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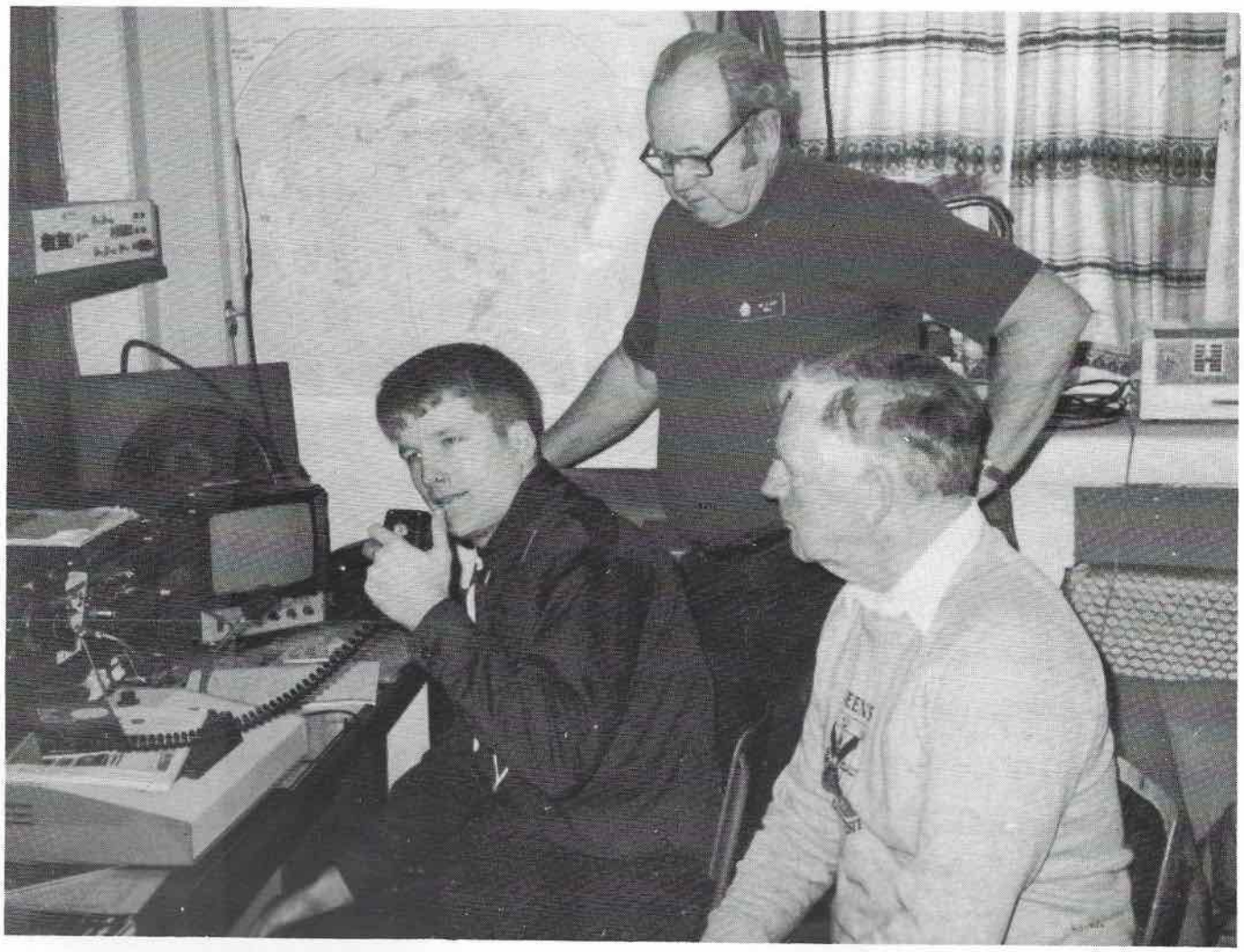
TCA

JUNE 1985

The Canadian Amateur Radio Magazine

La Revue des Radio Amateurs Canadiens



Catching 'em young at Kingston. Story Page 21.

Repeater Directory

The ZX81 Repeater

— Page 42

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The Canadian Amateur Radio Federation, Inc. is incorporated and operates under a federal charter, with the following objectives:

1. To act as a coordinating body of Amateur radio organizations in Canada;
2. To act as a liaison agency between its members and other Amateur organizations in Canada and other countries;
3. To act as a liaison and advisory agency between its members and the Department of Communications;
4. To promote the interests of Amateur radio operators through a program of technical and general education in Amateur matters.

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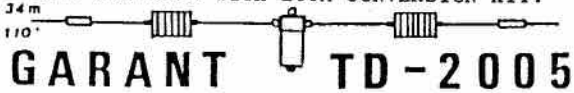
VSWR at resonance:	1.3.1	Surface area:	5.7 sq.ft.
Impedence:	50 ohms	Wind loading at 80 mph:	114 lbs.
F/B ratio:	up to 20 dB	Assembled weight (approx.):	37 lbs.
Boom (O.D. x length):	2" x 14'4"	Shipping weight (approx.):	42 lbs.
No. elements:	3	Direct 52 ohm feed, no balun required	
		Maximum wind survival:	100 mph

ALL BAND TRAP ANTENNA !

NEW! NOW ALSO WITH 160M CONVERSION KIT!



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THE NEW IMPROVED GARANT TRAP DIPOLE TD-2005 (FORMERLY W3-2005) IS NOW AVAILABLE FOR 80-40-20-15-10M. ADD THE CONVERSION KIT TD-160 AND WORK ALSO 160M BAND. 1:1 BALUN WITH LIGHTNING ARRESTOR. LOW-LOSS PRETUNED ADJUSTABLE TRAPS ARE PAIRED AND NUMBERED. STRONG ANTENNA WIRE. ONE NEAT SMALL ANTENNA FOR UP TO FIVE BANDS. TRAPS ALMOST INVISIBLE. 4.6CM O.D. X 14CM LONG. GUARANTEED FOR 2KW SSB OR 1KW CW. CAN BE USED AS "INVERTED-V". IDEAL FOR NARROW LOTS. COMES WITH OUR FAMOUS 3 YEAR WARRANTY. THE ONLY ANTENNA YOU'LL EVER NEED FOR ALL FIVE BANDS. USED BY HAMS IN 28 COUNTRIES WORLDWIDE. HUNDREDS ARE IN USE IN CANADA. EVEN ALERT AT THE NORTH POLE HAS ONE FROM US!

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ALL BAND NO TRAP ANTENNA !

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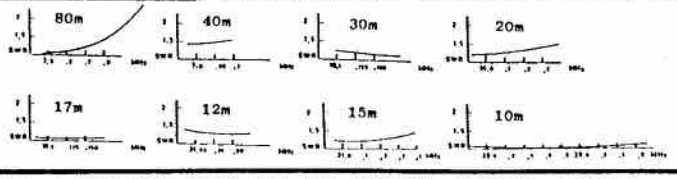
GARANT DIPOLE GD-6; 80-40-20-17-12-10M BAND, COMPLETE.....$ 99
GARANT DIPOLE GD-8; 80-40-30-20-17-15-12-10M BAND, COMPLETE.....$ 119
CONVERSION KIT GD+2; TURNS YOUR GD-6 INTO A GD-8.....$ 29
CONVERSION KIT GD-160; WORK 160M BAND WITH YOUR GD-6 OR GD-8.....$ 59



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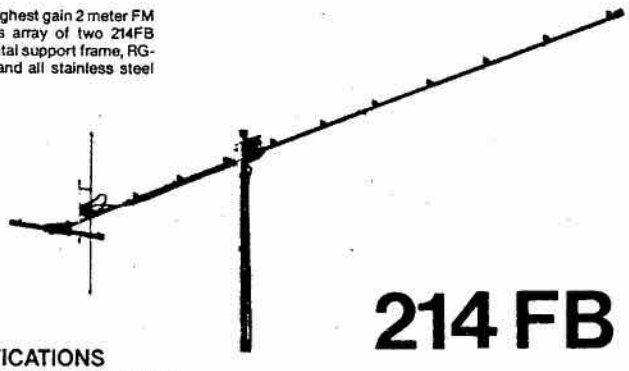
Full quieting FM communications and a lot longer reach... that's what you expect with a 214FB Boomer. You'll enjoy reduced interference because of its precise pattern and exceptional front-to-back ratios created by the Trigon reflector. And you can expect those same highly prized performance characteristics that are associated with EME, Scatter, and Tropo from your 214FB. Boomer's standard T-match driven element with coaxial balun makes matching a cinch. A heavy wall aluminum boom, solid aluminum rod elements and stainless steel hardware round out Boomer's exceptional design features.

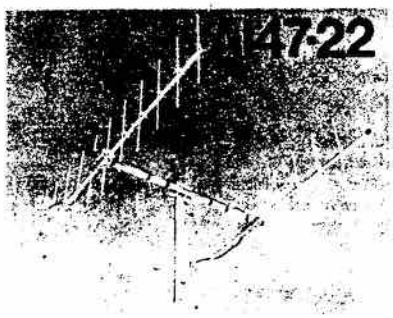
The 228FB Boomer is the highest gain 2 meter FM antenna in the world. This array of two 214FB antennas features a horizontal support frame, RG-8/U cable, power dividers and all stainless steel hardware.

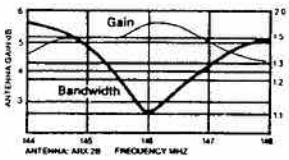


214 FB

FM YAGI SPECIFICATIONS

MODEL	214FB	228FB	A147-11	A147-22
Frequency Range, MHz	145.5-148	145.5-148	145.5-148	145.5-148
F/B Ratio, dB	24	24	20	20
Forward Gain, dBd	15.2	18.2	13.2	16.2
2:1 SWR Bandwidth, MHz	3	3	3	3
3 dB Beamwidth, deg	36	18	48	42
Boom Length, ft	15	15×11	12	6.6 × 12
(m)	(4.57)	(4.57)	(3.6)	(2.1 × 3.6)
Long Element, in	39.5	39.5	40	40
(m)	(1.0)	(1.0)	(1.0)	(1.0)
Turning Radius, ft	7.5	9.5	6	6.6
(m)	(2.29)	(2.9)	(1.8)	(1.5)
Wind Area, ft²	1.7	4.0	1.21	2.82
(m²)	(.16)	(.37)	(.11)	(.37)
Max Mast OD, in	2	2	1.50	2
(cm)	(5.0)	(5.0)	(3.8)	(5.0)
Weight, lb	8	22	6	15
(kg)	(3.63)	(9.98)	(2.7)	(6.7)





FM YAGIS

Two antennas have been keys to the growth of FM communication: our eleven element A147-11 and Power Pack A147-22 arrays. Why? Because they combine reasonable size with high levels of value and performance. Assembly is quick and easy, and matching is strictly no problem with the adjustable Reddi Match. Our A147 antennas are favorites with hams across the band today. If you're looking for more solid, reliable contacts for your station, A147-11 and A147-22 are smart thinking.

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ICOM HF Transceiver IC-735

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More Standard Features

Dollar-for-dollar the IC-735 includes more standard features...FM built-in, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.

Superior Performance

It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

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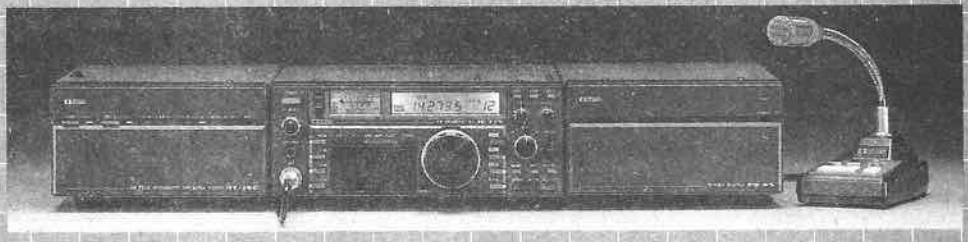
The large LCD readout and conveniently located controls enable easy operation, even in the mobile environment. Controls which require rare adjustment are placed behind a hatch cover on the front panel of the radio. VOX controls, mic gain and other seldom used controls are kept out of sight, but are immediately accessible.



Options. A new line of accessories is available, including the AT-150 electronic, automatic antenna tuner and the switching PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

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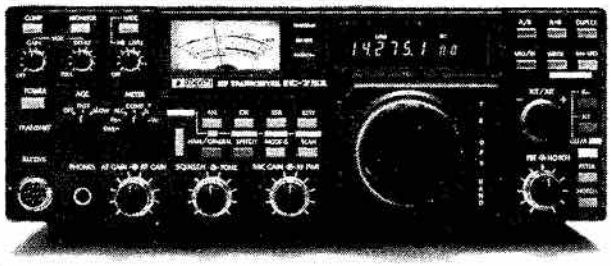
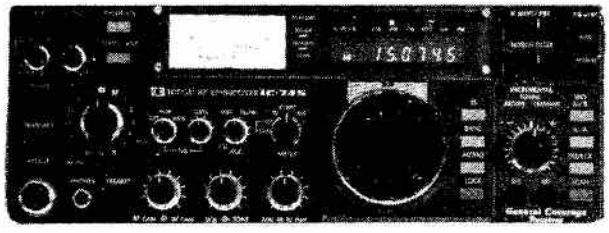


ICOM IC-751 BASE REGULAR $1794.00
CALL FOR SPECIAL PRICE

- *160-10M*
- *100KHz - 30MHz Receiver*
- *CW/SSB/ AM/RTTY/ FM*
- *32 Memories*
- *Microprocessor Controlled*
- *12 VDC Operation*
- *Fluorescent Display*



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- *117/220 VAC*
- *Autoband-switching*
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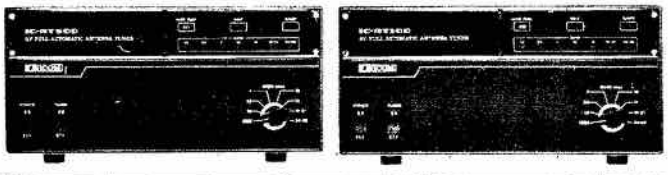

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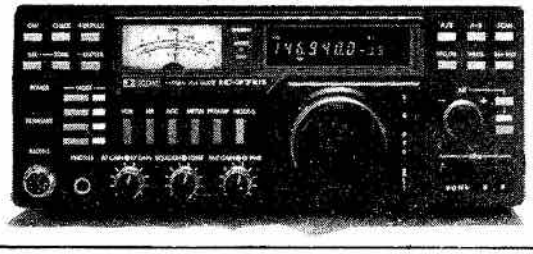

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- *32 PL Frequencies*

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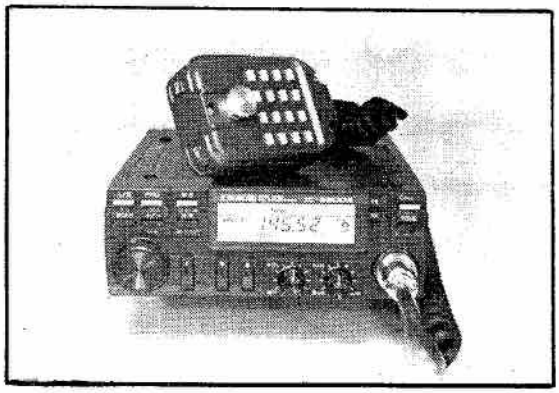

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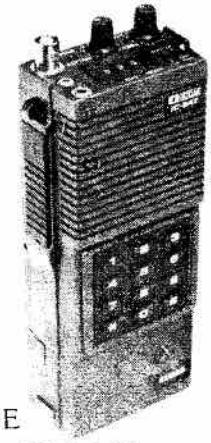

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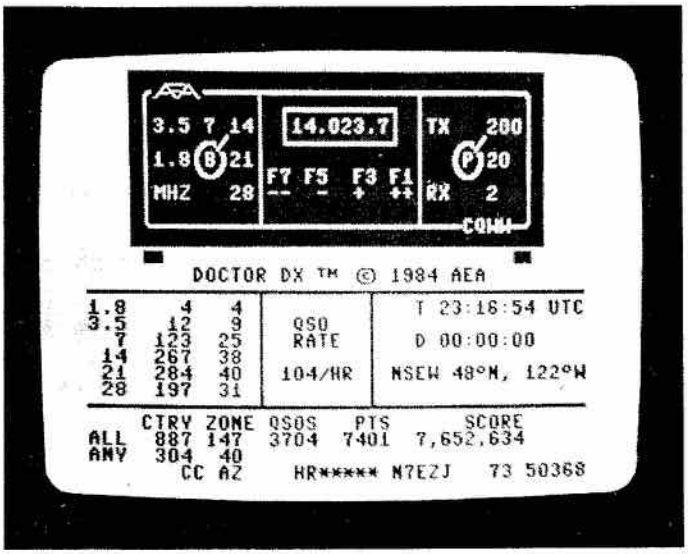

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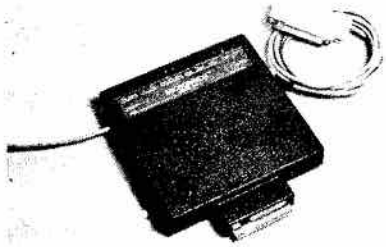

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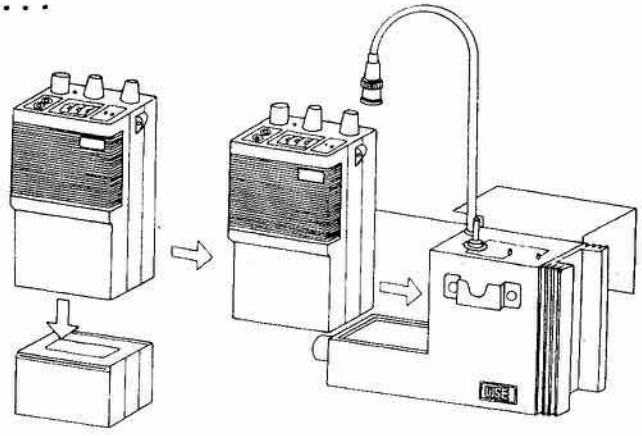

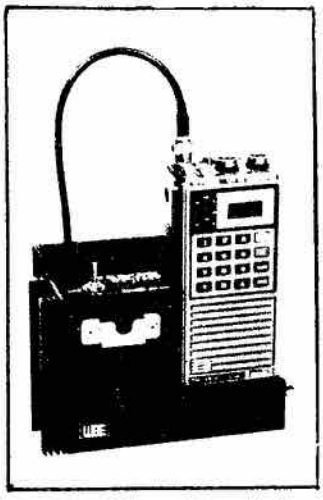

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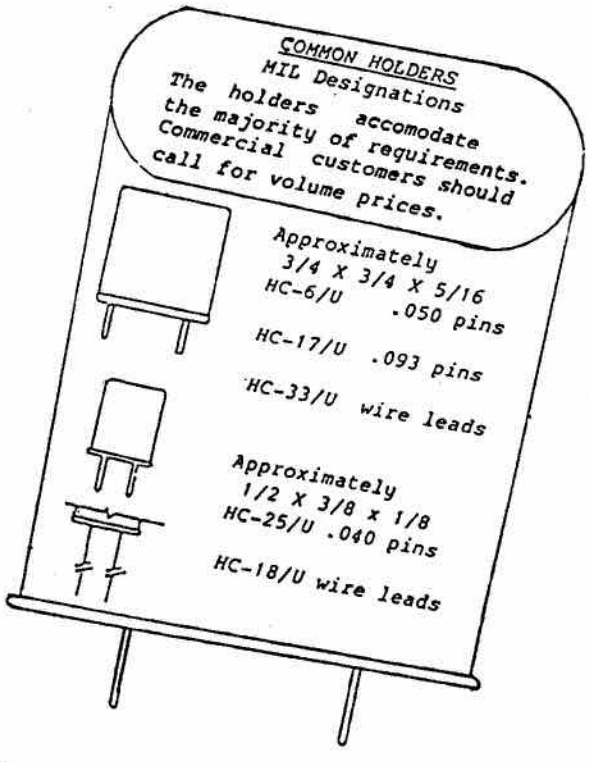

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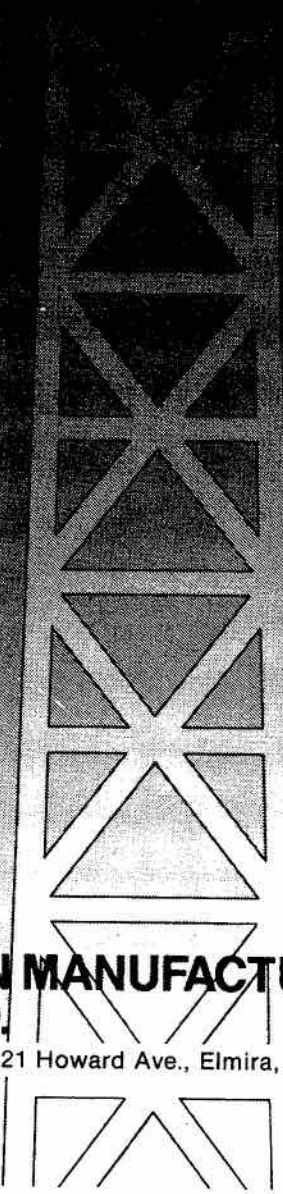

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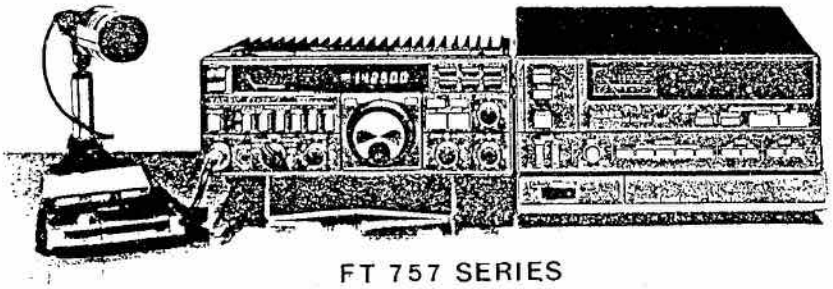

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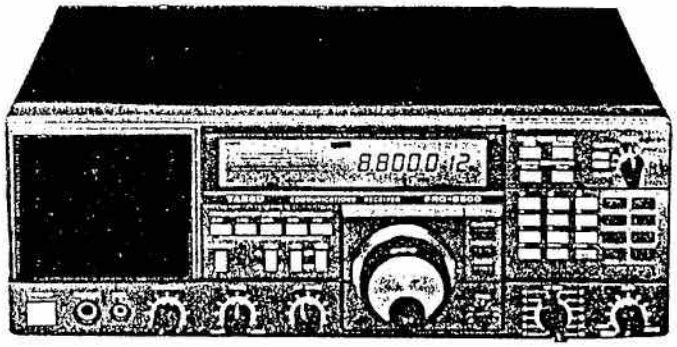

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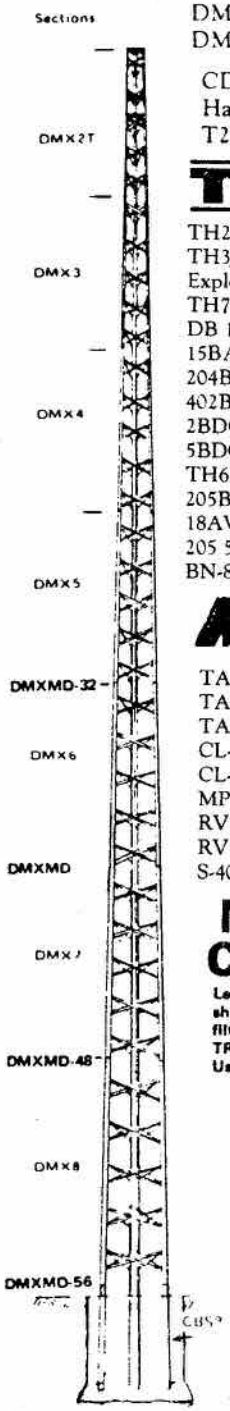

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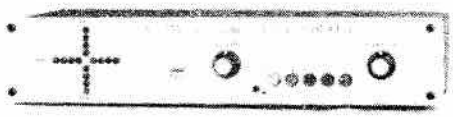

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TCA

ISSN 0228-6513

June 1985
Vol. 13 No. 6

QUA CARF How About It?

Last week She-Who-Must-Be-Obeyed suggested/ordered that I do something about the chaos in my bureau drawers. When she did not buy my excuse that this was simply a manifestation of the Second Law of Thermodynamics (the disorder of the universe is increasing), I set about sorting the clothing into two piles, "keep" and "discard." Into the "keep" pile went all the T-shirts I had collected while participating in various events providing communications via Amateur Radio. I would be the first to admit that I enjoy getting involved in events like a marathon or games for the disabled. It is a perfect opportunity to sell Amateur radio, and I am well aware that I am a member of a somewhat elite fraternity/sorority as I dazzle the public with my synthesized HT. Participation in such endeavours wins all sorts of "brownie points" for Amateur Radio, and the organizers of the events are the first to tell you that "they could not have done it without the Hams." And the T-shirts are nice!

