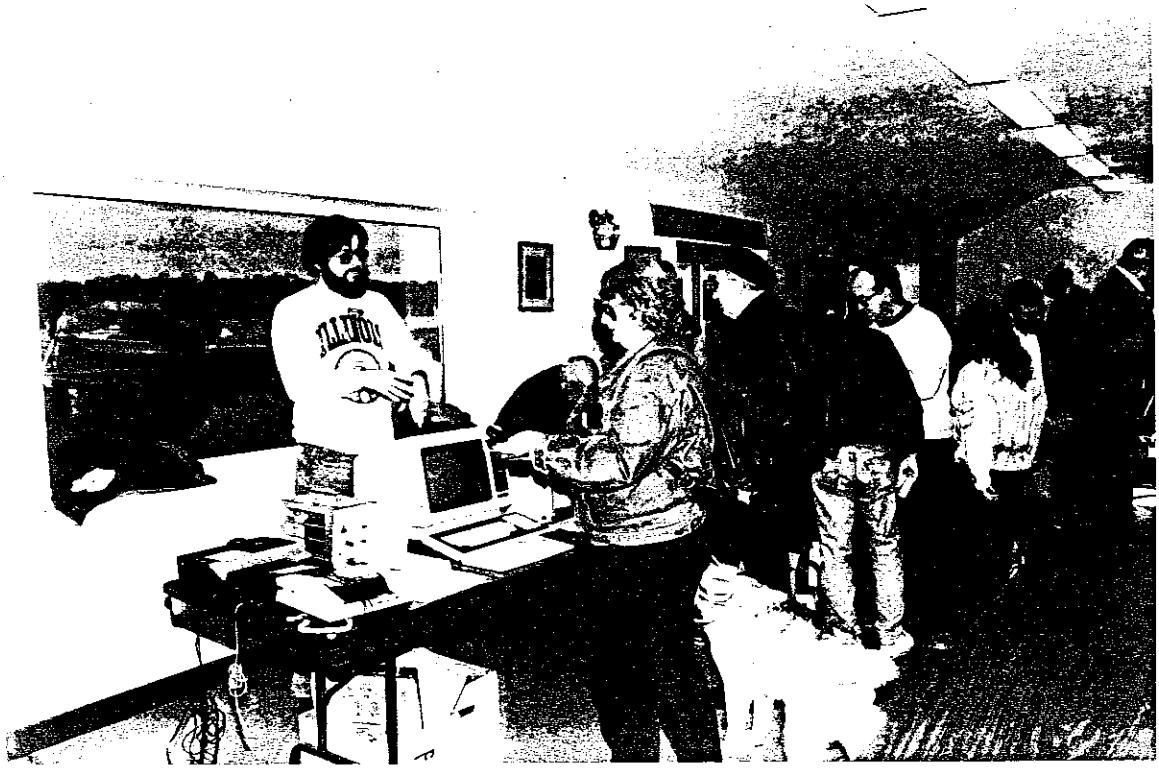
John Belrose and Peter Bouliane, "The Off-Center-Fed Dipole Revisited: A Broadband, Multiband Antenna," August 1990 QST. The best single article I have found on the subject.

I can provide copies of these articles, for the cost of reproduction and mailing, to any GBARC member wishing to build an OCF dipole.

HAM HEAVEN --- EATING ,TALKING AND GETTING YOUR PICTURE TAKEN

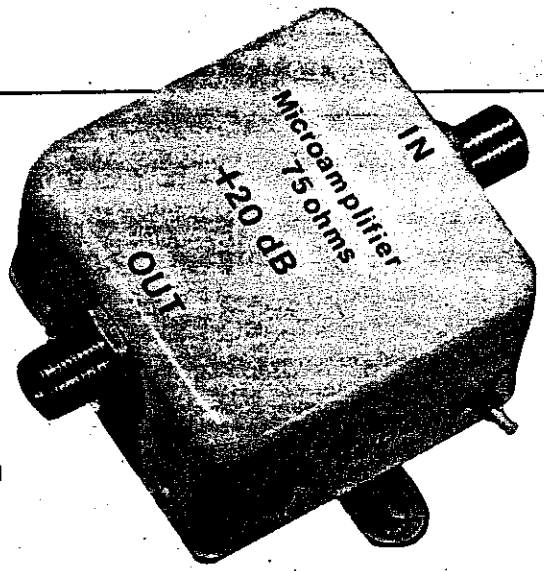
1992 SANTA CLAUS PARADE

1992 FLEAMARKET



BUILD THIS

Miniature Wideband Amplifier



JOHN CLAWSON

From DC to 450 MHz, 20-dB gain in the palm of your hand.

FROM DC THROUGH TO THE MOBILE RADIO and TV frequencies, there's always need for some amount of additional amplification. In particular, when it comes to TV reception just a *smidgen* extra gain can make the difference between looking at a snowstorm or a decent picture having rock-stable color.

Often, obtaining enough of a signal for a good TV picture means using some kind of deep-fringe antenna and a preamplifier. The problem is, however, that *stable* preamplifiers don't come cheap unless you build them yourself, and even then you might spend countless days, nights, and weekends getting one to work without producing more *spuri* (spurious signals) than it does TV signal.

But spurious signals are nonexistent in the wideband high-frequency amplifier shown in the photographs; yet it rivals commercial units in both performance and reliability—but without their formidable price tags. While a commercial counterpart might easily sell for $100 or more, our version, shown in Fig. 1, can be built for about $12. How can a commercial-quality amplifier be built so inexpensively? The answer to that question is found in a new breed of integrated circuit, the Signetics NE5205, a UHF amplifier with a fixed gain of 20 dB.

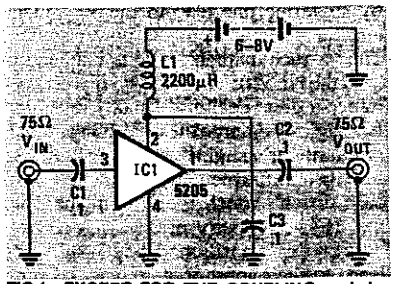


FIG.1—EXCEPT FOR THE COUPLING and decoupling capacitors, IC1 is a complete wideband amplifier having a fixed gain of 20 dB to 450 MHz. No external compensation is required.

Signetics offers the NE5205 in two kinds of housings: the TO-46 metal can shown in Fig. 2-*a*, and the SO-8 DIP shown in Fig. 2-*b*. Unlike earlier monolithic amplifiers, the NE5205 does its job without external compensation networks and matching transformers. What's left is an experimenter's dream: an inexpensive black-box amplifier that can be plugged into practically any circuit, Put into other words, a gain-block.

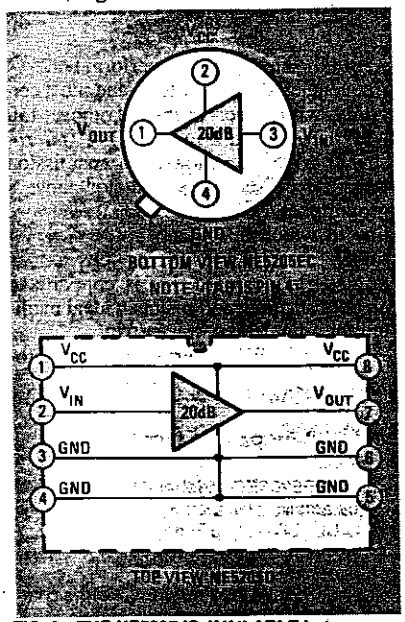


FIG. 2—THE NE5205 IS AVAILABLE in two configurations: a pinout for a conventional TO-46 metal can whose tab provides the ground connection is shown in *a*. An SO-8 DIP pinout is shown in *b*. The grounded metal case of the TO-46 version extends the response from 450 MHz to 650 MHz.

Before going into construction details, let's go over some of the NE5205's specifications, because they will give you a better feeling for the IC and its performance.

