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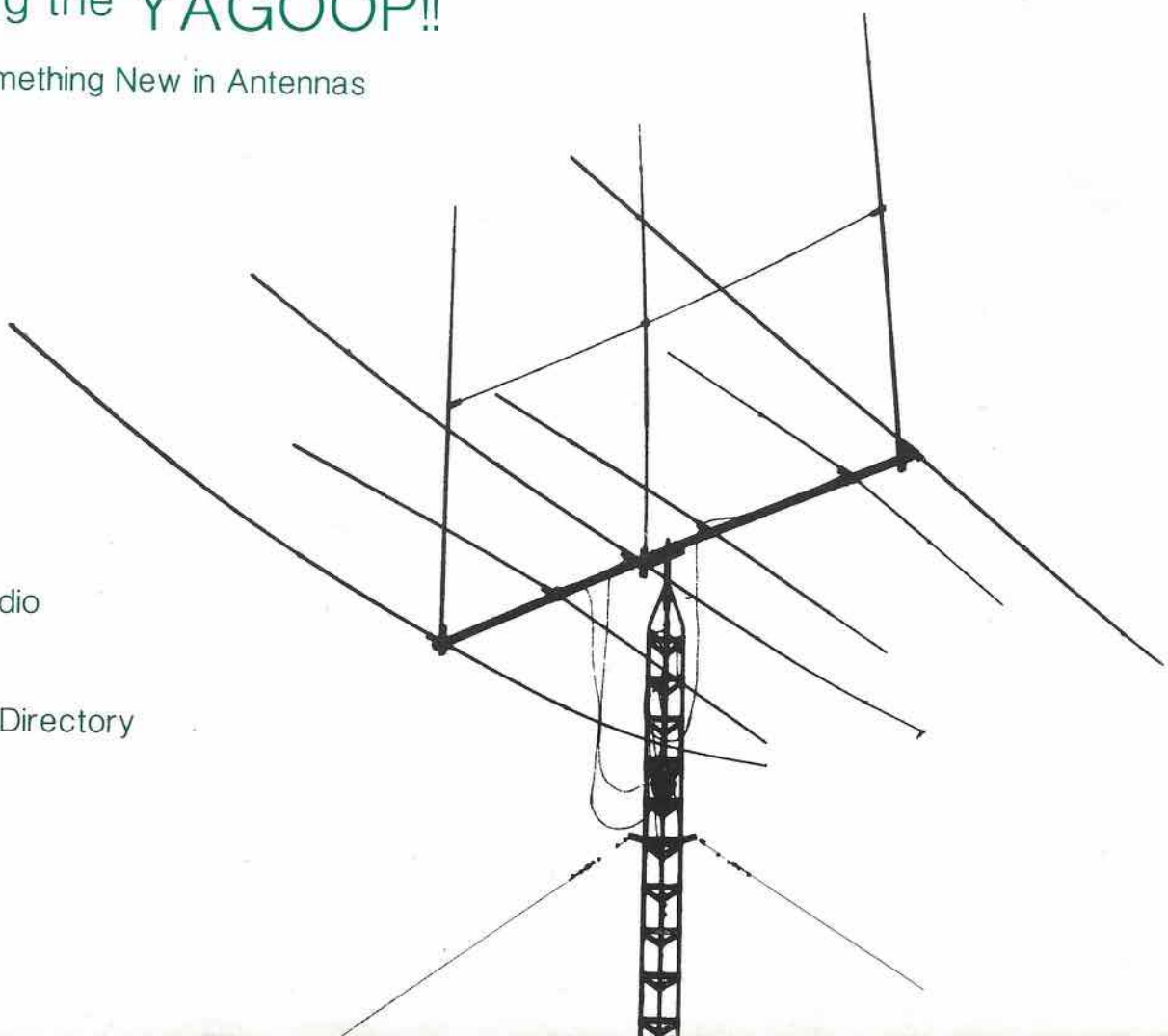

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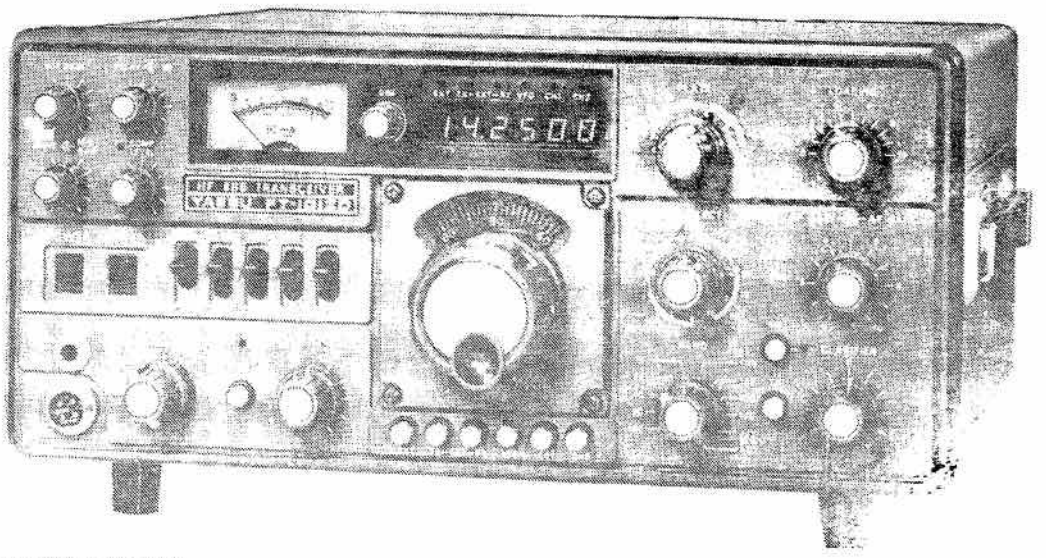
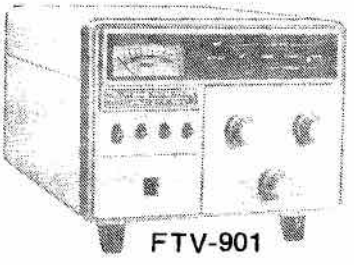
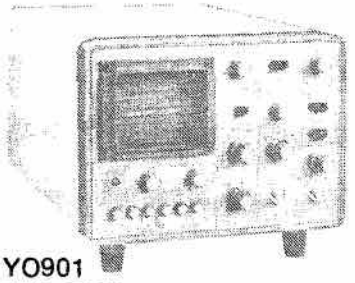




FTV-901



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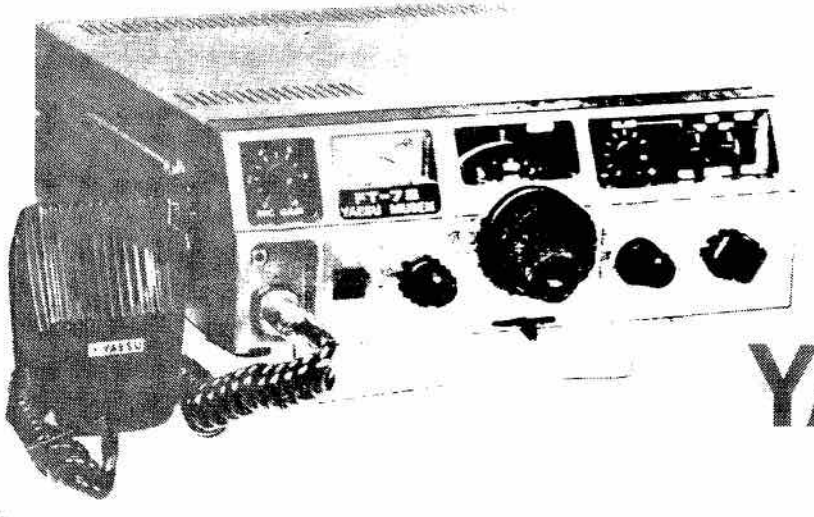

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Unsolicited articles, reviews, features, criticism and essays are welcomed. Manuscripts should be legible and include the contributor's name and address.

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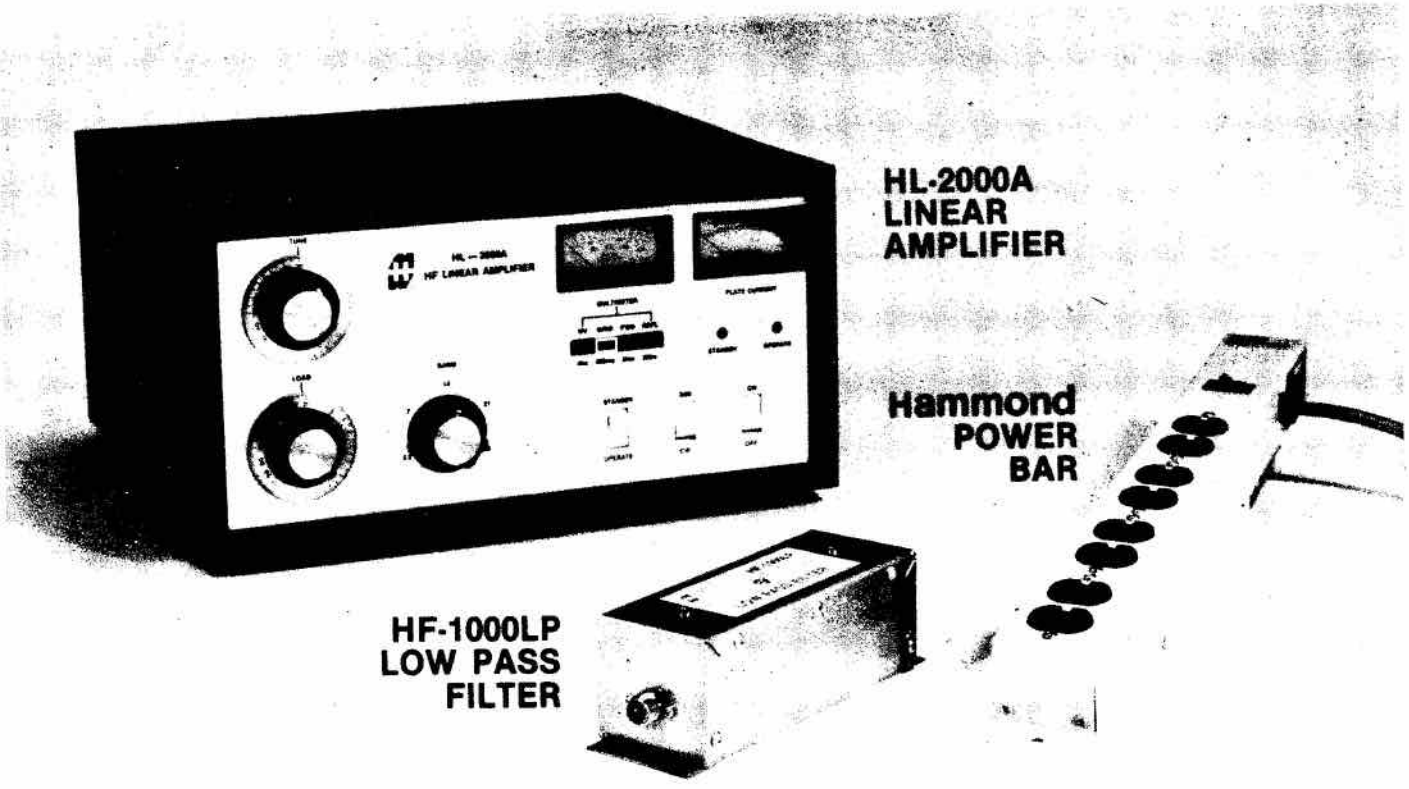

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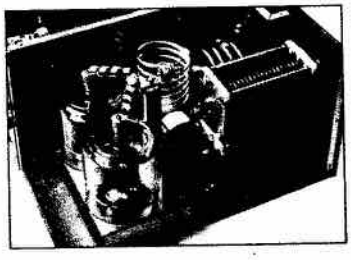

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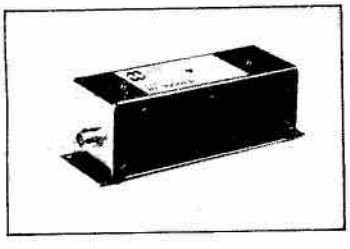

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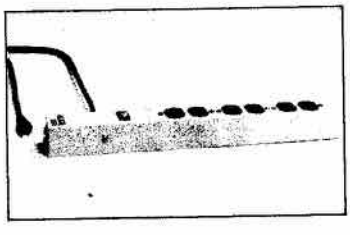

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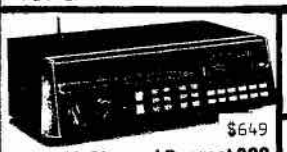

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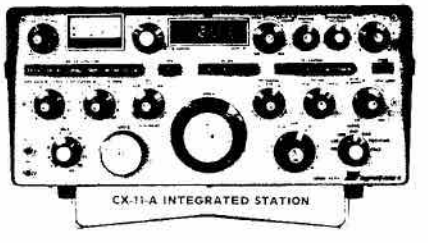