There is, however, another group of volunteers in the Amateur community who is most deserving of a T-shirt or two, and who does not get kudos from the general public. Far more important is the fact that they get few gold stars from their peers. These unsung heroes are the Amateurs who keep the clubs running, the small group of individuals who do all the "dirty" jobs which no one else seems to want to do. At election time each year it is often difficult to get a full slate of nominations. A year on the executive is no picnic for anyone, yielding usually more than a full share of aggravation and frustration. However, if the club is to survive and grow, there must be new blood added to the system annually. Clubs die when just a few do all the work. So how about a T-shirt for anyone who has spent a year as a member of the executive? You owe him! Another shirt should go the bulletin editor— he gets it in the neck when the club bulletin is a little thin in material, but compliments are few and far between when he churns out a really super edition. And T-shirts for the Amateurs who teach code and theory classes for no pay, sponsor handicapped Amateurs, who stay behind to help clean up after a fleamarket. The list could go on.

Because of the pressures of editorial deadlines, this is being written in mid-April, a time period which coincides with "Volunteer Week." The slogan for this week is "Volunteering: A great way to Grow." If our hobby is to thrive and grow, all of us, not just a special few, are going to have to start volunteering. Δ

Geoff VE3KCE

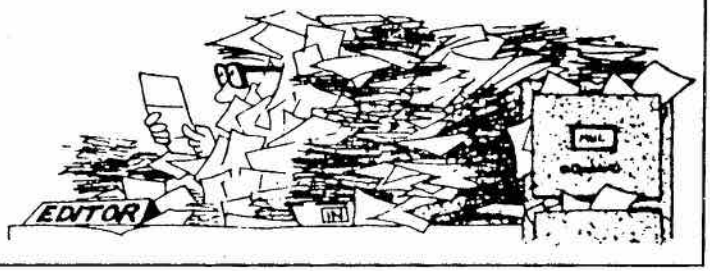
THANKS, CRRL!

CRRL published a notice telling CARF members the reason why some of them were missing TCA's. CARF thanks CRRL for this kind action. May such cooperation continue!

NEED A SPEAKER?

Clubs within driving distance of Newmarket Aurora: If you need a speaker for a meeting, a CARF presentation on Printed Circuit Boards, give CARF a call!

LETTERS



1 INCH = 25.4 MM

It looks as if *TCA* is printed by an OM for other OM's, because measurements are stated in feet and inches. *Ham Radio*, the Handbook, and other publications put their measurements in feet AND METRIC. *TCA* is useless to me!

— Carlo VE3JPW.

It seems scarcely worthwhile, Carlo, to use valuable space on the obsolete metric system. Within the decade, as computer literacy mounts, people will realize that the pint and its halves, the dollar and its quarters, the inch and its eighths, the pound and its sixteen ounces, fit perfectly on a hexadecimal keyboard. Today's computers contain an unnecessary part— the binary to decimal converter— to correct this unnecessary fault.

Nevertheless, for those unfamiliar with the system of the future— the inch-pound-system— we'll help with metric for a year or two.— Editor.

WHEN, IN THE COURSE OF HUMAN EVENTS...

There was a comment in the March issue that we need one good Canadian organization, not two. I endorse this 100%. If the resources for CARF and CRRL were pooled, the resulting organization could be much more beneficial to the Amateurs of Canada.

I suspect that one of the reasons why CRRL people are in favour of that organization is the idea that affiliation with ARRL is beneficial. I do not believe this, and am fully convinced that ARRL does not have the least concern for anyone's interest outside of the U.S.A.

I have a membership in CRRL, but freely admit that it is for one reason only, to receive *QST*. With all the advertising in *QST*, there is absolutely no justification for restricting subscription to membership, and they would probably sell many more magazines if that were not the case.

— Paul VE8YQ.

SILENT KEY

'Syl' Shaw VE7QC became a silent key on March 19 in the hospital at Trail B.C. after a long illness.

Syl was well known on the B.C. Public Service net throughout B.C., Alberta and the State of Washington. He took over as Net Manager in 1951, and his ability to enlist dedicated net control stations contributed largely to the success of the net.

Syl had many ARRL citations for exemplary service in time of emergency and in 1953 was awarded the B.C. Amateur Radio Association cup for outstanding service to Amateurs.

Syl was born at Wetaskiwin, Alberta in 1916. He was a member of the Shriner's Communication Unit.

He leaves his XYL, Rosemary, his daughter Carol, and his son Grant. Amateurs from all over have enjoyed the Shaw's hospitality. He will be missed.

— Don VE7AMW

COMPLIMENTS

What does one say about *TCA* when so much of it is produced through unpaid, voluntary effort? Sure, you can always think of ways it could be improved, but invariably there is a cost to be paid and it would likely require full-time staff.

I know that it's no easy job turning out a quality publication month after month, one which will satisfy the desires of all your readers. Even *QST* and the other U.S. Amateur publications with the resources available to them have their bad months. I *would* like to see an attempt at a higher level of sophistication in technical articles from time-to-time. However, I know that the perfect rejoiner to this is, "OK, send us a sample of what it is you're looking for!" Maybe I shall.

Compliments to VE2DUB for his microwave column, this being a subject close to my heart. I know that Mike doesn't have a lot of spare time— he manages to come up with a very readable effort every month, as does VE5XU. I guess the point of this note is just to tell you to keep up the good work.

Don VE2DWG

ON INCREASING OUR NUMBERS

As a new Amateur operator (April 1984) and a new member of CARF, I am furious with the comments of Mike Shacklock VE3LAR, in the February 1985 *TCA*.

Why one would want the communicators' class of licence is beyond my comprehension.

To begin with, I started as a SWL in 1963. Over the years I kept saying: "Now is the time to get cracking on my Amateur permit." My first obstacle was my passion for the female human being. Then came the early family and the desire to stay afloat economically. My interests stayed with the SWL, and was supplemented with the computer.

Between the computer, SWLing, and family, I finally decided that 1983 would be the year to work for the Amateur certificate. At no time did one interest prevent me from obtaining the licence. It was a combination of things that prevented me from working to this goal. I now find that I can blend all interests together to form one great big pastime that I can devote my time to.

I think that the communicators' licence will only create Amateurs with GRS minds who go home at night to their computers. What is the sense of having operators who do not take an active part in Amateur radio?

I believe the way to go is the same as in the past. Let's attract people for what our service really

is. Fun, excitement and the learning experience.

I for one want to keep the system the way it is. You must have code, theory, regulations and the DOC.

— W.H. Booth VE3NXK

THE RIGHT STUFF— AMATEUR YOUTH

The community of Amateur youth is very strong but is in danger of dying out. The U.S. Marines slogan "A few good men" is almost perfect at summing up our situation. We are few, but we are good. Willing to be involved yet sometimes, not sure how. Every now and then in *QST* you'll read about an 11-year-old novice who just got their licence and their first QSO was with Pitcairn or the like. While this is often successful at turning many old timers purple and keeping Blue Cross busy, it rarely goes further than that.

However, it doesn't have to. As Amateur youth, it is up to us to get more Amateur youth into the mainstream. For the most part because we are! Take a handheld or some magazines to school or wherever. Wear a hat or button, but something "Ham." Wait for questions, if the person asks several and/or has that sparkle in their eye then with the right bait and follow through, they'll get their licence.

Overall, being a young ham is more than doing 50 QSO's after school. Cut down and spend time elsewhere. READ *TCA*, *QST* and the local club rag. Check nets and bulletins and set aside a little time in evenings and weekends to go to a meeting, a flea market or a public service event. If all parties are willing you can even spoil yourself and set up a school station. Why not? It's a great way to get at least some "brownie points."

73, and let's be visible out there!
Steven VE3OOS

(Steve is our cartoonist, and the youngest— 13— Canadian Advanced Amateur. Congratulations, Steve!— Ed.) Δ

The excellent illustrations to the Ottawa Papal visit were taken by Bob Baillargeon VE3MPG and Mailes Dier VE3AP.

The Chilean Earthquake

On March 4, Pete VE5BEL and I received a telephone call from the president of the Chilean community group in Saskatoon asking for our assistance in finding out the well-being of relatives and friends in Chile after an earthquake had devastated parts of that country. After seeing news reports of the damage, they were understandably very concerned.

For about three weeks following this call we became heavily involved in contacting Chilean Amateur stations who telephoned the friends and relatives of several members of the community here.

The first station we established contact with happened to be a Canadian living in Santiago for the past two years doing work for the Mennonite Church there. Keith CE3HOS, who is from the Edmonton Alberta area. This was followed by several other contacts with various Chilean Amateurs and further schedules were arranged with Keith. In total, some 83 health and welfare messages were sent and received.

The members of the Inter America Traffic Net also deserve special mention. Many members of this net were most helpful in relaying our check-ins to the net control station who was inaudible here most of the time. We were able to pass a number of messages directly to Chile by finding stations of this net on 15 metres.

Martin VE5GK was most helpful locally, having one of the most impressive stations in Saskatoon with a 120-foot tower and a kilowatt. On one occasion when we were unable to contact Keith (CE3HOS) due to band conditions, Martin patched us through.

Wally VE5WG and Pete VE5BEL appeared on the local television news regarding our efforts with the Chilean community and Keith CE3HOS was on the CBC national radio news in the morning a day after the earthquake giving a description of the city to a CBC reporter visiting an Amateur station in Calgary.

The following stations were involved in handling traffic or relaying traffic for us, Eric VE5HG, Wally VE5WG, Pete VE5BEL, Ernie VE5BEO, Martin VE5GK, Andy VE5ZO, Will VE5ZJ, Jim VE5BDI, Vic VE5VL and Dave VE5BAF.

Thanks are also due to all the Amateurs who were standing by and were willing to help if called upon and to all the Chilean stations that were of such valued assistance to us. Δ

Dave VE5BAF

Please Help

Can anyone tell Debbie the correct addresses of any of these CARF members? Call her at 613-544-6161, or write Box 356, Kingston, Ont. K7L 4W2.

L. Singer VE6ARM
J. Barr VE6BKM
George Janonis VE3ERM
A. Stevenson VE7EWB
Edwin Flynn VE3OLF
Jim Sullivan VE3LCU
Emmy Belanger VE3IQR
A. Bureau VE1AHV
G. Wickert VE4ALT
O. Leppard VE3EXZ
Ian Humenny VE4TM
B. Surette Sure
Norm Pratt VE3NBJ
James Loukota VE3LJ
Dr. B.C. Viney VE3OSO
Frank Else VE3EMC
Betty Gorman 'Assoc.'
R.J. Mackee 'Assoc.'
A. Johnstone VE3JJV
T. Rogers VE3PN
Thomas Mugridge
P. Tomaszewski
Roger Diemert VE3AYU
Mansel MacDonald VE3LLG
N. Richards VE3BAS
I. Byers

Deadlines for *TCA* copy will be: July/August issue May 24, September issue July 26, October issue August 23, November issue September 27, December issue October 25.

DOC DOINGS

A Crosswaves Success

March 13, 1985

Eaton's Product Research
Bureau
Toronto, Ont.

Gentlemen,

About a month ago I purchased a solid state electrically programmable light control model by Diablo Technology Inc. The controller was Model SSW-3 and made by Diablo in California.

The Canadian distributor for this controller is the firm Ballarat of Toronto.

I subsequently returned the Model SSW-3 to your Eaton's outlet at Bayshore for the reason it generated objectionable radio interference. In fact the interference was quite audible 30 feet from the house, when monitored on a battery radio.

The SSW-3 uses a Triac or SCR controller which generates this noise and I was rather surprised that a product originating in the U.S. would do this. You are probably aware the FCC in the U.S. is quite strict about interference of this type.

I wrote to Ballarat (the distributor) and explained the foregoing. They politely said my letter would be forwarded to Diablo engineering for comment. I am still waiting.

Could you tell me if it is your policy to test these devices, specifically for interference, prior to offering for sale.

My interest is more than casual as I am Chairman of the local Amateur Radio Club Interference (E.M.I.) committee. My background in Electronics and measurements on the SSW-3 indicate very steep spikes with amplitude 400V p-p are being generated. The noise is relatively broad and covers from the lower broadcast band to above 20 MHz.

Two of my neighbours have the same problem with the same device.

Your comments about this controller would be of great interest, because it is really an excellent device except for this problem.

Sincerely yours,
Ralph D. Cameron

April 18, 1985
Mr. Ralph D. Cameron
Dear Mr. Cameron,

Further to our letter to you dated February 8, 1985 and your letter of March 25, 1985 the engineering personnel for Diablo have advised that the problems you described, although infrequent, have been resolved in their 2nd generation unit which is to be marketed later this year. Running changes have been effected during production to eliminate the noise problem.

As an interim measure we will be pleased to send you 3 modified units (2 of which for your neighbours) that eliminate the noise interference. We will send them to you within 4-6 weeks.

We trust this solution is satisfactory.

Yours very truly,
BALLARAT CORPORATION LIMITED
Phillip J. Cox, President
C.C.: Mr. E. Legate, Eatons Product Research Bureau

April 23, 1985
Mr. Phillip J. Cox, President
Ballarat Corporation Limited

Dear Mr. Cox,

Thank you for your letter of April 18, 1985 and your assistance in resolving my complaint.

Your solution is both satisfactory and generous and I will ensure that parties copied with previous correspondence are made aware of your action.

Your responsible attention to this problem speaks well for your Company and Diablo Technology. Thank you again.

Yours truly,
Ralph D. Cameron
c.c. Canadian Amateur Radio Federation
Department of Communications, Ottawa △

Spread the Word!

Next time you visit the public library, ask for and fill in one of these cards:

I WOULD LIKE TO SUGGEST THE FOLLOWING BOOK - OR RECORD - BE ADDED TO THE LIBRARY.

AUTHOR C.A.R.F.
TITLE Certificate Study Guide
PUBLISHER CARF publications PRICE $15.00
NAME Lee Ever
TEL.: 987 555 1212
APPEND REVIEW IF POSSIBLE, OR GIVE DESCRIPTION - OVERLEAF
Box 356 KINGSTON, ONT K7L 4W2

On the back write: This book will greatly help those wishing to take the Amateur Radio Operator's Certificate examination, set by the Department of Communications.

Catching 'Em Young

Scouting in the United States is 75 years old, and the Scouts celebrated the occasion recently. Naturally, CARF opened VE3VCA to scouts from Kingston, and exposed them to Amateur radio. They were welcomed by Bill VE3DXY, Jim VE3HZC, Jean VE3MNI, George VE3LXA and Bill VE3NFU.

Here's a scout talking to a fellow scout at the New York State fairgrounds, near Syracuse, New York. That's Jim VE3HZC in a supporting role.

TCA appeals to all ages! The young man on the left is pricing HT's, but the young lady on the right seems totally absorbed in one of the articles.

Hey, don't I get a turn? Jean VE3MNI ensures the circuit is satisfactory before handing over to a scout.

Club News

Beaver Valley ARC (VE7BWI) set up a booth at the Waneta Mall during Education Week in Trail. Dan VE7CRY arranged the event and guided it to a successful conclusion. The Mall is of metal construction, so HF was out: they demonstrated 2 M and computer communications. The effort paid a dividend! Four new students at their ARC class!

— VE7BPN

Winnipeg Senior Citizens ARC's station VE4WSC is almost complete. They are working Oscar— 12 contacts so far. They have established a Trans-Canada Senior Citizens net on 14.130, Bill VE4MZ is net control, Charlie 4FG is backup.

They have an AR class of eight, and another class at the Blind Institute.

— VE4AEM

Halifax ARC's AR classes have snowballed— they plan two classes this fall, Amateur and Advanced Amateur. Both begin first week of October at Harrietsfield School, Monday and Thursday evenings, ready for the February 1986 exams. So if you're within range and want to upgrade or know of a beginner, call Dan VE1JV 479-1557 or Spud VE1BC 868-2343.

American Newsfronts

WASHINGTON (BS) State department officials here today announced that a predawn raid has netted another shipment of highly complex electronic components destined for the Soviet Union.

The super-sophisticated '7400 Quad Two-input NAND gate' as it is known in elite industry jargon, could have been used in video games, officials said, adding that the shipment had an estimated 'street value' of at least $10 million.

Other top officials, speaking under the condition that they not be identified, said the parts were worth about $1000 apiece. "At least that's what we pay for them through the Pentagon's spare parts procurement program," commented one official.

Later reports from knowledgeable sources said that the '7400' components are manufactured in hidden factories in exotic jungle locations such as Malaysia and Puerto Rico and are blatantly sold over-the-counter in Radio Shack stores within blocks of the Soviet Embassy.

"With enough of these super-hi-tech parts, the Soviets could have constructed the world's fastest video game," said one spokesman. "Such a game would be superior to current American and Japanese models because it would also serve as an excellent space heater, and we all know how cold Moscow winters are."

Commenting on the raid, an obviously pleased President Reagan said, "It is obvious that one of America's greatest assets is its large pool of skilled youngsters ready to take the controls when the nation constructs its sophisticated space-based laser ICBM defence system. This technology would have given the Soviets the capacity to train THEIR youngsters to shoot down OUR missiles."

(from Ottawa ARC's *Groundwave*)

The Group of Seven. Back row (left to right) Vic VE3DEP, Bill VE2BZU, Lloyd VE2AXY, Ed VE3NWP, Front row Ed VE3SH, Serge VE2BOO.

The Quebec Radio Net

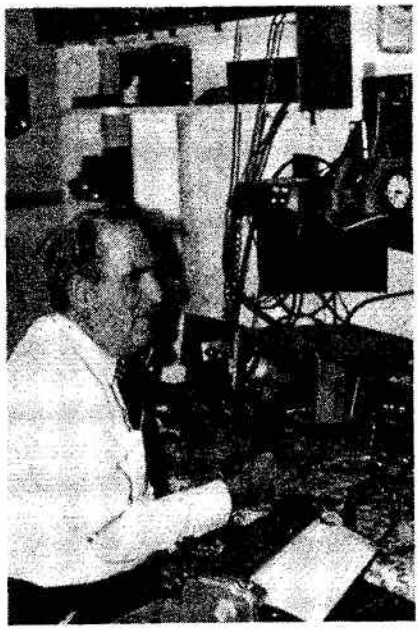
By Ed Henderson VE3SH

Another year has passed and soon the Quebec Radio Net controllers will be having their annual get-together.

As we enter our 14th year of continual operation, we are confronted with possibly the greatest change since our humble beginning in 1972. The band expansion in the U.S.A. has given us an increase in QRM on both sides of the net frequency.

The extremely poor operating conditions during January and February made things look bleak for a time, but we have overall made significant gains.

Since conditions have improved in late February, we are once gain enjoying a large number of check-ins and an increase in U.S. participation.



Lloyd VE2AXY in the shack. That's a Braille typewriter in the foreground.

The net controllers feel that we are still serving a need and we enjoy providing the service. We would very much like to hear from those out there who are the reason for our existence. Please write to us with your comments and/or suggestions on how we can serve you better. We are good listeners!

Letters can be sent to the QRNET Manager, Lloyd McClintock VE2AXY, 5156 Belmore Ave., Montreal, Quebec. H4V 2C6.

Net Participation Recognition Certificates have been sent to: Mel VE1BMV, Doug VE2IH, George VE2GXH, Hugh VE3EZR, Buster VE3NF. These Amateurs are congratulated for their contributions to the QRNET over the years. THANKS!

The following are the current active QRNET controllers: Sunday— Bill VE2BZU, Monday— Ed VE3SH, Tuesday— Serge VE2BOO, Wednesday— Gord VE3HTJ, Thursday— Vic VE3DEP, Friday— Lloyd VE2AXY, Saturday— Arn VE2SD. Assistants are Bob VE3IWR and Merv VE3CV.

This year's meeting will take place in July in Brockville at the QTH of Bob VE3IWR. Meanwhile, we look forward to hearing those check-ins on 3775 kHz between 1930 and 2030 hrs EST/EDST daily. 73 and CHEERS! △

Serge VE2BOO. (CARF publishes very convenient log forms, Serge.)

Ed VE3SH, Monday night net control.

From the CARF Office

We would sincerely like to thank all the members of CARF for bearing with us during all the upheaval caused by computer failure and the transition to new office staff. We have finally caught up with, and re-entered, the bulk of our membership into a new computer system, which, by the way, consists of TWO computers, so that we don't run into the same problems again. If you know of anyone we may have missed for this June issue, please tear off the bottom portion of page 15 and forward it to the Kingston office. This way we may identify the lost people from the regular renewals, and the new members.

All CARF members have been issued new MEMBERSHIP NUMBERS. The new number is found on the top of the June label. When corresponding with this office, please quote this number. All other numbers have been deleted. The QSL bureau has been given these new numbers as well.

During the months of JUNE, JULY and AUGUST, the CARF office hours will be: 7 a.m. to 3 p.m. EDT. At all other times, there is an answering machine for messages.

Again, thank you for your assistance and patience. Δ

Debbie Norman
C.A.R.F. Office Manager
Lise Nault Boislard
Office Clerk

The CARF table at the VE2CVR (Club Radio du Vallée du Richelieu) at a shopping centre demonstration.

Club News

The Barrie ARC has a new executive, VE3IMA, President, VE3MES, VE3NBN, VE3ATP, VE3NLN, VE3NP and VE3FJB, and a new location, complete with workshop, for club station VE3GCB, in Georgian College. They have a Packet radio group; their AR class has 21 students, and they are getting ready for Field Day.

The Barrie area nets are on 146.25/85 Wednesday evening, and 28.4 MHz Sunday mornings. Stop by, if you're mobile in Barrie!

— VE3OYA

Your QSL Bureau

On the last day of February, Jean VE3DGG, our QSL service manager, got 110 pounds of mail away.

The week before, 50 pounds.

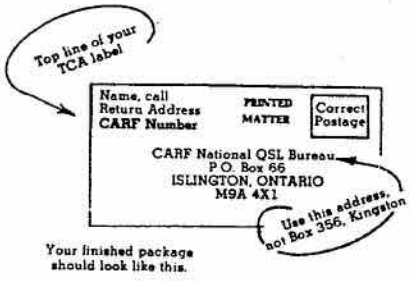
Since 168 cards weigh a pound, you can understand what a tremendous amount of work these volunteers do for you.

That's what CARF is— Amateurs like you doing dozens of necessary tasks because they believe Canadian Amateurs need the service.

Free CARF QSL Service

The CARF Outgoing QSL Service will forward your QSL cards to anywhere in the world. **This service is free to CARF members.**

1. Sort cards alphabetically by prefix.
2. Sort Canadian cards numerically by call area.
3. Place small lots of cards in strong, heavy envelopes and seal securely. Include the label (or copy or facsimile) from your current copy of *TCA*. Wrap heavier packages in strong paper or put in a cardboard box. Tie securely. **Do not staple.**
4. Address your package as shown in the diagram.
5. **Do not register the cards!** This only delays them, costs more and is not really necessary.
6. If you want proof that CARF received your cards, enclose a self-addressed, stamped postcard or envelope with 'Receipt' marked on it.
7. If a package should be damaged on arrival (very rare), CARF will send you a list of cards received so you can check to see if any were lost.



Your finished package should look like this.

CRAG

By Cary Honeywell
P.O. Box 2610, Stn. 'D'
Ottawa, Ont. K1P 5W7

Craig Howey VE6DT discovered, after taking on a new job in Alberta, that his time was very limited. Twelve-hour work days will do that to you. Because of that, he decided to relinquish the job of CRAG secretary. Those of us who know Craig, and know how hard he works, can understand the pressures he must be under. He has worked hard for CARF and equally hard at the job of secretary for CRAG. We shall miss him.

When I first heard that Craig would be resigning, I immediately volunteered to take over as secretary. Keeping the repeater directory would be simple with my new IBM-PC computer. As it turns out, I can access any type of information on repeaters in Canada just by typing in the appropriate commands on the computer. Nice thing about this is that I can produce just about any type and form of repeater directory, or just compile statistics such as:
How many repeaters are there in Canada? (630) How many use 146.34/146.94 as frequencies? (49) How many repeaters are there in B.C.? (106)

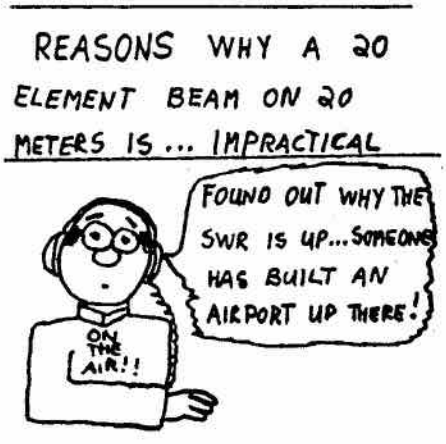
Some of the statistics can be quite useless unless you have a specific need for it. One particular benefit to all this is that I can produce a complete repeater listing for a vacation trip. For instance, if I were to plan a trip from Ottawa to Halifax, all I would need to know is the main centers that I pass through on my trip, and I can get a listing of all the repeaters in the general area. Neat! So much for the bells and whistles.