Let's start with amplification, because how well the NE5205 does that job will greatly influence how it is used. To begin with, there's 20 dB of fixed insertion gain that is essentially ruler-flat to 450 MHz. The grounded case of the TO-46 version extends the response to −3 dB at 650 MHz. Unlike some theoretical or optimized values, 20 dB is a real-world figure that is not swamped in a sea of noise. For example, the NE5205 can be used as a 50- or 75-ohm line amplifier; yet even with such a low impedance it preserves a remarkably low +4.8 dB NF (*N*oise *F*igure) at 75 ohms, +6.0 dB at 50 ohms. Input and output VSWR (*V*oltage *S*tanding *W*ave *R*atio) for both impedances remains below 1.5:1 to 450 MHz.

Twenty decibels is a hefty boost, but as Murphy's Law would have it, with 20 dB of gain available you will undoubtedly need 21 dB. How, then, do you provide the extra gain? As shown in Fig. 3, simply cascade two NE5205s for a total gain of 40 dB. Notice the conspicuous absence of compensation. Although providing a total of 40 dB gain, the amplifier is still our basic wideband amplifier circuit; only an extra IC, a choke, and two capacitors have been added.

Also notice that again we are saved from circuit complexities by using only AC coupling capacitors rather than reactive networks. That is amazing, considering that chaining even the most docile conventional high-frequency amplifier can often severely strain stability.

Circuit operation

Referring back to Fig. 1, the wideband amplifier uses only five components. External signals enter pin 3 of IC1 via AC coupling capacitor C1. Following amplification, the boosted signals from IC1 pin 1 are coupled to the output by capacitor C2. Capacitor C3 decouples the DC power supply, while RF current is isolated from the power supply by RF choke L1.

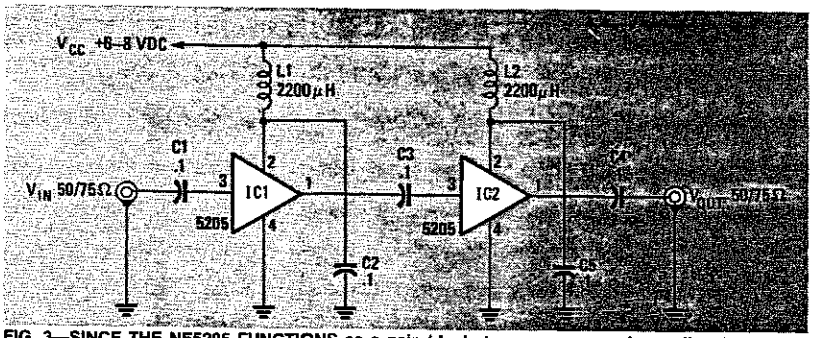


FIG. 3—SINCE THE NE5205 FUNCTIONS as a gain block, two or more can be easily cascaded to provide additional amplification. In this circuit, which uses two NE5205s, the overall gain is 40 dB.

strip are given in PC Service. The recommended printed-circuit board material is double-clad 0.060-inch G-10 epoxy board. The pattern shown is intended for 75-ohm operation. For alternate impedances (Z_O) or different thicknesses of G-10 board, you will need to change both the input and the output trace widths; refer to the chart shown in Fig. 4, which shows the characteristic impedance *vs.* signal-trace width required for various G-10 thicknesses. For example, a 50-ohm Z_O (characteristic impedance) and a 0.031-inch G-10 board requires a signal trace width of approximately 0.050-inch.

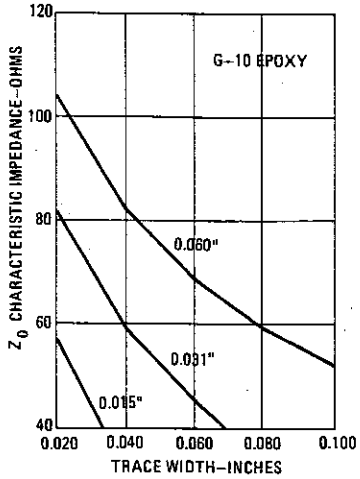


FIG. 4—USE THIS CHART to determined microstrip trace width for various impedances and thicknesses of G-10 epoxy board.

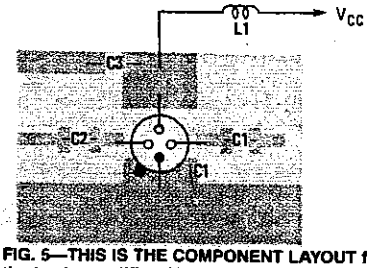


FIG. 5—THIS IS THE COMPONENT LAYOUT for the basic amplifier. All components are on the soldering side of the board.

The NE5205's low current consumption of 25 mA at 6 volts DC makes battery-powered operation a reality. (Although the device is rated for a 6- to 8-volt power supply, 6 volts is recommended for normal operation.) Six volts provides an internal bias of 3.3 volts, which permits a 1.4-volt peak-to-peak output swing for video applications.

Construction

Below 150 MHz, just about any kind of point-to-point wiring assembly can be used if the leads are made as short as possible, if you don't run the output and input wires close together, and if you remember to ground the metal case.

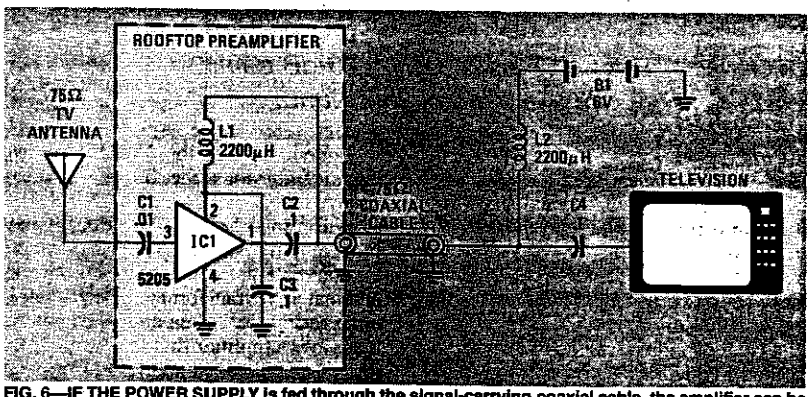


FIG. 6—IF THE POWER SUPPLY is fed through the signal-carrying coaxial cable, the amplifier can be mounted in a weatherproof enclosure directly at the antenna.

But the amplifier will perform better at frequencies above 30 MHz, and most certainly with fewer problems above 150 MHz, if built on a microstrip. A *microstrip* is a microwave low-loss transmission line. It consists of a conductor above a groundplane, analogous to a two-wire line in which one of the lines is represented by the groundplane. Obviously, printed-circuit board that is copper-clad on both surfaces will make an ideal medium for a homebrew microstrip.

Full-scale PC patterns for the micro-

PARTS LIST

IC1—NE5205EC wideband high frequency amplifier (Signetics).
C1, C2, C3—0.1 μF, multilayer ceramic chip capacitor, 10%, 100-WVDC (Steiner Electronics KEFQ1210).
L1—RF choke, 2200μF, 10%, Ferrite core (Digi-Key M8153 or equivalent).

Note. The following are available from John Clawson, P.O. Box 225, Tillamook, OR 97141: NE5205EC, $8.50; NE5205D, $6; set of three 0.1-μF chip capacitors, $3; Printed circuit board, $3.25. Shipping and handling $3.25 per total order. Foreign orders add $4.75. U.S. funds only. Oregon residents add appropriate sales tax. Check or M.O. only.

Since IC1's TO-46 case is grounded, don't be concerned about providing an insulated hole through the groundplane. You can leave the underside copper complete and simply drill a 3⁄16-inch hole through from the top side of the board.

If you want to expand the foil pattern to include another NE5205, keep all new signal paths short and as straight as possible. The groundplane should be extended beyond each edge of any added traces by no less than the trace width.

The parts-placement pattern is shown in Fig. 5. Prior to assembling the etched and drilled PC board, be sure that all circuit traces are free from residue, burrs, and obstructions.