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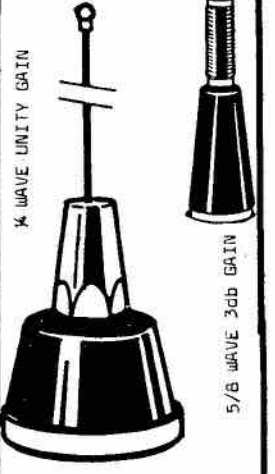

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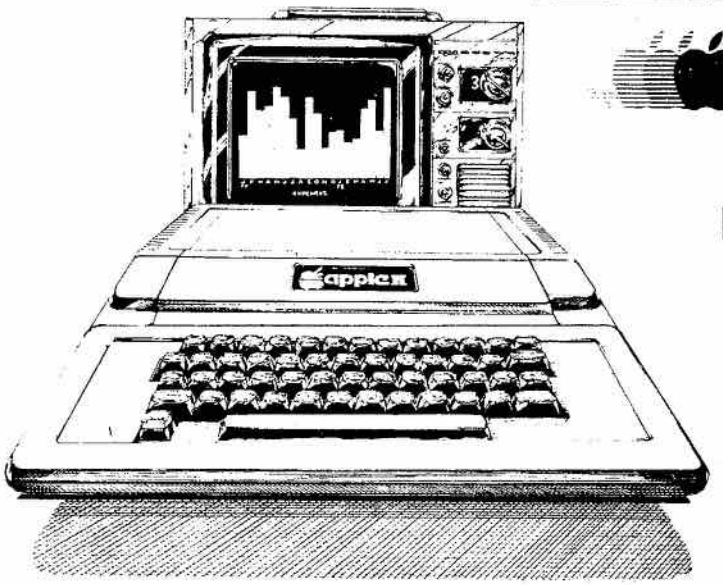

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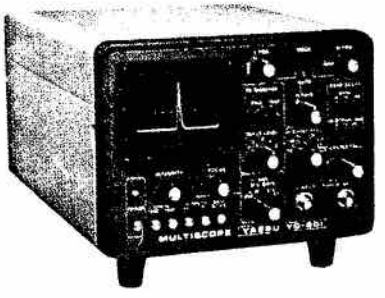

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MULTISCOPE

Unsurpassed monitoring capability is yours with the YO-901 Multiscope. Featuring a high performance oscilloscope, useful for countless station adjustments, the YO-901 also includes a two-tone generator, as well as an optional band scope for instant determination of band conditions and activity.

Narrow-band IF signal observation is not possible with the FT-101ZD and YO-901.

YAESU FT-207R
Synthesized
Handie-Talkie

YAESU

YAESU

FT-901DM

COMPETITION-GRADE HF TRANSCEIVER

Model 1514

Drake WH-7 Directional RF Wattmeter

1.8-30 MHz

$149.00 +$2 S&H IN STOCK!

Drake directional, inline wattmeters, using printed circuits, toroids, and state of the art techniques, permit versatile performance and laboratory accuracy, yet at a lower cost.

Removable coupler provides remote metering, and allows convenient positioning of coaxial cable.

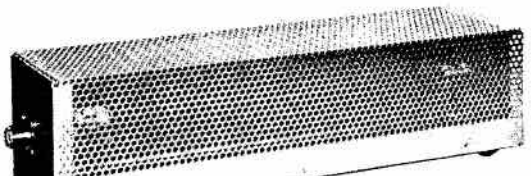
WH-7 wattmeter makes possible quick, accurate adjustments of antenna resonance and impedance match, when placed between transmitter and matching network.

Drake WH-7: Designed for user convenience and high accuracy. This instrument includes three calibrated scales for rf power to satisfy applications from QRP to high power (0-20, 0-200 and 0-2000 watts full scale) A fourth calibrated scale provides direct reading VSWR information, and is switch selected from front panel. The WH-7 is styled to match the 7-line.

Specifications

Frequency Coverage	1.8-30 MHz
Line Impedance	50 ohm resistive
Power Capability	2000 W continuous
Jacks, Removable Coupler	Two S0239 input and output connectors
Semiconductors	Two power meter rectifiers
Accuracy	± (5% of reading + 1% of full scale)
VSWR Insertion	Insertion of wattmeter in line changes VSWR no more than 1.05:1
Shipping Weight	3 lbs (1.4 kg)
Dimensions	5.3"H x 6.9"W x 7.5"D (13.5 x 17.5 x 19 cm)

Drake "Dry" Dummy Loads—no oil required



Model 1551 Drake DL-1000

$79.00 +$2 S&H
IN STOCK!!

- **1000 watts** for 30 seconds, with derating curve to 5 minutes. Designed to accept Drake FA-7 cooling fan for extended high power operation.
- **VSWR of 1.5:1 max.** 0-30 MHz.
- Provided with SO-239 coax connector, and rubber feet for desk or bench use.
- **Size** 14" x 3.6" (35.6 x 9.1 cm). Wt. 2 lbs (910 g)

Model 1550 Drake DL-300

IN STOCK!
$40.00 +$2 S&H

- **300 watts** for 30 seconds, with derating curve to 5 minutes.
- **Built-in PL-259** coax connector for direct connection to rear of transceiver or transmitter-no jumper coax necessary.
- **VSWR of 1.1:1 max.** 0-30 MHz 1.5 max. 30-160 MHz.
- Ideal as bench test device for amateur or commercial hf and vhf gear.

FREE..WRITE OR SEND QSL CARD FOR THE 100 PAGE WSI CATALOG!

WSI RADIO
SWL RADIOS—HAM RADIOS—ANTENNAS
18 SHELDON AVENUE NORTH
KITCHENER, ONTARIO N2H 3M2
Telephone (519) 579-0536

FT-707

YAESU

HF SSB TRANSCEIVER

The FT-707 "Wayfarer" is the beginning of a new generation of compact solid state transceivers. Though hardly larger than a book, the FT-707 is a full-feature transceiver with performance you might expect only in a "top of the line" transceiver. Ideally suited for your home station or as a traveling companion, the FT-707 is the radio of the 1980's.....and it's brought to you by the active hams at YAESU.

FT 707 $1199.00

NEW BANDS FACTORY INSTALLED

When the new amateur bands become available, you won't want to go through the time and expense of overhauling your present equipment. With the FT-707, you get complete coverage of 80 through 10 meters, including the new 10, 18, and 24 MHz bands, all factory installed!

FP-707 POWER SUPPLY	$239.00
FV-707DM DIGITAL VFO	$439.00
FC-707 ANTENNA COUPLER	$189.00
RACK MOUNT YOUR STATION	$35.00
FT-707 TRANCEIVER	$1199.00

GENERAL

Frequency coverage: 80 m 3.5–4.0 MHz, 40 m 7.0–7.5 MHz, 30 m 10.0–10.5 MHz, 20 m 14.0–14.5 MHz, 17 m 18.0–18.5 MHz, 15 m 21.0–21.5 MHz, 12 m 24.5–25.0 MHz 10 m 28.0–29.9 MHz **Modes of operation:** LSB, USB, CW, and AM **Power requirements:** 13.5 volts DC, negative ground **Current consumption:** DC 1.5 amps receive, DC 20 amps transmit **Case size:** 93(H) x 240(W) x 295(D) mm incl. heat sink **Weight:** Approx. 6.5 kg

TRANSMITTER

Power input: SSB/CW 240 watts DC, AM 80 watts DC **Carrier suppression:** Better than 40 dB **Unwanted sideband suppression:** Better than 50 dB at 14 MHz, 1 kHz mod. **Spurious emissions:** At least 50 dB down **Frequency response:** 350–2700 Hz (–6 dB) **Third order distortion products:** At least 31 dB down **Frequency stability:** Less than 300 Hz drift over 30 minutes after 10 minute warmup; less than 100 Hz drift after 30 minute warmup **Modulation type:** (SSB) Balanced modulator, (AM) Amplitude modulation of a low power stage **Antenna output impedance:** 50 ohms **Microphone impedance:** 500–600 ohms (low impedance)

RECEIVER

Sensitivity: SSB/CW 0.25 μV for 10 dB S/N, AM 1.0 μV for 10 dB S/N **Selectivity:** SSB 2.4 kHz (–6 dB), 4.0 kHz (–60 dB); CW* 0.6 kHz (–6 dB), 1.2 kHz (–60 dB); CW** 350 Hz (–6 dB), 1.2 kHz (–60 dB); AM 3.6 kHz (–6 dB), 6.8 kHz (–60 dB) **Image rejection:** 60 dB (80–12 m), 50 dB (10 m) **Audio output impedance:** 4–16 ohms **Audio output:** 3 watts @ 4 ohms @ 10% THD **Variable bandwidth control:** Continuous from 300 Hz to 2.4 kHz (SSB/CW modes only)

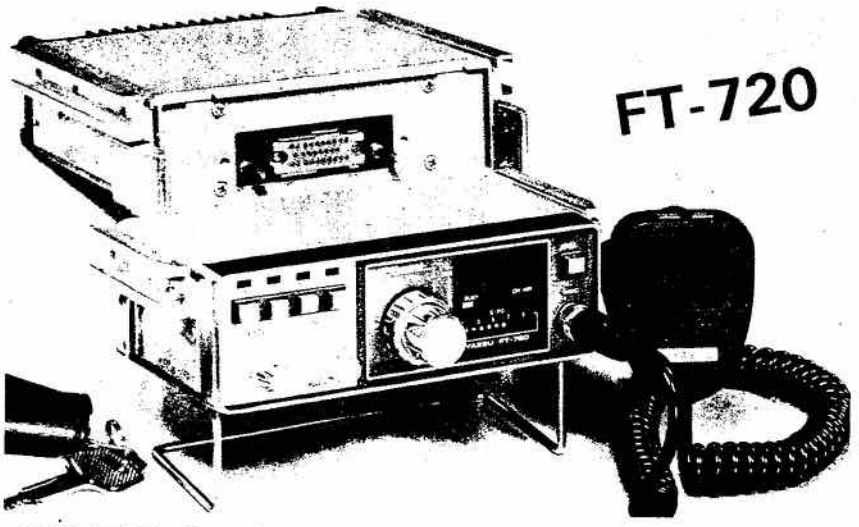
* with optional 600 Hz CW filter

** with optional 350 Hz CW filter

VE AMATEUR RADIO SALES

378 WILSON AVE.
DOWNSVIEW, ONT. M3H 1S9
PHONE (416) 636-3636 TELEX 065-24751

FROM YAESU



FT-720

ULTRA COMPACT VHF/UHF COMPUTERIZED FM TRANSCEIVER

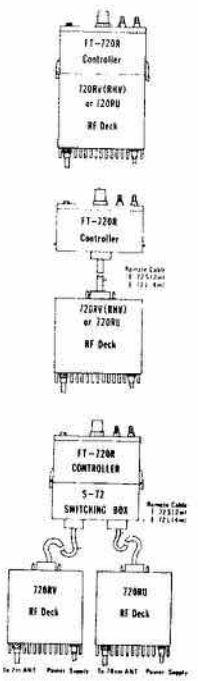
Choose Your Favorite Band
The FT-720R Control Head may be used with either the FT-720V 2 Meter RF Deck or the FT-720U 70 cm RF Deck. If you have never operated on 440 MHz, you'll be surprised at the superb coverage and clear, interference-free channels.

Advanced PLL Technology
Recent advances in Large-Scale-Integrated (LSI) circuitry have made single-chip PLL control systems a reality. In the FT-720R you get the stability of PLL, plus the flexibility of microprocessor control, in a package more compact than was ever possible before.

Scanning
Fingertip controls on the microphone provide instant up/down scanner control. The scanner may be programmed to stop on a busy or clear channel, if you wish.

Optional Control Box
The S-72 control box option will allow you to connect the control head, the 2 meter RF Deck and the 70 cm RF Deck together, thus enabling you to choose the desired band is simply by throwing one switch!

Five Memory Channels with Priority Feature
As many as five memory channels may be programmed, for instant return to a favorite repeater or simplex channel. One of the memory channels may be used as a priority channel, as well, and the microprocessor will then search between the priority channel and your main dial frequency!



	FT-720RV	FT-720RU
Frequency coverage:	144.00–147.99 MHz 144.00–145.99 MHz	430–439.975 MHz 440–449.975 MHz
Synthesizer steps:	10 or 12.5 kHz	25 kHz
Power output:	10 watts (RV model) 25 watts (RVH model)	10 watts
Modulation type:	Variable reactance phase modulation	Variable reactance phase modulation
Devision (max):	±5 kHz	±12 kHz
Maximum bandwidth:	16 kHz	30 kHz
Spurious emissions:	–60 dB or better	–60 dB or better
Antenna connector:	SO-239	Type N
Output impedance:	50 ohms	50 ohms
Microphone impedance:	500–600 ohms	500–600 ohms
Receiver type:	Double conversion superheterodyne	Double conversion superheterodyne
First IF:	10.7 MHz	16.9 MHz
Second IF:	455 kHz	455 kHz
Sensitivity:	0.32 μV for 20 dB quieting	0.5 μV for 20 dB quieting
Selectivity:	±6 kHz (–6 dB) ±12 kHz (–60 dB)	±12 kHz (–6 dB) ±24 kHz (–60 dB)
Audio output:	1.5 watts @ 8 ohms @ 10% THD	1.5 watts @ 8 ohms @ 10% THD
Audio output impedance:	8 ohms	8 ohms
Power requirements:	13.8 VDC, negative ground 13.6 VDC (RVH model)	13.8 VDC, negative ground
Current consumption:	Approx. TX 3.5A (RV model) TX 6.5A (RHV model) RX 0.5A	Approx. TX 4.5A RX 0.5A
Case size:	150(W) x 50(H) x 247(D) mm	150(W) x 50(H) x 247(D) mm
Weight:	Approx. 2.5kg	Approx. 2.5kg

Specifications subject to change without notice.