The repeater listing featured in this issue is as up-to-date as is possible. Information given to Craig during the past year has been included, as has some information recently gathered by the CARF News Service, through Doug VE3CDC. As is usually the case with any list of this size, there are some inaccuracies. Sorry, but we did ask for information. Nevertheless, an enormous amount of work has gone into compiling the repeater directory, and most of the credit can go to both Hugh Lines V3DWL, former secretary, and Craig Howey, past secretary of CRAG. Between the two of them, over the past eight years, CRAG's repeater directories have been kept up-to-date and as accurate as possible.

You probably have noticed that I have referred to the position of Secretary of CRAG. That is a pretty good description of what the position is. The secretary is not actually an appointed job either. The original concept of CRAG was that it operate as a non-partisan clearing house for two metre repeaters, councils and enthusiasts, and was to be operated as a joint effort on behalf of CARF and the Canadian Division ARRL/CRRL. This was to benefit all Canadian Amateurs. CRAG was supposed to be a joint effort but, in fact turned out to be a one man show most of the time with help from VE3CDC, and a great deal of patience on the part of the first CRAG secretary, the late Lyall Ward (ex-VE3CEZ). Amateurs on both sides supported the work CRAG was doing to help coordinate and set up repeater councils and promote cooperation between repeater operators. I fully intend to continue this tradition. CRAG is available to all Amateurs.

The repeater directories are published in *TCA*. Copies are sometimes available at flea-markets and Hamfests, usually costing only as much as it took to photocopy the thing. A complete repeater directory will be available from the CARF office.

This column is intended to provide information on problems, situations, and techniques of repeater operating. In the past the column has provided information on frequency changes and coordination. I would like that to continue as well. This will help me to compile an up-to-date directory, which can be published from time to time. If you have any info you would like to see published, send it to me care of the above address, or send it to either CARF, or the Editor of *TCA*. They will see to it that I get it. Depending on the information provided, I will try to keep a monthly column going. Be warned, however. No material, no column. I'm not going to invent stories. △



For TCA Subscription problems, call the Kingston office *613-544-6161* anytime.
For enquiries and membership information, please quote top line of TCA label.

Repeater Directory

NEWFOUNDLAND/LABRADOR

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
CORNER BROOK	VO1MO	146.340	146.940	A	
GANDER	VO1AV	146.460	147.060	Q	
GRAND FALLS	VO1CNR	146.340	146.940		
GRAND FALLS	VO1JY	146.160	146.760	A	
LABRADOR CITY	VO2AD	146.340	146.940	A	
ST. JOHNS	VO1EN	146.460	147.060	A	
ST. JOHNS	VO1GT	146.340	146.940		
ST. JOHNS	VO1PG	146.190	146.790	A	

PRINCE EDWARD ISLAND

CHARLOTTETOWN	VE1AHC	146.070	146.670	L11	
CHARLOTTETOWN	VE1AHC	448.300	443.300	L F	
CHARLOTTETOWN	VE1CRA	146.070	146.670	A E L	
CHARLOTTETOWN	VE1HI	146.340	146.940	A E	
CHARLOTTETOWN	VE1UHF	449.400	444.400	A E L	
O'LEARY	VE1ATN	147.720	147.120	E	
SUMMERSIDE	VE1CFR	146.250	146.850	A E	

NEW BRUNSWICK

BATHURST	VE1CRH	FREQUENCIES UNKNOWN			
BATHURST	VE1PL	146.340	146.940		
CARAQUET/CHATHAM	VE1BRF	146.160	146.760		
EDMONSTON	VE1EDM	146.280	146.880		
FREDERICTON	VE1BM	147.720	147.120	A	
FREDERICTON	VE1GT	146.340	146.940		
FREDERICTON	VE1PD	146.160	146.760		
MONCTON	VE1HUB	147.870	147.270		
MONCTON	VE1MTN	147.690	147.190		
MONCTON	VE1RPT	146.280	146.880	A	
NEW CASTLE/CHATHAM	VE1NCR	147.750	147.150		
PERTH	VE1BTK	146.220	146.820	O	
PERTH	VE1KMT	146.460	147.060		60
PLASTER ROCK	VE1PRR	147.870	147.270	E	
SAINT JOHN	VE1KI	146.220	146.820		
SAINT JOHN	VE1SIR	146.100	146.700		
SAINT JOHN	VE1SIR	147.810	147.210	A L12	LOC
SAINT JOHN	VE1SIR	444.100	449.100	A L12	LOC
SAINT JOHN	VE1SJR	147.870	147.270		
ST. ANDREW	VE1IE	146.250	146.850		
SUSSEX	VE1SMT	146.010	146.610		
WOODSTOCK	VE1EMT	146.370	146.970	A	

NOVA SCOTIA

BIG HARBOUR	VE1BVH	146.720	147.120	A	
BRIDGETOWN	VE1BO	146.460	147.060	E	
BRIDGEWATER	VE1LCA	147.840	147.240		
DALHOUSIE	VE1SMR	146.040	146.640		
DARTMOUTH	VE1DAR	147.750	147.150		
DIGBY	VE1AAR	146.190	146.790	A	
GORE	VE1LHR	146.040	146.640		
GRANITE VILLAGE	VE1BBY	147.960	147.360	M R	
GREENWOOD	VE1WN	147.870	147.270		
HALIFAX	VE1CBC	146.340	146.940		
HALIFAX/DARTMOUTH	VE1MAR	147.870	147.270	A Q	
LIVERPOOL	VE1VO	147.900	147.300	A	
MT. BLOMIDON	VE1AEH	147.780	147.180		
MULGRAVE	VE1RTI	146.220	146.820	L	
NEW GLASGOW	VE1HR	146.160	146.760	E	50
NINEVEH	VE1NIN	147.690	147.090		
NORTH SYDNEY	VE1AUY	147.840	147.240	A L	
REAR BOISDALE	VE1HAM	146.280	146.880	L	
SHELBURNE	VE1SCR	146.010	146.610		
SPRINGHILL	VE1SPR	146.400	146.000	A L11	
SPRINGHILL	VE1SPR	443.300	448.300	A L F	
SYDNEY	VE1CBI	146.010	146.610	R	
SYDNEY	VE1SYD	146.340	146.940	A	
TRURO	VE1TRO	147.810	147.210	E	
TRURO	VE1XK	146.190	146.790	E	
TRURO	VE1ZG	146.310	146.910	E	
YARMOUTH	VE1YAR	146.130	146.730		

CRAG REPEATERS DIRECTORY NOTES

STATUS:

A - AUTOPATCH	O - TEMPORARILY OFF THE AIR
B - BATTERY POWERED	P - PROPOSED
C - TEMPORARY CALL	Q - TEMPORARY LOCATION
D - PACKET RADIO/DATA	R - RTTY/FAX
E - EMERGENCY POWER	T - TONE ACCESS
L - LINKED (SEE BELOW)	V - ATV VIDEO CARRIER

L11 - (L)INKED IN CALL AREA (1) SYSTEM (1)
L33H - (L)INKED IN CALL AREA (3) SYSTEM (3) (H)UB SITE OR FREQUENCY
L62 - (L)INKED IN CALL AREA (6) SYSTEM (2)
ASC - AUDIO SUBCARRIER FOR ATV (NOT NECESSARILY SPECIFIED)

RANGE: (in kilometres)
LOC - LOCAL COVERAGE
SR - SHORT RANGE UP TO 25 Km
MR - MEDIUM RANGE UP TO 70 Km
LR - LONG RANGE MORE THAN 75 Km
DR - DIRECTED RANGE (BEAMED TO A SPECIFIC AREA)

QUEBEC

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
ALMA	VE2RCA	146.070	146.670	A	
ALMA	VE2RCR	146.340	146.940	E L	
AMOS	VE2RYE	146.100	146.700		
AMQUI	VE2KH	146.280	146.880		

QUEBEC

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
AMQUI	VE2RKH	146.160	146.760		
ATHABASKA	VE2RCL	146.835	146.235		
BAGOTVILLE (CFB)	VE2RYB	146.040	146.640		
BAIE COMEAU	VE2RPR	146.100	146.700	A	
BROWNSBURG	VE2RWC	146.205	146.805		
CARLETON	VE2RIN	146.220	146.820		
CARLETON	VE2RXT	146.460	147.060	L21	
CHICOUTIMI	VE2RCC	147.720	147.120	D	
CHICOUTIMI	VE2RIU	146.160	146.760	A	
CHICOUTIMI	VE2RPJ	147.870	147.270		
CHICOUTIMI/MNT DUFOR	VE2ES	146.280	146.880	L21	
COATICOOK	VE2RDM	147.960	147.360	E	
COVEY HILL	VE2RTS	444.500	449.500	R	
COVEY HILL (VALLEYFIELD)	VE2RBV	147.810	147.210	A R	
COVEY HILL(HAVELOCK)	VE2REX	146.085	146.685	B E L	LR
DESCHAMBAULT	VE2RAP	147.810	147.210		
DOLBEAU	VE2RCD	146.100	146.700	A	
DONACONA	VE2RUV	146.430	147.030	A	
DRUMMONDVILLE	VE2RDL	146.025	146.625	A	
DRUMMONDVILLE	VE2RDV	147.690	147.090		
GAGNON	VE2RGA	146.340	146.940		
GASPE	VE2RLE	146.280	146.880	L21 P	
GRANBY	VE2RTA	147.780	147.180	A E	
GRANDE MERE	VE2RGM	146.310	146.910	ABL21	
HAUTE RIVE	VE2RJG	147.900	147.300	L21	
HAVELOCK	VE2RHQ	146.220	146.820		
JOLLIETTE	VE2RMA	146.430	147.030	L21	
JONQUIERE	VE2VP	146.220	146.820		
L'ASSOMPTION	VE2RBB	147.810	147.210		
LA MALBAIE	VE2CTT	146.400	147.000	A	
LA SARRE	VE2RRL	146.100	146.700		
LA TUQUE	VE2RTL	146.190	146.790	A L21	
MATANE	VE2RAS	147.720	147.120	A E	
MONT DUFOR	VE2ES	146.280	146.880		
MONT JOLI	VE2RAC	146.130	146.730	L21 E	
MONT JOLI	VE2RMJ	147.780	147.180	A	
MONT LAURIER	VE2RMC	146.370	146.970	L21 E	
MONT LOGAN	VE2OE	146.160	146.760		
MONT TREMBLANT	VE2RMT	146.130	146.730	L21 E	
MONT VALIN	VE2RMV	147.840	147.240	P	
MONTMAGNY	VE2RAB	146.370	146.970		
MONTMAGNY	VE2RQM	147.870	147.270	A	
MONTREAL	VE2 ?	223.500	223.500	D	
MONTREAL	VE2BG	146.460	147.060		
MONTREAL	VE2HH	222.900	224.500		
MONTREAL	VE2MRC	147.720	147.120	A E	
MONTREAL	VE2RBD	444.600	449.600		
MONTREAL	VE2RED	147.870	147.270	A E	
MONTREAL	VE2REP	146.280	146.880		
MONTREAL	VE2RJS	147.615	147.015	UNKNOWN	
MONTREAL	VE2RKO	146.040	146.640	A	
MONTREAL	VE2RTV	436.000	446.000	V	
MONTREAL	VE2RVS	146.250	146.850	R	
MONTREAL	VE2RWC	146.205	146.805		
MONTREAL	VE2RY	147.900	147.300		
MONTREAL (DORVAL)	VE2RAU	146.310	146.910	B	
MONTREAL (DORVAL)	VE2RBI	147.975	147.375		
MONTREAL (MT BRUNO)	VE2RMB	146.100	146.700	E	

QUEBEC

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
MONTREAL (ST. JEROME)	VE2RMP	146.160	146.760		
MONTREAL/RIGAUD	VE2PAK	223.050	223.050	D	
MONTREAL/RIGAUD	VE2RM	146.400	224.060		
MONTREAL/RIGAUD	VE2RM	146.400	147.000	A	
MONTREAL/RIGAUD	VE2RM	444.000	449.000		
PARC DES LAURENTIDES	VE2RAH	53.135	53.635		
PARC DES LAURENTIDES	VE2RJZ	147.810	147.210		
PARC DES LAURENTIDES	VE2RMG	147.690	147.090	L21 E	
PERCE	VE2RLC	146.190	146.790	L21 P	
PLESSISVILLE	VE2CRP	146.130	146.730		
QUEBEC CITY	VE2ASU	146.100	146.700		
QUEBEC CITY	VE2DB	146.280	146.880		
QUEBEC CITY	VE2OM	146.340	146.940		
QUEBEC CITY	VE2RAA	147.960	147.360	L	
QUEBEC CITY	VE2RAG	144.710	145.310	A P	
QUEBEC CITY	VE2RAQ	146.250	146.850	R	
QUEBEC CITY	VE2RAR	147.015	147.615	A	
QUEBEC CITY	VE2RAX	147.655	147.855		
QUEBEC CITY	VE2RCQ	147.900	147.300	A E	
QUEBEC CITY	VE2RCQ	449.000	444.000		
QUEBEC CITY	VE2RDS	146.250	146.850	R	
QUEBEC CITY	VE2RQR	146.010	146.610	A R	
QUEBEC CITY	VE2RQT	434.000	1278.750	V	
QUEBEC CITY	VE2RQT	438.500	1283.250	ASC	
QUEBEC CITY	VE2SRC	147.720	147.120	A	
QUEBEC CITY	VE2UX	146.220	146.820	L21 E	
QUEBEC CITY	VE2VD	146.160	146.760	E	
QUEBEC CITY/LAUZON	VE2RQC	449.400	444.400	A	
RIMOUSKI	VE2CSL	146.340	146.940	A E	
RIMOUSKI	VE2RWM	146.010	146.610	L21	
RIPON	VE2RBA	147.945	147.345		
RIVIERE DU LOUP	VE2NY	147.660	147.060	L21 E	
RIVIERE DU LOUP	VE2RAY	147.750	147.150	A	
RIVIERE DU LOUP	VE2ROO	146.190	146.790		
ROUYN/NORANDA	VE2RON	146.220	146.820	L21	AP
S-ISLES/BAIE TRINITY	VE2RRU	146.190	146.790	L21	
SEPT ISLES	VE2RSI	146.340	146.940	L21	
SHERBROOKE	VE2RSH	146.370	146.970		
SHERBROOKE	VE2SS	146.250	146.850		
SHERBROOKE (MT ORFORD)	VE2TA	146.190	146.790	L21	EP
SHERBROOKE/MEGANTIC	VE2FX	147.930	147.330	L21	
SOREL TRACY	VE2RBS	146.010	146.610		
ST. EUSTACHE	VE2REL	147.315	147.915	L21	
ST. FELICIEN	VE2RSF	146.010	146.610	A	
ST. GABRIEL	VE2RGC	147.900	147.300		
ST. GABRIEL/BRANDON	VE2RGZ	147.900	147.300		
ST. GEORGES	VE2RSG	146.040	146.640	A	
ST. HYACINTHE	VE2RBE	147.355	147.955	E	
ST. JEAN	VE2RVR	147.840	147.240		
ST. MARTINE	VE2REC	147.345	147.945		
ST. RAYMOND	VE3RAZ	147.840	147.240		
ST. URBAIN	VE2RAI	146.310	146.910	A	
ST.GABRIEL/KAMOURASK	VE2RAK	146.100	146.700		
ST.GEORGES DE BEAUCE	VE2RCN	145.650	145.050		
ST.JOSEPH DE BEAUCE	VE2RMF	147.990	147.390	L21 P	
STE. MONIQUE	VE2TG	146.430	147.030	L21 P	
TEMISCAMING	VE2RTE	146.130	146.730	A	
TROIS RIVIERES	VE2CTR	146.460	147.060	A	

TROIS RIVIERES	VE2ROX	146.985	146.385		
TROIS RIVIERES	VE2RTR	146.070	146.670	A	
VAL D'OR	VE2RYE	146.160	146.760	A	
VICTORIAVILLE	VE2RBF	147.750	147.150		

OTTAWA/HULL

OTTAWA/HULL	VE2CRA	146.340	146.940		100
OTTAWA/HULL	VE2CRA	448.300	443.300	O	
OTTAWA/HULL	VE2CSO	146.100	146.700	LP21	
OTTAWA/HULL	VE2KPG	147.960	147.360	A	
OTTAWA/HULL	VE3CPC	147.750	147.150	A L	
OTTAWA/HULL	VE3OCR	146.250	146.850		40
OTTAWA/HULL	VE3OCR	223.340	224.940		45
OTTAWA/HULL	VE3OEA	146.070	146.670	A	
OTTAWA/HULL	VE3ORA	146.280	146.880		
OTTAWA/HULL	VE3PAK	223.050	223.050	D	30
OTTAWA/HULL	VE3RST	146.010	146.610	A	
OTTAWA/HULL	VE3TEL	146.430	147.030		
OTTAWA/HULL	VE3TEL	222.340	222.340	D	
OTTAWA/HULL	VE3TWO	147.900	147.300		
OTTAWA/HULL	VE3TWO	449.200	444.200	P	

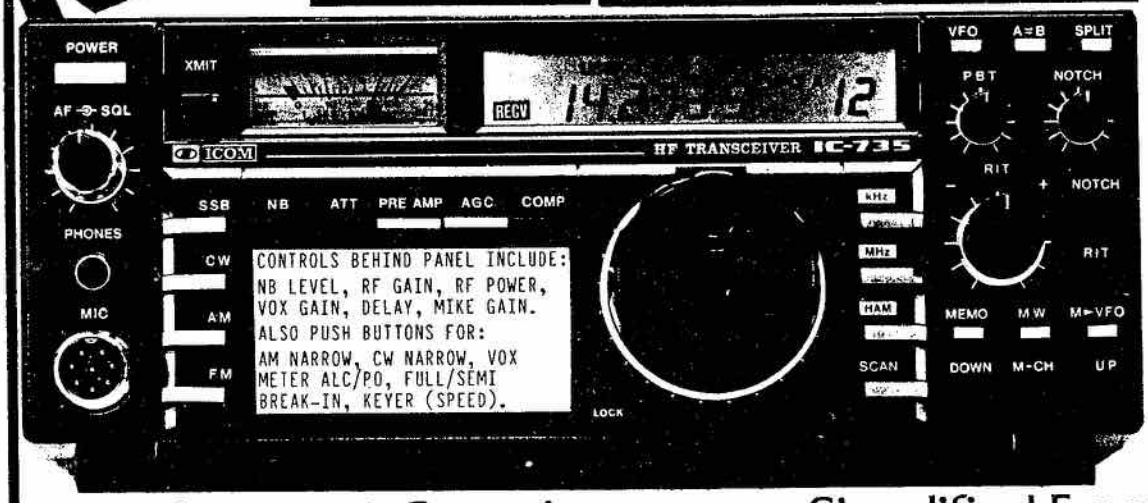
ONTARIO

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
AJAX	VE3 ?	144.510	145.110		
AURORA	VE3ULR	447.025	442.025	L32H	
AURORA	VE3YRC	147.825	147.225		
BANCROFT/ESSONVILLE	VE3TBF	147.840	147.240	L31	
BANCROFT/ESSONVILLE	VE3TBF	223.240	224.840	L31H	
BARRIE	VE3RAG	146.070	146.670		
BELLEVILLE	VE3OKR	147.885	147.285	Q	SR
BELLEVILLE	VE3QAR	146.430	147.030	A	25
BRACEBRIDGE	VE3MLR	147.690	147.090		
BRACEBRIDGE	VE3MRT	146.280	146.880	A	
BRAMPTON	VE3MHZ	146.280	146.880	B	
BRAMPTON	VE3MPC	146.280	146.880	E	
BRAMPTON	VE3MTC	449.450	444.450		
BRAMPTON	VE3SSS	147.880	147.280		
BRANTFORD	VE3TCR	147.750	147.150		
BRANTFORD	VE3XPR	147.990	147.390		
BRIGHTON	VE3LGX	147.765	147.165		
BROCKVILLE	VE3BAT	146.220	146.820	A	80
BROWNSBURG	VE3BOW	146.025	146.625		
BURLINGTON	VE3RAE	146.895	146.295		
BURLINGTON	VE3RAE	449.300	444.300		
BURLINGTON	VE3RSB	147.810	147.210		
BURLINGTON	VE3RSB	449.825	444.825		
CAMBELLFORD	VE3KFR	147.990	147.390		40
CARLETON PLACE	VE3FXE	147.870	147.270	P	
CHATHAM	VE3KCR	147.720	147.120	A E	
CHATHAM	VE3KCR	449.900	444.900	E L	
CHATHAM	VE3SOC	144.810	145.410	E L	
CHATHAM	VE3SOR	144.590	145.190	L33	
CLAIMONT	VE3TNT	144.850	145.450		
COBALT	VE3TAR	146.370	146.970		
COLLINGWOOD	VE3MTR	146.190	146.790	L32	
COLLINGWOOD	VE3MTR	223.280	224.880	L32	
COPPER CLIFF	VE3ZZZ	449.400	444.400		
COPPER CLIFF	VE3ZZZ	449.400	444.400		
CORNWALL	VE3 ?	144.770	145.370		
CORNWALL	VE3SVC	147.780	147.180		

ONTARIO

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
DORCHESTER	VE3NDT	147.840	147.240		
DUNDAS	VE3TTL	223.160	224.760		
DUNVILLE	VE3HNR	147.075	147.675		
DWIGHT	VE3MUS	146.220	146.820	L31	
ELLIOT LAKE	VE3WRR	146.160	146.760	P	
ELLIOT LAKE	VE3WRR	147.600	147.000	Q	60
ELMIRA	VE3EUC	449.700	444.700	Q	
FINCH	VE3SDG	147.840	147.240	P	
FINCH	VE3SDG	223.260	224.860	P	
FINCH	VE3SDG	449.200	444.200		
GEORGETOWN	VE3IZU	52.130	53.130		
GEORGETOWN	VE3OD	147.135	147.735	L	
GODERICH	VE3GOD	147.630	147.030		
GODERICH	VE3WZL	145.610	145.010	A	LOC
GRAND BEND	VE3RGB	146.160	146.760		
GUELPH	VE3ZMG	147.960	147.360		
HALIBURTON	VE3GTS	147.720	147.120		
HAMILTON	VE3DRW	144.890	145.490		
HAMILTON	VE3DRW	223.360	224.960		
HAMILTON	VE3GIV	449.025	444.025		
HAMILTON	VE3MBR	147.105	147.705	A	
HAMILTON	VE3NCF	146.160	146.760	E	
HAMILTON	VE3NCF	449.075	444.075	A	
HAMILTON	VE3RFI	449.750	444.750		
HAMILTON	VE3ROS	146.625	146.025		
HAMILTON (GRIMSBY)	VE3TVI	146.205	146.805	L	
HAMILTON (GRIMSBY)	VE3TVI	448.250	443.250		
HENSALL	VE3OBC	146.310	146.910		
HUNTSVILLE	VE3NMR	146.520	147.120		
INGERSOLL	VE3HOR	147.870	147.270		
IROQUOIS	VE3PTL	145.160	145.760	E A	30
KENORA	VE3LWR	146.430	147.030		
KINGSTON	VE3KAR	146.190	146.790	A	
KINGSTON	VE3KER	146.340	146.940	E	
KINGSTON	VE3LGS	147.945	147.345	D	
KIRKLAND LAKE	VE3KLR	146.280	146.880	O	
KITCHENER	VE3IC	146.865	146.265	B E	
KITCHENER	VE3KSR	146.370	146.970		
KITCHENER	VE3TRS	449.550	444.550		
KITCHENER	VE3XRX	146.190	146.790		
LEAMINGTON	VE3TOM	147.900	147.300		
LONDON	VE3LAC	147.660	147.060		
LONDON	VE3MGI	52.470	53.470		
LONDON	VE3MGI	144.790	145.390		
LONDON	VE3MGI	448.200	443.200		
LONDON	VE3NRN	147.990	147.390		
LONDON	VE3RGM	146.160	146.760		
LONDON	VE3SOL	144.590	145.190	L33	
LONDON	VE3SOV	144.850	145.450		
LONDON	VE3SOV	447.200	442.200		
LONDON	VE3SUE	449.400	444.400		
LONDON	VE3TTT	147.780	147.180	A E	
LONDON	VE3TTT	223.180	224.780	P	
LONDON	VE3TTT	447.300	442.300		
LONDON/LUCAN	VE3MCR	52.010	53.010		
LONDON/LUCAN	VE3MCR	147.600	147.000		
MIDLAND	VE3UGB	146.310	146.910		
MIDLAND	VE3UGB	223.160	224.760	P	
MIDLAND	VE3UGB	449.650	444.650	P	

NEW ICOM IC-735



Ultra Compact

The new ICOM IC-735 is what you've been asking for...the most compact and advanced full-featured HF transceiver with general coverage receiver on the market. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine or base station operation.