Except for one lead of RF choke L1, all components are mounted directly on the soldering side of the board. L1 is attached by soldering one lead to the V_{CC} plane and the other lead to the power source. The 3⁄16-inch diameter hole is intended to hold the NE5205 very snugly. If you experience a great deal of difficulty installing IC1, slightly enlarge the hole using a small round file or a slightly larger drill bit. Be sure that the the metal flange on the TO-46 case doesn't touch the V_{CC} plane, and that IC1 is properly oriented. After you have correctly positioned the IC, solder its leads to their appropriate traces, keeping length to an absolute minimum. Then make a good electrical connection be-

tween the NE5205 case and the groundplane. If you prefer, electrically-conductive epoxy may be used for that.

Capacitors C1, C2, and C3 are 0.1-μF surface-mounted high-frequency ceramic chips. A small drop of quick-drying adhesive such as *Crazy Glue* will hold them stationary during soldering. Solder coupling capacitors C1 and C2 to their respective pads on the input and output signal traces. Bridge the gap between V_{CC} and the small ground plane with decoupling capacitor C3 and solder it into place.

The last step in the assembly portion of the project is to strap the top and bottom ground planes together. Don't run long wires to do that. A better, and a far easier way to accomplish the task is with inexpensive, self sticking ¼-inch copper tape; the kind used in making stained-glass windows. (The tape can be purchased at most craft centers.) Wrap the tape around the edge of the board to the top and bottom ground planes and then flow-solder the tape to the copper foils.

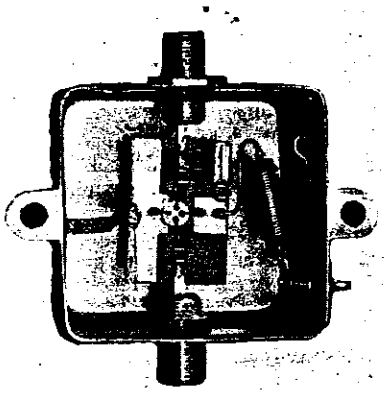
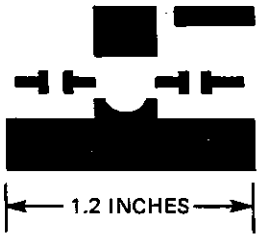


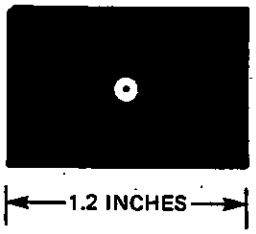
FIG. 7—THE AMPLIFIER CAN BE BUILT into existing equipment, or made part of a stand-alone device, such as this CATV amplifier.

Applications

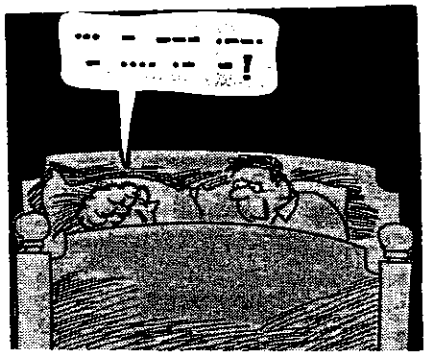
The amplifier can be used in a wide variety of applications, such as a CATV line amplifier, a 70-MHz satellite amplifier, or a composite video amplifier. The circuit can also improve the operation of 2- to 160-meter amateur radio equipment; AM, FM, CB, and shortwave radios; 50-ohm test equipment; frequency counters; and oscilloscopes. By using a phantom power source on the signal lead, it can even be used as a rooftop antenna preamplifier, such as shown in Fig. 6. Your application will determine whether or not a case is needed. The board either can be incorporated in a piece of existing equipment or mounted in an RF-tight case (see Fig. 7) for stand-alone use.

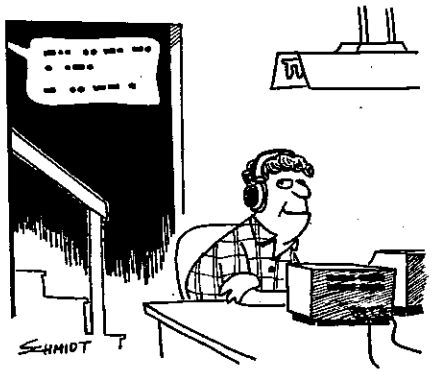


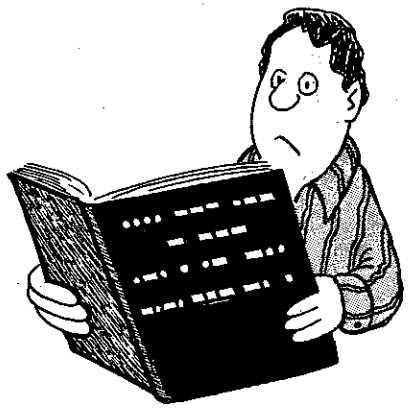
SOLDER-SIDE DIRECT-ETCH FOIL PATTERN for the wideband amplifier.



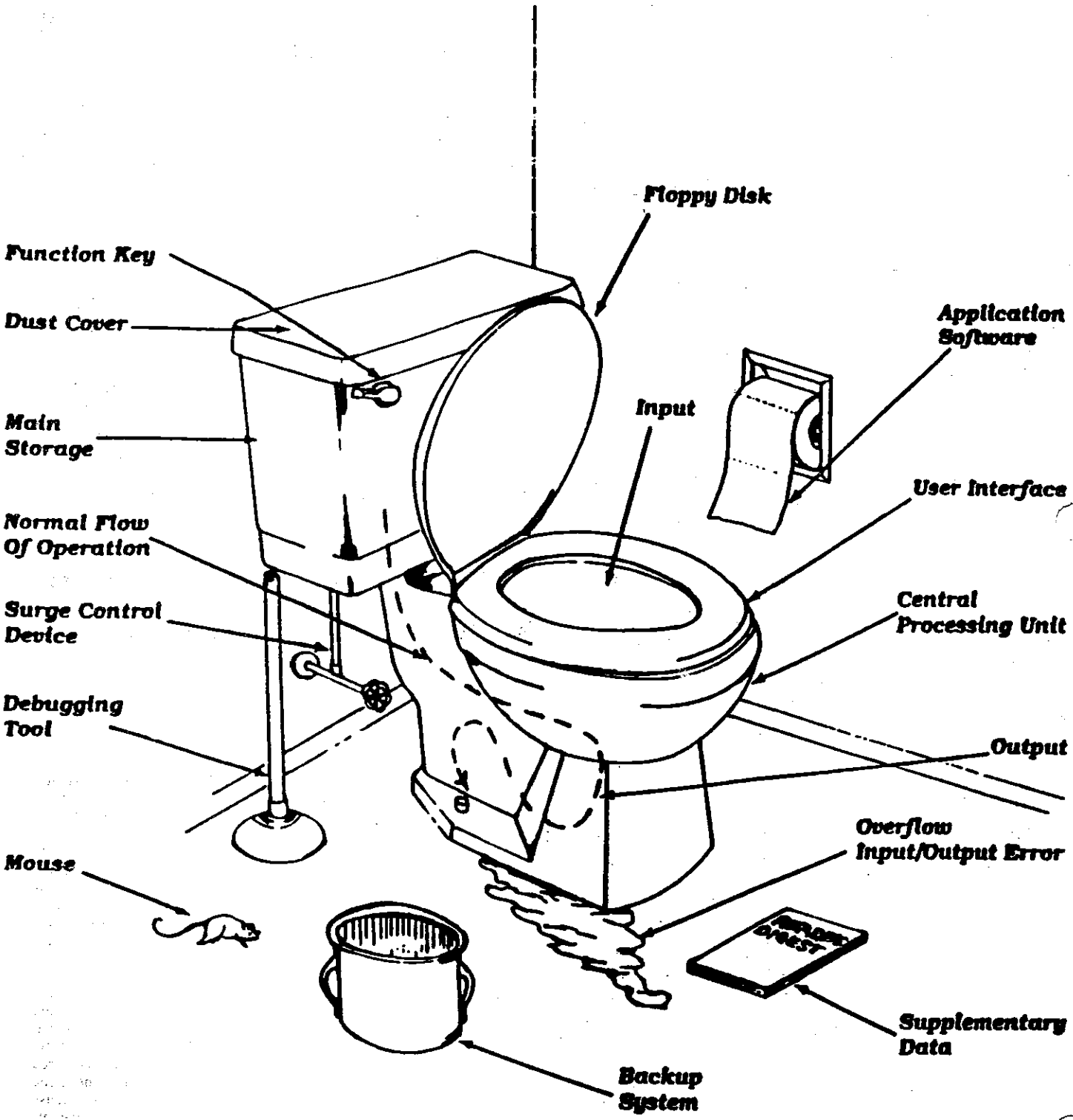
COMPONENT-SIDE DIRECT-ETCH FOIL PATTERN for the wideband amplifier.