PRICES

FT 720R CONTROL HEAD WITH BRACKET	$329.00
720 RVH 2 MTR. RF DECK - 25 WATTS	$370.00
720 RU 440 MTR. RF DECK - 10 WATTS	$450.00
S72 SWITCH BOX	$129.00
E72L REMOTE CABLE	$63.00

ALL YAESU PRODUCTS ARE AVAILABLE FROM YOUR LOCAL AUTHORIZED YAESU DEALER.

DEALER ENQUIRIES INVITED

TRIBAND LTD.
IMPORTERS AND DISTRIBUTORS OF YAESU EQUIPMENT

378 WILSON AVE.
DOWNSVIEW, ONT. M3H 1S9
PHONE (416) 636-3636 TELEX 065-24751

HEAVEN ON SIX METERS!

The New ICOM 551

Proven Digital Technology

ICOM has used its expertise with Digital Technology, developed with the IC-701, in designing the all-new IC-551. A Microprocessor Controlled PLL is at the heart of this rig. The frequency tuning dial is ICOM's unique Optical Chopper, which provides years of problem-free service. This is also the first radio to use a pulse power supply, resulting in a lighter weight.

All Modes Plus Scanning

The IC-551 has All Mode capability: USB, LSB, AM, CW, and FM. The operating mode is indicated by an LED display beside the frequency readout. The module to provide FM is optional. Scanning is a standard feature, which includes Program Scan and Memory Scan. Program Scan allows scanning between two programmed frequencies. Stop-On-Signal and Speed adjustment is also included. All scanning operations work in any mode. Reading and writing to the three memories is quick and simple. Complete 4 MHz coverage without a band select switch. Two built-in VFO's provide split frequency operation at no extra cost. The optional extras for the IC-551 are FM, VOX, and Pass Band Tuning. The IC-551D includes all of the options, **except FM**, plus 80 watts RF output. An external power supply is neccessary for this model.

Specifications

GENERAL

Frequency Coverage	:	50 – 54MHz
Operationable Temperature	:	–10°C ~ +60°C (14°F – 140°F)
Power Supply Requirements	:	13.8V DC ±15%, negative ground, or 117V/240V AC ±10%
Power Consumption	:	Receive at min. audio level DC 0.9A AC 35W
		at max. audio level DC1.1A AC 41W
		Transmit in SSB/CW modes DC 3.3A AC 98W
		in AM mode DC 3.0A AC 92W
		in FM mode* DC 3.3A AC 98W
Dimensions	:	111mm (H) x 241mm (W) x 311mm (D)
Weight	:	6.1 kg

TRANSMITTER

RF Output Power	:	SSB 10W PEP (1 – 10W adjustable)
		CW 10W (1 – 10W adjustable)
		AM 4W (0 – 4W adjustable)
		FM* 10W (1 – 10W adjustable)
Modulation System	:	SSB/AM Balanced modulation
		FM* Variable reactance frequency modulation
Max. Frequency Deviation*	:	±5KHz
Spurious Emission	:	More than 60dB below peak power output
SSB Carrier Suppression	:	More than 40dB below peak power output
SSB/AM Unwanted Sideband	:	More than 40dB down at 1000Hz AF input
Microphone	:	600 ohm dynamic or electret condenser microphone

RECEIVER

Receiving Mode	:	A1 (CW), A3J (USB, LSB), A3H (AM), F3 (FM)*
Receiving System	:	SSB/CW/AM Single Superheterodyne (Triple Superheterodyne when Pass Band Tuning unit is installed)
		FM* Double Superheterodyne
Intermediate Frequency	:	SSB/CW/AM 9.0115MHz (When Pass Band Tuning Unit is installed: 2nd IF: 10.75MHz, 3rd IF: 9.0115MHz)
		FM* 1st IF: 9.0115MHz, 2nd IF: 455KHz
Sensitivity	:	SSB/CW/AM Less than 0.5 μV for 10dB S+N/N
		FM* More than 30dB S+N+D/N+D at 1 μV
Spurious Response Rejection Ratio	:	More than 60dB
Selectivity	:	SSB/CW/AM More than ±1.1KHz at –6dB
		Less than ±2.2KHz at –6dB (When Pass Band Tuning Unit is installed: less than 1KHz at –6dB)
		FM* More than ±7.5KHz at –6dB
		Less than ±15KHz at –60dB
Squelch Sensitivity	:	SSB/CW/AM 1 μV
		FM* 0.4 μV
Audio Output Power	:	More than 2 watts

551-$749 FM-$195 VOX-$85 PBTUNE-$169

551D-$1125 PS-20-$299

ICOM Canada

Dollard Electronics Ltd.

P.O. BOX 58236, 810 S.W. MARINE DRIVE

VANCOUVER, B.C. V6P 6E3 (604) 321-1833 TELEX 04-54315

LETTERS:

TCA welcomes Letters to the Editor. Please send correspondence to Editor TCA, 151 Fanshaw , Ottawa, Ont. K1H 6C8

LAHR ARC

We both enjoy **TCA** and look forward to it every month. It helps us keep in touch with what the OMs and XYLs back home are doing.

There are a number of Amateurs from Canada here in the Lahr Amateur Radio Club and also in the Baden ARC (about 60 km north of us) and we all enjoy **TCA**.

Please mention our weekly net on 14.169 MHz, plus or minus QRM, at 1800 GMT with DA2CF as net control so your readers will have the chance to talk to some Canadians overseas. A lot of us 'DA' types would love to hook up with you.

Derek & Bee Jay Quinn
VE5BAD/DA1ST &
VE5BAZ/DA2EQ
Canadian Forces Network
CFPO 5000, K0K 3R0
Lahr, West Germany

YUKON SSB STATION

Please permit me to clarify your article on my station in the 'DX News' in your March issue. I am the first **SSB** six-metre station in the Yukon and the first six-metre station operating under VY1. I understand that there were six-metre **AM** stations in operation some years ago.

The above will alert the Amateur world that the Yukon is in a progressive stage and not as dormant as some remarks seem to indicate. Strangely enough, we still are asked the question "Where is VY1?" after having our call since April 1978. Keep up the excellent column.

Bill Champagne VY1AU
Whitehorse, Yukon

Thanks for the note, Bill. The news on Page 33 of the March issue was not written by DX Editor Garth Hamilton, but was culled by yours truly from the pages of HR Report. Seems the Yukon VY1 may be unknown to some Canadians, but not in the U.S.A. Ah well, remember the old chestnut about "... a prophet is without honour in his own country"...VE3CDC.

ON MANDARIN

The statement that 'Mandarin is a language more or less peculiar to the educated' (**TCA**, April - BY on the air) is grossly misleading. Mandarin happens to be the mother tongue of a half billion Chinese who inhabit the northern, western and central regions of China and is therefore the most widespread and the most popular of all the Chinese languages. Furthermore, since official government policy is to establish Mandarin as the national language its popularity throughout the country may be expected to grow.

Al Fraser VE3EYW
Ottawa, Ont.

If Al means that we don't know what we are talking about, he may be right -- we may be wrong. The information, however, is what we understood in a conversation with Tom Wong VE7BC. Unfortunately, Tom can't be reached at the moment -- he's in China again on business. In the meantime, until we speak with Tom again [in English!] our apologies to our half-billion mandarin-speaking readers whom we so grossly misled.

NEW REGS CHANGES

Congratulations and Thanks! Thank you for all those new regulation changes which have just been passed. I know that, without your help, these changes could never have been realized. You have proven to me that, without a doubt, CARF is the organization which supports Canadian Amateurs.

In the past two years I have seen CARF make several recommendations to the DOC which have been adopted. What really makes me happy is that CARF follows through on the recommendations of the membership. To me, an organization that decides what is good only for Amateurs within the executive, not allowing the members an opinion, is an irresponsible organization.

Another thing which has really impressed me is that the organization has not become purely 'Eastern'. Although CARF is based in Ontario, it is not merely looking after the eastern Amateur's interests. Instead, CARF looks after Canada as a whole!

When I first became a member of CARF, I wasn't very happy with the magazine. It never contained too many interesting articles and it always arrived a month late, so any news in it wasn't news anymore.

As I thumbed through the newly-styled magazine (I received my March issue in March!), I became more and more impressed with the changes within. A good contest column seems to be shaping up and finally a reasonable DX column has surfaced. I hope you continue to make CARF a first-rate Canadian organization!

Ross Gallinger VE7CXC

P.S. I have talked too many Amateurs who say that their **TCA** arrives the next month.

Honest folks, this is an unsolicited testimonial! Kidding aside Ross, thanks for the bouquets. Our all-volunteer officials like to hear their spare

time activities are appreciated. As for our national outlook, nearly all of our officers and officials in VE2 and VE3 have lived in the Maritimes or the West at one time or another, so we have a national perspective. As for the mailing problem, it's not unique to TCA. Third class mail goes by truck, pony express and dog team when it finally gets to the top of the pile. We mail on time and then rattle our beads and spin the prayer wheels.

VE2LN MOVES UP

The DOC announced in a recent news release (as of April 8) the appointment of Real Therrien VE2LN as a Vice-Chairman of the Canadian Radio-television and Telecommunications Commission. Mr. Therrien (whose picture appeared in May **TCA**), already a full-time member of the CRTC, will complete his seven-year term as Vice-Chairman. In announcing the appointment, Communications Minister Francis Fox stated that VE2LN is "an ideal choice for the Vice-Chairman's job because of his vast experience with the CRTC and regulatory matters". Real was first appointed a full-time commissioner in 1968 and reappointed in 1975.

FIBRE OPTICS PLANT

Northern Telecom plans to build an 11-million dollar fibre optics plant in Saskatoon. Northern recently won a $22 million contract from SaskTel for fibre optic cable and other equipment for a fibre optic broadband network to link major communities in the province by 1984. The new plant will have a research and development division, which should boost Saskatoon's Amateur population.

HELP WANTED

In an earlier issue we ran a letter from Clarence E. Gaspar. We would like to write to him, but there was no address on the letter. Could some Missisauga reader come up with one for us? ...Editor.

Let there be no non-believers!

Larry Kayser VE3QB is not conducting an evangelical service in an Ottawa church, but he is preaching the marvels of packet radio to a fascinated audience in the National Research Auditorium in Ottawa.

Larry held forth at the Ottawa ARC April meeting on the possibilities inherent in the technology of packet radio married to 'smart' repeaters fitted with complicated logic circuitry. The Ottawa 220 MHz repeater is now on the air and under continuous development is a type of machine which Larry has christened a 'digipeater' and a story on the new look in Amateur repeaters in the next few years appears on Page 20 of this issue.

(Photo – Ray Wilson VE3WI)

News Briefs

CANADA WEEK

The 12th annual celebration of Canada Week, promoted by the Council for Canadian Unity (CCU), is slated for the last week in June. As the real thrust of Canada Week, Canada's birthday celebration, occurs at the local level in an attempt to motivate and involve individual Canadians, the CCU has suggested that Amateur Radio can play a meaningful part in the week's events, such as providing communications facilities and coverage of local sports events and community competitions. Any involvement by the Amateur Radio fraternity will be appreciated by the CCU. Go ahead, and have FUN!

AMATEUR TARIFFS

Last year's recommendation by the Tariff Board that import duties on Amateur transitters and transceivers should be removed may surface as an accomplished fact very soon. CARF News Service learned that if the duty is to be removed such notice will appear in the budget speech in the upcoming session of this new Parliament. Scuttlebutt was that we can be optimistic that it will appear.

SIGNALS CORPS REUNION

Royal Canadian Corps of Signals veterans staged a reunion on May 30 and 31 at the Rockliffe Canadian Forces Base in Ottawa. The get-together featured a stag party on the Friday night and a banquet and dance on the Saturday evening.

SPACE SOCIETY

An international society of all space-oriented Amateur organizations, as proposed at this month's AMSAT board meeting in Washington, will be the subject of an organizational meeting tentatively set for September in London, according to HR Report.