Superior Performance

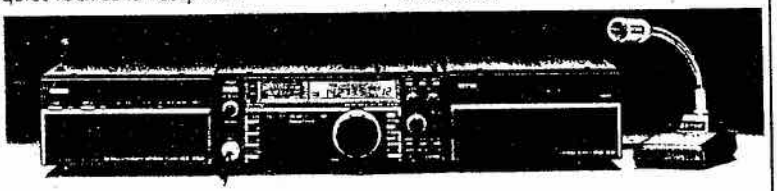
It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel

The large LCD readout and conveniently located controls enable easy operation, even in the mobile environment. Controls which require rare adjustment are placed behind a hatch cover on the front panel of the radio. VOX controls, mic gain and other seldom used controls are kept out of sight, but are immediately accessible.

More Standard Features

Dollar-for-dollar the IC-735 includes more standard features...FM built-in, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.



Options. A new line of accessories is available, including the AT-150 electronic, automatic antenna tuner and the switching PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

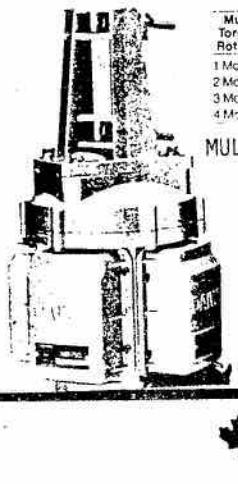
EARLIER ADS INDICATED THE CW FILTER AND KEYER AS STANDARD. IN ORDER TO KEEP THE BASE PRICE LOWER THESE ARE NOW OPTIONAL.

WE'VE GOT 100 OF THE NEW IC-735's ON ORDER. THAT'S MORE THAN THE DISTRUBUTORS ORDER. BECAUSE OF THE LARGE ORDER WE CAN OFFER YOU UNHEARD OF PRICES ON THIS NEW TRANSCEIVER. ORDER YOUR NEW IC-735 NOW. CALL OR WRITE FOR OUR SUPER SPECIAL (TOO LOW TO PRINT) GROUP PRICES ON PURCHASES OF 3 OR MORE. IC-735 LIST PRICE $1149.00 CALL NOW !!

Check These Features:

1. The rotator frame can house up to 4 motors to increase the torque and load capacity of your antenna system.
2. Each motor is equipped with a Super Wedge and Clutch brake system which works independently from the main frame gear train.
3. Maximum brake power is 18,300 lbs/in when 4 motors are installed. The main frame and reduction gear train have been designed to withstand maximum wind loading.
4. The motor unit can be dismantled easily for maintenance if required.
5. A 1½" to 2½" diameter can be installed and aligned easily with the rotator center.
6. Low voltage (24VAC) motors are used to ensure safety during installation work on the antenna tower.
7. Low cost 6-wire control cable can be used for the low voltage motors.
8. The control panel can be removed easily for calibrating the direction indicator.
9. Balanced type control knobs have quick lock mechanisms on both sides.
10. The advanced Super Wedge and Clutch brake system (Slip clutch type) provides exceptional holding power and protects the rotator mechanism from excessive torque

DAIWA



MR-750E/MR-750PE

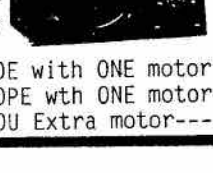
Multi Torque Rotator	Output Torque lbs/in	Brake Power lbs/in
1 Motor	610	5,200
2 Motors	1,200	9,600
3 Motors	1,800	13,900
4 Motors	2,400	18,300

MR-750U Motor For use with MR-750E and MR-750PE Standard Rotators

MULTI-TORQUE ANTENNA ROTOR FROM DAIWA

MR 750E Rotator Standard Model (58 sec/rotation)

MR 750PE Rotator For use with Pre-Set Controller (58 sec/rotation)



CR-4 Manual Controller for use with MR-750E

CR-4P Controller with Pre-Set function for use with MR-750PE Rotators

MR-750E with ONE motor $399
MR-750PE wth ONE motor $439
MR-750U Extra motor----$129

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PA-3 DC-DC Adapter
FNB-2 Nicad Batter
YM-24A Speaker Mic
FBA-2 Sleeve (Char
Service Manual----

LAST CALL ON SOME OF

XF8.2HSN SSB Filte
XF8.2HC 600Hz CW F
XF8.2HCN 300Hz CW
AM/FM Board for FT
XF8.2GA AM Filter
SERVICE MANUAL FT-
FC-102 1.2kW PEP A
FAS1-4R Remote Swi

The following XF8.
FT-901/2 FT101ZD F

XF8.9HC 600Hz CW F
XF8.9HCN 300Hz CW
XF8.9GA AM Filter-

FT-901/2 FM Board-
FA-9 Fan for FT-90

XF8.9KC 600Hz CW F
XF8.9KCN 300Hz CW
XF8.9KA AM Filter
XF10.7KC 2nd IF C
Keyer Board FT-90

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n TT®Pad
freq. entry
memory scan

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----------$32
----------$42
ne---------$39
NB-2/NC-7/8$10
----------$20

ACCESSORIES:
102--------$45
FT-102----$45
r FT-102---$45
----------$99
2----------$39
----------$20
a Tuner---$299
ption-----$115

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FT-107 FT-980
----------$55
r----------$55
----------$55
----------$99
T-101/E/ZD-$29
FT-ONE/77-$35
r FT-ONE/77$35
E----------$35
er FT-ONE--$29
) ONE------$55

ICOM SPECIALS

IC-45A $399

ATLANTIC HAM RADIO LTD. does it again !! We have purchased the remaining stock of IC-45A's and offer you this bargain.....

IC-45A $399.00 Ins S&H $10

This once popular 440MHz FM rig is now available at this special CLEAROUT price The IC-45A covers 440-450MHz has 10Watts output and comes with a TT® mike. It also has 2 VFO's and 5 memories. The IC-45A scans the memories or the band.

LIMITED SUPPLY !!

QUALITY -- VALUE -- PERFORMANCE

KDK presents TWO NEW MODELS to join the popular FM-2033. KDK has one model for each of the amateur bands from 2M to 440MHz. The popular FM-2033 is for 2M, the FM-4033 is the NEW radio just about everybody has been waiting for on 220MHz, and the NEW FM-7033 is the NEW 440MHz model. All these fine radios are models of simplicity of operation. One-hand single-knob tuning and memory recall provide the most convenient method of operating FM mobile All models have automatic recall of the repeater offset from memory, small size for easy mounting (but big enough to be comfortable to use). The KDK-2033 and KDK-4033 are both 25W and the KDK-7033 is 10+W output. The NEW KDK's are the most value packed line of FM mobile available.

ALL MODELS COME WITH UP/DN SCAN TOUCHTONE® MIKE

FM-2033 $339; FM-4033 $349; FM-7033 $369

NEW IN MAY !!

DAIWA LA-2035 2M Amplifier for Handies will be available in a LA-2035/5W Model to take the input from IC-02AT & FT-209RH 5 Watt rigs. So order now !!

LA-2035 up to 3½ watts $109.95
LA-2035/5W----------$129.95
Output for both is 30-35 watts

CONSIDER THE NEW DAIWA ROTOR FOR YOUR NEXT ROTOR PURCHASE ON MULTI-MOTOR SYSTEMS THE TORQUE IS SHARED BY ALL THE MOTORS INSTEAD OF BEING AT ONE SPOT ON THE RING GEAR ! COMPARE TORQUE & BRAKE WITH HAM IV AND TAILTWISTER.....

CHECK THE FEATURES IN THE AD IN THE BOTTOM LEFT CORNER...

DUAL CONTROL ANTENNA ROTOR

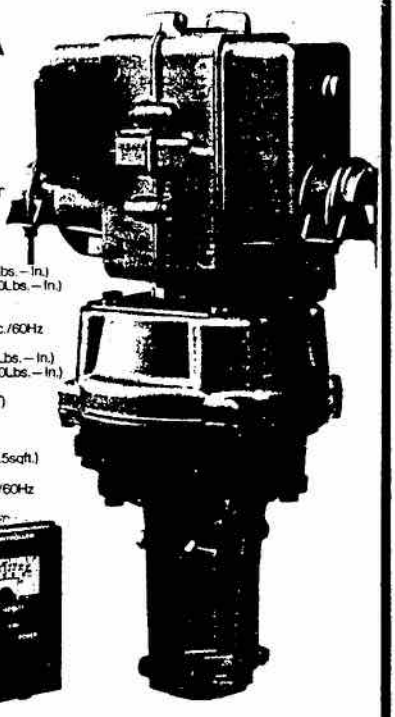
With an interface and RS-232 port on your computer you can let the computer track the satellites.... Interface availability TBA.....

MODEL
KR-5400A

$499.00

Dealer Inquiries invited.

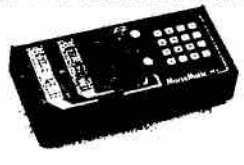
Also available from:
DOLLARD'S RADIO WEST-Vancouver



SPECIFICATIONS
Model: KR-5400A

§ AZIMUTH (KR-400)	
Rotation	: 600Kg.-Cm. (520Lbs.-In.)
Stationary Brake Torque	: 2000Kg.-Cm. (1730Lbs.-In.)
Vertical Load	: 200Kg. (440Lbs.)
End-of-Rotation Stopper	: Mechanical
Rotation Time	: 60sec./50Hz, 50sec./60Hz
§ ELEVATION (KR-500)	
Rotation Torque	: 1000Kg.-Cm. (866Lbs.-In.)
Stationary Brake Torque	: 2000Kg.-Cm. (1730Lbs.-In.)
End-of-Rotation Stopper	: Mechanical
Rotation	: 0° to 180° (+5°/-0°)
Permissible Mast Size	: φ38 – φ63
Permissible Boom Size	: φ32 – φ43
Continuous Operation Time	: Max. 5Minutes
Antenna Wind Load Area	: Less than 0.8M² (8.5sqft.)
Control Cable	: 6 Conductor
Input Voltage	: AC 115/230V, 50Hz/60Hz
Motor (Rotor Unit)	: AC24V
Meter Indication Difference	: ±4°
Weight (Incl. Rotor & Clamps)	: 12Kgs.

MORSEMATIC Advanced Keyer/Trainer



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MM-2 MORSEMATIC was $329 NOW $249

CK-2 CONTEST KEYER $279 NOW $199
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INSURED SHIPPING AND HANDLING: Ontario and East add 2% - MINIMUM $3.50; Manitoba and West add 3% - MINIMUM $4.50; UNLESS OTHERWISE STATED..... IF TWO PRICES ARE SHOWN THE LOWER PRICE APPLIES TO ALL ORDERS WHICH ARE PREPAID BY CASH, CHEQUE, MONEY ORDER, OR BANK TRANSFER. THE HIGHER PRICE APPLIES TO ALL OTHER ORDERS INCLUDING COD, CREDIT CARDS, CHARGES, ETC... FOR INFORMATION OR PRICE REQUESTS PLEASE SEND 64¢ IN STAMPS. THANK YOU..

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ONTARIO

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
MISSISSAUGA	VE3ACN	448.250	443.250	C Q	
MISSISSAUGA	VE3RBW	144.830	145.430		
MORRISBURG	VE3SVR	146.160	146.760		
NAIRN CENTRE	VE3 ?	146.070	146.670		
NAPANEE (BELLEVILLE)	VE3KBR	146.385	146.985		60
NEWMARKET	VE3YRC	147.825	147.225		
NORTH BAY	VE3NBR	147.750	147.150	A	
NORTH BAY	VE3NFM	146.340	146.940	A	
OAKVILLE	VE3OAK	147.015	147.615		
OAKVILLE	VE3OKV	448.150	443.150		
ORANGEVILLE	VE3RSO	146.625	146.025		
ORILLIA	VE3LSR	52.070	53.070		
ORILLIA	VE3LSR	146.250	146.850		
ORILLIA	VE3LSR	147.990	147.390		
ORILLIA	VE3LSR	449.350	444.350		
ORILLIA	VE3ORR	147.810	147.210		
OSHAWA	VE3OSH	147.720	147.120		60
OWEN SOUND	VE3OSR	146.340	146.940		
PEMBROKE	VE3NRR	146.160	146.760		
PENETANG/MIDLAND	VE3PEN	147.750	147.150	E	
PENETANG/MIDLAND	VE3SGB	147.780	147.180	L	
PENETANGUESHENE	VE3MGB	147.780	147.180		
PENETANGUISHENE	VE3 ?	147.960	147.360	P	
PETERBOROUGH	VE3KRA	223.320	224.920		
PETERBOROUGH	VE3PBO	146.340	146.940	A	
PETROLIA	VE3MGK	144.770	145.370		
PICKERING	VE3PIC	146.070	146.670		
PICKERING	VE3SPA	147.975	147.375		
PICKERING	VE3SPA	449.600	444.600		
PORT COLBORNE	VE3WCR	147.900	147.300		
PORT ELGIN	VE3PER	146.220	146.820		
RENFREW	VE3STP	146.460	147.060		
RIDGEWAY	VE3LJJ	147.165	147.765		
RIDGEWAY	VE3NKH	147.765	147.165		
ROSSEAU	VE3YQA	223.340	224.940		
SARNIA	VE3SAR	146.340	146.940		
SAULT STE MARIE	VE3SAP	146.460	147.060	O	
SAULT STE MARIE	VE3SSM	146.340	146.940		
SAULT STE MARIE	VE3YAK	147.750	147.150	A	
SEBRINGVILLE	VE3WHY	144.570	145.170		
SHELBURNE	VE3ZAP	146.220	146.820	L31-2	
SHELBURNE	VE3ZAP	449.925	444.925	L31-2	
SMITHS FALLS	VE3RLR	147.810	147.210	O	
ST CATHERINES	VE3NRS	147.840	147.240		
ST CATHERINES	VE3RAF	147.990	147.390		
ST IGNACE ISLAND	VE3 ?	146.340	146.940	E P	
ST JOSEPH ISLAND	VE3SJI	146.280	146.880	B	
ST THOMAS	VE3STR	147.930	147.330		
STONEY CREEK	VE3VSC	449.650	444.650		
SUDBURY	VE3NRB	146.460	147.060		
SUDBURY	VE3SSI	146.100	146.700	Q	
TEMAGAMI	VE3TEM	146.310	146.910	P	
THORNHILL	VE3NSF	448.550	443.550		
THORNHILL	VE3POT	144.630	145.230		
THUNDER BAY	VE3TBR	146.220	146.820	A B	
THUNDER BAY	VE3TBU	FREQUENCIES UNKNOWN 70 CM			
THUNDER BAY	VE3YQT	146.460	147.060		
TILLSONBURG	VE3TIL	146.655	146.055		
TIMMINS	VE3TIR	146.460	147.060	A	60

ONTARIO

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
TIMMINS	VE3TIS	146.340	146.940	O	
TIVERTON	VE3TIV	146.010	146.610		
TORONTO	VE3ABG	449.675	444.675		
TORONTO	VE3CNT	448.900	443.900	O	
TORONTO	VE3GER	144.770	145.370	L32	
TORONTO	VE3MLZ	449.200	444.200		
TORONTO	VE3MOT	147.780	147.180		
TORONTO	VE3MPU	147.870	147.270		
TORONTO	VE3NOR	448.650	443.650		
TORONTO	VE3NUV	449.500	444.500		
TORONTO	VE3PVT	448.500	443.500		
TORONTO	VE3RPT	147.660	147.060	A L31	
TORONTO	VE3RPT	447.100	442.100	L31H	
TORONTO	VE3SBH	144.550	145.150		
TORONTO	VE3SIS	52.230	53.230		
TORONTO	VE3SIX	52.030	53.030	O	
TORONTO	VE3SKY	146.385	146.985		
TORONTO	VE3SKY	448.100	443.100		
TORONTO	VE3SSB	144.870	145.470		
TORONTO	VE3TDO	146.430	147.030		
TORONTO	VE3TDX	147.930	147.330		
TORONTO	VE3TFM	29.520	29.620		
TORONTO	VE3TNC	147.870	147.270		
TORONTO	VE3TOR	146.340	146.940		
TORONTO	VE3TRO	144.530	145.130	A	
TORONTO	VE3TRO	447.700	442.700		
TORONTO	VE3TTR	223.380	224.980	L32	
TORONTO	VE3TTY	146.100	146.700	A	
TORONTO	VE3TWR	449.400	444.400		
TORONTO	VE3WAS	147.315	147.915		
TORONTO	VE3WHO	144.750	144.350	L31	
TORONTO	VE3YYZ	448.050	443.050		
TORONTO	VE3ZUU	145.230	144.630		
TORONTO/AURORA RIDGE	VE3UHR	449.250	444.250	L32H	
TRENTON	VE3TRN	147.615	147.015		
WALLACEBURG	VE3WAL	146.985	146.385		
WATERLOO	VE3SOK	144.730	145.330	L33	
WATERLOO	VE3WFM	147.690	147.090		
WATERLOO	VE3WWW	146.835	146.235		
WAWA	VE3WAW	146.340	146.940	O	
WELLAND	VE3UHF	449.500	444.500		
WHITNEY	VE3WPR	146.400	147.000	L31	
WIARTON	VE3ERX	146.130	146.730		
WINDSOR	VE3IIE	144.690	145.290		
WINDSOR	VE3III	147.660	147.060	AELT	
WINDSOR	VE3III	449.000	444.000	AELT	
WINDSOR	VE3OOO	223.260	224.860		
WINDSOR	VE3RRR	449.300	444.300		
WINDSOR	VE3SOT	144.870	145.470		
WINDSOR	VE3UUU	449.400	444.400		
WINDSOR	VE3VVV	146.835	146.235		
WINDSOR	VE3WAA	144.510	145.110	A	
WINDSOR	VE3WER	147.795	147.195		
WINDSOR	VE3WIN	147.600	147.000		
WOODSTOCK	VE3OH	147.870	147.270		

MANITOBA

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
ALTAMONT/MIAMI/CARMAN	VE4HS	146.220	146.820		
ALTONA	VE4SMR	146.070	146.670		
BALDY MOUNTAIN	VE4BMR	146.430	147.030		
BIRDSHILL	VE4INT	146.220	146.820		
BRANDON	VE4BDN	146.340	146.940		
BRANDON	VE4TED	146.130	146.730	A T	
FLIN FLON	VE4FFR	146.340	146.940		
GIMLI	VE4GIM	146.250	146.850		
KILLARNEY	VE4KIL	146.250	146.850		
LETELLIER	VE4LET	147.960	147.360		
NEEPAWA	VE4NEP	147.810	147.210		
PINAWA	VE4PIN	146.340	146.940		
THOMPSON	VE4TPN	146.340	146.940		40
WINNIPEG	VE4AGA	52.760	52.525		
WINNIPEG	VE4AGA	147.720	147.120		
WINNIPEG	VE4AGA	449.500	444.500		
WINNIPEG	VE4CNR	146.160	146.760		
WINNIPEG	VE4MAN	146.010	146.610		
WINNIPEG	VE4RAG	147.840	147.240		
WINNIPEG	VE4TTR	223.340	224.940		
WINNIPEG	VE4UHF	449.000	444.000		
WINNIPEG	VE4UMR	147.870	147.270	A E	40
WINNIPEG	VE4WDX	147.780	147.180		
WINNIPEG	VE4WPG	146.460	147.060	A	

SASKATCHEWAN

ANGLIN LAKE	VE5BBI	146.160	146.760		
DUVAL (LAST MOUNTAIN)	VE5AT	146.250	146.850	B	
ESTAVAN	VE5EST	147.780	147.180		
GRENFELL	VE5GRP	146.070	146.670		
ITUNA	VE5ABO	146.310	146.910		
LLOYDMINSTER	VE5RI	146.340	146.940		
MELFORT	VE5RPT	146.280	146.880		
MOOSE JAW	VE5CI	146.340	146.940		65
MOOSE MOUNTAIN	VE5MMR	146.220	146.820		
MOOSOMIN	VE5MRC	146.160	146.760		
NORTH BATTLEFORD	VE5BRC	146.280	146.880		
PRINCE ALBERT	VE5EEE	146.460	147.060	A	
REGINA	VE5ATV	439.250	1253.000	V	
REGINA	VE5KE	146.460	147.060		
REGINA	VE5RAG	146.010	146.610		
REGINA	VE5RRG	147.720	147.120	A	
REGINA	VE5SS	146.280	146.880	A	
REGINA	VE5UHF	449.000	444.000		
ROCK POINT	VE5XW	146.130	146.730		
SASKATOON	VE5SK	146.040	146.640		
SASKATOON	VE5SM	146.370	146.970	A	
SONNINGDALE	VE5SON	146.010	146.610		
SWIFT CURRENT	VE5SCR	146.280	146.880		
WATSON	VE5HV	146.160	146.760	L	
WEYBURN	VE5WEY	146.100	146.700		
YELLOWHEAD	VE5ESK	146.160	146.760		
YORKTOWN	VE5RF	146.280	146.880	C L Q	

ALBERTA

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
ANDREW	VE6JET	146.040	146.640	A	
BANFF	VE6BNF	146.070	146.670	Q	
BEAVERLODGE	VE6XN	146.250	146.850		MR
CALGARY	VE6AID	147.640	147.240		
CALGARY	VE6AUY	146.460	147.060	A	LR
CALGARY	VE6HE	145.440	145.440	A SPX	
CALGARY	VE6NOV	223.340	224.940		
CALGARY	VE6NOV	449.400	444.400		
CALGARY	VE6OIL	146.010	146.610		LR
CALGARY	VE6ONE	449.975	444.975	L A B	
CALGARY	VE6RPT	146.340	146.940	A L	MR
CALGARY	VE6RYC	146.250	146.850		
CALGARY	VE6TWO	147.990	147.390		
CALGARY (KANANASKIS)	VE6ONE	147.630	147.030	P	
CALGARY (MILLARVILLE)	VE6CBI	147.900	147.300		
CLARESHOLM	VE6ROT	146.130	146.730		LR
COLD LAKE	VE6OC	146.460	147.060		
EDMONTON	VE6 ?	439.250	1281.000	V	
EDMONTON	VE6EAR	146.340	146.940	A	MR
EDMONTON	VE6HM	146.460	147.060	A	MR
EDMONTON	VE6MC	146.250	146.850	P	
EDMONTON	VE6PKT	449.000	444.000		
EDMONTON	VE6PMR	146.070	146.670		
EDMONTON	VE6SC	147.960	147.360	A	
ELK POINT	VE6SB	146.070	146.670		
FORT MCMURRAY	VE6TRC	147.600	147.000		
FORT McMURRAY	VE6MAR	146.460	147.060		
GRAND PRAIRIE	VE6OL	146.460	147.060		LR
GRANDE PRAIRIE	VE6GBS	146.340	146.940	A	
HARDISTY/CAMROSE	VE6WW	146.160	146.760		SR
HIGH RIVER	VE3CQM	147.600	147.000		MR
HINTON	VE6YAR	146.160	146.760		
INNISFAIL	VE6SPR	146.370	146.970	L62	LR
LACOMBE	VE6AHW	147.750	147.150	A	
LETHBIRDGE	VE6CCH	146.190	146.790	A	
LETHBRIDGE	VE6CAM	146.280	146.880		MR
MEDICINE HAT	VE6HAT	146.460	147.060		MR
MILK RIVER	VE6BRC	146.160	146.760		
OYEN	VE6CNK	146.340	146.940		MR
PIGEON LAKE	VE6SS	146.280	146.880		LR
RED DEER	VE6QE	146.400	147.000		MR
RED DEER	VE6RCQ	147.780	147.180	A	
ROCKY MOUNTAIN HOUSE	VE6VHF	146.310	146.910	L	LR
THREE HILLS	VE6FUN	146.220	146.820	L62	
WARNER	VE6BBR	146.070	146.670		MR
WHITECOURT	VE6PP	146.220	146.820		
WILLINGDON	VE6RJK	146.190	146.790		

BRITISH COLUMBIA

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
100 MILE HOUSE	VE7RKM	146.220	146.820	P	
???	VE7RAM	146.040	146.640		
BURNABY	VE7BYL	448.150	443.150		
BURNABY	VE7CFK	147.960	147.360		
BURNABY	VE7RMS	144.610	145.210	P	
BURNABY (BURNABY MTN)	VE7RBY	144.750	145.350		
BURNABY (EAST VANCOUVER)	VE7FVR	147.660	147.060	A	