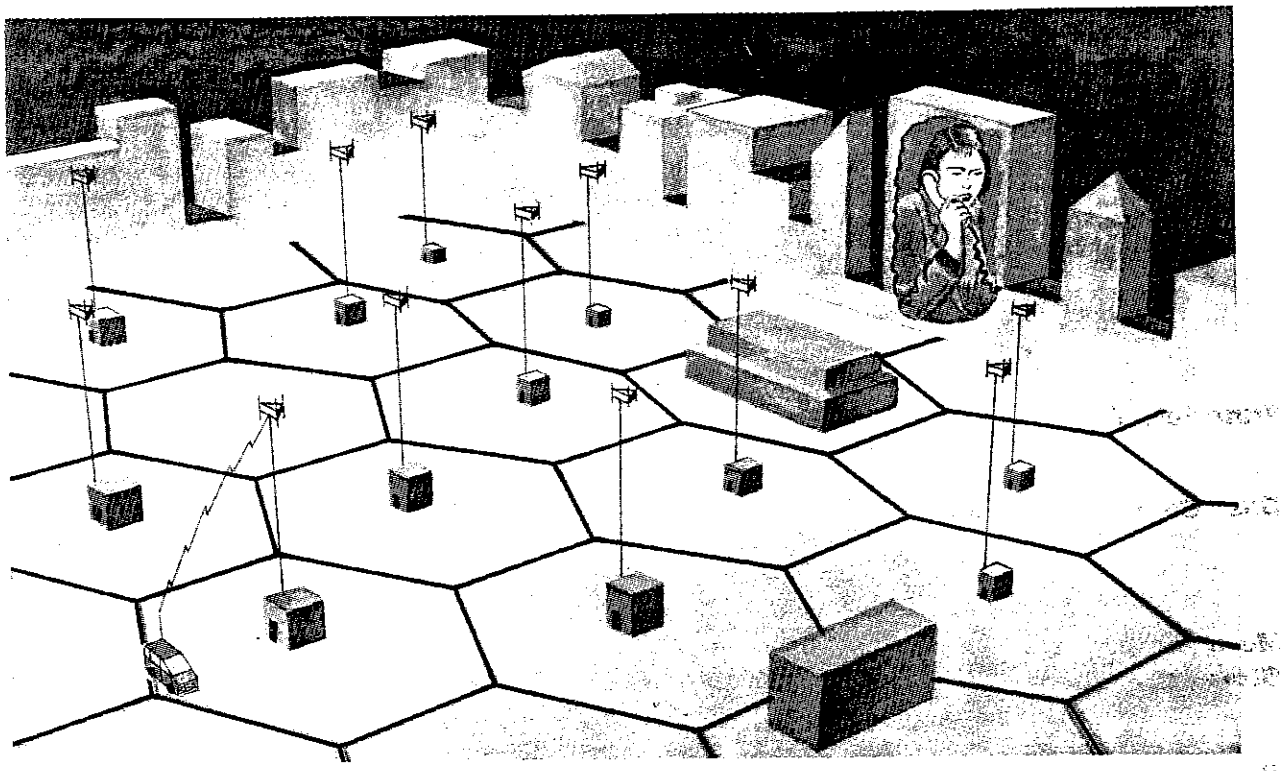






UNDERSTANDING THE COMPUTER





INSIDE CELLULAR TELEPHONE

A look inside cellular telephone, and the fascinating technology that has revolutionized mobile communications.

JOSEF BERNARD

NOT SO LONG AGO, WHEN ONE THOUGHT of a telephone, the image conjured up would be of a jet-black, rotary-dial, electromechanical device. Now, conventional telephones come in a rainbow of colors, sport sleek lines, and feature pushbutton dialing. But even more impressive are the features that are packed inside them. Thanks to microprocessors and memories, phones are capable of storing a telephone-book's worth of most-often-called numbers to be dialed at the push of a button. And that's only the beginning.

But if you think that the phone on your desk or in your kitchen is "smart," then you would have to place cellular mobile phones in the "genius" class. Those phones have to perform a number of sophisticated tasks, including monitoring signal levels and frequency switching, in such a way that the user is not aware of them. Because of that, many people who use cellular phones daily aren't aware of the high level of technology built into their equipment. That's unfortunate, because the technology inside the phones is, for the most part, much more interesting than the conversations that they transmit.

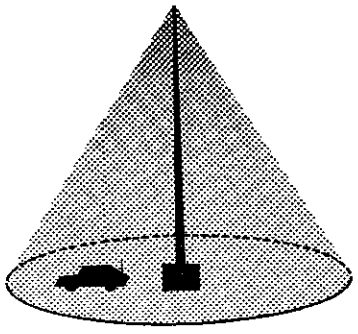


FIG. 1—EARLY, NON-CELLULAR, MOBILE-phone systems used a centrally located high-power transmitter. Only a few communications channels could be accommodated within a service region.

Cellular principles

Prior to the development of the cellular system, mobile telephone systems relied on centrally located transmitting and switching equipment to communicate with vehicles subscribing to their services. See Fig. 1. Cellular systems, on the other hand, divide their region of coverage into many small areas, each encompassing only a few square miles. See Fig. 2. It is that territorial subdivision that allows the mobile units to use low-powered transmitters (no more than three watts), and to use and reuse the same frequencies in the same area to increase the number of communications channels available.

There are 999 two-way communica-

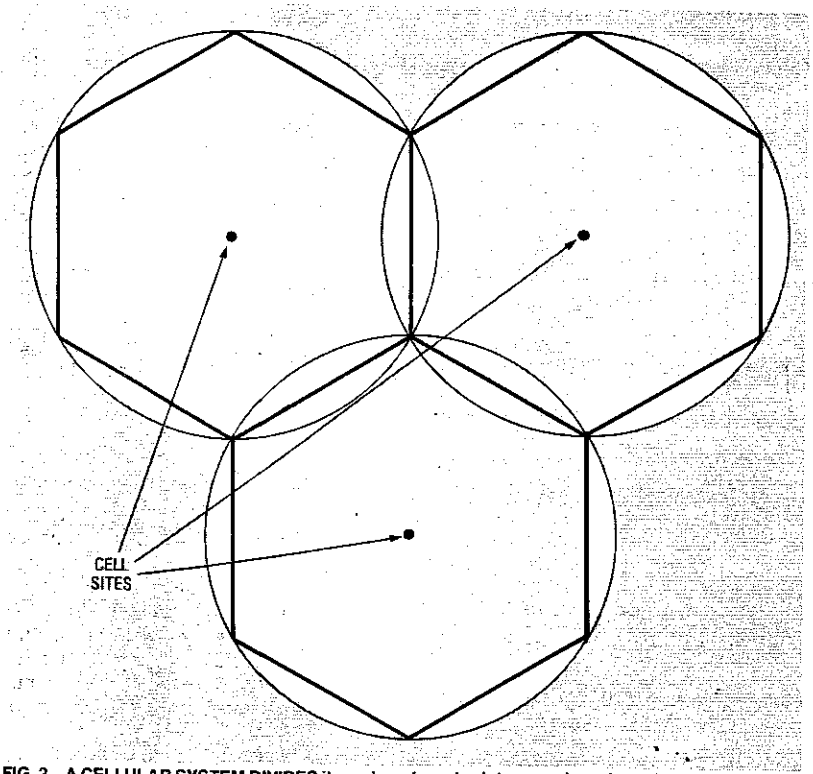


FIG. 2—A CELLULAR SYSTEM DIVIDES its region of service into a number of small cells, each with its own cell site containing a low-power transmitter and receiving equipment. As a vehicle passes between cells, the signal is analyzed and any further communications are handed off to the cell best able to handle them.

tions channels allocated for cellular service, although the phones currently available can use only 666 of them. (The other 333 frequencies were allocated in 1986 and equipment manufacturers, as of this writing, have not yet caught up with the FCC.) Of those channels, 42 are devoted to carrying control signals between cellular phones and the cell sites, where the transmitting and receiving equipment for each cell are located. It is over those channels—which you never hear, and rarely hear about—that a cellular system coordinates its activities.