Hugh Lines VE3DWL
53 Monterey Dr.
Nepean, Ont. K2H 7A8

Repeater List

CRAG REPEATER DIRECTORY
30 APRIL, 1980

Canadian Amateur Radio Federation
Canadian Repeater Advisory Group

Compiled by H. Lines, VE3DWL

NFLD/LABRADOR
<<<<<<#>>>>>>

Corner Brook	VO1MO	146.340	146.940	
Gander	VO1AV	146.460	147.060	P
Grand Falls	VO1CNR	146.340	146.940	P
Labrador City/Wabush	VO2AD	146.340	146.940	
St Johns	VO1GT	146.340	146.940	
St Johns	VO1EN	146.460	147.060	

NOVA SCOTIA
<<<<<<#>>>>>>

Bear River	VE1ASQ	146.190	146.790	
Big Harbour	VE1BVH	147.720	147.120	
Blockhouse	VE1LCA	147.840	147.240	
Bridgetown	VE1BO	146.460	147.060	
Dartmouth	VE1PB	146.250	146.850	
Gore	VE1LHR	146.040	146.640	
Halifax	VE1CBC	146.340	146.940	
Liverpool	VE1VO	147.900	147.300	
Mt Blomidon	VE1AEH	147.780	147.180	
Mulgrave	VE1RTI	146.220	146.820	
New Glasgow	VE1HR	146.160	146.760	
New Ross	VE1 ?	147.840	147.240	P
North Sydney	VE1AUY	147.840	147.240	A
Nutby Mtn	VE1LHD	147.810	147.210	D
Rear Boisdale	VE1HAM	146.280	146.880	
Shelburne	VE1SCR	146.010	146.610	
Springhill	VE1SPR	146.400	147.000	1
Springhill	VE1SPR	443.300	448.300	A 2
Sydney	VE1CBI	146.010	146.610	R
Sydney	VE1SYD	146.340	146.940	A
Truro	VE1LHD	147.810	147.210	
Truro	VE1XK	146.190	146.790	
Truro	VE1ZG	146.310	146.910	P
Yarmouth	VE1YAR	146.130	146.730	

NOTES
*****
1 - Linked with VE1AHC (PEI)
2 - VE1AHC link frequency

P.E.I.
<<<<<<#>>>>>>

Charlottetown	VE1AHC	146.070	146.670	1 A
Charlottetown	VE1AHC	448.300	443.300	1 2
Charlottetown	VE1UHF	449.400	444.400	1 A
O'Leary	VE1ATN	147.720	147.120	
Summerside	VE1CFR	146.250	146.850	

NOTES
*****
1 - Linked with VE1SPR (NS)
2 - VE1SPR link frequency

NEW BRUNSWICK
<<<<<<#>>>>>>

Bathurst	VE1PL	146.340	146.940	
Dalhousie	VE1BKX	146.040	146.640	
Fredricton	VE1BM	147.720	147.120	A
Fredricton	VE1PD	146.160	146.760	
Moncton	VE1MTN	147.690	147.190	
Moncton	VE1RPT	146.280	146.880	A
Mt Champlain	VE1TWO	146.100	146.700	
Newcastle/Chatham	VE1NCR	147.750	147.150	P
Perth	VE1BGK	146.220	146.820	
Perth	VE1KWT	146.460	147.060	
Saint Davids Ridge	VE1IE	146.250	146.850	
Saint John	VE1KI	146.220	146.820	
Saint John	VE1 ?	Not	Known	P
Sussex	VE1SMT	146.010	146.610	
Woodstock	VE1EMT	146.370	146.970	

QUEBEC
<<<<<<#>>>>>>

Alma	VE2RCA	146.070	146.670	
Alma	VE2RCM	146.250	146.850	
Alma	VE2RCR	146.340	146.940	E L
Amos	VE2RYE	146.160	146.760	
Amqui	VE2KH	146.280	146.880	
L'Assomption	VE2RBB	147.810	147.210	
Baie Comeau	VE2RPR	146.100	146.700	A
Brownsburg	VE2RWC	146.205	146.805	
Carleton	VE2 ?	Not	Known	P
Chicoutimi	VE2IU	146.160	146.760	
Chicoutimi	VE2RCC	147.720	147.120	
Deux Montagnes	VE2RAU	146.310	146.910	B
Donacona	VE2RAP	146.430	147.030	
Dolbeau	VE2RCD	146.100	146.700	
Drummondville	VE2RDV	147.690	147.090	
Franklin Ctr	VE2RBV	147.810	147.210	
Gagnon	VE2RGA	146.340	146.940	
Gaspe	VE2ELE	146.280	146.880	
Grand Fond	VE2CTT	146.400	147.000	A
Granby	VE2RTA	147.780	147.180	E
Haute Rive	VE2RJB	147.900	147.300	
Hereford	VE2ROM	147.960	147.360	E
Hull	See NATIONAL CAPITAL REGION			
Joliette	VE2RMA	146.430	147.030	
Jonquiere	VE2VP	146.220	146.820	
La Tuque	VE2EH	146.190	146.790	
Laval	VE2RVS	146.250	146.850	
Matane	VE2RAS	147.720	147.120	A E
Mont Dufor	VE2ES	146.280	146.880	
Mont Laurier	VE2RMC	146.370	146.970	E
Mont Logan	VE2OE	146.160	146.760	
Montmagny	VE2RAB	146.370	146.970	
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	
Montreal	VE2REP	146.280	146.880	
Montreal	VE2RKO	146.040	146.640	
Montreal	VE2RM	146.400	147.000	A
Montreal	VE2RM	146.400	224.060	
Montreal	VE2RM	444.000	449.000	
Montreal	VE2RMB	146.100	146.700	E
Montreal	VE2RMP	146.160	146.760	
Montreal	VE2RY	147.900	147.300	
Montreal	VE2 ?	223.500	223.500	D 6
Mont Joli	VE2RAC	146.130	146.730	E L
Mount Carmel	VE2 ?	Not	Known	P
Mt St Joseph	VE2IN	146.220	146.820	
Mt Tremblant	VE2RMT	146.130	146.730	E
Parc Des Laurentides	VE2RMG	147.690	147.090	E L
Perce	VE2ELC	146.190	146.790	
Plessisville	VE2CRP	146.130	146.730	
Port Alfred	VE2TG	146.430	147.030	
Quebec City	VE2ASU	146.100	146.700	
Quebec City	VE2DB	146.280	146.880	A
Quebec City	VE2DM	146.340	146.940	
Quebec City	VE2RAA	147.960	147.360	L
Quebec City	VE2RAD	146.010	146.610	
Quebec City	VE2RAQ	146.250	146.850	R
Quebec City	VE2RCQ	147.780	147.180	E A
Quebec City	VE2RCQ	449.000	444.000	
Quebec City	VE2SRC	147.720	147.120	A
Quebec City	VE2UX	146.220	146.820	E L
Quebec City	VE2VD	146.160	146.760	E
Rimouski	VE2CSL	146.340	146.940	E
Rimouski	VE2WM	146.010	146.610	
Ripon	VE2RBA	147.945	147.345	
Riviere Du Loup	VE2DO	146.190	146.790	
Riviere Du Loup	VE2NY	147.660	147.060	E L
Riviere Du Loup	VE2RAY	147.750	147.150	A
Rouyn-Noranda	VE2RON	146.220	146.820	A
Sept Isles	VE2RRU	146.190	146.790	
Sept Isles	VE2RSI	146.340	146.940	
Sherbrooke	VE2FX	147.930	147.330	L
Sherbrooke	VE2RAL	146.310	146.910	
Sherbrooke	VE2RSH	146.370	146.970	
Sherbrooke	VE2SS	146.250	146.850	
Sherbrooke	VE2TA	146.190	146.790	E
Sorel Tracy	VE2RBS	146.010	146.610	
St Hyacynthe	VE2RBE	147.225	147.825	E
St Jean	VE2RVR	147.840	147.240	
Trois Rivieres	VE2RTR	146.070	146.670	
Trois Rivieres	VE2CTR	146.460	147.060	A
Trois Rivieres	VE2OW	147.900	147.300	A
Val D'Or	VE2RYE	146.160	146.760	A
Victoriaville	VE2RBF	147.750	147.150	

NATIONAL CAPITOL REGION
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Hull/Ottawa	VE3CPC	147.750	147.150	
Hull/Ottawa	VE2CRA	146.340	146.940	
Hull/Ottawa	VE2CRA	443.300	448.300	0
Hull/Ottawa	VE2CSO	146.100	146.700	
Hull/Ottawa	VE3JGP	56.760	52.525	
Hull/Ottawa	VE2KPG	147.960	147.360	A
Hull/Ottawa	VE3OCR	52.525	52.525	I L
Hull/Ottawa	VE3OCR	52.150	53.150	A P L
Hull/Ottawa	VE3OCR	53.150	53.150	L
Hull/Ottawa	VE3OCR	146.250	146.850	A E L
Hull/Ottawa	VE3OCR	223.340	224.940	A E L
Hull/Ottawa	VE3OEA	146.070	146.670	A
Hull/Ottawa	VE3ORA	146.280	146.880	
Hull/Ottawa	VE3OTT	147.720	147.120	
Hull/Ottawa	VE2RBG	147.990	147.390	A
Hull/Ottawa	VE2RBG	223.100	147.390	A
Hull/Ottawa	VE2RBG	223.100	224.700	A
Hull/Ottawa	VE3RAR	222.340	222.340	0
Hull/Ottawa	VE3ROB	147.780	3.540	4
Hull/Ottawa	VE3TEL	146.430	147.030	
Hull/Ottawa	VE3TRO	147.900	147.300	
Hull/Ottawa	VE3TRO	449.200	444.200	P

ONTARIO
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Aurora	VE3RYC	147.225	147.825	
Bancroft	VE3TBF	147.840	147.240	
Barrie	VE3RAG	146.070	146.670	
Belleville	VE3IVL	146.430	147.030	
Belleville	VE3KBR	146.985	146.385	
Bracebridge	VE3MRT	146.280	146.880	
Brampton	VE3MHZ	146.280	146.880	E
Brampton	VE3SSS	147.880	147.280	
Brantford	VE3TCR	147.750	147.150	
Brantford	VE3XPR	147.990	147.390	
Brockville	VE3BAT	146.220	146.820	9
Brockville	VE3WXR	146.370	146.970	
Burlington	VE3RSB	147.810	147.210	
Cambellford	VE3KFR	146.370	146.970	
Carleton Place	VE3FXE	147.870	147.270	P
Chatham	VE3KCR	147.720	147.120	
Chelmsford	VE3JIQ	146.160	146.760	
Cobalt	VE3TAR	146.370	146.970	
Collingwood	VE3MTR	146.190	146.790	

Cornwall	VE3SVC	147.780	147.180	
Deep River	VE3NRR	146.160	146.760	
Elliot Lake	VE3 ?	Not	Known	P
Finch	VE3SDG	147.840	147.240	P
Fonthill	VE3WCR	147.900	147.300	
Goderich	VE3GOD	147.630	147.030	
Georgian Bay	VE3MGB	147.780	147.180	
Georgetown	VE3OD	147.135	147.735	
Georgetown	VE3IZU	52.130	53.130	P
Guelph	VE3ZMG	147.960	147.360	
Haliburton	VE3GTS	147.720	147.120	
Hamilton	VE3DRW	146.160	146.760	
Hamilton	VE3MBR	147.705	147.105	
Hamilton	VE3TVI	146.805	146.205	
Hensall	VE3OBC	146.310	146.910	
Kenora	VE3LWR	146.460	147.060	
Kingston	VE3KER	146.340	146.940	
Kingston	VE3KNR	146.190	146.790	9
Kirkland Lake	VE3KLR	146.280	146.880	
Kitchener	VE3KSR	146.370	146.970	
Kitchener	VE3XRX	146.190	146.790	
Lavant	VE3DVO	146.610	52.525	
London	VE3LAC	147.660	147.060	
London	VE3NDT	146.340	146.940	
London	VE3RGM	146.160	146.760	
London	VE3TTT	147.780	147.180	A E
London	VE3TTT	449.400	444.400	
Lucan	VE3OPR	147.600	147.000	
Minden	VE3MIN	Not	Known	P
Montreal River	VE3LSP	146.460	147.060	
Morrisburg	VE3SVR	146.160	146.760	
New Liskeard/Cobalt	VE3TAR	146.340	146.940	
New Liskeard/Cobalt	VE3TAR	146.460	146.940	
North Bay	VE3NFM	146.340	146.940	
Orangeville	VE3RSO	146.625	146.025	
Orillia	VE3LSR	146.250	146.850	
Orillia	VE3ORR	147.810	147.210	
Oshawa	VE3OSH	147.720	147.120	
Ottawa	See NATIONAL CAPITOL REGION			
Owen Sound	VE3OSR	146.340	146.940	
Peterborough	VE3KRA	222.340	223.940	
Peterborough	VE3PBO	146.340	146.940	A
Pickering	VE3IL	146.070	146.670	
Port Colborne	VE3WCR	147.900	147.300	
Ramore	VE3TIR	146.460	147.060	
Renfrew	VE3STP	146.460	147.060	
St Catherines	VE3NRS	147.840	147.240	
Sarnia	VE3SAR	146.340	146.940	
Sault Ste Marie	VE3SAP	146.460	147.060	
Sault Ste Marie	VE3SJI	146.280	146.880	B
Sault Ste Marie	VE3SSM	146.340	146.940	
Sault Ste Marie	VE3YAK	147.750	147.150	A
Smiths Falls	VE3RLR	147.810	147.210	O
St Ignace Island	VE3 ?	146.340	146.940	P E
Sudbury	VE3SSI	146.100	146.700	P
Sudbury	VE3NRS	146.460	147.060	
Temagami	VE3 ?	146.310	146.910	P
Thunder Bay	VE3YOT	146.460	147.060	
Timmins	VE3KAC	146.070	146.670	
Timmins	VE3TIR	146.370	146.970	
Timmins	VE3TIS	146.340	146.940	
Tiverton	VE3TIV	146.010	146.610	
Toronto	VE3MHZ	146.280	146.880	
Toronto	VE3MOT	147.780	147.180	
Toronto	VE3PRT	448.300	443.300	
Toronto	VE3RPT	52.760	52.525	
Toronto	VE3RPT	147.660	147.060	A
Toronto	VE3SIS	52.230	53.230	
Toronto	VE3SKY	146.985	146.385	
Toronto	VE3TDO	146.430	147.030	
Toronto	VE3TDX	147.930	147.330	
Toronto	VE3TFM	147.870	147.270	
Toronto	VE3TOR	146.340	146.940	
Toronto	VE3TTY	146.100	146.700	R
Toronto	VE3TWR	449.400	444.400	P
Toronto	VE3UHR	449.250	444.250	
Toronto	VE3YRC	147.825	147.225	
Waterloo	VE3WFM	147.690	147.090	
Waterloo	VE3RRR	146.835	146.235	
Wawa	VE3WAW	146.340	146.940	
Windsor	VE3HFR	147.720	147.120	
Windsor	VE3III	146.460	147.060	
Windsor	VE3III	146.280	147.060	
Windsor	VE3WIN	146.400	147.000	