BRITISH COLUMBIA

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
CHEMAINUS	VE7RMT	144.850	145.450	L72	
CHILLIWACK	VE7ELK	146.400	147.000		
CHILLIWACK (VEDDER MTN)	VE7RCK	147.700	147.100		
COQUITLAM	VE7RCH	146.000	146.600		
COURTENAY (MT.WASHINGTON)	VE7RCV	146.310	146.910		
CRANBROOK (EAST KOOTENAY)	VE7CAP	146.340	146.940		80
CRESTON	VE7RCA	146.200	146.800		
DAWSON CREEK	VE7RSP	146.280	146.880		
DAWSON CREEK (BEAR MTN)	VE7RDC	146.340	146.940		
FORT FRASER	VE7RFF	147.630	147.030		
FORT NELSON	VE7RFN	146.340	146.940	?	
FORT ST. JOHN	VE7RSJ	146.460	147.060	A	
FORT ST. JOHN	VE7RSJ	445.100	438.100	L	
FORT ST. JOHN	VE7RTR	438.100	445.100	L	
HANEY (MAPLE RIDGE)	VE7RMR	146.200	146.800		
HANEY (MAPLE RIDGE)	VE7RMR	448.625	443.625		
HOPE	VE7 ?	147.940	147.340		
HOPE	VE7RTN	147.990	147.390		
KAMLOOPS (DUFFERN MTN)	VE7KAR	146.340	146.940	A	
KAMLOOPS (GUNSTONE MTN)	VE7RKA	146.250	146.850	L	
KAMLOOPS (MT LOLO)	VE7 ?	146.360	146.960	UNKNOWN	
KELOWNA	VE7ROC	146.400	147.000	A	
KELOWNA (OK MTN)	VE7ROK	146.220	146.820	A	
MACKENZIE	VE7 ?	146.040	146.640	P	
MANNING PARK	VE7MPR	146.460	147.060	L71	
MASSET	VE7MAS	146.370	146.970		
MASSET/SANDSPIT	VE7RQC	146.340	146.940		
NANAIMO	VE7ISC	146.040	146.640		
NANAIMO	VE7RNA	144.830	145.430	A L71	
NELSON	VE7RCW	146.340	146.940	A	
NELSON (CRAWFORD BAY)	VE7BTU	146.460	147.060		
NELSON (SLOCAN RIDGE)	VE7RCT	146.040	146.640		
NEWCASTLE RIDGE	VE7RNC	146.080	146.680	B L71	
OLIVER/OSOYOOS (MT KOBAU)	VE7OKN	146.340	146.940		
PENTICTON	VE7RAP	147.120	147.720	D	
PENTICTON	VE7RPC	147.720	147.120		
PENTICTON (APEX MTN)	VE7RTO	146.100	146.700		
PORT ALBERNI	VE7 ?	449.750	444.750		
PORT ALBERNI	VE7RAC	147.840	147.240	B L71	
PORT ALBERNI	VE7RPA	147.750	147.150		
PORT HARDY (SHELLY MTN)	VE7RNI	146.340	146.940	A L71	
PRINCE GEORGE	VE7RTI	52.525	52.525	LP ?	
PRINCE GEORGE	VE7RTI	147.930	147.330	LP ?	
PRINCE GEORGE	VE7RTI	449.900	444.900	E ?	80
PRINCE GEORGE (PILOT MTN)	VE7AFG	146.340	146.940	E A	160
PRINCE GEORGE (TABOR MTN)	VE7RPG	146.280	146.880		
PRINCE RUPERT	VE7RPR	222.980	224.580		
PRINCE RUPERT (MT HAYES)	VE7RPR	146.280	146.880	A	
QUESNEL (DRAGON MTN)	VE7RQL	146.460	147.060		
RICHMOND	VE7RMD	147.740	147.140		
RICHMOND	VE7RMD	448.750	443.750		
SALMON ARM	VE7RNH	146.160	146.760		
SALT SPRING ISLAND	VE7RSI	147.930	147.330		
SATURNA IS (GULF IS)	VE7RVC	146.080	146.680	L71 P	
SMITHERS	VE7RBH	146.280	146.880	?	
SMITHERS	VE7RHD	146.460	147.060		
SORRENTO	VE7 ?	146.040	146.640	P	
SQUAMISH (BLACKCOMBE MTN)	VE7RDP	144.570	145.170	L72	

BRITISH COLUMBIA

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
SURREY	VE7RPM	449.200	444.200		
SURREY	VE7RSE	147.640	147.040	P	
TERRACE	VE7RDD	146.340	146.940	E	
TERRACE	VE7RDM	146.460	147.060		
TERRACE (COPPER MTN)	VE7RTK	146.250	146.850		
TRAIL	VE7RBV	147.930	147.330	A	
TRAIL (RED MTN)	VE7CAQ	146.240	146.840		
VANCOUVER	VE7 ?	448.725	443.725		
VANCOUVER	VE7 ?	449.925	444.925		
VANCOUVER	VE7AYT	447.975	442.975		
VANCOUVER	VE7BHY	448.900	443.900		
VANCOUVER	VE7ESR	144.890	145.490	L72	
VANCOUVER	VE7RAP	449.975	444.975		
VANCOUVER	VE7RPT	448.525	443.525		
VANCOUVER	VE7UHF	448.800	443.800		
VANCOUVER	VE7URG	449.000	444.000		
VANCOUVER (HOLLYBURN RDS)	VE7VAN	147.720	147.120		
VANCOUVER (MT SEYMOR)	VE7RAG	147.620	147.020		
VANCOUVER (MT SEYMOR)	VE7RBC	146.120	146.720	T	
VANCOUVER (MT SEYMOR)	VE7RPT	146.340	146.940	A	
VANCOUVER (MT SEYMOR)	VE7RPT	222.700	224.300		
VANCOUVER (MT SEYMOR)	VE7WRS	147.870	147.270	D	
VANCOUVER (MT SEYMOR)	VE7WRS	448.850	443.850		
VANCOUVER (UBC)	VE7RHS	144.670	145.270		
VANCOUVER NORTH	VE7BYL	223.200	224.800		
VANCOUVER NORTH	VE7GTC	447.325	442.325		
VANCOUVER NORTH	VE7RDX	147.900	147.300		
VANCOUVER NORTH	VE7RTM	449.925	443.925	D	
VANCOUVER NORTH	VE7RTY	146.100	146.700	R	
VANCOUVER NORTH	VE7TOK	146.060	146.660		
VANCOUVER NORTH	VE7TOK	449.900	444.900		
VERNON	VE7RSS	146.280	146.880	L	
VERNON (PSBL FREQ CHNG)	VE7RVN	146.460	147.060	A	
VICTORIA	VE7BEL	223.300	224.900		
VICTORIA	VE7FCR	448.575	443.575		
VICTORIA	VE7RTC	448.950	443.950		
VICTORIA	VE7VIC	449.875	444.875		
VICTORIA	VE7RCU	144.570	145.170	L72	
VICTORIA (MT McDONALD)	VE7RSR	144.810	145.410		
VICTORIA (MT McDONALD)	VE7VIC	146.240	146.840	A	
WHONNOCK	VE7RRR	144.910	145.510		
WILLIAMS LAKE	VE7DSO	147.975	147.375	L	
WILLIAMS LAKE	VE7RWL	147.720	147.120		

YUKON/NORTH WEST TERRITORIES

LOCATION	CALL	INPUT	OUTPUT	STATUS	RANGE
FORT SMITH	VE8RDP	145.170	144.570		80
FROBISHER BAY	VE8 ?	146.340	146.940		
HAY RIVER	VE8HR	146.280	146.880		
HAY RIVER (CHANGE MID 85)	VE8HR	146.010	146.610		
WHITEHORSE	VY1RBW	146.280	146.880	A B E	60
WHITEHORSE	VY1RPT	146.340	146.940	A B E	120
YELLOWKNIFE	VE8YK	146.340	146.940	A P	80

Social Events

SASKATCHEWAN HAMFEST '85

The annual Saskatchewan Hamfest will be held in Regina on Aug. 2, 3 and 4, 1985. Highlight of the event will be the discussion of new Amateur licensing requirements by Robert Jones, Director of Operations, Dept. of Communications.

A number of technical sessions have been planned including a DX Forum with Tom Wong VE7BC, Antenna Designs with Tex Galpin VE4AB, Amsat Oscar program with Gordon Wightman VE5XU, and many more.

There will be an outdoor flea market, contests, non-Amateur programs, displays, and presentations by CARF and CRRL.

Activities begin Friday evening with a wine and cheese reception. Major events run all day Saturday concluded by a banquet, address, awards and dance Saturday evening. Sunday will be the culmination of all activities.

For registration and further information please contact the Regina Amateur Radio Association, P.O. Box 153, Regina Sask, S4P 2Z6.

Proceeds go toward the continued development of our club station— listen for VE5NN or CH5NN, our special call for Hamfest and to commemorate Heritage Year and the 100th Anniversary of the Riel Rebellion.

More from Bill VE5AEJ, 44 Flamingo Cres., Regina, Sask. S4S 0E9.

VE3CNE

VE3CNE will be operating once again at the Canadian National Exhibition, from Aug. 14, 1985 to Sept. 2, 1985. For the third year in a row this display is being organized and mounted by the Toronto and district presidents' council, with financial support from Amateur Radio Clubs from the province of Ontario plus CARF, RSO and CRRL. In addition to the display, Amateurs will provide communications for the Warriors Day parade and the Opening Day parade. The booth last year was large and very striking. Amateurs are invited to participate in this event, and those volunteering well in advance will be given free admission to the CNE grounds. Any Amateurs who just drop by the display will be welcome to operate the equipment which last year consisted of two HF stations, a 2M station, and a CW RTTY station, complete with computer.

If any individuals or clubs are interested in participating please contact Stan Treeby VE3HT, staffing co-ordinator, 104 Cottonwood Drive, Don Mills, Ont. M3C 2B4, Telephone (416) 444-0318.

ELEVENTH ONTARIO HAMFEST

Milton Fairgrounds, Saturday July 13 1985, hosted by Burlington Amateur Radio Club. $3000+ in prizes, and Superprize: complete outfit— Icom 745 transceiver, power supply, microphone and automatic antenna tuner. Preregister prior to June 15 by sending $3 to Ontario Hamfest, P.O. Box 836, Burlington, Ont. L7R 3Y7. Campsite $10.00. Superprize tickets $2.00. △

CALENDAR

June 14, 15, 16: CARF AGM. Park Lane Hotel, Ottawa.
June 19: DOC licence exam.
June 21, 22, 23: RCN Reunion, Hotel Nova Scotian, Halifax. Write P.O. Box 297, Dartmouth B2Y 3Y3. Details January *TCA*.
June 27-30: YLISSB Convention, Sugarloaf/U.S.A. Write P.O. Box 805, Presq'ile, ME. 04769. Details January *TCA*.
July 1: Canada Day Contest and Parks Canada centennial.
July 13: 11th Ontario Hamfest, Milton fairgrounds. Details June *TCA*.
July 27-28: Okanagan International Hamfest, Oliver Centennial Park, Oliver, B.C. Details May *TCA*.
July 27 and 28: 33rd Annual Pacific North West DX Convention, Richmond Inn, Richmond B.C. Details April *TCA*.
Aug. 2, 3, 4: Saskatchewan Hamfest '85. Details June *TCA*.
Aug. 14-Sept. 2: VE3CNE operates from the Canadian National Exhibition. Details June *TCA*.
Sept. 27-29: RSO/CRRL Convention, London, Ontario. P.O. Box 73, Hyde Park N0M 1Z0. Details January *TCA*.
October 16: DOC licence examination.

Publicize your get-together here. Write the Editor, TCA, P.O. Box 855, Hawkesbury, Ontario K6A 3C9.

Larry VE3FXQ and Wib VE3NID at VE3CNE '84.

YL NEWS & VIEWS

By Cathy Hrischenko VE3GJH

Elsie Thompson VE6YW is a YL I've been in touch with and admired for many years. Elsie has a most interesting background.

Her radio history actually starts about 1920, when her husband Frank saw an article about radio in a *Popular Science* magazine, and thought what a great thing that would be for them, on the homestead. The nearest broadcast station to them was in Seattle, Washington, (U.S.A.). He wrote for the information. Much to

his dismay he found the receiver would cost $240 from Seattle, plus duty and shipping. That made it out of reach— that was a fortune! Frank haunted the magazine rack whenever he got to town, about 26 miles, and it was reached by horse or the ole tin lizzie.

Finally he found a 'diagram' for building a receiver. He scrounged brass strips and all sorts of junk. He bought a 'peanut' tube, socket, headset, condenser, etc. and was ready to receive, by the time CJCA started broadcasting in 1922. In the next couple of years, Frank built 14 sets for neighbours.

In 1927 they sold the farm and moved into Barrhead. They became International Harvester agents and handled radios as a sideline. About ten years later they acquired an all-band receiver and discovered 'hams.' They began listening more to them than they did the programmes.

By 1938 they had radio repairmen working for them. They all decided they would study for their licence and try to get a rig. They found a used Ham rig for sale in southern Alberta and ordered it— sight unseen! When it arrived they were a bit shocked. It was a big set, although good. The cabinet was rough, unplaned lumber, with a backing of chicken wire and looked as though it had been stored in some old shed for many moons. George, the main radio man, took it completely apart and rebuilt it. A pole was put up and now they were going to have a real 'ham shack.'

By then it was the fall of 1939 and war broke out, so that stopped further attempts of getting on the air.

Frank became ill in 1944 and sold the business. He then proceeded to get his licence. He built a transmitter and bought a surplus Bendix TA12G and received his call VE6PS in 1949. (He's now a Silent Key.)

In 1951 Elsie got her call VE6YW. She had been interested all those years. She'd been watching and helping Frank build radios and started to study the code and theory. Her first contact was with VE6PR. She said, "I took the exam here at home. Frank was surprised I was answering the question the R.I. was giving me." At the end the R.I. said to me, "What would you do if something went wrong with your rig while you were operating?" She told the truth. She said, "I'd pull the switch and call Frank. If he wasn't here I'd find a serviceman." She passed the CW, diagrams, the whole thing and went on the air for the first time at the age of 56. Elsie is a procrastinator and delayed trying for her advanced until 1969 and at 74 years she passed her advanced.

A family joke was that she won the high CW score for VE6 area in the YLRL Anniversary party for 1958-59 and 60. She says, "It was a rather doubtful honour, as I was the only YL from Alberta to enter the Contest." Frank took pains to remind everyone of this, when the subject came up. She also received YL Century Award and DX-YL with four seals. She was also active on the 'hair pin net.'

Another interest Elsie has is the preservation of the history of her area. When the Barrhead and District Historical Society was formed in 1962 they started researching the history of the local people. They had two centennial projects. One to write a book on the history of the area, and the other to build a museum. Both were accomplished. The book *Trails Northwest* was a lot of work, but most interesting.

Elsie has achieved many things in her life, thus far. I'd like to wish a Happy 90th Birthday, Elsie, on May 31 (our 34th wedding anniversary). Let's go for the big 100!

That's it for this time. Δ

73/33/88 as the case may be.—

Cathy VE3GJH

ANNUAL MEETING

CARF's Annual General Meeting and Board of Directors Meeting will be held in the Park Lane Hotel, Ottawa, Ontario, on June 14, 15, 16.

Beginner? Want help? Write CARF.

MICROWAVES

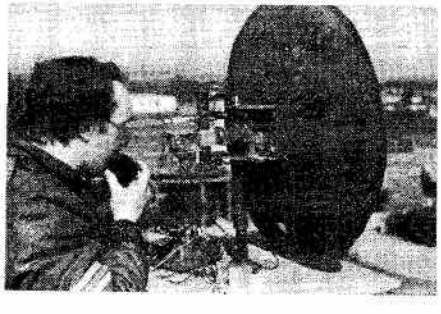
By Michael Ross VE2DUB 988 Hudson,
St. Bruno, Quebec J3V 3Y2

Last month we discussed microwave beacons and their use as reference signals and propagation indicators. In this month's column I will describe a beacon for the 10 GHz band using a surplus microwave motion detector source, a simple modulator/power supply and a tape player.

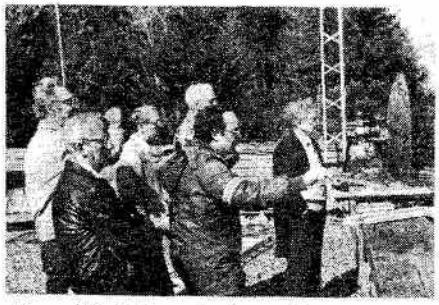
The heart of the beacon is a SOLFAN microwave head containing a Gunn diode and a mixer diode. These can sometimes be found at flea markets or may be obtained from local home security outfits. The motion detector is tuned to a frequency counter; find someone with a Gunnplexer and use his receiver to get in the Amateur band. Set the brass screw SLOWLY. Keep turning until the receiver S meter is pinned. Don't be satisfied that you are on frequency with any of the lesser signal readings you obtain at close range.

Once you have found your signal, tighten the locknut firmly in place. Electrical tuning using the 10 K pot can now be used to fine tune the frequency.

The power supply/modulator unit originally appeared in July 1984 *CQ Magazine* by WB5MAP as a video modulator for 10 GHz. Tests with audio input produced the desired FM modulation of the Gunn Diode when driven by the output of a tape player. An endless loop tape with voice and CW ID completes the system. Power supply requirements are 12 V at 150 mA for the beacon and whatever it takes for the tape player. A battery or well-filtered supply should be used to eliminate hum modulation. Control circuitry could be added to disconnect power to the beacon if required.



Pipewrench radio.



You didn't have to homebrew the key, Robert!

The beauty of this modulator is in its simplicity and that the parts cost less than 10¢ even if all are purchased brand new. Note that the coil and 470 pF capacitor can be omitted. Feed the audio in the subcarrier input. The video input can also be used if two audio sources are desired.

To add receive capability, just connect a piece of coax from the mixer diode output to the receiver input. Any two FM receivers tuned to the same frequency will allow full duplex communication, with the microwave oscillators offset by the receiver frequency. A 30 MHz receiver would make it compatible with the ARR 30 MHz board, commonly used with the Gunnplexer transceiver. A 10.7 MHz receiver may also be popular, depending on the standard adopted in your area. Check with stations already on the air first.

For those of you interested in the ATV application of the modulator, substitute a video source for the tape recorder and connect the mixer diode to the VHF input terminals of a TV set. Range will be reduced due to the greater bandwidth of the TV signal but communication over a few miles should be possible, depending on antennas used. See the entire article in July 1984 *CQ* for more details.

Frank Merritt VE7AFJ reports on 10 GHz activity from *Static*, the monthly publication of the Nanaimo Amateur Radio Assn. (see box). Photos by VE7AFJ.

Frank also reports the electronics in his own 10 GHz system to be 95% complete with three or four additional stations to be activated in Nanaimo. Any reports of microwave activity are welcome for inclusion in this column. △

X-BAND DEMONSTRATION

Robert Skegg VE7AII brought his x-band equipment to Malaspina College, Nanaimo, B.C. on March 16 and demonstrated it to VE7AXX, VE7FPO, VE7DJC, VE7DGI, VE7GBL and VE7AFJ.

He set the rig on top of the Physics building and ran a sked with Peter Talbot VE7CVJ, on a mountaintop near Vancouver, some 50 miles (80 km, Carlo) across the Strait of Georgia.

At x-band, equipment is homebrewed. The business end of the rig is a salvaged paraboloid fed with 5 mW from a $2 Gunn diode— antenna gain about 30 dB. All power was derived from a small gel-cell battery.

— VE7AFJ

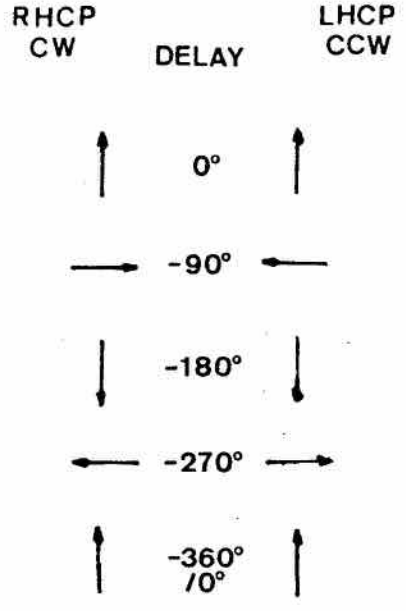
Please, teacher, what's a Gunn diode? Bob gave a fascinating 2½ hour lecture on x-band technology.

VHF/UHF

By Bob Morton VE3BFM
8 Thornbay Dr., RR 2
Stouffville, Ont. L0H 1L0

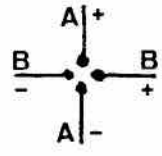
In my first article on circular polarization, I discussed the helical antenna. As mentioned then, crossed linearly polarized yagis can also be fed to provide circular polarization.

The definition of right-hand circular polarization as standardized by the IRE is: "For an observer looking in the direction of propagation, the rotation of the electric field vector in a transverse plane is clockwise for right-hand polarization." For left-hand circular polarization, the rotation is counterclockwise.



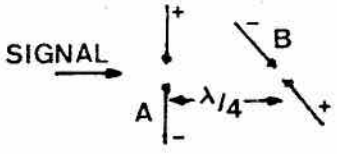
Consider two dipoles mounted in the same plane at 90° to each other with the feed points almost touching.

A signal of right-hand circular polarization into the page arriving at these dipoles would first maximize on dipole 'A' ↑ ; A quarter wavelength or 90° later the incoming signal will now be cross polarized on dipole 'A' but maximum on dipole 'B' → . Similarly, another 90° later will be maximum on 'A' ↓ , and then 90° later on 'B' ← . This is for clockwise or right hand circular. To properly phase the signals, a 90° delay is built into the coax connected to dipole 'A'. This will now peak the signal received on it with the peak signal of dipole 'B'.



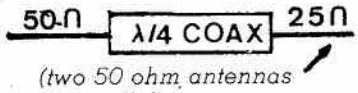
If left-hand circular polarization is desired, simply add an additional half-wave of coax to the 90° delay of coax from dipole 'A'. A signal arriving at dipole 'A' will be delayed 270° before it is combined with the maximum signal from dipole 'B'.

This method is commonly used if two separate yagis of the same type are combined. If space is a problem, then a single boom can be used with the elements mounted perpendicular (90°) to each other. An offset now occurs if thru-the-boom elements are used since they both cannot go through the same place on the boom. A 1" offset is allowable on VHF but on UHF this will start to cause phasing errors, because the 0° electrical spacing now becomes 10° - 20° - or more. This will cause the pattern to go from circular to an elliptical shape unless this phase difference is calculated and added or subtracted to the coax phasing harness.



Another common way to solve this is to space the horizontal and vertical yagi elements a quarter wavelength apart on the boom. A right-hand circular signal coming into this part from the left will first maximize on 'A', 90° later the incoming signal will be cross polarized at 'A' and then because of the λ/4 spacing between dipoles, will maximize on 'B' 90° later; total delay 180°. If the + part of dipole 'A' is connected in phase with the — part of dipole 'B', then right hand circular polarization is achieved. For left-hand circular simply add 180° or a half-wave of coax to either dipole.

Paralleling two 50 ohm dipoles yields 25 ohms. To properly match these impedances, the following method can be used:



(two 50 ohm antennas in parallel)

$$Z_o \text{ COAX} = \sqrt{50 \times 25} = 35\ \Omega \text{ (RG83)}$$

The electrical length is 90° but the physical length is 0.659 times (for polyethylene) the calculated free space quarter-wave length.

$$\frac{\lambda}{4}\text{COAX} = \frac{11811 \times .659}{F(\text{MHZ})}\ \text{IN}$$

(Inches x 2.54 = cm, Carlo.)

Just how much gain you need in a circular antenna depends on who you want to communicate with. For very local communications, not much gain is required (you may not even need a circular antenna). For 2M communications up to 100 miles, the benefits of circular polarization start to be realized, especially if you use both vertical for FM plus horizontal for CW and SSB, and only use a single feedline.

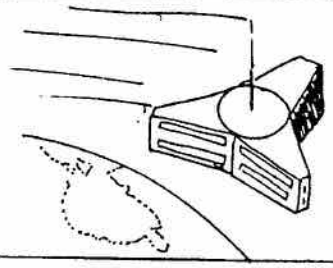
For satellite and moonbounce communications, as mentioned in a previous article, the benefits are rewarding.

I'll go into path loss and receiver sensitivity in my next article and from that we will determine just how much gain will be required to make a contact.

Reference:
'Antenna Engineering Handbook' Jasik, Chapter 17— 'Methods of Obtaining Circular Polarization' by OFFUTT, DeSIZE and YALE. Δ

AMSAT NEWS

By Gordon Wightman VE5XU
3637 Victoria Ave.
Regina, Sask. S4T 1M4



A-10 Spring Schedule Unveiled

AMSAT has announced a new operating schedule for AO-10 which will go into effect at 0000 UTC on April 1, 1985. The new schedule responds to the changes in sun angle now being experienced. It also includes provisions for thermal considerations which will become increasingly important as the season wears on.