All kinds of information flows on those channels, including that for coordinating frequency changes, identifying phones, and even adjusting power levels.

Handing off

When a mobile unit leaves the region of coverage of one cell site and enters that of the adjoining one, it is said to be *handed off* from one cell to the other. There is a lot of behind-the-scenes activity connected with that transfer of responsibility, and the intelligence built into cellular phones handles a lot of it.

As a vehicle equipped with a cellular phone traverses a particular cell, it eventually reaches a point where its signal is no longer strong enough for reliable communications. Fortunately, by the time it has reached that point, it is well within the region of coverage of an adjacent cell. The handing-off process of transferring the responsibility for a call-in-progress from one cell site to another requires a lot of "intelligence" on the part of both the cell site and the mobile unit.

The first thing that has to be done is to sense when a signal is approaching the point where it is about to become too weak to be usable. That's easy—all you need is what amounts, more or less, to a signal-strength detector. More complicated is the task of determining which new cell site is to receive the hand-off. The cell sites in the system have to "confer" to see which of them is receiving the signal in question the best, and make arrangements for transferring the call without interruption. That's not too difficult, either. The next part of the process, however, is quite complex.

Because adjacent cell sites cannot use the same frequencies, even though others in the same system can, a new set of frequencies must be used after the hand-off. And, since the new cell site will be using different frequencies, so must the mobile phone. That is where the control channels, and the intelligence built into a cellular phone, come into play. The new cell site knows which of its frequencies are in use and which are free, and makes a decision to allocate one of its frequency pairs (one channel) to the new conversation entering its district. It then transmits, over the control channel, instructions for the cellular phone carrying the conversation to switch to those new frequencies. The phone adjusts the voltages of its frequency synthesizer accordingly, and the conversation continues in the new cell site, on the new frequencies—all of that with only an unnoticeable interruption of a millisecond or two.

Power levels

A cellular system can use the same frequencies for different conversations at the same time, provided, of course, that the signals of one cell site do not interfere with those of another. That non-interference is accomplished in several ways.

The first is simple coordination of frequencies. While several cells in the same system may use the same frequencies, no two adjacent cells do. That puts cells using the same frequency far enough away from one another that the signal from one to a vehicle in its area, and vice versa, will override another signal from farther away. That is further ensured by the *capture effect*, which is a characteristic of FM, the transmission mode used by cellular phones. If there are two signals on the same frequency, one stronger than the other, the capture effect guarantees that a receiver will lock onto the stronger one, and ignore the weaker. Unless the two signals are nearly identical in strength, the stronger one will completely capture the receiver, and no trace at all of the weaker one will be heard.

All that is the consequence of good planning, and of the nature of FM equipment. Inside a cellular phone is circuitry that adds another level of interference protection. There is a constant dialogue going on between a cellular mobile unit and the cell site it is using. One "topic of conversation" is signal strength. Cellular equipment is low powered. Cell-site transmitters have an output of only 25–35 watts (compared to about 250 watts in older systems using central transmitters), and the mobile equipment a maximum output of three watts—and as low as 600 milliwatts for handie-talkie-size units.

One of the rules of cellular telephony is "use only as much power as you need." Consequently, a cell site monitors the strength of the signal it receives from a mobile unit. If the strength increases to a predetermined level, the cell site sends instructions over the command channel for the low-powered phone to reduce its power to an even lower level. Conversely, if the received signal strength drops, a mobile phone can be instructed to increase its power. Cellular phones are capable of between 3 and 8 discrete output levels. Keeping output power to the minimum required for good communications

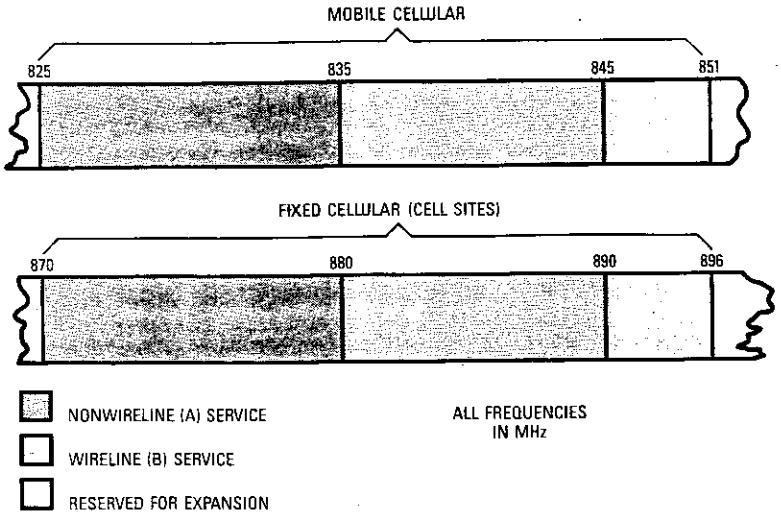


FIG. 3—THE 666-CHANNEL CELLULAR PHONE RF spectrum is divided into bands for fixed and mobile equipment (cell sites and phones), and for non-wireline (A) and wireline (B) service.

also reduces the risk of interfering with communications in a nearby cell.

NAM's

Every cellular phone contains an "identification" PROM or EPROM. In cellular terminology, this is called a NAM (*N*umeric *A*ssignment *M*odule). A phone's NAM is programmed at the time the phone is purchased; it contains such information as:

- The telephone number, or ESN (*E*lectronic *S*ervice *N*umber), assigned to the phone.
- The serial number given to the phone at the time of its manufacture.
- Personal codes that can be used to lock and unlock the phone electronically, to prevent its unauthorized use.

NAM information is more useful than you might at first imagine. For one thing, it is the job of the NAM to identify the phone containing it to the cellular systems it uses. When a cellular phone is turned on, it makes an announcement over a control channel that says, "Here I am." The cell site responds, "And exactly who *are* you?" The reply from the phone consists of information contained in its NAM.

That information tells the cellular system several things. First, of course, is that that particular phone is now on the air and is ready to receive calls placed to its number. The cell site is connected to a computer at the MTSO (*M*obile *T*elephone *S*witching *O*ffice), which is the link between the cellular system and the conventional landline phone system, and which recognizes all the cellular phones registered in the calling area it is responsible for. If the phone is a local one, the process is more or less complete at the point of recognition.

Because they are mobile, cellular phones may frequently be used outside of the area in which they are permanently registered. That is called *roaming*, and is one of the outstanding features of cellular telephony. You can take your cellular phone almost anywhere in the country where there is service, turn it on, and use it to call anywhere in the world.

In some areas you can roam and use a foreign system without advance notification. Other cellular systems require that you let them know ahead of time that you are coming. In either case, the NAM information transmitted to the system allows you to log on to it, and tells that system what to do about your billing.

NOT JUST FOR CARS, cellular phones come in portable models, like this one from GE, that keep you constantly in touch.

Cellular phones have a ROAM indicator, which lights when you have left your local area and are in the operating area of another system. (The phone realizes that it has entered a system other than its own, and lets you know that.)

The serial number contained in the NAM, incidentally, can serve a second purpose. Should a phone be stolen and reported so, it is possible for a system to recognize that phone when it is next used. While tracking down the phone would be rather difficult, it is easy to cut off service to that number automatically, avoiding the possibility of your being charged for calls you never made.

A/B switching

When it established the cellular phone service, the FCC provided for two cellular carriers in each region. One, the *wireline* service, would be operated by a phone company engaged in conventional telephony, frequently the one that already provided landline service to the area. The other, known as the *non-wireline*, service would be operated by a company that was engaged in other forms of mobile communications—perhaps paging, or private two-way radio services. Sometimes a region of cellular service has both types of carriers, and sometimes only one, at least when service is inaugurated. Each service is assigned a separate set of frequencies. See Fig. 3.