NOTES
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4 - Special DOC Authorization

6 - Soon to be changed to 222.300 222.300

9 - Exchanging Freqs in early 1980

MANITOBA
<<<<<<#>>>>>>

Brandon	VE4AL	146.130	146.730	A T
Brandon	VE4BDN	146.340	146.940	
Flin Flon	VE4FFR	146.340	146.940	
Gimli	VE4GIM	146.250	146.850	
Killarney	VE4KIL	146.250	146.850	
Miami	VE4HS	146.220	146.820	
Pinawa	VE4PIN	146.340	146.940	
Winnipeg	VE4AGA	52.760	147.120	
Winnipeg	VE4CNR	146.160	146.760	
Winnipeg	VE4MAN	146.010	146.610	
Winnipeg	VE4TTR	223.340	224.940	
Winnipeg	VE4RAG	147.840	147.240	
Winnipeg	VE4WDX	147.780	147.180	
Winnipeg	VE4WPG	146.460	147.060	A

SAKATCHEWAN
<<<<<<#>>>>>>

Anglin	VE5 ?	146.160	146.760	
Grenfell	VE5 ?	146.310	146.910	P
Ituna	VE5ABO	146.310	146.910	
Last Mountain	VE5AT	146.250	146.850	
Lloydminster	VE5RI	146.340	146.940	
Meacham	VE5HVR	146.220	146.820	L
Melfort	VE5RPT	146.280	146.880	
Melville	VE5 ?	Not	Known	P
Moose Jaw	VE5CI	146.340	146.940	
Moose Mountain	VE5MR	146.220	146.820	
Moosomin	VE5 ?	146.160	146.760	
North Battleford	VE5BRC	146.280	146.880	
Pilot Butte	VE5 ?	449.000	444.000	P
Prince Albert	VE5EEE	146.460	147.060	
Prince Albert	VE5 ?	146.160	146.760	
Regina	VE5KE	146.460	147.060	
Regina	VE5SS	146.280	146.880	
Rock Point	VE5RPR	146.130	146.730	
Rosetown	VE5 ?	Not	Known	P
Saskatoon	VE5SK	146.040	146.640	L
Saskatoon	VE5SM	146.340	146.940	
Shaunavon	VE5 ?	146.160	146.760	P
Sintaluta	VE5 ?	Not	Known	P
Stranraer	VE5 ?	146.370	146.970	P
Swift Current	VE5SCR	146.280	142.880	
Tompkins	VE5 ?	146.070	146.670	P
Watrous	VE5 ?	146.010	146.610	P
Yellowhead	VE5ESK	146.160	146.760	L
Yorktown	VE5 ?	146.280	146.880	P

ALBERTA
<<<<<<#>>>>>>

Andrew	VE6 ?	146.040	146.640	P
Calgary	VE6AUY	146.460	147.060	A
Calgary	VE6RPT	146.340	146.940	A L
Calgary	VE6RUM	Not	Known	
Calgary	VE6RYC	146.250	146.850	
Calgary	VE6 ?	Not	Known	B P
Cold Lake	VE6OC	146.460	147.060	
Edmonton	VE6HM	146.460	147.060	
Edmonton	RE6MC	146.250	146.850	A
Fort McMurray	VE6 ?	Not	Known	P
Grand Prairie	VE6OL	146.460	147.060	
Hardisty	VE6NW	146.250	146.850	P
Hinton	VE6YAR	146.160	146.760	
Lethbridge	VE6CAM	146.280	146.880	
Medicine Hat	VE6HAT	146.460	147.060	
Medicine Hat	VE6COH	146.250	146.850	
Milk River	VE6BRC	146.160	146.760	
Pigeon Lake	VE6SS	146.340	146.940	
Porcupine Hills	VE6ROT	146.130	146.730	
Red Deer	VE6QE	146.400	147.000	
Rocky Mtn House	VE6VHF	146.280	146.880	L
Swan Hills	VE6 ?	146.220	146.820	P
Three Hills	VE6FUN	146.220	146.820	
Willingdon	VE6PP	146.220	146.820	

BRITISH COLUMBIA
<<<<<<#>>>>>>

Chilliwack	VE7ELK	146.400	147.000	
Chilliwack	VE7 ?	146.370	146.970	P
Courtenay	VE7CVW	146.310	146.910	
Cranbrook	VE7 ?	146.340	146.940	
Dawson Creek	VE7RDC	146.340	146.940	
Dawson Creek	VE7RSP	144.280	145.880	
Delta	VE7RTY	144.100	146.700	R
Fernie	VE7 ?	Not	Known	P
Fort Fraser	VE7RFF	147.630	147.030	
Fort St John	VE7RSJ	146.220	146.820	A
Fort St John	VE7RTR	438.100	445.100	L
Fort St John	VE7RSJ	445.100	438.100	L
Fruitvale	VE7 ?	146.340	146.940	
Kamloops	VE7RKA	146.250	146.850	L
Kamloops	VE7KAR	146.340	146.940	
Kelowna	VE7ROK	146.220	146.820	P
Kimberly	VE7CAP	146.340	146.940	
Maple Ridge	VE7RMR	146.190	146.790	
Massett	VE7DRZ	146.340	146.940	
Mt Bruce	VE7RSI	147.930	147.330	
Nanaimo	VE7ISC	146.040	146.640	
Nanaimo	VE7 ?	144.830	145.430	P
Nelson	VE7BTU	146.460	147.060	
Nelson	VE7 ?	146.340	146.940	
Penticton	VE7OKN	146.340	146.940	
Port Alberni	VE7RAC	147.840	147.240	C
Port Edward	VE7RPE	146.400	147.000	
Prince George	VE7AFG	146.340	146.940	
Prince George	VE7RPG	146.280	146.880	
Prince George	VE7RTI	52.525	52.525	P L
Prince George	VE7RTI	146.730	147.330	P L
Prince George	VE7RTI	446.000	446.000	P L
Prince Rupert	VE7RPR	146.280	146.880	
Quesnel	VE7RQL	146.460	147.060	
Salmon Arm	VE7APH	146.160	146.760	
Smithers	VE7RHD	146.460	147.060	
Terrace	VE7ORT	146.340	146.940	
Trail	VE7CAO	146.250	146.850	
Trail	VE7 ?	147.830	147.230	P
Vancouver	VE7ESR	147.810	147.210	
Vancouver	VE7RAG	147.630	147.030	
Vancouver	VE7RPT	146.340	146.940	A
Vancouver	VE7UHF	448.800	443.800	
Vancouver	VE7URG	449.000	444.000	
Vancouver	VE7VAN	147.720	147.120	
Vancouver	VE7 ?	224.300	222.700	P
Vancouver	VE7WRS	147.870	147.270	D
Vernon	VE7RSS	146.280	146.880	
Vernon	VE7RVN	146.460	147.060	A
Victoria	VE7RSR	144.810	145.410	
Victoria	VE7VIC	146.250	146.850	A
Williams Lake	VE7DSO	146.340	146.940	L

YUKON/N.W.T
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Whitehorse	VY1RBH	146.340	146.940	
Frobisher Bay	VE8 ?	146.340	146.940	

NOTES
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A - Autopatch
B - Battery Power
C - Temporary Call
D - Packet Radio/Data
E - Emergency Power
L - Linked
O - Temporarily off the air
P - Proposed
Q - Temporary Location
R - RTTY/FAX
T - Tone Access

CHIPS & BITS

A COMPUTER COLUMN FOR AMATEURS

By Charles MacDonald

Hello again, and welcome to the world of computers. The purpose of this column is to help the Amateur become more acquainted with the microprocessor.

This month we will look at just what the microprocessor needs in order to live happily in a circuit. Again we will use the 6502 microprocessor that is used in the Apple II and Commodore Pet computers as an example with the pin numbers of the -80 as used in the TRS-80 in brackets.

The microprocessor is a single intergrated circuit that acts as the central processing unit, or CPU of a computer system. Just as a final amplifier, or a crystal does not by itself make a transmitter the microprocessor does not make a complete computer.

A complete computer must have a CPU, memory, input/output, and power. These necessities are connected to the microprocessor by means of 40 pins that make up the normal IC package. Engineers who work with ICs say that everything that is not in the IC package is part of the outside world, a very descriptive term.

The first thing that every IC needs is of course DC power. In the case of the 6502 and the Z-80 a single 5 Volt supply is required on pin 8 of the 6502 (11 of the Z-80). The supply should be regulated to within 5%. Almost any project that used a microprocessor would need this sort of supply for the other chips in the circuit. A 7805 of LM-309-5 regulator may be used to generate this voltage or you may decide to use a regulated power supply from the surplus market.

The microprocessor also needs a clock signal to allow it to coordinate all the operations that go on internally. The 6502 uses a two phase clock. Phase zero on pin 37, and phase one on pin 3. The clock may be provided from an external source as in the Apple II where it is derived from the video display logic, or by using the chip's built-in oscillator that simply requires a 1 MHz XTAL as on the Commodore/ MOS KIM-1. (Z-88 uses a single phase clock signal at 1.77 to 4.0 MHz on pin 6).

Most of the pins of the chip are used for the address and data lines. Most of the so-called 8 bit processors use 16 address lines. These address lines are used by the microprocessor to specify which memory location it wants information from, or it wishes to store information in. In the last column when we looked at machine language programming you may recall we used the LDA instruction to put a character, or at least a number that represented a character in one of the registers of the microprocessor. The address lines tell the memory of the computer which storage location has the information that is currently desired. With 16 address lines the computer can have 65536 separate locations the memory locations are numbered in binary from 0 [000000000000] to 65535 [1111111111111111]. Any number in between can be represented by a combination of zeros and ones.

The address lines of the 6502 from most significant to least significant are 25, 24, 23, 22, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, and 9. The Z-80 uses 5, 4, 3, 2, 1, 40, 39, 38, 37, 36, 35, 34, 33, 32, 31, and 30.

The next major group of pins is the data buss. Data lines carry all the information that the processor handles. (Every letter now on this page went through the data lines on the 6502 in the Commodore PET that I used to write this article.) The data lines are said to be bi-directional. They are used both to send information out of the microprocessor to the memory, and to bring information into the microprocessor from the outside world.

Data lines in the 6502 are pin 26, 27, 28, 29, 30, 31, 32, and 33. The Z-80 uses 13, 10, 9, 7, 8, 12, 15, and 14.

Reset pin 40 (26) and of course ground 1, and 21 (29) wrap up the pins that are common between the 6502 and the Z-80.

The remaining pins of the 6502 have the following designations. Pin 34 or R/W this pin is held at a one when the processor wants to read a location and goes to zero when it does a write. NMI and IRQ are the interrupt request lines. The 6502 can be interrupted in the course of a task, it will store away whatever it is doing and then do the higher priority job. After the interrupt has been taken care of, the 6502 goes back to its first job as if nothing had happened, NMI is the interrupt that can't be disabled by the machine with software. IRQ can be ignored under software control. This is done when the primary task has critical timing, as in receiving a RTTY signal and decoding it on the screen of the computer.

RESET pin 40 is used to start up the CPU, and to regain control in the event of a program error. When the reset pin is grounded the processor goes to the locations at the very highest numbered locations in memory. These locations contain a table that tells the processor where the program it is to start executing is stored. The startup program is normally kept in read only memory (ROM). The ROM is programmed at the factory, or at the bench, and will remember even with the power turned off. All 6502 systems, from the smallest video game, to a full fledged computer with several disk drives, require some ROM to get them started.

RDY is an input to the chip. When the memory is unable to respond to a request from the processor immediately, it sends a signal on this line. The CPU will do a do-nothing cycle while it is waiting for the memory to catch up. This situation may occur in systems that use slow memory. (The price of memory chips is partly based on how fast they respond, with the fastest priced the highest.) SYNC is an output that tells the circuit that the CPU is expecting an opcode and not data. SO is an input that can set the overflow flag. Control applications where the 6502 is operating automatic equipment might use this input.