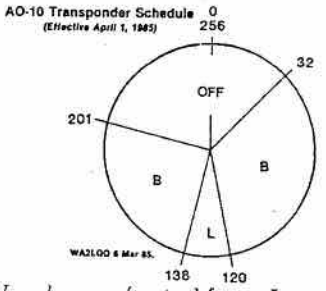
The new schedule is shown in the figure. The mean anomaly points for switchover are:

032 - 119 Mode B
120 - 137 Mode L
138 - 200 Mode B
201 - 031 Off

In order to begin maneuvering immediately, the operating schedule was modified slightly on Mar. 5 '85. That modification changed the Mode B startup time from 15 to 32. According to AO-10 command station VE1SAT, the change was required to provide the electrical energy for the torquing magnets.

Magnetorquing is a technique for spacecraft attitude adjustment which uses pulsed electromagnets in the 'arms' of the spacecraft. The field created by the electromagnets interacts with the geomagnetic field to produce a torque. Pulsing the magnets in a precisely timed sequence can change the orientation of the spacecraft. In effect, the satellite and the geomagnetic field form a motor wherein the spacecraft is the rotor and the geomagnetic field is the stator. Because the strength of the geomagnetic field varies with (among other factors) distance from the earth, it is most effective to pulse the magnetorquers at or around perigee. Thus the need to keep the transponders off slightly longer (from 15 through 31).

According to VE1SAT it would take about two days beginning Mar. 5 to change the orientation of AO-10 to its holding pattern for the month of March, 150 degrees longitude in the orbital plane. It had been at 131 degrees. By Mar. 6, KA0OOQ had noticed improvements in Mode B performance around apogee. This was interpreted as corroboration that the maneuver was working and was having the desired effect.



Numbers refer to Mean Anomaly. Perigee = 000. Apogee = 128. To convert to minutes of time multiply by 2.732.

VE1SAT told AMSAT's Newsletter, *ASR*, the operating schedule had been developed in consultation with DJ4ZC and W3GEY and represented a compromise between optimum operating time and schedule stability. Other key milestones pointed to by VE1SAT were as follows. By April 1, the attitude of the spacecraft shall be 170° and excellent operating conditions should have largely returned. The difficulty of working stations to your east will have largely mitigated by this time says VE1SAT. This was due to AO-10 antenna pointing.

By May 1 the longitude of the spin (Z) axis will be 180°. At this point the spacecraft will be pointing directly towards the geocenter at apogee. This point, called apogee nadir pointing, should provide a perfect balance between east-west QSO ease. However, as spring ebbs into summer, the spacecraft will head towards its most difficult era yet. This will be a time of very serious eclipses and perfectly miserable sun-angles. The spacecraft is expected to emerge from the late summer travail unscathed, but it will take some skillful stewardship on the part of VE1SAT and the rest of the command team to set the appropriate geometry, thermal and energy balance. According to VE1SAT, if we are imprudent here, we may wind up freezing the batteries. To absorb more solar radiation (especially infrared for heating), the spacecraft will be maneuvered in increments past the 180° optimum attained in June. By July 1 it will be set at 190° but the operating schedule will remain unchanged. Between July 1 and Aug. 1, the spacecraft will be reoriented from 190° to 230°.

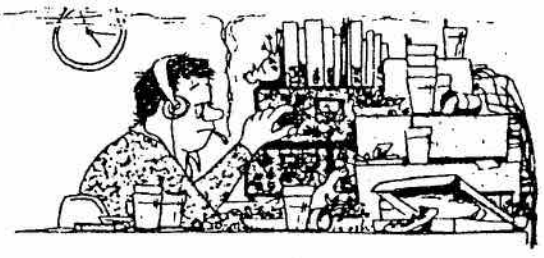
The major series of eclipses commences on Aug. 4 and lasts until about Sept. 1. The eclipses will occur on each orbit from MA 75 to about 128. A transponder operating schedule change is likely to be required during this period to reduce risk. During this period QSOs to the east will be easier than those to the west. The satellite will be oriented so as to favor stations looking towards the satellite from west of it. This is opposite of the situation which existed late in 1984 and early in 1985 when AO-10 favored stations to its east.

In sum, the next three months may provide some of the best operating on AO-10 this year. By late summer the poor sun angle will be the dominant consideration and determine much of the operating characteristics of the satellite. Δ

— ©*Amateur Satellite Report*

CONTEST SCENE

By John Connor VE1BHA



Jun 22/23— Field Day
Jul 13/14— IARU Radiosport
Jul 20/21— CQ WPX VHF Contest

Well, gee. When I took this job, nobody told me that people were going to yell at me. But lately a fair number of people have been doing just that. It seems that they have not received certificates for various CARF sponsored contests in the past few years. I apologize for this. However, I do not presently have anything to do with either log checking or certificate issuing. But I will try to see that this problem gets straightened out. So if you haven't received a certificate from a past contest, let me know and we shall see what can be done about it.

At this time of the year, the contest news gets a bit slow. I have no results to report this month, and not really much in the calendar to talk about. But fear not! In order to keep you occupied for a while, we gleefully present our (possibly First Annual) Fiendishly Difficult Contester's Quiz.

So, sharpen up your pencil and put on your thinking caps. In order to avoid getting more people mad at me, I will NOT be offering prizes, hi!

FIENDISHLY DIFFICULT CONTESTER'S QUIZ (FDCQ)

1. In which CQ zones could a station operating at the geographic south pole claim to be in? (HINT: There are seven possibilities.)
2. In the CQ WW Contest, you work the following stations on 20M. How many zone and country multipliers do you score? ST2SA, HZ1HZ, FP8AP, RG6G, 6T1YP.
3. Name the North American French DXCC countries.
4. Who holds the Canadian Single Operator, All Band record in the CQ CW Contest? What was his previous callsign?
5. How many CQ zones are there in Canada?
6. Who holds the world Multi Multi record in the WPX SSB Contest?
7. Who was the first person to break one million points in the ARRL DX Competition? In what year?
8. What is (probably) the longest call sign ever used in a contest, excluding portable callsigns? (HINT: It was used in Guatemala.)
9. How many DXCC countries are there whose prefix begins with the letter 'O'.
10. How many Sweepstakes multipliers are there in the fifth U.S. call district?
11. What ITU zone is New Brunswick in?
12. A certain well-known contester and DXer has used these call signs over the years... HI8XAL, HS1ABD, HS5ABD, LU5HFI, HK3NBB and K3ZO. What is his name?
13. On what frequencies would you look for the following countries on 80M SSB? JAs? VKs? USSR?
14. What was the lowest score ever made in a CQ contest?
15. Spell 'Missisippi.'

ANSWERS TO THE FDCQ

The answers to the quiz are given below, with the point value for each question. Maximum possible points is 50.

1. 12, 13, 29, 30, 32, 38 or 39 (7 Points).
2. Zones 34, 21 and 5 plus 5 countries for eight multipliers and 8 points.
3. FG, FM, FP, FS, and FO Clipperton for 5 points.
4. VE3IY, who used to be VE3EDC. (2 points)
5. Zones 1, 2, 3, 4 and 5 for 5 points.
6. NP4A (1 point)
7. Juan Lobo y Lobo, XE1A in the 1957 CW DX Competition made 1,281,702 points. (2 points)
8. TG0FRACAP (1 point) (Anybody got one to beat that?)
9. OA, OD, OE, OH, OH0, OJ0, OK, ON, OX, OY and OZ (11 points)
10. Seven (1 point)
11. Zone 9 (1 point)
12. Fred Laun (1 point)
13. JA on 3793-3803 kHz, VK on 3690-3700 kHz and USSR on 3640-3650 kHz (3 points)
14. An OY worked several other OY stations and made zero points a few years back. (1 point)
15. No, that's wrong. It should be 'Mississippi.' (1 point)

Well, I said it was fiendishly difficult, didn't I? I don't know about you, but that's all the excitement that I can stand for one month. Next month, we will hopefully have some results to print, and will also tell you about a new contest— the CQ WPX VHF contest. Don't forget the Canada Day Contest, which takes place on Canada Day, July 1. (Pretty clever, isn't that?) Δ

The Bluewater ARC had their local Recreation Department publish their name and repeater frequencies in their Directory. The Goderich *Signal Star* publishes their information, too, occasionally. The club suggests that flea markets should open at 10:00 local rather than 0800, allowing those driving a long way to get there to have an equal chance at the best pickings.

— Bruce VE3EAR

Thanks to those Amateurs who have sent the Editor copies of their letters to their M.P.'s.

Canada Day Contest

CANADA DAY CONTEST
July 1 1985, 0000Z to 2400Z.

These contests are open to all Amateurs. Everybody works everyone on 160 metres through to 2 metres in both CW and Phone.

Classes:
Single operator, all bands.
Single operator, single band.
Multi operator, all bands.

Contacts: All contacts between Amateur stations are valid. The same station may be worked twice on each band, once in CW and once on Phone. No cross-mode QSO's allowed.

Exchange: Signal report, Consecutive serial numbers, Province.

QSO Points: 10 points for each Canadian station, 4 points for stations in other countries. VE0 counts as Canada and 1 multiplier, + 20 points may be claimed for each contact with a CARF official station that uses the suffix TCA or VCA. That means an official station counts 10 plus 20 points bonus for a total of 30 points.

Multipliers: Total of Canadian Provinces and Territories worked on each band on each mode, i.e. VO1/VO2, VE1-NB, VE1-NS, VE1-PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VE0, VY1. Total of 26 per band using both modes.

Frequencies, kHz:

1810/1840	21025/21250
3525/3775	28025/28500
7025/7070/7155	
	50040/50110
14025/14150	144090/146520

We suggest phone on the hour and CW on the half hour.

Entries: A valid log must contain log sheets, dupe sheets or statement, and a summary sheet showing claimed scores, QSO's, a list of multipliers and calculation of claimed scores. Summary and Multiplier sheets are available for a SASE. Entries must be mailed within one month of the contest, with your comments and photos, etc. to:

CARF CONTEST
c/o N. Waltho VE6VW
Box 1890, Morinville,
Alberta T0G 1P0

Awards: Certificates will be awarded to top scoring entries in each class in each province, territory, U.S.A. and DXCC country. Trophies will be awarded to the top single-op all band and Multi-op all band stations.

Results: Results will be published in *TCA* prior to the next contest. Non-members of CARF may wish to include a SASE with their entry for a copy of the results. The decision of the contest committee shall be final in all cases of dispute.

NOTE: PARKS CANADA DAY NET. A 50 point bonus will be awarded to any Amateur that provides communications for Parks Canada from a National Park during the Canada Day Contest 85. A 50 point bonus will be awarded to any Amateur who uses the special prefixes for the National Parks Centennial during the Canada Day Contest 85.

'73, Norm Waltho VE6VW.

CONCOURS "CANADA DAY"
00:00 TU A 24:00 TU 1er juillet chaque année.

Ce concours est accessible à tous les radioamateurs, qui auront réalisé un QSO sur les bandes comprises entre 1810 et 146520 kHz en graphie et en phonie.

Classe D'Opérateurs:
Opérateur unique toute bande
Opérateur unique bande unique
Plusieurs opérateurs toute bande

Contacts: Seront valides les QSO bilatéraux avec toutes les stations. Un contact avec une même station peut etre établi 2 fois, en graphie et en phonie. Les QSO en mode croisé (graphie-phonie) seront non valides.

Echanges: On échangera durant le QSO, le rapport de signal, les numeros d'ordre consécutifs de QSO, le QTH et la province.

Points QSO: Seront alloués 10 points pour chaque QSO réalisé avec des stations canadiennes et 4 points avec des stations étrangères. VEO sera compté comme canadien et les contacts realisés seront calculés comme pour les autres provinces. 20 points supplémentaires pourront être réclamés pour chaque contact avec une station officielle de FRAC utilisant les suffixes TCA et VCA. Ceci signifie qu'un contact avec une station officielle voudra 10 points plus 20 points boni, soit un total de 30 points.

Facteur De Multiplication: C'est le total des provinces et territoires contactés sur chaque bande et les deux modes. Ex: V01/V02, VE1 - NB, VE1 - IPE, VE2 - QUE, VE3 - ONT, VE4, VE5, VE6, VE7, VE8, VE0, VY1, pour un total de 26 points par band utilisant les deux modes.

Fréquences: (kHz)

1810/1840	21025/21250
3525/3775	28025/28500
7025/7070/7155	
	50040/50110
14025/14150	144090/146520

Nous proposons la phonie à l'heure et la graphie à la demi-heure.

Applications: Pour être acceptée, une application devra comprendre: un duplicata (dupe sheet), un journal du station, une feuille résumé incluant le pointage réclamé, les QSO, la liste des facteurs de multiplication et le calcul du pointage. Des feuilles de résumé et la chartre des facteurs de multiplication vous seront envoyées sur réception d'une enveloppe pré-adressée et pré-affranchie. Les applications doivent être mise à la poste un mois après la date du concours avec commentaires, photos etc... à l'adresse suivante:

Concours FRAC
A/S de N. Waltho VE6VW
Boîte Postale 1890
Morinville, AB
T0G 1P0

Prix Attribués: Des certificats seront accordés aux participants qui auront accumulé le plus

Continued on next page ▷

grand nombre de points pour chaque classe dans chaque province, territoire, les E.U. et pays DXCC. Des trophées seront attribués aux opérateurs uniques toutes bandes et aux opérateurs multiples toutes bandes.

Résultats: Les résultats du concours seront publiés dans notre journal *TCA*. Les non-membres pourront les obtenir en faisant parvenir à FRAC une enveloppe pré-adressée et pré-affranchie.

La décision du comité en charge du concours sera finale.

N.B: On accordera 50 points boni à toute radioamateur installé dan l'un des parcs nationaux qui effectuera des communications pour PARCS CANADA, le 1er juillet 1985.

On accordera 50 points boni à tout radioamateur qui utilisera le 1er juillet 1985 les prefixes spécialement adoptés à l'occasion du centenaire des Parcs Nationaux.

'73, Norm Waltho VE6VW

Concour 'CANADA DAY' est parrainé par la Fédération des Radioamateurs Canadiens, Inc.

Δ

LES INDICATIFS DU CENTENAIRE DES PARCS NATIONAUX

Parcs Canada commémore cette année le centenaire des parcs nationaux, et le ministère des Communications* a autorisé l'emploie d'un indicatif spécial pour les radioamateurs qui prendront part aux célébrations. Les voici:

Terre-Neuve	XO1
Labrador	XO2
Maritimes	XJ1
Québec	XJ2
Ontario	XJ3
Manitoba	XJ4
Saskatchewan	XJ5
Alberta	XJ6
Colombie-Britannique	XJ7
Territoires du Nord-Ouest	XJ8
Yukon	XK1

* Extrait d'une lettre datée du 1er février 1985, signée par W.A. Winsor, chef de la Section des permis, Division de la gestion des fréquences et des permis, Opérations, Ministère des Communications, et adressée à Mme Joan Powell, présidente de la Fédération des Radioamateurs du Canada.

NATIONAL PARKS CENTENNIAL PREFIXES

Parks Canada is commemorating the centennial of the National Parks system this year and the Department of Communications* has made available special call sign prefixes for Canadian Amateur radio operators taking part in the events as follows:

Newfoundland	XO1
Labrador	XO2
Maritimes	XJ1
Quebec	XJ2
Ontario	XJ3
Manitoba	XJ4
Saskatchewan	XJ5
Alberta	XJ6
B.C.	XJ7
N.W.T.	XJ8
Yukon	XK1

The above prefixes may be used from June 20 to Aug. 29, 1985.

* excerpt of a letter dated 1.2.85 from W.A. Winsor, Chief, Licensing Section, Frequency Management and Licensing Division, Operations Branch, Department of Communications to the Canadian Amateur Radio Federation President Ms. Joan Powell.

SWAP SHOP

FOR SALE: HAM IV Antenna Rotor, never used. In original carton with control unit and handbook. $295. or nearest offer. You pay shipping, VE7EHD, 604-265-3175.

FOR SALE: TET Roof Tower, Never Used. Four sections 12" square plus base = 33 ft. high above your roof. Extra strength anti-corrosive aircraft type aluminum. Total weight only 123 lbs. Incl. working top steps, HD thrust bearing, rotor plate, SS hardware. Save digging & concrete— $995. or nearest offer. You pay shipping. VE7EHD, 604-265-3175.

FOR SALE: GEM Quad, Never Used. Two elements, complete with spider, fiberglass spreaders, wire & balun. 10, 15, 20 metres & wire for 2 metre band. Handbook and instructions. $220. or nearest offer. You pay shipping. VE7EHD, 604-265-3175.

FREE: 100 Worldwide Stamps. When you request to see our approvals— no obligation, cancel anytime, please include 50¢ for mailing— Philtex, 11225 Omer-Heroux Suite - CA- Montreal Nord, Que., H1G 4V8.

FOR SALE: Yaesu FT-7B 80-10 metre mobile transceiver less than 10 hours use. $400.00. Kenwood R-2000 Receiver 150 kHz. to 30 MHz. Brand New $600.00 original boxes & manuals for both. Jim Miller VE2DTI, 396 52nd Ave., Lachine Quebec H8T 2X2 514-634-6069.

FOR SALE: Heathkit SB-104 transceiver with noise blanker, external speaker, power supply. All solid state. $400.00. MFJ Noise Bridge $50.00. Kenwood DM-81 Dip Meter. $85.00. All in excellent condition. John Benson VE3JJH, 628 Second St. S., Kenora, Ont. P9N 1H1. 807-468-5629.

FOR SALE: HQ1 Mini-quad antenna, balun, full instructions, extra tuning spokes, $120.00. Dave Alderman VE3MUQ, 416-493-9455, 28 George Henry Blvd, Willowdale, Ont, M2J 1E2.

FOR SALE: Heathkit SB 200 and spare 572 B Tubes $500.00, and Regency scaner $350.00. Jim Nazar VE4NC, 20 Main St., Flin Flon, Man. R8A 1J4. Phone 204-687-5185.

Send your 'Swap Shop' notices to the TCA Swap Shop. Box 356, Kingston, Ont. K7L 4W2. Single insertion is $1.00 minimum (10 words) and $1.00 for each additional 10 words. To renew, send copy and payment again. Please print or type, and put your membership number and call (not counted) at the end of your ad. Include your full address with postal code; if using a phone number, include the area code. TCA accepts no responsibility for content or matters arising from ads.

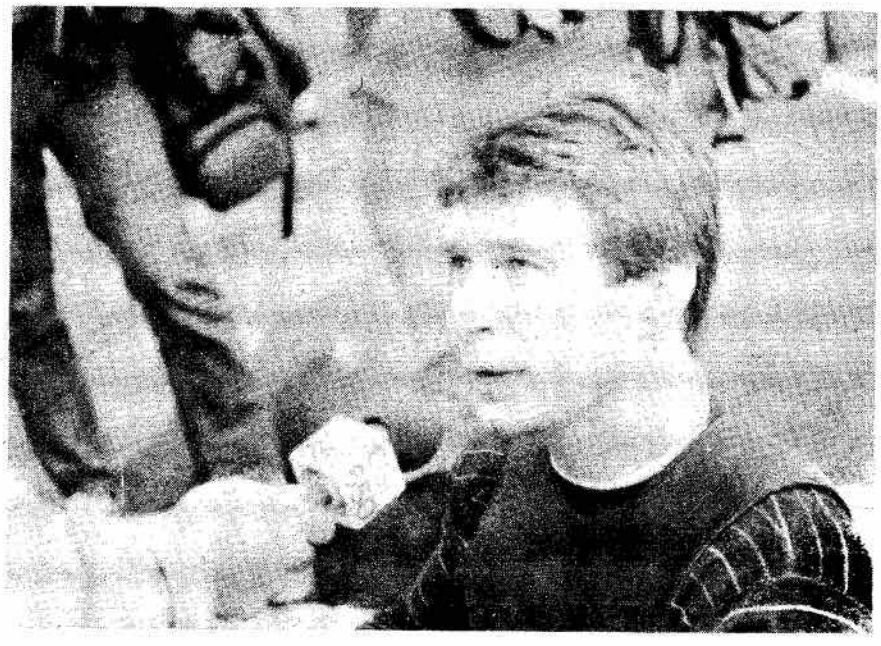
What's holding *you* back?

Historic Journey Begins

By Bob Smits VE7EMD

Rick Hansen, a young British Columbian athlete, began a historic 25,000 mile journey around the world— by wheelchair. Rick, who has successfully competed in wheelchair sports since a tragic car accident, has embarked on a 25-country odyssey to raise money for spinal cord research and to make people aware of the potential within every 'disabled' person.

On his trip, communications between the motor home accompanying Rick and a lead vehicle scouting the pre-arranged route will be conducted by volunteer Amateur Radio operators. Each operator will use his own equipment and plug into an antenna and power cord installed in each of the vehicles. Problems that involve route changes or delays, etc, can thus be dealt with. In addition, operators will transmit a daily situation report back to 'Man in Motion' headquarters via the HF facilities of VE7PH, a club station of quadraplegic Amateurs located at the Pearson Hospital in Vancouver.



Rick Hansen at news conference, Richmond, B.C., at the start of his journey.

Rick's route began in Vancouver, and runs south along the west coast of the United States, east from San Diego to Florida where he will sail to Ireland. He will then travel through Western Europe, the U.S.S.R., Poland, Austria, Spain, Portugal and Algeria before heading to the Middle East, Australia, New Zealand, Korea, Japan and China. After that, he will roll on through Venezuela and the Eastern Seaboard of the United States before wheeling across Canada, assisted by Canadian Amateurs, where he expects to arrive at the gates to EXPO 86 in August 1986.

He's off! Rick wheeling down Oak Street in Vancouver, March 21.

In the United States, Amateur communications is being organized by Maureen Pranghofer, KFOI, of Courage Handi-Hams in Minnesota. All across the U.S., Amateur Radio Emergency Service sections are assisting the 'Man in Motion.'

In other nations, national Amateur Radio organizations are being asked to lend a hand as well. Australia and Portugal have taken the lead in offering their help. Δ

TECHNICAL SECTION

Section Editor
Frank Hughes VE3DQB

The Apotheosis of the ZX-81

A Computerized Repeater

By Roger Coudé VE2DBE
1049 Ricken ouest
Alma, Que. G8B 4L9

Introduction

This article is addressed to repeater oriented radio Amateurs who are looking for new and easier ways to build and use them.

The computerized repeater is a new approach to repeater design. It simplifies the hardware (logic controller, timer, specialized circuits like identifier, autopatch decoder) by using the computer as the only link between the indispensable components (TX, RX, tone decoder and phone patch).

This brings, in an easy way, much more versatility to the repeater, even more if it is linked to an autopatch. The computer produces the delays, CW ID, and alarm. With a tone decoder, it can implement remote control commands sent by a tone pad. Linked to a phone line, the computer will simulate perfectly a standard pulsed telephone ring, put receive/audio on the telephone line, or take the audio from the line and bring it to the transmitter mixer.

It can keep a directory of 100 telephone numbers that could be automatically dialed with three tones; add or delete numbers using tone commands, redial numbers.

This method offers real advantages: fewer parts on the board; muting of the audio by carrier holding; maximum efficiency on both sides of communication. As a side advantage, by using a low price computer such as the ZX-81 (or Timex 1000), the costs are kept to minimum.

In this article we will present an overview of the system using the ZX-81. We will discuss the interfaces and present a program for a repeater with autopatch facilities.

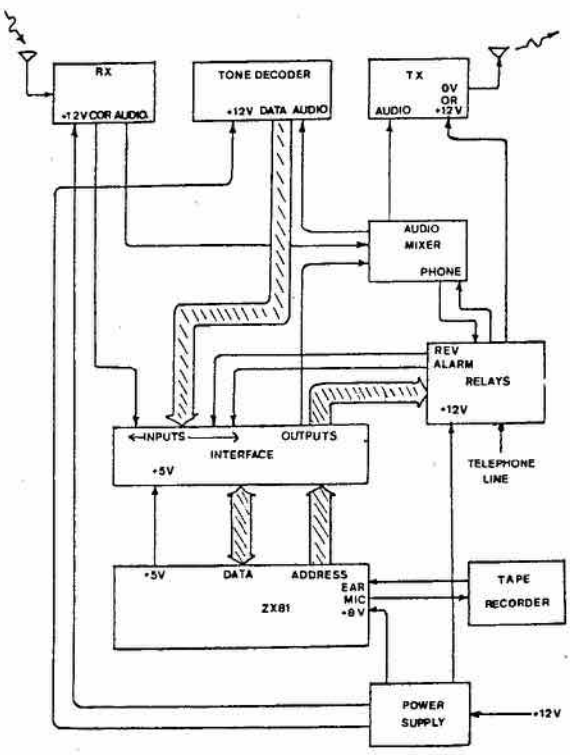


Figure 1: BLOCK DIAGRAM

Theory of Operation

In Fig. 1, you will find a general schematic of the repeater operation. All the sections are under the computer control; this give a powerful versatility to the user. All informations are directed to the computer via the computer INTERFACE. This interface has an input bus that brings data from RX, DECODER, ALARM sensor, REVERSE AUTOPATCH signal, and an output bus that sends data to RELAYS section and AUDIO MIXER. The RX section is a conventional receiver as is the TX section. The DECODER demodulates tone from a tone pad that is used as control command or as telephone number data. The RELAYS section is used to switch different lines that do some action.