Regardless of where in the country you are, the non-wireline service is referred to as the *A service*, and the wireline one as the *B service*. Normally you subscribe to only one service or the other (provided your area offers you a choice), but you may at times have occasion to use the other type—when you are roaming, for example.

To provide for that, cellular phones have A/B switches to allow you to go from one type of service (band of frequencies) to the other. Those switches are generally not mechanical devices, but are programmable from a phone's keypad. Some of the switches are more flexible in their capabilities than are others, and the more sophisticated of them offer at least the following modes of operation:

- A (or B) service only—the other is locked out.
- Give priority to one type of service over the other.
- Automatic selection of the one active service in an area.

Again, it is the intelligence a phone applies to the information coming in over its control channel that makes it possible for it to select the appropriate A or B setting.

When you are roaming, the phone lets you know you are outside of your normal area of use by illuminating its ROAM indicator. Some phones can apply their

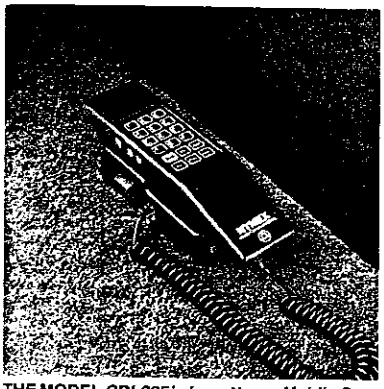
knowledge of A and B services to that indicator, causing it to flash if the service it encounters is different from the one you have selected. That notifies you that, if you have to switch services manually (perhaps you have locked into one or the other—the recommended method), that is the time to do so.

What else?

In addition to performing those invisible tasks, the sophistication of cellular phones and phone systems makes using them more convenient.

Of course, they provide such things as auto-redial, muting, and memories that can hold up to 32 phone numbers that can be dialed by just a keypress or two. But just about every phone these days has those features. Cellular phones provide even more!

A few cellular phones give you the luxury of speech recognition for hands-free dialing. It's really more than a luxury—the less your attention is diverted from your driving, the longer you're likely to be around to make more phone calls. One phone, available from AT&T, not only



THE MODEL *CDL205* is from Nynex Mobile Communications.

understands what you say to it but also talks back to you. When you pick up the handset it says, "Name please," and waits for you to tell it whom to call (it can also associate names with phone numbers). If the person you are calling is one of those stored in the phone's memory, the phone will dial the number after you speak the name. If you dial the phone manually, it will announce the digits entered as you punch them in. If the line is busy, you can later tell the phone to redial the number.

Cellular phones also use their intelligence to keep you informed of situations they encounter. We've already seen what the ROAM indicator can tell you. Another indicator, labeled NO SERVICE lights if the phone encounters no response on its control channels, meaning that there is no cellular service in the area you're in at the moment. That indicator also can be used to let you know when a call is terminated, or when a signal dropout occurs.

Because they already contain a clock circuit for the control of a microprocessor, cellular phones can also provide timekeeping services. The simplest just tell you the length of the last call you made. Others tell you how long you've been engaged in the call you're currently making (that can be quite useful, since cellular phone calls are billed on a per-minute basis). Some phones can tell you how long you've been talking, the total length of time you've used the phone (the timer can be reset to zero whenever you like), and the total number of calls you've made.

Finally, if you leave them on while you're away from them, most cellular phones are able to notify you when you return if you had a call in your absence. They can't tell you who called (although at least one firm has plans to introduce an answering machine for your car), but if you were expecting a call, at least you'll know that it probably came.

Use an FM radio as a transmitter

SEVERAL YEARS AGO I NOTICED THAT AN FM radio generates an interference signal that can be picked up on another FM radio turned 10.7 MHz above the first one. Out of curiosity, I tried injecting an audio signal into the RF-oscillator section, and found that I now had a small transmitter.

Now that I have a VCR, I use the same technique to broadcast the TV's sound on the FM band using a portable FM radio. The circuit I use is shown in Fig. 1. The 50K potentiometer allows you to adjust the modulation level to maximum without distortion. The RC network improves the fidelity of the transmitted signal and provides DC isolation. The component values shown are provided as a starting point. They are the ones I used for my setup but may vary somewhat for different radios. Note that if you can't get the signal at 10.7

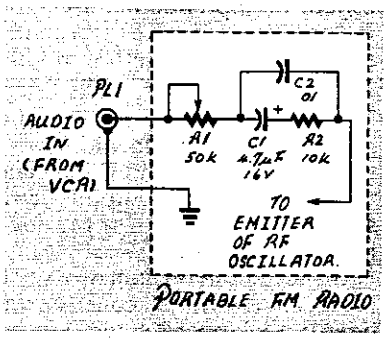


FIG. 1

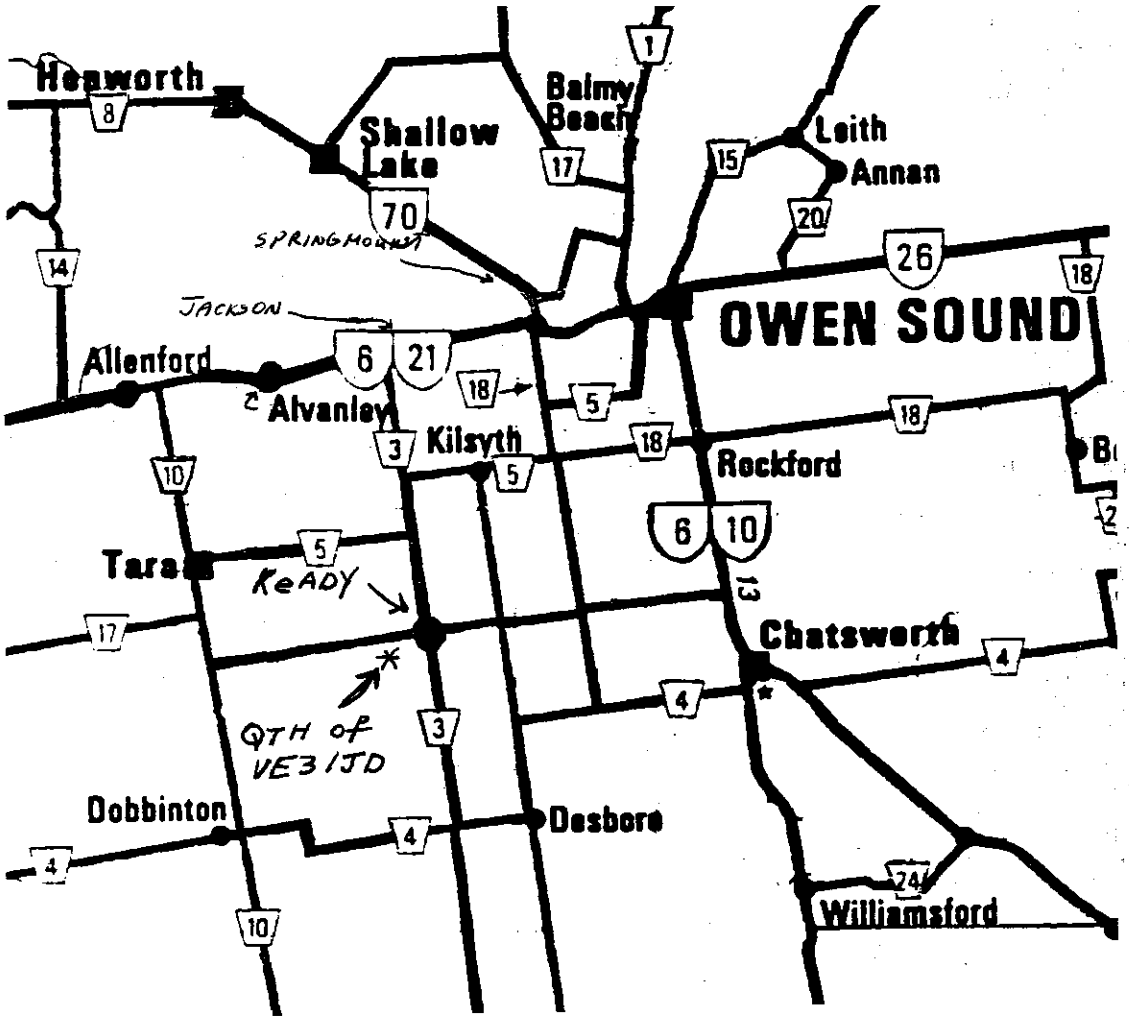
MHz above the frequency setting of the first radio, try tuning at 10.7 MHz below. Also, note that both tuned frequencies must be unused, otherwise you will hear your audio on top of the audio that is already there. You might have to play with both frequencies until you find two blank spots that are 10.7 MHz apart.