The lines on a Z-80 are slightly more complex. Z-80 based computers use a concept known as ports. In the 6502 computers all input and all output is accomplished by wiring up special memory locations in the machine. These locations appear to the microprocessor as normal locations, and to the outside world as inputs and outputs. The Z-80 on the other hand has a set of lines called IORQ, RD, and WR. These lines are used to control up to 256 Ports (numbered 0 to 255). A separate line MREQ is used with RD and WR when the Z-80 wants to talk to the memory. Pin numbers are MREQ 19, IORQ 20, WR 22, and RD 21.

Another interesting line out of the Z-80 is RFSH. Dynamic memory chips are less expensive and use less power than static memory chips. Unfortunately, dynamic chips must be "refreshed" every 2 msec or else they lose the data. The Z-80 has a refresh counter built in and will do a refresh automatically. The RFSH line indicates a cycle that is done just to refresh the memory. This is the refresh system that the Radio Shack TRS-80 and the EXIDY Sorcerer computers use. The system works quite well in most cases. However, if the wait line is used for an extended period (for the same purpose as the RDY line on the 6502) the memory refresh will not get done. Thus, anyone contemplating an interface to one of these machines should pay close attention to the WAIT timing, if WAIT is used. RFSH is pin 28, WAIT is 24.

You can now see that the microprocessors pins can be divided into four basic groups: power and ground, address, data, and control. Together these four groups carry all the information that the microprocessor handles. Before designing any interface it is recommended that you study the manufacturers manuals very carefully.

Next time we will take a look at a program that lets a computer send morse code.

PACKET RADIO FOR CB?

Announcements last year that permission was granted to a Sault Ste. Marie group to establish a repeater in the 900 MHz band to serve as a development project for eventual allocation of a slice of 900 MHz for 'personal radio', coupled with a DOC news item noting that Carleton University recently was given a $40,000 contract to design 'land mobile' packet radio techniques, appears to mean that 'personal radio' will soon be in the 20th Century.

COMMENDATION

The Canadian Red Cross has sent a certificate of commendation to Chuck Powers VE3ADK and the members of the Oakville Amateur Radio Club for their contribution to relief work between Canada and the island of Dominica after Hurricane David last year.

Illegals: The 5th Column

It is becoming evident that illegal use of the radio spectrum is becoming more and more prevalent and that precious spectrum space is being stolen. This is not only so on Amateur frequencies, but on commercial and military frequencies, especially those adjacent to Amateur bands.

At the March executive meeting of the Federation, it was decided that CARF would undertake to coordinate documented reports on illegal operations in the Amateur bands and, if adequate information is supplied and the circumstances warrant it, CARF will press DOC for remedial action.

The problem arose, as many of us are aware, with some GRS (CB) operators working 'skip'; from there it graduated to the adjacent low-power commercial frequencies, then to 'HF' operators obtaining and using modified Amateur 10-metre equipment with high-power capabilities. The next step was an encroachment on our 10-metre band. Now, because little positive action has been taken by the appropriate authorities in both Canada and other countries to stamp out illegal activity on that band, it has developed into incursions into other Amateur bands. Some of these illegals use 'stolen' Amateur call signs, others use self-assigned call signs or 'handles', or no identification at all.

Most of these 'pirates' are using commercially-made Amateur equipment because of the ease with which it can be obtained. The cure, of course, is control of the sale of equipment, but unfortunately the governing authorities do not all agree to this procedure since it may be construed by some as 'restraint of trade'. This **might** be an argument if adequate policing of the spectrum was carried out, followed promptly by 'the due process of law' as provided for in existing legislation, but this, unfortunately, is not being done in all parts of our country. Lack of funds and staff is the usual explanation (excuse?).

These 'bootleg' or 'pirate' operators are not just a few who will hopefully go away if ignored. They are organizing. They have their own clubs and associations. They 'assign' their own call signs. They openly defy the authorities to do anything to put an end to their illegal activities – and there is little, if anything, being done to stop them. It is obvious that, unless drastic action is taken soon, they will get their own way – the authorities will take the easy way out and, one way or another, declare them a 'hobby' service, and then the next step would be to merge them with our own Amateur Service. Then where are we?

So what to do?

DOC has been established by law as the government agency responsible for enforcing the Radio Act and Regulations. They are given the men and the money each year to do it. This job has not been given to the police forces or the users of radio in Canada. We know that DOC cannot be 'all-seeing all-hearing' and that there is no reason for our not informing them of the problem and of its magnitude.

There is already an intruder watch program, but this has been aimed mainly at foreign broadcast and commercial stations in our HF bands. For various reasons largely related to international problems, it has not been too effective.

CARF is now proposing an 'Illegal Operations Reporting Program' aimed at convincing DOC that, as Spectrum Manager for Canada, it must undertake domestic enforcement action in the interest of protecting authorized operations and ensuring orderly use of the spectrum in Canada.

To accomplish this we need precise, detailed and accurate information which can be coordinated, consolidated and, if possible, double-checked before presentation to the DOC for disciplinary action. To assist Amateurs in providing this essential information, a suggested report form has been prepared and is shown below.

Illegal Operations Report

Reporting Station

a) Name
b) Call Sign
c) Address
d) Home Telephone
e) Office Telephone
f) Report Number

Reported Station

g) Station Identification
h) Frequency
i) Location (including Address in full if possible)
j) Bearing to observed Station (if location unknown)
k) Date and Time (UTC) of Observation and Duration
l) Transcript of Illegal Transmission (If extensive, give summary. A good tape recording is useful.)
m) Was this incident reported to DOC?
n) If so, when and by what means?
o) Action taken by DOC □

Packet Radio

(This is an extract from one of the papers on packet radio being circulated by CARF.)

In early June, 1979, Larry Kayser (VE3QB) button-holed a couple of his friends (Hugh Pett VE3FLL and Stan Kazmiruk VE3JBA) and said, "You are going to help me put packet radio on the air in Ottawa." Those of you who know Larry will recall that he has a certain 'presence'; this makes it kind of hard to refuse!

The immediate target was the July meeting of the Ottawa Computer Group, at which there was to be a demonstration of packet radio. That left 28 days to put together a transmitter (with modulator), receiver (with demodulator) and programs to run in two computers. Through a lot of hard work and some luck (especially in the computer aspect), the demonstration was held successfully, using an RF link in one direction (range: .7 metres), and a wire in the other.

The first week of work established criteria to be used in the creation and operation of the packet radio system. In approximate order of importance, these were:

1) use state-of-the-art technology, including: (a) minimum 9600bps data rate (b) maximum 25kHz RF channel bandwidth (c) control software that can be changed without visiting the site (d) a repeater operating in a simplex mode.

2) use simple, reproducible hardware

3) allow for large numbers of users.

There were obviously countervailing forces in these criteria, since state-of-the-art often implies high-cost or complex hardware. Even the design parameters contain a conflict between bandwidth and data rate. The July demonstration showed that by using FSK modulation the criteria might be met.

Stan (who has been the primary worker in the electronics area) made a circuit that would symmetrically FSK the transmitter, and an op-amp slicer circuit to run directly off the discriminator of an old GE TPL FM communications receiver. The RF end of things was Larry's concern, including the building of the transmitter and receiver, and starting to think about a location, antenna and housing for the repeater.

It was agreed from the outset that this packet radio system would be a controlled one, with a repeater to give the greatest possible coverage. This meant that the repeater would have to be intelligent, and that it would be in moment-to-moment control of the system. This led to the requirement for a method of sending the repeater's computer a new control program whenever required, for example, to add new users to the system.

Hugh worked out a simple protocol for polling system users. Polling was selected as the easiest way of maintaining control of the system, especially with large numbers of users. The protocol was designed to ensure that all users could pass traffic, even if there were hundreds of users.

In working out the first version of the software, he noticed that ordinary transmit/receive delays (using relays) were long relative to the time required to send a packet (about 50 or 100 msec. vs. 16 msec.). This would have drastically reduced the effective throughput of the system, in some extreme cases by as much as 90%. The solution was obvious: shorten the T/R time delay to about 1 or 2 msec., using a diode switcher. Another of the early group members, Graham Ide VE3BYT, found a circuit for a T/R switch using PIN diodes that seemed likely to be suitable.

After the July demonstration, work continued on the software. The first version (written in BASIC, with an Assembler subroutine) would quite predictably fail after a few hundred packets. A great deal of work was needed to whip the control program and user program into shape.

Concurrently, Hugh developed the software for the loading of the control prog-

in Ottawa

ram into the repeater computer from a control station. By early October, the software was reliable enough to give a demonstration of the full range of capabilities, including loading the control program, polling, sending a message via a packet, and acknowledging the packet.

The major reliability problem was the H-8 front panel interrupt servicing, as it interacted with the packet interrupts. Hugh eventually went to a totally non-interrupt form of software, which ran several million packets without failure before he took down that test (about 5 days long).

During this time, the principal electronics problem had been ensuring that the D.C. component of the FSK signal coming from the discriminator was precisely compensated for (ie, that the receiver was tuned within about 100 cycles). Failure in this resulted in errors quickly appearing in the relative lengths of 0 and 1 bits, making signals unreadable.

The difficulty arose because the jury-rigged receiver used up to then had a very narrow IF, and the signal from the discriminator was a distorted sine wave. Extra bandwidth was needed, preferably up near the limit available to us in the 222.34 MHz channel, namely 25 kHz. Stan had constructed a circuit which would track the D.C. component very precisely, but only if the signal could swing far enough, fast enough (ie, in a wide IF). All this discussion may seem unnecessary, but in normal operation each transmitter will be at a slightly different frequency relative to the receiver. For the repeater at least, a signal tracking capability is mandatory; individual users may find it acceptable to adjust their receivers once in a while, but the repeater must compensate for different user transmitter frequencies in a couple of milliseconds at most.

Other activities also continued. The repeater computer was assembled from Larry's Mod80 computer system, power supply from Goodwood Data Systems, and a programmable serial I/O port built by Stan. This was installed and put into operation in a beacon mode (no reception) on December 12 last year, operating out of Hugh's basement. The next morning, Hugh asked DOC to verify that the transmissions met the regulations for the channel, and was pleasantly surprised to find that it occupied only 7 kHz at 30 dB down.

At this point, no one had yet received the signals in digital form over a long distance. Ted Baleshta VE3 CAF mentioned that he planned to make an effort to detect the signals over the Christmas holidays. He worked to determine the best way of modifying the detector circuitry in his receiver, to effectively increase the IF bandwidth. He quickly succeeded in getting a usable digital signal, and built a slicer circuit to translate it into R5-232 levels. Connecting this to a 9600 bps terminal confirmed that data was arriving reliably.

Ted suggested two changes: increasing the deviation to get a better signal-to-noise ratio, and the use of a different character for UART synchronization. The result was virtually error-free copy, on 1 watt, at a range of over 7 kilometres, using the inexpensive kits from VHF Engineering.

Packet Radio was on the air in Ottawa!

There are other aspects to a system such as this. There has to be a site for the repeater, and the construction, installation, etc. of an antenna. Hugh Lines VE3 DWL, Frank Stratton VE3JBB and Graham have prepared the site, along with others in the group. The controller and transmitter were moved there Feb. 10, to allow valid path testing by the other Amateurs with receivers around the city.

And the work went on. Details such as the transmitter turn-on and turn-off times had to be checked (they are less than one millisecond), and the PIN diode switch was installed.

➡

THE FUTURE

The next few months are certain to produce changes, problems and lots of learning. Hugh is currently modelling the repeater operation, paying special attention to the protocol to be used. It is already clear that slight changes to the protocol will nearly double the effective throughput in most circumstances, while still guaranteeing each user rapid access to the system. The simulations show that, even with 200 users, a given user would never have to wait longer than 30 seconds to send his first packet of the day, and that thereafter he would have an equal shot at sending packets.

As more and more people begin using this packet radio system, there will be a number of experiments carried on. Some are set already, including the use of telephone links to permit some use of the system by people who don't have radio equipment. Also, attempts will be made to link this system with others, say in Montreal (using a relay station) and Vancouver (using HF RTTY). There will be many more ideas to try out.

This system will evolve, to some extent, by consensus. Different protocols will be tried, and probably higher data rates (with IF bandwidth again being a major limiting factor).

After using this rather general-purpose system for a while, it is likely that some users will want a greater or different capability. This will lead to one or more additional systems being established, with unique operating characteristics. Hopefully, new systems will link to earlier ones, to allow users on one to communicate with users on the others.

Hugh Pett VE3PLL

(The technical details and full text of the packet radio systems and experiments in Ottawa, Montreal and Vancouver are available from CARF, which is publishing and distributing the first three papers and subsequent issues. These and on-going papers for this year may be obtained by sending $5.00 in money order or cheque to 'Packet Radio Mailing', CARF Inc., Box 356, Kingston, Ont. K7L 4W2. The papers are being coordinated by Hugh Pett VE3PLL. Input for inclusion in the papers and request for information may be directed to Hugh through CARF at the above address.

Delete those Expletives!

The Vancouver Sun reports that, for the first time, the Canadian Coast Guard obtained a conviction against two B.C. Marine Channel users for profane language.

They drew fines of $150. This may not seem like a just amount when Section 25 of the General Radio Regulations provides for fines up to $1000 or imprisonment for up to a six month term, but it is a step forward.