Hardware Section

The computer Interface is the computer communicating sense with the outside world. The schematic is found in Fig. 2. The 74LS244 is used as an input port to put the binary equivalent of tone signals on the data bus. The two 74LS175 are used as output ports to implement software controlled action.

On the output side there are relays to isolate the system from external electrical noises. The 74LS138 is a partial address dec-

oder and control bus; it insures that data transfer (in/out) occurs at the right time.

The +5V supply needed for these circuits is taken from the computer +5V line. All the connections can be soldered near the edge connector to leave it free for the 16K memory pack.

Tone Detection is the heaviest part of the construction. Refer to Fig.3 for the schematic of the decoder. Seven LM567 give total recognition of a standard telephone keypad. Only the schematic of the first LM567 have been included; it is the same for the others; when the components were not the same they have been shown.

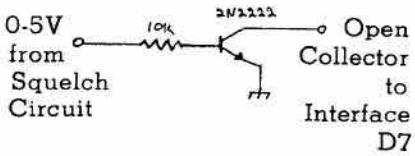
It is only necessary to wire outputs (pin 8) to the parallel input of the interface. Special care must be taken in wiring these phase lock loop circuits. The seven LM567 and their passive components can stand in a cigarette box. The seven trimpot and LED indicators must be aligned for an easy tuning.

The +5V line must be stable and clean to give maximum performance. Bypassing capacitor directly at the LM7805 is a must! In the RC timer, use only mylar capacitors (no ceramic!) to minimize temperature variation.

The Phone Patch is completely silent if the computer does not control it. The schematic of the relays and phone patch section is given in Fig. 4. It will be very efficient with a little audio transformer (the blue one at the input of the final transistors of a small transistor radio). A little capacitor is added to the dialing relay to filter sparks.

The Audio Mixer section found in Fig.5, is used to transfer all the audio signal from/to specific areas.

The TX and RX arrangement is quite simple. On the RX side, you need to interface the COR with an open-collector transistor (see figure below).



The 2N2222 transistor will act as a short circuit on receive. It will drive the computer interface directly.

A Power Supply of +8V DC is needed for the ZX-81. It is best to work from a 12V DC power supply and to step down the voltage to 8 VDC with an IC regulator (7808). Diode switching can be used to connect the circuit to rechargeable batteries in case of power failure.

Software Section

When a received signal enables the COR, the input line 7 becomes low on the interface. The computer answer will depend on the software. It may put the transmitter on-air and begin to count time until time-out is reached. It will then switch off the transmitter and wait for a no signal period.

If a "*" tone combination of sufficient duration is received, the computer will accept it and wait for the three digit tones to come in a specified maximum time. If the digits correspond to a valid command or number, it will prompt two 'beeps' by generating a 600 Hz tone on output line 1. The tone is fed directly to the transmitter audio mixer. The same output is used for the CW ID. The program can be modified in minutes to give a new identification.

The Main Program is an illus-

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Figure 2: INTERFACE

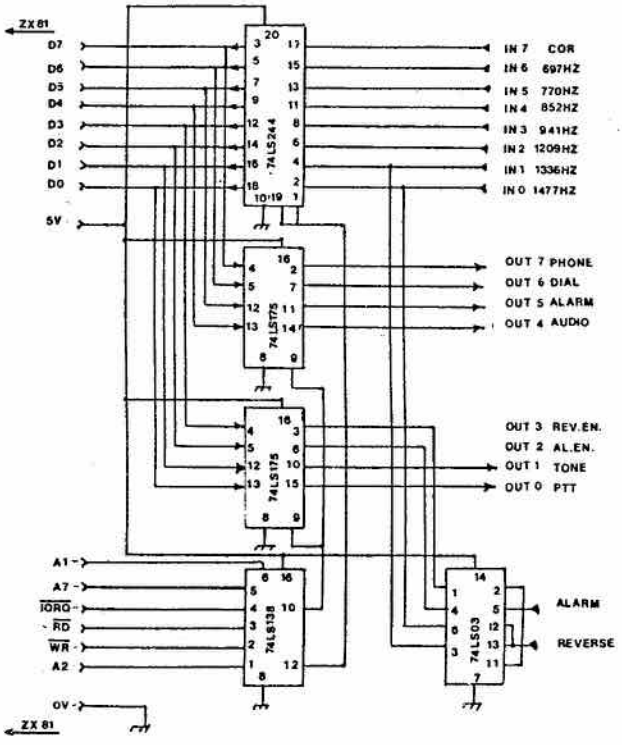
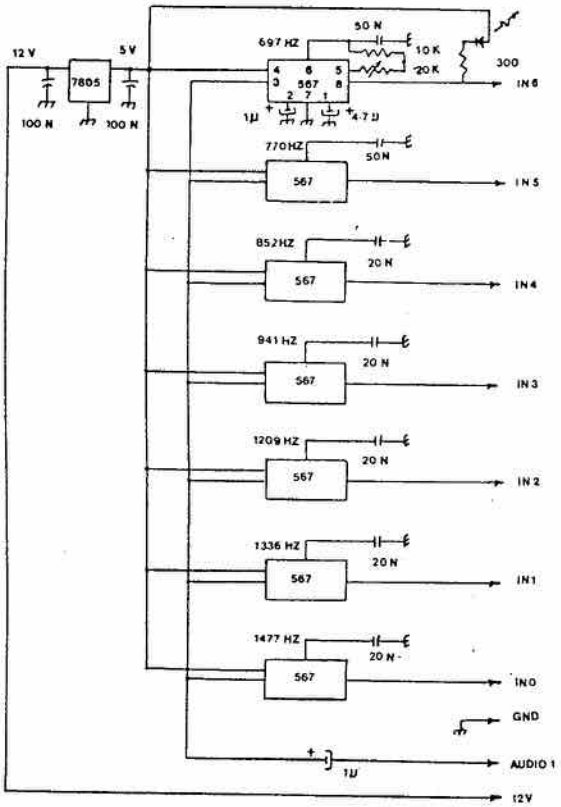


Figure 3: TONE DECODER



tration of the multiple features that can be implemented with minimum hardware (See the accompanying listing, APPENDIX B).

Each program section is identified by a REM statement. Many variations can be implemented. Feel free to experiment.

The difficult part of it is the instruction POKE 16661, (number) followed by the RAND USR 16660. This is a call to the machine language routine for an OUT instruction. For example, POKE 16661,109 will put data bus lines as follows:

lines:	D7	D6	D5	D4	D3	D2	D1	D0
volts:	0	+5	+5	0	+5	+5	0	+5
logic state:	0	1	1	0	1	1	0	1

(binary equivalent of the decimal 109)

The lines LET IN=USR 16650 will input the variable IN, the decimal equivalent of the binary input of the data bus lines.

To protect your repeater from the tone pad maniacs, change the control codes that are in the lines 5000-5490.

If you do not need the reverse autopatch, erase lines 1050, 8000-8060, or the alarm, erase lines 1060, 7500-7540.

This program dials a "9" to reach the telephone service. If you do not need it, erase 6010, 6015, 6020, 6031, 6032, 6033, 6125 and change line 6030 to "FOR I=1 to 7".

Loading Programs Procedure

1) Type the INITIAL PROGRAM (See APPENDIX A).
2) Run it.
3) Type the memory content listed below the INITIAL PROGRAM at the requested memory address.
4) Delete lines 2 to 9. Be sure not to delete line 1 REM (...).
5) Using the Edit Mode, change line number 1 to 9999. After erase line 1; this will permit the full use of the LIST command.
6) Type the MAIN PROGRAM (See APPENDIX B). Be sure to SAVE it frequently during this process. This is a long program and it is frustrating to lose it!
7) when the program is fully entered before running it, use the Edit Mode to change line 9999 to 1. After, erase line 9999.
8) Save the program by typing GOTO 9000 to ensure automatic RUN after LOADing. Don't forget to put the program name in line 9020. This is the final version, be sure to have more than one copy of it.

Software Utilization

This program operates in this way. If you press "*" for a second you will hear a double beep (//) and have 5 seconds to give a 3-digits tone code. If you exceed time, the 8 beeps (////////) error message will be heard and the computer will wait for another "*".

The 3 digits codes are as follows:

000 to 099 — control codes
100 to 199 — pre-coded telephone number

For example: "*" followed by
000 Call cw id
050 Put the repeater transmitter ON
051 Put the repeater transmitter OFF

096 Put alarm ON and reverse autopatch ON
097 Put alarm ON and reverse autopatch OFF
098 Put alarm OFF and reverse autopatch ON

008 Will dial again the last telephone number
013 Will erase a telephone number in memory
Ex: * // 013 // 105 //
099 Will put a telephone number into memory
Ex: * 099 // 105 // 6623556
105 Will dial the corresponding pre-coded telephone number
088 Will implement a direct dialing
Ex: * // 088 // 6623556
090 Will SAVE the program and data on tape.

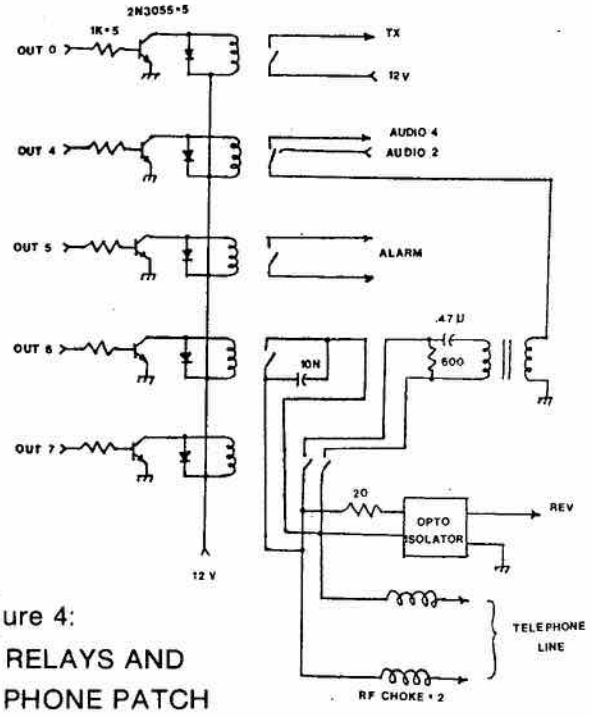


Figure 4:
RELAYS AND
PHONE PATCH

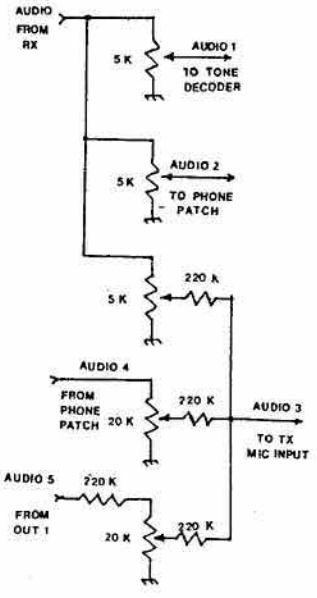


Figure 5: AUDIO MIXER

INITIAL PROGRAM

```
  1 REM  MACHINE CODE LOCATION

         200 SPACES


  2 FAST
  3 SCROLL
  4 PRINT "GIVE START ADDRESS"
  5 INPUT S
  6 SCROLL
  7 PRINT "TO STOP ENTER 500"
  8 FOR I=S TO 16707
  9 SCROLL
 10 PRINT I;"/";
 11 INPUT X
 12 IF X>255 THEN STOP
 13 PRINT X
 14 POKE I,X
 15 NEXT I
```

JUST RERUN TO CORRECT MISTAKES

```
 99 REM * VERIFY PROGRAM
100 FOR I=16515 TO 16705 STEP 5
110 LPRINT I;"  ";
120 FOR J=0 TO 4
130 LET X=PEEK (I+J)
140 IF X<100 THEN LPRINT " ";
150 IF X<10 THEN LPRINT " ";
160 LPRINT "  ";X;
170 NEXT J
180 LPRINT
190 NEXT I
```

```
16515   118     0   255   255   255
16520   255     0     0     0     0
16525     0     0     0     0     0
16530    33   130    64     6     7
16535    54   255    35    16   251
16540     0    33   130    64     1
16545     0     0   219     7   186
16550    87    32     7    11   175
16555   184   200    24   244     0
16560   254   127    56    12   126
16565   254   255    40   231    35
16570   125   254   133   200    24
16575   224   254   115    40   206
16580   254   118   200   254   117
16585    32     2    54     0   254
16590    59    32     2    54     1
16595   254    61    32     2    54
16600     2   254    62    32     2
16605    54     3   254    91    32
16610     2    54     4   254    93
16615    32     2    54     5   254
16620    94    32     2    54     6
16625   254   107    32     2    54
16630     7   254   109    32     2
16635    54     8   254   110    32
16640     2    54     9   195   160
16645    64     0     0     0     0
16650   219     7     6     0    79
16655   201     0     0     0     0
16660    62    61   211     7   201
16665     0     0     0     0     0
16670     6    12    14    10    62
16675    61   211     7    22     6
16680    30    25    29    32   253
16685    21    32   248    62    63
16690   211     7    22     6    30
16695    25    29    32   253    21
16700    32   248    13    32   225
16705    16   221   201     0     0
```

```
  1 REM   COPY COPY COPY COPY
        5 RND T0 COPY 7( CLS
5 RND"   <=  74" COS / POKE  RE
TURN S£? RETURN  COS / STEP RET
URN ?CEXP RETURN
  2 REM VE2RCM
 10 DIM T$(100,7)
 12 LET N$=" "
 15 LET I$=" -.. .   ...- . ..-
-- .-. -.-. --   .- .-.. -- .-
 "
 20 LET TX=48
 25 LET NO=0
 30 FAST
1000 POKE 16661,TX
1010 RAND USR 16660
1015 FOR T=1 TO 5000
1020 LET IN=USR 16650
1030 IF IN<128 THEN GOTO 2000
1050 IF IN=254 THEN GOTO 8000
1060 IF IN=253 THEN GOTO 7500
1070 NEXT T
1080 IF USR 16650=255 THEN GOTO
1080
1090 IF USR 16650>127 THEN GOTO
1015
1100 GOSUB 8900
1110 GOTO 3040
2000 POKE 16661,61
2010 RAND USR 16660
2020 FOR T=0 TO 10000
2025 LET IN=USR 16650
2030 IF IN=115 THEN GOTO 4000
2040 IF IN>127 THEN GOTO 3000
2050 IF T=5000 THEN GOSUB 8900
2060 NEXT T
2070 POKE 16661,TX
2080 RAND USR 16660
2090 IF USR 16650<128 THEN GOTO
2090
2100 GOTO 4500
3000 PAUSE 20
3020 RAND USR 16670
3040 FOR T=1 TO 100
3050 IF USR 16650<128 THEN GOTO
2000
3060 NEXT T
3070 GOTO 1000
4000 FOR S=1 TO 10
4005 IF USR 16650<>115 THEN GOTO
 2025
4010 NEXT S
4015 IF USR 16650=115 THEN GOTO
4015
4020 GOSUB 8600
4030 IF PEEK 16516=255 THEN GOTO
 4500
4040 IF PEEK 16514=0 THEN GOTO 5
000
4050 IF PEEK 16514<>1 THEN GOTO
4500
4100 LET N$=T$(N+1)
4105 IF CODE N$=0 THEN GOTO 4500
4106 GOSUB 8500
4110 GOTO 6000
4500 IF USR 16650<128 THEN GOTO
4500
4505 FOR I=1 TO 8
4510 RAND USR 16670
4515 PAUSE 2
4520 NEXT I
4530 GOTO 3040
```

Continued on next page ▷

```
5000 IF PEEK 16516=255 THEN GOTO
 4500
5010 IF N=99 THEN GOTO 5500
5020 IF N=98 THEN LET TX=52
5030 IF N=97 THEN LET TX=56
5040 IF N=96 THEN LET TX=48
5050 IF N=88 THEN GOTO 7000
5060 IF N=90 THEN GOTO 9000
5070 IF N=13 THEN GOTO 5700
5080 IF N=0 THEN GOTO 1100
5090 IF N=51 THEN GOTO 7700
5091 IF N=8 THEN GOTO 4105
5490 GOTO 3040
5500 GOSUB 8600
5510 IF PEEK 16514<>1 OR PEEK 16
516=255 THEN GOTO 4500
5530 GOSUB 8700
5540 IF PEEK 16520=255 THEN GOTO
 4500
5550 FOR I=1 TO 7
5560 LET T$(N+1,I)=CHR$ (PEEK (1
6513+I)+28)
5570 NEXT I
5580 GOTO 3000
5700 GOSUB 8600
5710 IF PEEK 16514<>1 OR PEEK 16
516=255 THEN GOTO 4500
5720 LET T$(N+1)=""
5730 GOTO 1000
6000 POKE 16661,109
6001 RAND USR 16660
6003 SCROLL
6005 LET NO=NO+1
6006 IF NO>10000 THEN LET NO=0
6007 PRINT N$,NO
6010 FOR T=1 TO 100
6015 IF USR 16650=118 THEN GOTO
1100
6020 NEXT T
6021 POKE 16661,253
6022 RAND USR 16660
6023 PAUSE 20
6024 POKE 16661,191
6025 RAND USR 16660
6030 FOR I=0 TO 7
6031 IF I>0 THEN GOTO 6040
6032 LET N=9
6033 GOTO 6060
6040 LET N=CODE N$(I)-28
6050 IF N=0 THEN LET N=10
6060 FOR J=1 TO N
6070 POKE 16661,61
6080 RAND USR 16660
6090 PAUSE 3
6095 IF USR 16650=118 THEN GOTO
1100
6100 POKE 16661,191
6105 RAND USR 16660
6110 PAUSE 2
6120 NEXT J
6125 IF I=0 THEN PAUSE 50
6130 PAUSE 30
6140 NEXT I
6141 POKE 16661,253
6142 RAND USR 16660
6143 PAUSE 20
6145 FOR T=1 TO 20000
6150 POKE 16661,109
6152 IF USR 16650<128 THEN POKE
16661,125
6155 RAND USR 16660
6170 IF USR 16650=118 THEN GOTO
6200
6180 NEXT T
6190 GOTO 1100
6200 FOR S=1 TO 15
6210 IF USR 16650<>118 THEN GOTO
 6170
6220 NEXT S
6230 GOTO 1100
7000 GOSUB 8700
7010 IF PEEK 16520=255 THEN GOTO
 4500
7015 GOSUB 8500
7020 LET N$="0000000"
7030 FOR I=1 TO 7
7040 LET N$(I)=CHR$ (PEEK (16513
+I)+28)
7050 NEXT I
7060 GOTO 6000
7500 POKE 16675,53
7501 POKE 16689,55
7502 RAND USR 16670
7505 FOR T=1 TO 300
7510 IF USR 16650=115 THEN GOTO
6145
7520 IF USR 16650=253 THEN GOTO
7500
7530 NEXT T
7531 POKE 16675,61
7532 POKE 16689,63
7540 GOTO 1000
7700 POKE 16661,TX
7710 RAND USR 16660
7720 GOSUB 8610
7725 IF USR 16650=254 THEN GOTO
1000
7730 IF PEEK 16514<>0 OR N<>50 T
HEN GOTO 7720
7740 GOTO 1100
8000 FOR T=1 TO 10
8001 IF USR 16650<>254 THEN GOTO
 1000
8002 NEXT T
8007 POKE 16675,29
8010 POKE 16689,31
8020 RAND USR 16670
8030 IF USR 16650<>115 THEN GOTO
 8020
8033 GOSUB 8600
8035 IF PEEK 16514<>0 OR N<>98 T
HEN GOTO 8020
8040 POKE 16675,61
8050 POKE 16689,63
8060 GOTO 5020
8500 IF USR 16650<128 THEN GOTO
8500
8505 PAUSE 20
8510 RAND USR 16670
8520 PAUSE 2
8530 RAND USR 16670
8550 RETURN
8600 GOSUB 8500
8610 SLOW
8620 RAND USR 16530
8630 FAST
8640 LET N=PEEK 16515*10+PEEK 16
516
8650 RETURN
8700 POKE 16572,137
8705 GOSUB 8500
8710 SLOW
8720 RAND USR 16530
8730 FAST
8740 POKE 16572,133
8750 RETURN
8900 POKE 16661,61
8905 RAND USR 16660
8907 FOR I=1 TO LEN I$
8910 IF I$(I)=" " THEN GOTO 8970
8920 POKE 16671,4
8930 IF I$(I)="-" THEN POKE 1667
1,12
8940 RAND USR 16670
8960 PAUSE 2
8965 GOTO 8980
8970 PAUSE 6
8980 IF USR 16650=115 THEN GOTO
8990
8981 NEXT I
8990 POKE 16671,5
8995 RETURN
9000 POKE 16661,TX
9010 RAND USR 16660
9020 SAVE "VE2RC■"
9030 FAST
9040 GOTO 1100
```

Δ

Dummy Load Kit

By Keith Baker VE2XL

Canadian-made dummy load kits for use in the Amateur radio high frequency bands are available, low power and medium power. The materials are drilled, etched, single sided printed circuit boards and multiple 1 watt type GB1, hot molded Allen Bradley carbon resistors.

Power Capability:

In general terms, radio frequency dummy loads fall into one of three categories.

1. Low power loads; those loads that handle up to a few tens of watts.
2. Medium power loads; those that handle up to a few hundreds of watts.
3. High power loads; those that handle from a few hundred to several thousand watts.

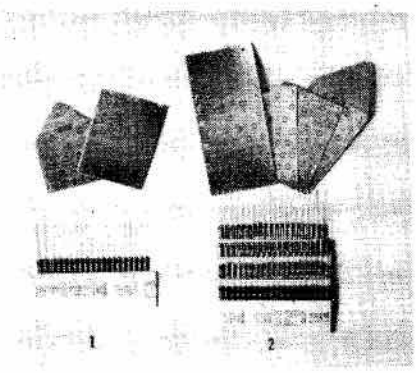
The low power load handled 20 watts without irreversible resistance changes, always a sign of abuse of a resistor. Continual overloading will eventually render the assembly useless.

The low power load accepted two times rated load in still air at 20° (68° F) using a 10 second on and 60 second rest duty cycle without appreciable resistance shift, for a period of one hour.

If this load is blower cooled with a shrouded air flow from a small muffin fan or a phono motor driven bladed fan, it will tolerate 50 watts continuous, and 100 watts using the 10 second on and 60 second rest duty cycle. In oil in a metal paint can of one gallon capacity the load handled 100 watts for 20 minutes before the temperature of the oil and in the vicinity of the resistors rose to a level where resistance shift would become a matter of concern. It handled 200 watts with room temperature oil with 10 seconds on 60 rest duty cycle for several cycles (10) before the temperature of the resistors became excessive.

The medium power load handles 80 watts continuous and a two times rated load 10 seconds on with a 60 second rest duty cycle for 10 cycles in free air at 20°C (68°F). If this load is blower cooled, shrouded to blow across all of the resistors, load will handle 300 watts for five minutes with a 10 minute cool down period. In a one gallon can of oil the load handled 200 watts adequately for 30 minutes before the temperature rose excessively. The load will handle 400 watts with a 10 seconds on 60 seconds rest for 10 cycles.

Lowering the length of time the load is exposed to severe overload does not permit high power level dissipation for there is a lag between the resistors' internal heat generation before the resistor case, leads, board and oil begin to transfer the heat away. The load might appear to be handling a higher power level, but in fact it has already reached a temperature where there will be a permanent resistance change. Using the load therefore in the 400 to 500 watt range should be done with care and regard to the duty cycle. If you need a one kilowatt load you will have to design and build one or purchase one.



1: low power kit. 2: medium power kit.

Technical notes:

Remember that when these loads are used in free air and not shielded in any way they are in fact a small antenna.

There is a small impedance change when going from an air dielectric to an oil dielectric.

The resistor manufacturer's technical bulletins state that environment effects on resistor derating and high frequency characteristics are conducted on individual resistors and may not necessarily apply to groups of resistors. A single resistor overloaded by a factor of 10 times for 10 seconds ended up reading 30% high. The manufacturer's bulletin indicates a 2% change in resistance if the resistor is subjected to temperatures of 105°C (220°F).