When building the circuit, you can mount the components on a piece of perforated construction board or on a terminal strip; you can mount the board or terminal strip inside the radio if there is sufficient space. The 4.7-µF capacitor can be a tantalum, electrolytic, or non-polarized unit if you can find one, and the 0.01-µF capacitor is a ceramic disc. Use an RCA plug for PL1 so that you can plug it into your VCR's audio output jack or any other audio source you wish.

The circuit allows using a personal stereo as wireless headphones. To use it, I just tune my personal stereo to a blank spot in the upper half of the FM band and tune the portable FM radio until the sound comes through on the headphones. Just think; you can put a tape in the VCR, put the TV in the window, go out to the car and tune in the sound. Presto—instant drive-in!—*John E. Boser.*

FIELD DAY 1993

Once again, Field Day will be held at the QTH of Gene McDonald, near Keady. The directions to Gene's home is identified on the map below. Field Day rules are covered on the following pages and any who are attending should read these. **So what should I bring?**, you might ask.....Well, Field Day is an event which tests our abilities to operate under adverse conditions. That pretty much means roughing it for a day so bring something to sleep on/in, a chair and eating utensils and some food and beverages. A warm jacket/coat will come in handy especially at night, and rain gear may be needed. If you have an 12VDC powered HF rig ,trap dipole, coax, tent, a fully charged 12V automotive or marine battery, a battery operated digital clock, then bring it along...even if we don't use it...two years ago a rig died on us and a spare had to be used. The consumption of alcaholic beverages is permitted but you will not be allowed to drive having done so. And yes, I am big enough to enforce that. Bob XOX, stated at the last meeting that we would likely have a sit down meal, pot luck style, so bring a salad, buns or desert etc. Above all, this weekend is an oportunity to get together, operate the equipment and generally enjoy ourselves. **But I don't have my 5 WPM** If you don't have a CW qualification to your licence, this is not a problem, as you can legally operate the HF equipment as long as there is a person so qualified nearby , and there always will be . Last year we had a chap who operated 80 metres for two hours, and he wasn't licenced at all. **When should I show up?** Field Day starts at 18:00UTC Saturday (2p.m.) till 18:00 UTC Sunday (2p.m.). The setup for Field Day starts at 16:00 UTC Saturday (noon) , so there isn't much point being there before 15:00UTC (11a.m.). Note that the RULES on the following pages are in error. Paragraph 4 should read..... *Others must begin their set up no earlier than 16:00 UTC Saturday*..... Well I'm sure I've forgotten something...anyway...see u there....editor



Field Day Rules

1) **Eligibility**: Field Day is opened competitively to all amateurs in the ARRL/Canadian Field Organization (plus Yukon and NWT). Foreign stations may be contacted for credit, but are not eligible to compete.

2) **Object**: To work as many stations as possible on any or all amateur bands (except 10 MHz) and in doing so, to learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed on skills and equipment developed to meet the challenge of emergency preparedness and to acquaint the public with the capabilities of Amateur Radio.

3) **Dates**: June 26-27, 1993.

4) **Field Day Period**: From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations that do not begin setting up until 1800 UTC Saturday may operate the entire Field Day period of 27 hours. Others must begin their set up no earlier that 1800 UTC Friday and may operate no more than 24 consecutive hours; ie, once on-the-air Field Day operation has started, it must end 24 hours from that point.

5) **Entry Categories**: Field Day entries are classified according to the maximum number of simultaneous transmitted signals, followed by the designation of the nature of the individual or group participation. Below 30 MHz, once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for purpose of determining transmitter class. Switching devices are prohibited.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations and must use no facilities installed for permanent station use, nor any structures installed permanently for Field Day use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for one reason of another, operate a transmitter or receiver from commercial mains for one or more contacts, will be listed separately at the end of their class.

Any Class A group whose entry classification is two or more transmitters (non-Novice) may also use **one** Novice/Technician operating position (Novice bands only) without changing its basic entry classification. For Field Day purposes only, any Canadian amateur licensee who has been licensed for less than six months prior to Field Day, shall be considered a "Novice," to provide a means for Canadian Field Day Class A stations with two or more transmitters to participate with a "Novice/Technician" operating position. This "Canadian Novice station" is restricted to the US Novice subbands and power/mode restrictions as well as to the restrictions of the operator's license. The Novice/Technician station (including antennas) should be set up and operated by Novice and Technician licensees and should use the call sign of one of the Novice/Technician operators.

(Class A—Battery) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day and all contacts are made using an output power of 5 W or less, and the power source is other than commercial mains or motor-driven generator (eg, batteries, solar cells, water-driven generators). Other provisions are the same as for Class A.

(Class B) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A. One- and two-person Class B entries will be listed separately in the results.

(Class B—Battery) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs and all contacts are made using an output power of 5 W or less, and the power source is other than commercial mains or motor-driven generator (eg, batteries, solar cells, water-driven generators). Other provisions are the same as for Class A. One- and two-person Class B Battery-entries will be listed separately in the results.

(Class C) Mobile: Stations in vehicles capable of operating while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

(Class D) Home stations: Stations operating from permanent or licensed station locations using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points.

(Class E) Home stations—emergency power: Same as Class D, but using emergency power for transmitters and receivers. Work stations in Class A, B, C, D and E.

6) **Exchange**: Stations in any ARRL/Canadian Section will exchange their Field Day operating class and ARRL/Canadian Section (see page 8 in any *QST*). For example, if your club group was planning to operate in the three-transmitter, Class A category from Missouri, you would send "3A Missouri." Foreign stations send RS(T) and QTH.

7) **Miscellaneous Rules**:

A) Operators participating in Field Day may not, from any other station, contact for point credit the Field Day portable station of a group with which they participated.

B) A station used to contact one or more Field Day stations may not subsequently be used under any other call sign during the Field Day period. Family stations are exempted.

C) Each phone and each CW band segment is considered a separate band. All voice communication contacts are equivalent and packet/RTTY/ASCII/AMTOR is counted as CW. A station may be worked once on each band. Crossband contacts are not allowed. The use of more than one transmitter at the same time on a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts.

8) **Scoring**: Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the Field Day period, plus bonus points. Phone contacts count one point each and CW contacts count two points each. *Power multipliers*: If all contacts are made using an output power of 5 W or less and **if a power source other than commercial mains or motor-driven generator is used (eg, batteries, solar cells, water-driven generators), multiply by 5.** If any or all contacts are made using an output power of 150 W or less, multiply by 2. Multiply by 1 if any or all contacts are made using an output power of more than 150 watts. Batteries may be charged while in use for Class C entries only. For other classes, batteries charged during the Field Day period must be charged from a power source independent of the commercial mains.

A) **Bonus points**: The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Just check the box on the Field Day summary sheet to indicate that you qualify for the bonus and attach the necessary proof.

1) **100% emergency power**: 100 points per transmitter for 100% emergency power. All equipment and facilities at the Field Day site must be operated from a source independent of the commercial mains. Example: A club operating 3A using 100% emergency power may claim 300 bonus points.

2) **Public relations**:

A) 100 points for media publicity. Publicity must be obtained or a *bona fide* attempt to obtain publicity must be made. Evidence must be submitted in the form of a newspaper clipping, a memo from a BC/TV station stating that publicity was given or a copy of the material that was sent to the news media for publicity purposes.