The DOC is now indicating preparedness to act upon presentation of documented evidence of illegal activity CARF is now coordinating 'illegal action reports' on the Amateur bands with the intent of presenting a fully-documented and extensive case to DOC management for increased enforcement action against violations occuring in our bands.

A documented complaint to DOC will raise some action – as in a similar case reported to CARF recently by Ken Martin VE6BBM in which an Amateur repeatedly used profane and offensive language on the air. A complaint to the local DOC resulted in the Amateur being censured.

Let's face it, the DOC does not have the manpower to properly police our bands for us. It's up to us to do the legwork, and ask the DOC to take it from there. Are we up to the challenge?

DOC acts on RFI problems

In a letter to CARF, DOC says that it is attempting to accelerate the pace of research and development of designs of consumer electronic equipment in order to reduce its susceptibility to radio interference. DOC was replying to a letter which was drafted by the CARF EMI committee chairman VE3TT. DOC stated that all of the concerned agencies, the Canadian Standards Association, the Canadian Radio Technical Planning Board and CARF, will be urged to support this move.

The Department has already issued a contract to Bell Northern Research for an evaluation of the urban radio environment as part of this increased effort. The results will be available to manufacturers as a follow-up to an earlier DOC bulletin on the interference problem. Amateurs may brush up on their knowledge of interference prevention by asking their DOC for the booklet 'How to Identify and Resolve Your Radio and TV Interference Problems'.

DX

By Garth Hamilton VE3EUP
P.O. Box 1156
Fonthill, Ont. L0S 1E0

April has turned out to be the premier month for the DXer with several large DXpeditions and numerous smaller ones. The most notable would be the German group that got Glorisso off the ground after several setbacks that almost saw the cancellation of the trip. ON6BC gave everyone a chance at TZ4AQS while the Athens crowd put Mt. Athos back on the air again briefly.

We also noted activity from 4S7, 8Q7, CR9, FK8, TI9, KH3, KH8, KC6 and 9M6 to name a few of the stations available in April.

While our information is accurate at time of writing, it has sometimes gone through some changes before you read it in this column.

CR9AK – several people have used this call recently from Macao. In June, KP2A expects to activate it for the third time this year.

ST2 – In June, Martti OH2BH will be in Khartoum and in ST0 as well. While in Khartoum, he will activate 6T1YP from the Youth Palace which was donated by the North Koreans to the youth of the Sudan. The club station has radio equipment supplied by ITU Geneva and Antenna system from the North California DX Foundation. The station is being assembled by Joko OH2BCP. No QSL information has been given to date.

VK0 (Heard Is) – Jim P29JS is mounting a concerted effort to get a DXpedition for early 1981 to Heard.

XZ – No more news available re George and his efforts as yet. He has been in Burma recently and at time of writing is supposed to be there still, arranging permission but not operating as yet.

7O – The same group that got 8Z4A off the ground last year are reported to be trying to activate this one in May or June.

ZA – G3SCP didn't show from Albania at Easter as reported, but was heard on 20M recently talking to a W station and said that if he went at all this year it would be in June. DL7FT was reported to be going back again to operate ZA2RPS, but when questioned in April by VE3DJG he said that he had no plans for this year; maybe next year. With all the contradictions, it is hard to know just what to expect.

7J1/JD1 – The group which had planned to go in late April have had to cancel their plans due to the recent death of JA6DDT, who was killed in a tower accident. The remainder of the group hope to be able to reorganize the trip and will try for the end of October of this year.

9N1MM – Father Moran is to have two visitors in the near future. KP2A is the second scheduled visitor who will be getting on the air from Moran station. I must say that Moran does a good job on his own, and has done so for a good many years. He has been very active this spring around 0100 on 20M, 15M and 10M depending on the propagation.

QSL INFORMATION

Thanks to Long Skip, Long Island DX Bulletin, Geoff Watts Newssheet, QRZ-DX and other individuals. 73.

```
CR9AK    VS6AG(opr VS6AG only)
K6LPL/KH3  N6AHU
KA6HIQ/KH3 Wm Morris, Box 142, APO San Fransico, 96305
8Q7AR      K2TJ
4S7DX      WB2VFT
FK8DJ      JH3XCU
FKØBW      DJ3CQ   (also FKØCQ)
TI9XXX     Box 3551 San Jose
TZ4AQS     ON6BC
SV1DC/A    Box 3751, Athens Greece (also SV1IW/A & SV1JG/A)
FRØACC/G   DK9KD  (also FRØACB/G)
9M6MU      N2CW
FK8DD      WB3JUK
VK9NM      DJ3CQ  (also VK2DIK/VK9)
9Q5GB      W7KTI
```

N4XX Propagation Forecast

May

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

June

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
18-A/H	19-H	20-H	21-H	22-H	23-H	24-H
25-H/A	26-H	27-H	28-H	29-A	30-A	31-A
1-A	2-H	3-H	4-H	5-H	6-H	7-H/L
8-H	9H*	10-H	11-A	12-A	13-A	14-A/H
15-H	16-H	17-H	18-H	19-H	20-H	21-H/A
22-H	23-H	24-H	25-A	26-A	27-A	28-A
29-H	30-H	*start of 54-Day Prediction				

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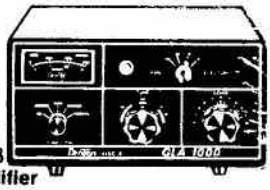
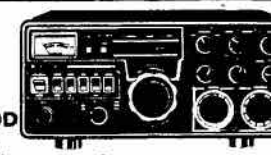
$589.



DENTRON GLA-1000B linear amplifier
Freq. coverage 80 to 10 meters, covers most MARS freq., RF drive: Max. 125, power consumption: 117 VAC 50/60 Hz 12.5 Amps, factory fused at 15 Amps. 234 VAC 50/60 Hz 7 Amps, DC input: 1 KW CW and 1200W PEP SSB. Final tubes 4D-50A tubes (6LQ6).



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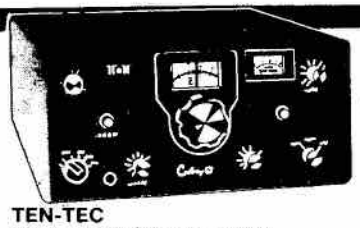

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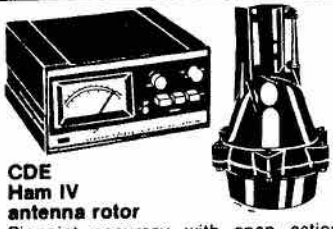

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QSO at 9.5

Garry Hammond VE3GCO

On board with JY5BJ/AM ... Faris Shukri and family, XYL Gigi, YL Alia and son Ganj. Looks like Superman is known in Jordan, too! Too bad we can't see a close-up of the Collins rig Farris operates while flying high up there!

The lawn was cut and I was relaxing with a cool blue 807 in one hand. Summer afternoons are usually not very productive for QSO's on the HF bands. This day, however, was an exception. I dialed the VFO of the R4B and heard a variety of DX signals of different accents and languages. One more twist of the dial to see who is on.....Ah...an S9 signal.....

"QRZ...This is Juliet Yankee Five Bravo Juliet Aeronautical Mobile, JY5BJ/AM calling QRZ."

Thanks to VOX and transceive, I gave a quick call...

"VE3GCO, This is JY5BJ/AM...good afternoon OM, Welcome aboard...my name is Faris and we're over the mid-Atlantic ... You're 5 by 7 ... How copy?"

Naturally I was delighted when Jy5BJ/AM returned my call for a QSO. Anyone would be, hi. For some reason, there has always been a certain mystique about mobile, maritime mobile, and aeronautical mobile QSO's. There you are, sitting in the comfort of your shack and home – relaxing, while your Amateur counterpart is perhaps wheeling through downtown or freeway traffic; cruising the hydrosphere; or flying high in the stratosphere.

In this case, Faris Shukri, JY5BJ, was the co-pilot of JY-AFA, the registration number of a B-747 flying over the Atlantic. ALIA (Arabic for "always the highest") is the name of the Royal Jordanian Airline which flies four times a week to New York City via Amsterdam. Depending on the jet stream, the return flight, direct to Amman, Jordan's capital city, usually takes about ten and one half hours. Faris, informed me, though, that on one flight they set a record time of 9 hours 25 minutes, due to a jet stream of 180 knots for 3½ hours!

Lots of interesting tidbits come out in a QSO such as this one ... the 747's position at the time of our QSO was approximately 49° 20' 05" N., 29° 30' 15" W. give or take a few seconds. After all they were flying at 9.5 miles per minute, hi!

The working conditions on board

miles/minute

JY-AFA is not a Jordanian Amateur call, but is the registration number of this Jumbo flying over southern Jordan. The depression below is part of the Great Rift Valley which extends from east Africa through the Red Sea and to the Dead Sea area.

included a Collins 618T2, a digital synthesized transceiver running 400 watts PEP. It has 2-30 MHz capability. The antenna was a rod-type dipole fitted at the trailing edge of the wing tip. They have two sets on hand ... one for ground communications and the other for the Amateur bands.

Faris mentioned that his home station was a FT101ZD to a vertical dipole antenna some 18 metres high. He doesn't have a directional antenna at home due to limited space caused by domestic QRM ... washing line, TV antennas, etc. hi. As you can imagine JY5Bj does enjoy his /AM hamming. I bet we all would with a dipole at 35,000 feet!

The novelty of /AM and /MM QSOs appeal to many Amateurs. As a geography teacher I feel there is an added dimension for me to have these contacts. Geographers teach the theory of how angular distances can be used to form a grid system for finding location on the earth/i.e. latitude and longitude. From a sound pedagogical point of view, all of this is of little use unless there is some practical application. Students in my classes know about Amateur radio through a coloured slide presentation I make to all new students and classes.

Although students of the 1980s seem somewhat blase about instant radio communications (what with direct distance dialing and television satellite coverage as it is), they do find the concept of talking to moving ships and planes to be an interesting facet of the hobby.

Yes, you guessed it. When I teach latitude and longitude why not have the students locate where the ship or plane was at the time of contact? Before giving them a world map and seatwork exercise on a gestetner or ditto page I show the students coloured slides of the QSL's I have received from the contacts. In a few cases, notably with 9Y4NP/AM I have made a tape of the QSO. That tape is a real attention-getter, believe me.

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Not all of you reading this article are teachers ... but many of you know someone who could use this idea. It could work two ways ... firstly, the student uses latitude and longitude in a meaningful way, and secondly ... the student is introduced to Amateur radio.

This example is just one of many enrichment possibilities offered by Amateur radio to those in teaching.

Where in the World?

Use your mental powers to locate these examples of co-ordinates of /AM or /MM stations contacted by VE3GCO. Your knowledge of ITU callsign allocations may help you too!

1. VE3CQU/AM	37,000 feet up	46°N. 65°W.
2. VE0MCA	Porpoise III	49°26'N. 123°27'W.
3. K4GMH/AM	32,000 feet up	4°S. 58°E.
4. 9Y4NP/AM	35,000 feet	17°N. 75°W.
5. W6WX/MM	Caroline	14°N. 160°W.
6.PA3APN/MM	nautical mobile	52°30'N. 5°30'E.
7. VK9XR/MM	Williwaw	74°40'N. 127°W.

ANSWERS to "WHERE IN THE WORLD"

(Think before you peek!)

1. Bill Davidson flying a CP DC8 on a flight from Athens to Montreal. He was near Moncton, N.B. at the time of the QSO.
2. Bill Killam, VE7BKI was sailing on his sloop in the Howe Sound near Vancouver.
3. Mike was flying on a Hurricane research flight over the Indian Ocean near VQ9 land.
4. Nick Percival was on a BWIA jet flying between Trinidad and Jamaica.
5. Gary using a TS120S and a dipole was sailing on Ijsselmeer Lake (formerly the old Zuider Zee) of Holland. QSB was bad as the wind caught his sailboat and changed the directivity of the dipole on board.
6. Rusty Epps, W6OAT operating from the motorsailer Caroline on way to the Northern California's DX Club operation from Kingman Reef.
7. Willy de Roos had just completed his Northwest Passage crossing and was taking it easy at Bathurst, NWT on board the Williwaw yacht.

If you had all seven right you must have ESP since some were not where you'd expect to find them. If you had 4 or more right you're an A student and would probably have worked some DX too. If you got two or less right, be advised that VE3GCO teaches a couple of lessons on latitude and longitude in September to his grade 9 and 11 classes at the Listowel District Secondary School. What with declining enrollments, we'd be happy to have you in one of the classes!

Autopatch pays off

One night last January, Jim Houston VE4QH was visiting a large Winnipeg grocery store to buy some green peppers. As he entered the store, he saw two suspicious-looking men come in. One pointed a rifle at the cashier and demanded the day's cash.

While this was happening, Jim slipped out of the store unnoticed, ran to his car and used autopatch to call the police. When the bandits left the store to make their escape, Jim followed, obtaining the licence number and a description of the getaway vehicle, which he transmitted to the police via his autopatch telephone call over the VE4WPG repeater.

He flagged down the police vehicle when it appeared and gave the police the facts of the robbery. His act was instrumental in the early capture of the robbers.

–VE4HK in 'The Manitoba Amateur'

SUN PARLOR NET

This net meets Sundays on 28.300 from 1830 to 1915 hrs Eastern Time. Phone and CW. VE3IJX is net manager.