Conclusion:

Given the economy and ease of construction, this style of load is an adequate device for dummy load use, within the power rat-

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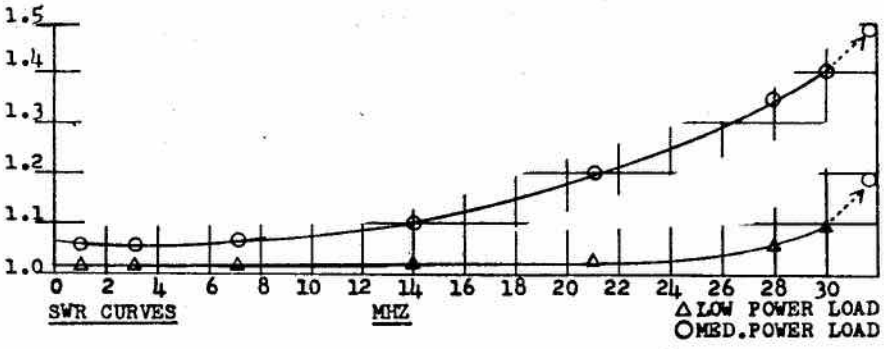


The Garant GD-6 Antenna

The Canadian-made Garant GD-6 Antenna is a windom multiband aerial with a balun feed. It is claimed to radiate on 80, 40, 20, 17, 12 and 10 metres with acceptably low SWR. The feedpoint impedance matches 50 to 60 ohm coaxial line.

The kit consists of a coil of 7/22 copper wire (7 strands of 22 gauge), two plastic end insulators, and a balun encapsulated into the centre insulator with a shrouded coaxial fitting.

The first mistake the reviewer made was to omit stretching the wire. When released from the coil the wire wants to play Laocoon with you. To avoid this can of worms, fasten one end of the wire to a firm support— a fence post, for instance— and unwind the coil carefully, walking backwards to the full extent of its length, allowing no kinks to form. The further end of the wire you fasten to a car and with the car gently pull the wire to its elastic limit. When the wire no longer wants to coil up when released, the job is done.

With the wire gently stretched, it is easy enough to cut it to the length prescribed in the instructions, and to fasten it to the insulators. A proper crimping tool is needed to fasten the centre connectors to the wire.

A length of coaxial cable (RG58U) has to be connected to the centre insulator. The shroud makes the final tightening of the SO-239 fitting a little hard, but care and patience soon gets the job completed.

At VE3DQB, the centre insulator was slung just under the TV aerial at about 30 feet (10 M, Carlo) above ground. The longer wire was guyed to the barn, and falls to about 20 feet (6 M) at the insulator. The short end slopes down to a convenient tree.

The proof of the pudding is in the eating. The GD-6 was connected to the SWR meter and the rig was fired up. SWR in the various bands checked out thus:

	HF	LF
80	1.4:1	1.25:1
40	1.1:1	1.1:1
20	1.2:1	1.0:1
10	1.1:1	1.0:1

These are not the same as the figures given by Garant, as the environments of the test sites differ, and the homebrewed SWR meter in the shack is not to laboratory standards.

I'd recommend the GD-6 to anyone who needs a general-purpose HF antenna. My salient impression of it is a delightful freedom from adjusting an ATU on changing bands. Otherwise, on 20, 40, and 80, it performs at least as well as its predecessor, the end-fed long wire. △

— VE3DQB

▷ *Continued from Page 47*

ings, applications for Amateur radio use.

Acknowledgements:

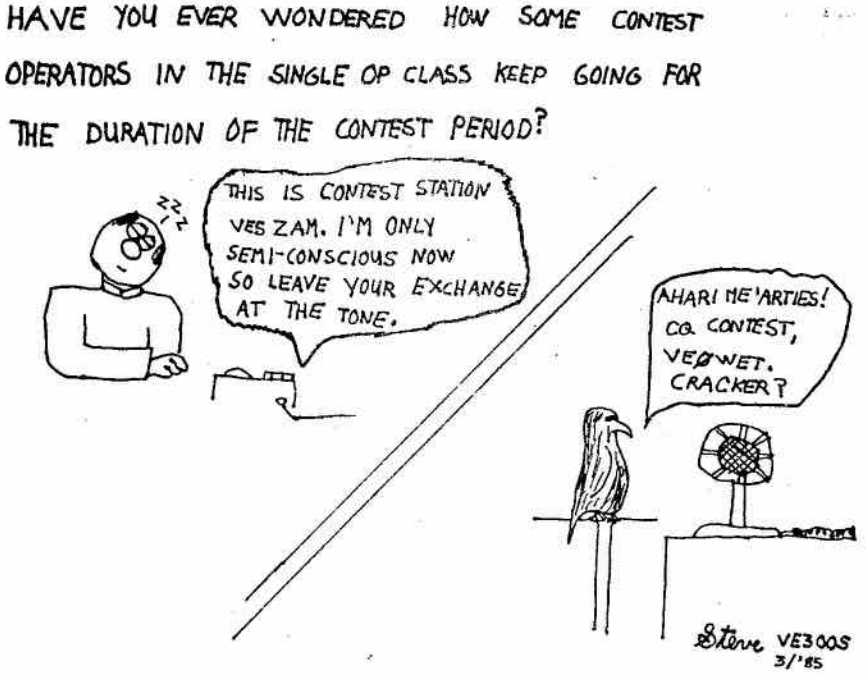
Thanks to Scott H. Mackay, Electronic Components Specialist, of Allen-Bradley, Dorval P.Q. for supplying information, catalogs and technical information on testing methods for Allen Bradley resistors.

To Frank Grant VE3FT of Ottawa for the photograph in Fig. D and making his medium power load available for testing.

Reference: Bill Wildenhien W8YFB, page 36, *Ham Radio*, Sept. 1968

Availability:

The loads are sold through Hobbytronique, 3677B Blvd., St Jean, Dollard des Ormeaux, Quebec H9G 1X2.
Price: Low Power Load $8.50 plus 9% Provincial Sales Tax for Quebec Residents plus $2.00 postage and handling.
Medium Power Load $16.00 plus 9% Provincial Sales Tax for Quebec Residents plus $2.50 postage and handling. △



Dipole Antennas

By VE3DQB

The last chapter discussed the natural swing of electrons back and forth along a wire— specifically a wire ten metres long. This chapter continues the story.

Our 10-metre-long wire is called a '20 metre dipole' because it *resonates* (vibrates naturally) at a wavelength of 20 metres, a popular DX band. It is called a dipole because in use it shows a negative pole at one end and a positive pole at the other, so it is di-polar, having two poles. Of course, the polarity reverses 28 million times a second.

Wavelength and Frequency

Working with antennas, you'll often want to know both wavelength and frequency. You find wavelength in metres by dividing 300 by the frequency in MHz, and frequency in MHz by dividing 300 by the wavelength in metres. Example:

A transmitter is tuned to a frequency of 29 MHz. What is the wavelength?

Answer: The wavelength is 300 + 29, or 10.3 metres.

What length of wire should be cut to resonate (and so be a suitable antenna) at this frequency?

Answer: (10.3 / 2) x 0.95 or 4.95 metres. (Note: the 0.95 allows for the velocity factor).

Energizing the Antenna

We can connect our transmitter to a dipole in several ways. If we cut the dipole exactly in the middle, we can connect the transmitter output stage there, and it will work well, Figure 12. This is not usual, though satellites and the handheld transceivers work rather in this manner. Usually a pair of wires (the *feedline, transmission line,* or *downlead)* is used to connect the transmitter to one end of or to the middle point of the antenna.

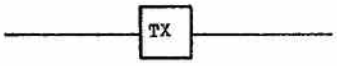


Figure 12: A transmitter in the center of a dipole. This is not usually practical...

We can connect a wire to the end of the dipole, to imitate the action of the charged body shown in Figure 5. To prevent this feedline becoming part of the antenna and radiating power itself, we place another wire close to it and parallel to it, and arrange for it to carry an equal and opposite voltage to the feed wire at all times, as in Figure 13. The equal and opposite currents cancel out each other's fields. More of this later (Chapter 11).

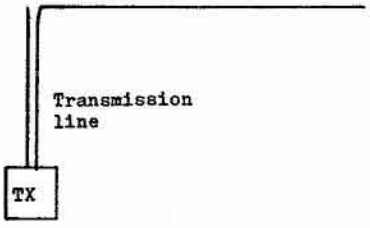


Figure 13: so a transmission line is used to carry the RF to the antenna, either at one end, where the apparent resistance of the antenna is 600 ohms or so, or

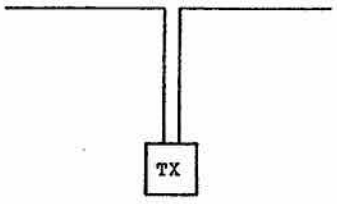


Figure 13B: the line is connected in the center, where the apparent resistance is 73 ohms.

Impedance of an Antenna

Suppose we set up an antenna, and connect a transmitter to the middle of it (See Figure 14). We note the meter readings. The wattmeter tells us we are putting 100 watts, say, into the antenna.

We switch off, remove the antenna from the downlead, and put a resistor in its place. Switching on again, we see that the wattmeter reads differently. Only when the resistor is about 73 ohms does it read 100 watts, as it did when the antenna was there.

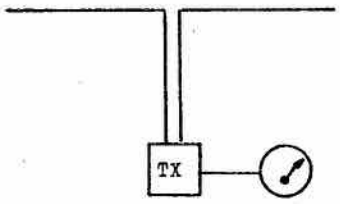


Figure 14: These resistances are found by substituting resistors for the antenna. The transmitter is tuned to transfer maximum power to the antenna, and then...

The resistance of the wire is usually only a small fraction of an ohm. Most of the power shown by the wattmeter, then, goes somewhere other than into heating up the antenna wire. The 100 watts we measured must go almost all into space, and the 73 ohms of resistance which loads the transmitter like the antenna itself is the apparent resistance of space in this configuration. This amount of power appears over a surface that continuously gets bigger as the wave travels out from the antenna, but never completely dies away, Figure 15 and 16.

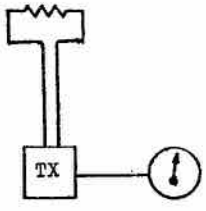


Figure 15: ...non-inductive resistors are substituted for the antenna. Only one resistance— 73 ohms, for a half wave, center-fed dipole in free space— gives the same meter readings.

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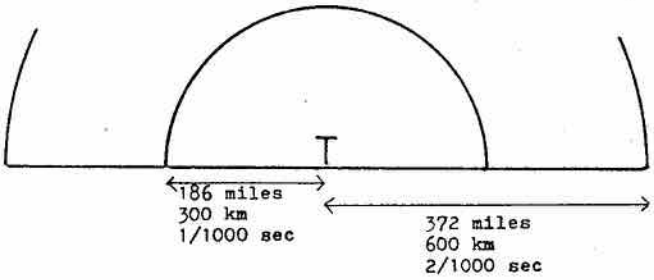


Figure 16: One one-thousandth of a second after the transmitter is keyed, the radio wave has travelled 186 miles from the transmitter. The energy is spread over a surface (not usually as perfect as shown) which continuously expands, never dying away completely.

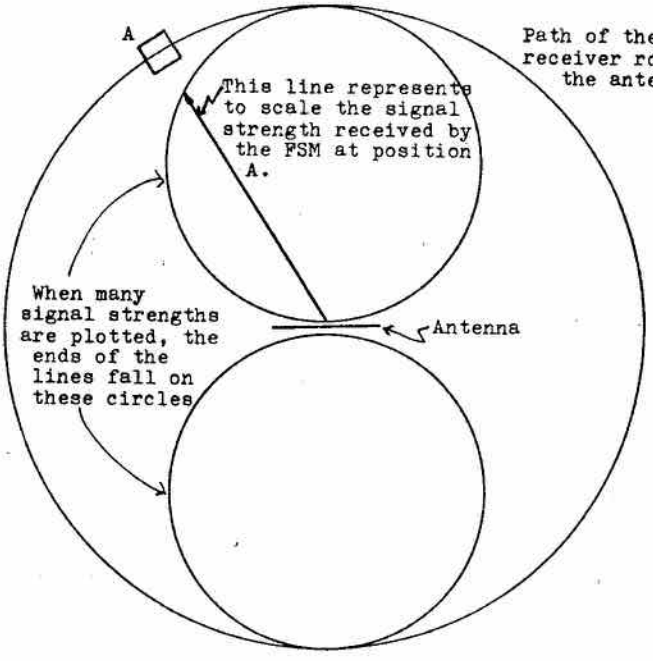


Figure 17: If readings of signal strength are taken round a dipole antenna transmitting a steady carrier, the signal strength received varies. Signals are weakest end-on to the antenna, strongest broadside-on. If lines are drawn from the antenna to the receiver, of length proportional to the signal received, the tips of the lines fall on two circles, as shown.

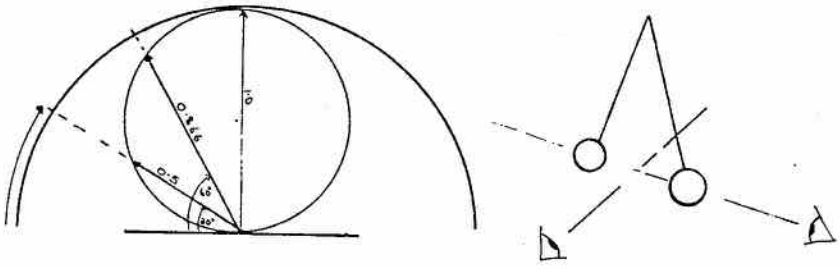


Figure 19: This repeats part of Figure 17, to show how the length of the line representing signal strength is proportional to the sine of the angle the receiver makes with the dipole.

If we try the experiment with an end-fed dipole, the resistance found is about 600 ohms.

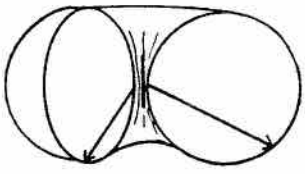
Antenna Patterns

The power going into space does not usually spread evenly in all directions (an antenna that did so would be called an *isotropic* antenna, but no practical one exists in radio). Since it is the *movement* of electrons that sends out the wave, we can find out what the pattern in space of the radiation from a dipole is.

If we look at the antenna square-on to its side, we see the full movement of the electrons. At other angles we see more or less movement, depending on where exactly we stand.

Practically, if we set up an antenna and explore round it with a receiver, we can measure the field strength and draw a diagram of the pattern on polar graph paper (Figure 17).

Now this pattern on the graph is only that of the signal strength in one plane. If we explore all round the antenna in all three dimensions the pattern is rather like that of a doughnut with a very small hole (Figure 18).



The antenna is the vertical line in the middle of the "doughnut."

Figure 18: If readings are taken in all 3 dimensions, the full pattern of a dipole antenna is found to be doughnut-shaped. Always remember the patterns you see on paper only tell part of the antenna's story.

If you're familiar with trigonometry, you will see that the pattern is that of the sine of the angle of view from the line of the antenna end-on. (Figure 19).

These patterns are only true for an antenna far from other objects, like those on a satellite in orbit. In practice, we always have other objects near the antenna, of which the most important is the ground.

Now radio waves are like those of light— they only differ in fre-

quency, so we should expect that the laws that govern the reflection of light also govern the reflection of radio waves. And so they do. The ground acts just like a mirror to radio waves— a mirror of quality variable from poor, like rock or sand, to excellent, like salt water.

So we should expect that putting an antenna over a good ground would give an effect like a light over a mirror, that is, that there would be a reflection of the antenna in the ground, as far below the ground, apparently, as the antenna is above it.

This is perfectly true, and we can work out the performance of an antenna over a ground on this law of optics with one important difference— the radio wave is often comparable in length to the distance between the antenna and ground. This distance affects the antenna profoundly.

If the antenna is set horizontally above ground, the radiation resistance varies as the antenna-to-ground distance is varied. Close to the ground, the resistance is very low, goes up to 100 ohms at a height of 0.35 times a wavelength, reaches its free-space value (73 ohms) at half a wavelength above ground, drops below 70 ohms at 0.8 wavelengths above ground, rises above 80 ohms near 0.9 and reaches 73 ohms again at a full wavelength above ground. Higher yet, the radiation resistance varies less and less, till, far from any other object, it remains at 73 ohms. (See Figure 20).

If the antenna is mounted vertically, however, the variation of radiation resistance with height is much less. If the center of the dipole is a quarter wavelength above ground (it cannot be less) the resistance is about 90 ohms. As the antenna is raised from this position, the resistance varies between 70 and 80 ohms until, like the horizontal antenna, it reaches a steady 73 ohms.

In discussing the behavior of antennas near the ground we always assume the ground is perfectly conducting. In fact it is not, but it is not practical to discuss all the possible grounds: they differ in conductivity and material, so no two are truly alike.

While radio waves reflect from the ground like light from a mirror, some things happen with radio waves that we do not notice with light, because the antenna is usually close to its 'mirror'— the ground. We can see why if we trace the path of one part of a wave from the antenna to a point in space both directly, and by way of the ground, Figure 21.

In Figure 21, the ray going from the antenna to the distant point (the *direct* ray) must be shorter than the *Reflected* ray that follows the path by reflection in the mirror. Now let's look at the structure of a radio wave.

In Figure 22, the voltage measured at a distant point caused by a current in a transmitting antenna is graphed against time. At time zero, the voltage is zero. The voltage steadily increases, until it reaches the *positive peak*. From then on, the voltage diminishes, until it reaches the *negative peak*. It then returns to cross the zero volts line and to continue repeating this figure as long as the transmitter is on.

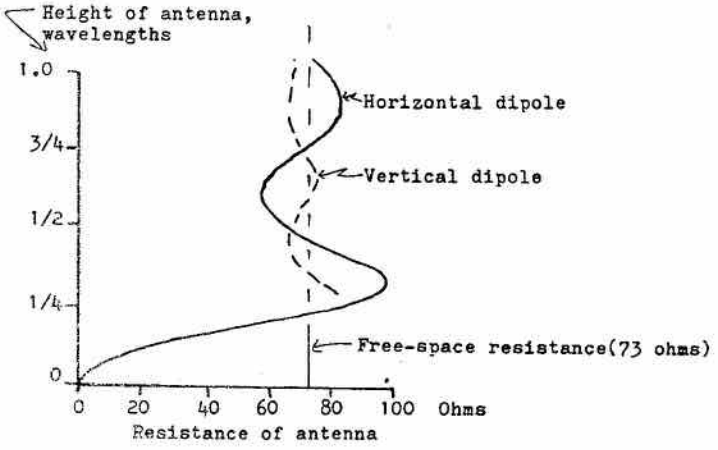


Figure 20: The radiation resistance (the apparent resistance to the transmitter) of a dipole antenna is greatly influenced by the ground.

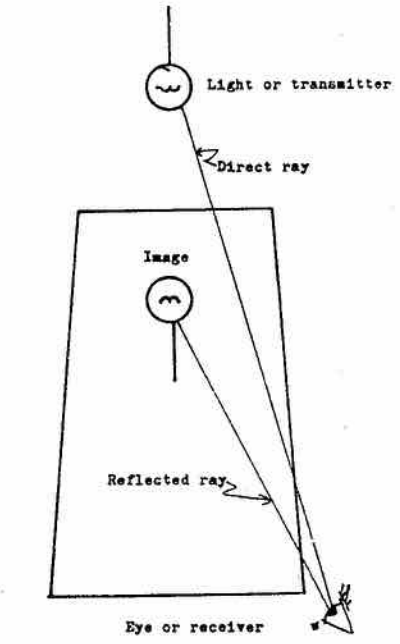


Figure 21: If a mirror is laid on the ground, under a lamp, the eye sees two lamps. The image seen by reflection is upside-down, and apparently on the other side of the mirror.

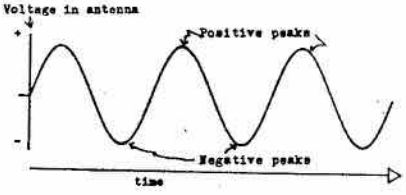


Figure 22: Current in an antenna excited by a transmitter varies regularly with time in this sine curve.

This shape is called a *sine* curve. The number of times the curve is repeated each second is called the *frequency* of the wave, and the distance between two positive peaks measured in space is called the *wavelength*.

Now let's apply this to the wave and its reflection shown in Figure 21. At the point in space, the Direct ray has reached its positive peak. But the reflected ray has been delayed half a wave, so at the distant point this ray has reached the negative peak. If the ground is a good mirror, the strengths of these two signals will be the same, so the positive peak

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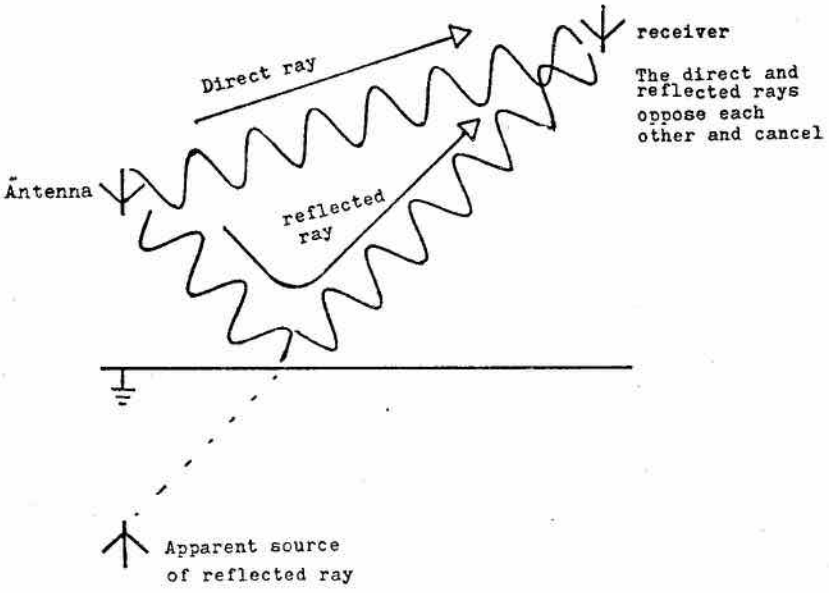

Figure 23A: Since antennas usually are within a wavelength or so of ground, a receiver 'sees' the antenna directly and also its image below ground. Because of the wave structure of the energy, the signals from the antenna may be reduced by the signal from the reflection, as here, or ...

is cancelled by the negative peak and the signal strength there is zero.

Now change the angle of ray so that the path length is a whole wave. Now the positive peaks arrive at the same time, with the result that the signal strength is double that of either ray alone, Figure 23.

In between these two angles the signal strength varies from zero to twice either peak. This variation is on top of the antenna pattern— the doughnut shape of the signal strength relationship between the antenna and the position of the receiving antenna.

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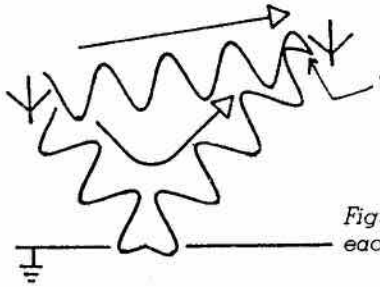

Figure 23b: ...they may reinforce each other.

Part 6

Printed Circuit Board Design

By John Iliffe VE3CES

This chapter is the result of information and questions received as a result of the previous articles in this series.

On the topic of Ferric Chloride staining clothes, the stain can be removed by soaking in Oxalic Acid, a white soluable powder which can generally be obtained from the drug store.

The bubble etcher described last month apparently will shorten the life of your Ferric Chloride solution by oxidizing it. The problem is to keep the etchant in motion so the entire process does not take too long and allow the traces to be undercut. Commercial manufacturers spray the Ferric Chloride on the board and collect the residue from a tray underneath. This provides a neat way to heat the Ferric Chloride before it reaches the board, by placing a propane torch near the spray pipe. Keep in mind when handling the etchant that hot $FeCl_3$ is very corrosive and the pump will have to be made of plastic, if you can guarantee the temperature will not damage it, or some other resistant material.

The correct etching temperature for $FeCl_3$ is 130°F.

Another method of making multiple boards which was not mentioned is to use a silk screen. I have never done this, which is why I did not write it up. The technique, in general, is to make a screen, consisting of silk carefully stretched over a wood frame, with a lacquer surface. The pattern is removed from the screen surface so it is permeable only where you want the copper to remain (on the traces). Effectively the screen is a negative on silk instead of polyester. It can be made in much the same way as the negative film is made.

A special paint is then brushed on the screen, which is fastened tightly to the surface of the board. It is forced through the holes in the screen where it is permeable and leaves the requisite pattern on the board in paint. The etching process is much the same.

The advantages are that the screen can be reused after washing, that only one item (the screen) needs to be sensitized, instead of each board, and that the paint is visible on the circuit board so it can be checked before etching. The disadvantages are that one more item is introduced into the process and that the pattern is not as fine due to the weave of the silk. Silk screen material is available from artist supply houses. Δ

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