B) 100 points for physically locating in a public place (eg shopping centers, parks, etc) with significant access by the public. The intent here is for Amateur Radio to be on display to the public.

C) An additional 100 points can be earned by such display stations in public places

Send for Your Field Day Package

Send to HQ a 9- × 12-inch self-addressed envelope with four units of First-Class US postage or four IRCs for the official Field Day Entry Package. This package includes one Publicity Kit, one Field Day Summary Sheet, one large dupe sheet with instructions and a check list to ensure that your entry is complete. If you require more dupe sheets, indicate so in your request and affix one unit of additional First-Class postage to your SASE for each two additional dupe sheets requested.

W1AW Field Day Bulletin Schedule

In addition to the regular schedule detailed elsewhere in this issue, extra CW bulletins will be run at 1400 UTC (10 AM EDT), and extra phone bulletins at 1500 UTC (11 AM EDT) Saturday and Sunday mornings.

actively conducting an information booth for the visiting public and dispensing information handouts, maintaining visitor's log, etc, as an information/recruiting tool for Amateur Radio. Evidence submitted for both (B) and (C) may consist of copies of handouts, visitor's log, brief report on activities conducted, photos, etc.

3) **Message origination**: 100 points for origination of a message by the club president or other Field Day leader, addressed to the SM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the Field Day period and a fully serviced copy of it must be in standard ARRL message form or no credit will be given.

4) **Message relay**: 10 points for each message received and relayed during the Field Day period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the Field Day report.

5) **Satellite QSO**: 100 points can be earned by completing at least one QSO via satellite during the Field Day period. The repeater provision of Rule 7C is waived for satellite QSOs. A satellite station **(one)** does not count as an additional transmitter. On the summary sheet, show satellite QSOs as a separate "band."

6) **Natural Power**: Field Day groups making a minimum of five QSOs without using power from commercial mains or petroleum derivatives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane or grain alcohol. This includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not wish to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

Additional Bonus Points Available

An additional 100 bonus points can be earned by qualified participants in Field Day for completing at least 10 VHF/UHF QSOs (excluding packet contacts). Also, a "free" VHF/UHF transmitter has been added for Class A and Class B stations. This station can operate the entire Field Day period, just like the "free" packet and satellite transmitters. Take a few minutes to look at VHF/UHF (item 9) under the bonus points in the rules. It's an ideal station for Technicians to operate since they have full privileges on these bands. Make sure your club or group invites everyone to fully participate in Field Day!

7) **W1AW message**: A bonus of 100 points will be earned by copying a special ARRL Field Day bulletin sent over W1AW on its regularly announced frequencies just before and during Field Day. This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your Field Day report.

8) **Packet Radio**: 100 points can be earned by completing at least one QSO on packet radio during the Field Day period. The repeater provision of Rule 7C is waived for packet radio QSOs. A packet station **(one)** does not count as an additional transmitter. On the summary sheet, show packet radio QSOs as a separate "band."

9) **VHF/UHF**: 100 points can be earned by completing at least 10 QSOs (excluding packet contacts) on any band or combination of bands above 50 MHz (VHF/UHF bands) during the Field Day period. A VHF/UHF station **(one)** does not count as an additional transmitter. This station is not limited to making just 10 QSOs. It may be operated for the entire Field Day period and all contacts (excluding packet contacts) count for QSO points credit, including the first 10.

9) **Reporting**: Entries must be postmarked by July 28, 1993. No late entries can be accepted. A complete entry consists of an official ARRL summary sheet (or reasonable facsimile), and a list of stations worked on each band/mode during Field Day, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets or an alphanumeric listing of call signs worked per band and mode. This list may be computer generated. Incomplete or illegible entries will be classified as checklogs. A copy of Field Day logs should be kept by your Field Day group, but should not be sent in unless specifically requested later by the ARRL.

10) **Condition of Entry**: Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

11) **Disqualifications**: See January 1993 *QST*, page 52.

26TH Annual Shindig....The OLD TYME RADIO OPERATORS' PICNIC...held in COUCHICHING PARK ON THURSDAY JUNE 17th.....PLAN TO MEET AT THE CHAMPLAIN MONUMENT AT 2P.M....BUFFET AT THE SUN DIAL AT 4:30 P.M....$17.50 PER PERSON (DINNER INCLUDED) SEND YOUR CHEQUE PAYABLE TO THE "ORRILLIA AMATEUR RADIO CLUB...KEN ROBERSON, VE3ERS, RR#1 VICTORIA HARBOUR, ONTARIO , L0K2A0.....BY JUNE 15th IF POSSIBLE...TALK IN ON VE3LSR 146.85- or VE3ORR 147.21+

GBARC NET CONTROL LIST FOR SUNDAY MORNING NET

VE3RHJ-BRAD-MAY 30
VE3FFN-WALT-JUNE 6
VE3DKF-JIM-JUNE 13
VE3RHJ-BRAD-JUNE 20
VE3DIQ-BILL-JUNE 27
VE3BFV-JIM-JULY 4
VE3DXO-DAVE-JULY 11
VE3HXX-IAN-JULY 18
VE3FYA-GERRY-JULY 25
VE3BZC-ROSS-AUG 1
VE3HGL-HAROLD-AUG 8
VE3NEM-TOM-AUG 15
VE3VTO-DON-AUG 22

Radio Amateurs of Canada

FOR IMMEDIATE NEWS RELEASE
Toronto ON, 2 May 1993

RADIO AMATEURS OF CANADA (RAC)

OFF AND RUNNING

On Sunday May 2, 1993 Canada's new single Amateur radio Organization was officially signed into existence!

Highlights of the ceremony included the induction into the Canadian Amateur Radio Hall of Fame of three distinguished Amateurs: Noel Eaton, VE3CJ, Member, and Oscar Hierlihy VO1DI, and Ralph Cameron, VE3BBM, Award of Honour.

Greetings from ARRL and IARU were given by Dr. Larry Price, W4RA, Secretary of IARU, and past President of ARRL. He indicated that RAC has been recognized as the Canadian IARU Representative, an event accomplished in record time.

After the ceremonies, the RAC Board held its first Board Meeting. The Board approved the plans for the finances, fees, and the organization of some of the integral elements. It was decided to retain membership fees at their present level for at least the next year.

Discussions took place for a fall membership drive and the 1st National RAC Convention to be held in Calgary in July of 1994.

Housekeeping matters too numerous to mention in this bulletin were attended to. Full minutes of the meeting will appear in a future edition of TCA. The meeting adjourned on a very positive note - RAC has been Born!

73 de VE3VCA Steve VE3GRS at the keyboard

ADDENDUM TO BRAD VE3RHJ'S ARTICLE ON OFF CENTER FED DIPOLES

P.S. Although it's been a few years since their ads appeared in QST, Garant Enterprises is still in business and selling these antennas. Their kit prices range from Cdn$169 (model GD-6, for 80-40-20-17-12-10 m) to Cdn$239 (model GD-9, all HF bands). Contact them at 227 County Blvd., Dept. 32, Thunder Bay, Ontario P7A 7M8, telephone 807-767-3888..... *VE3RHJ*

WANTED

VE3TSA TOM 371-9805

CARTOONS / ARTICLES FOR FEEDBACK..... I NEED SUITABLE CARTOONS AND/OR ARTICLES FOR USE IN FEEDBACK

VE3HIP IAN 371-5479

TUBES 6JS6A QTY 2

VE3TWK JACK 376-3440

MISC COMMODORE- MODEL 1700 MONITORS 12" $50 EA, MODEL 1541 DISK DRIVES $50 EA, PRINTERS $75 EA

VE3BFV JIM 371-1209

TAPE RECORDER- SONY 7" REEL TO REEL, PORTABLE, ALL SOLID STATE , 3 SPEED 7 1/2, 3 3/4, 1 7/8 "/SEC SELF CONTAINED POWER AMPLIFIER WITH 4 SPEAKERS, 2 DYNAMIC MICROPHONES, MINT....$200.00 NEGOTIABLE