THE CANADIAN *Contest Scene*

Dave Goodwin VE2DZE
4 Victoria Place
Aylmer, Quebec J9H 2J3

CONTEST CALENDAR

June 7-8 Townsville Pacific Festival Contest
14-16 ARRL VHF QSO Party
28-29 ARRL Field Day
July 1 CARF Canada Day Contest
12-13 IARU Radiosport(?)

This month presents a few interesting contests. A rather small affair organized by a VK4 group, the Townsville Pacific Festival Contest is open to Amateurs in Pacific Rim countries, of which Canada is one. All Canada, and not just B.C. should therefore be eligible.

Canada Day this year will see the second running of CARF's Canada Day Contest, and it should be even more successful than last year's.

At time of writing, the Newington USA-based IARU is still considering not running the IARU Radiosport. The reasons centre on the cost of the contest and, should the decision be made to go ahead, the rules will appear in the July/August **TCA**.

The Canadian Ten Metre Club, of the 28.4 MHz net fame, have released the results of their first contest, and are planning their next contest for January 1981.

Results: CTMC Contest
23 Feb 1980

1. VE7FAO	454#	
2. VE6CKW	423#	
3. VE7DGQ	376#	
4. VE3JUP	324#	
5. VE3KRJ	299	
6. VE7BUL	249	
7. VE7BHM	223	
8. VE5BBP	205#	
9. VE4NIG	159#	
10. VE3LDR	158	
11. VE1BNK	153#	
12. VE7AFY	138	
13. VE3DQM	136	
14. VE3LRD	92	tie
14. G3HTA	92	
15. VE1BBV	89	
16. VE3AML	74	

Award Winners

The results of the CQ WPX CW have also come out and, as this was the first running of this contest, the top scores are the records. Sauli VE1AIH won the CARF trophy for the top single operator score, and details of the presentation will appear later in **TCA**. Results are listed by call, band, QSOs, multiplier.

Results[CQ WPX CW 1979

Canadian Single Op.

VE1AIH	A	544,859	608	281
VE1EJ	A	119,350	312	155
VE2WA	A	13,120	71	64
VE3BMV	21	911,778	950	357
CK7WJ	21	669,600	990	270
VE1BNN	21	6,864	57	48
VE7SV	14	835,601	1087	323
CZ6MP	14	258,750	539	207
VE1AJP	14	172,965	380	195
VE3FRA	14	68,120	205	130
VE6APN	14	17,381	163	91
VE1AI	7	305,046	331	189
VE3KZ	3.5	65,520	156	104

Canadian Multi/Single

VE1UNB	1,158,765	1571	347
VE4XK	995,066	1224	307
VE7CNK	739,944	1021	258
VE3OCU	385,416	655	212
VE3FCU	231,753	430	201

NEW APPOINTMENTS

With the number of Amateurs in the world of professional telecommunications, it may be of interest to note that Eldon Thompson, former president of the N.B. Telephone Company, has been appointed president of Telesat Canada. Dave Golden, who held the presidency and the chairmanship of the board of directors, remains in the latter position.

The new assistant deputy minister (space programs) for DOC is Alexander Curran, who comes to the Department from Northern Telecom, where he was assistant vice-president, technology and planning. He will fill the vacancy left by the untimely passing of the late Dr. John Chapman.

Townsville [QLD] Pacific Festival Contest

Period: 220Z June 7 to 1000Z June 8. Classes: Single Operator only, all bands. Exchange: RST plus serial number.

Scoring: QSOs may be made with VK, ZL and P29 only. 3 pt. per SSB QSO, 6 pt. per CW QSO, 13 pt. per RTTY or SSTV QSO, 5 bonus pt. per 160 metre QSO. 3 bonus pt. per QSO with VK. 9 bonus pt. per QSO with Townsville, 15 bonus pt. per QSO with VK4WIT.

Entries: should be sent to Contest Manager, TARC, P.O. Box 964, Townsville, Qld., 4810, Australia by July 25, 1980.

ARRL VHF QSO Party

Period: 1900Z June 14 to 0600Z June 16. Bands: All Bands above 50 MHz. Classes: Single or Multi-op. Exchange: RST plus ARRL section or DXCC country.

Scoring: 1 pt. per 50 or 144 MHz QSO, 2 pt. on 220/430, 3 pt. higher. Multiplier is the number of ARRL sections and DXCC countries worked on each band. Final score is the total of QSO points multiplied by the total of multiplier pts. Note: use of the 146-148 MHz is restricted to recognized simplex frequencies.

Entries: must be received by July 7 at ARRL, 225 Main St., Newington, Ct., 06111, U.S.A.

ARRL Field Day

Period: 1800Z June 28 to 2100Z June 29. Any stations setting up at 1800Z can operate all 27 hours, and those starting before can operate only 24 hrs.

Bands: All Amateur bands. Phone and CW counted separately.

Classes: Designation consists of the number of transmitters operating at any one time followed by a letter designating nature of the operation. Class A are portable, emergency powered groups of three or more operators. Class B are non-club

portables, with emergency power and two or fewer operators. Class C are stations mobile either actually or potentially. Class D are stations using fixed stations on commercial power. Class E are fixed stations using emergency power. By example, a three transmitter club group of six operators using emergency power is class 3A. Class D & E may work only classes A, B and C. Exchange: Class and section. ex. 3A QUE.

Scoring: 1 pt. per phone QSO, 2 pt. per CW QSO. Multiplier is 5 if power used is 10 w or less, 2 if the power is 200w CW or 400w DC or less, and 1 up to 1 kw. Bonuses of 100 pts for use of 100% emergency power, 50 pts for some sort of publicity, 100 points for originating a message to the SCM detailing the number of operators, club name, location and number of ARES members. 10 pts for each piece of traffic QSPed, up to 100 pts, and 100 pts for the first QSO made via OSCAR. The OSCAR position need not count as a separate transmitter.

Entries: must include summary sheets, dupe sheets, copies of messages originated and QSPed, and copy from any publicity generated. Logs are not necessary unless requested. Entries must be received by July 28 at ARRL, 225 Main St., Newington, Ct., 06111, U.S.A.

Radio Bulletins replace Newsletter

The CARF Newsletter which appeared from time-to-time from 1972 until 1976, when it became a regular feature of CARF News service to affiliated clubs, has been replaced by the CARF Radio Bulletins. The original intent of the Newsletter as to bring club editors and executives, by first class mail, a summary of the news appearing in that month's "TCA", which due to its third class postage category suffered some delay in delivery. It was designed to get news to clubs for incorporation in their bulletins, as soon as possible, by first class mail.

The timeliness and increasing popularity of the Radio Bulletins and the increasing number of stations broadcasting them has made the Newsletter redundant.

To replace it the weekly Radio News Bulletins will be collected and mailed once a month to the former Newsletter addressees which use them for their club bulletins or local nets and who may have missed the Radio News transmissions.

SIX METRE AWARD

Certificate hunters may note that there is a 'Saguenay Six Metre' award obtainable by working VE2FIZ, VE2EFL and VE2AKD. Information available from Fernande Audet VE2FIZ, 227 Labreque St., Arvida, Que. G7S 1J9.

EMERGENCY PLANNING

In its current publication, the federal agency known as Emergency Planning Canada, which replaced the well-known EMO, carries a letter suggesting that it was time that a Canadian national Amateur radio emergency service was developed. Such a measure was recommended seven years ago by a conference of Amateurs sponsored by the then-EMO at Arnprior. For various reasons, the plan for such an organization was not followed up, but the time now seems ripe for further work to be done on it.

VE3ANY

Amateur frugality...

Gordon Gilchrist VE3ANY, Member of Parliament for Scarborough, Ont., has carried over the traditional Amateur trait of frugality in dealing with the Ottawa bureaucracy. According to a Globe and Mail story, when Gord was told that he would lose the $604 remaining in his constituency office budget unless he spent it by the end of the fiscal year, he became somewhat annoyed. He felt that such taxpayers' dollars should have just been taken back into the federal purse if they were not needed. Gord, however, was up against the system and eventually applied the money to some badly needed office equipment, the balance of which he paid himself. "Next year," reported the Globe and Mail, "he hopes will be a different story."

One of two Amateurs in the House of Commons, Gordon is a PC member, as is Doug Neil VE5QN from Moose Jaw, who appeared in these pages last year.

JUNE EXAMS

The next set of Amateur exams will be held on June 13.

News Briefs

FIRST VE-G 10 METRE TWO-WAY COLOUR TV TRANSMISSION

Early in April, CARF Life Member Bill Townson VE3KIF made contact with Jeremy G3NCX in Essex, England, and they succeeded in transmitting excellent colour patterns on 29.150 MHz. The 3,500 mile path was so good that Jeremy retransmitted it back to Bill who, for good measure, sent it back to England again. XYL and Life Member Mary VE3KIP, who just got her Advanced, was an interested spectator.

We hope to publish some details on this SSTV contact in a forthcoming issue.

A THANK-YOU NOTE

CARF has received quite a number of letters from Amateurs objecting to the idea that the U.S. 20-metre Amateur phone band should be widened. The Federation takes this opportunity to thank those Amateurs who took time to write and will be guided by their views in representations it makes to governments and others ... VE3NR.

RUSSIAN 'WOODPECKER'

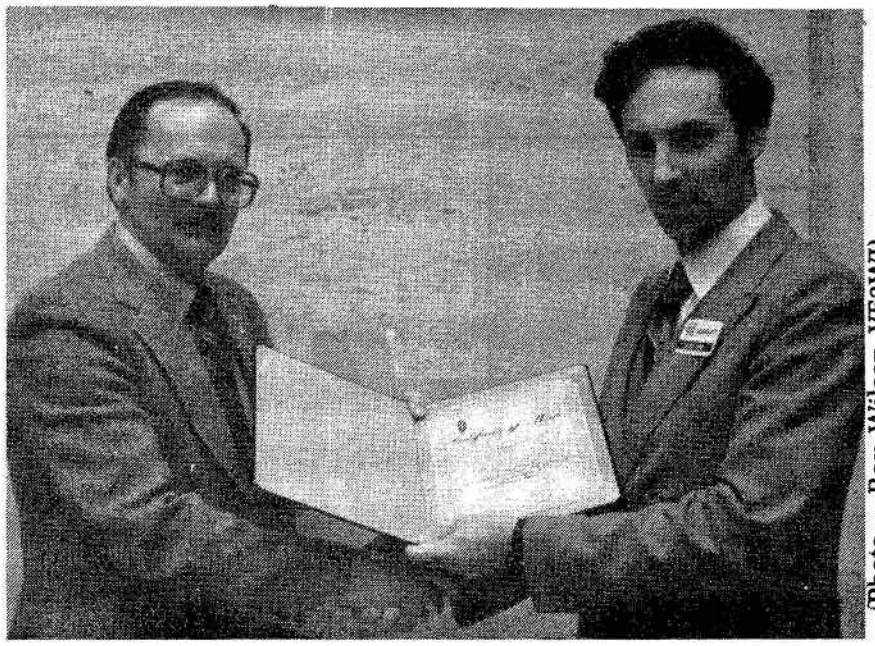
A recent HR Report states that a new Russian 'woodpecker' has appeared and has been spending a lot of time pecking away on the low end of ten metres. This bird's nest appears to be in the Kamchatka peninsula of Siberia. In contrast to this, another Russian bird, an Amateur satellite signing 'RS0', is being ground-tested according to reports heard from a station signing 'RS3A'. The satellite reportedly inputs on 145.910 to 145.950 MHz and outputs on 29.410 to 29.450 MHz. It also has a beacon on 29.450 MHz which sends seven telemetry channels.

CZ6 AND XJ5

The commemorative prefixes CZ6 and XJ5 respectively will be available to Alberta and Saskatchewan stations to mark the 75th anniversary of the formation of the two provinces and their entry into Confederation. They may be used from July 1 to Sept. 30 this year.

U.S. PHONE BAND

Amateurs who still wish to comment on an ARRL idea to move the U.S. phone band down to 14.150 MHz had better do so soon, because the ARRL committee considering this move will report back to the ARRL Board of Directors on July 24, according to VE3OT. Comments should go to Fred Towner VE6XX, Canadian Division vice-director, at 123 Rundelridge Close, Calgary. CARF would appreciate a copy.



(Photo – Ray Wilson VE3WI)

Mitch Powell VE3OT and John Henry VE2VQ.

CARF Officer receives ARRL Award

John Henry VE2VQ, past president of CARF and now president of AMSAT Canada, recently received a certificate of merit from the American Radio Relay League's Canadian Division director, Mitch Powell VE3OT.

The award, presented by Mitch at the April meeting of the Ottawa ARC, was in recognition of the work done by John and his group in the Canadian input to the Amateur satellite programs.

John is well-known across Canada as his work with Telesat Canada ground station maintenance keeps him on the road across the country.

Mitch, however, sprang into the national picture last December when he was elected to the ARRL Canadian director's post by a large majority of its members. He is an old-timer on the bands, having started in 1947 as VE1NW. A number of years as an MOT (then DOC) operator culminated in a teaching career. Mitch currently teaches at Fanshawe College in London and has the only post-graduate course in biomedical electronics available in Canada.

Flames in

A true life drama of an Amateur to the Rescue in the Northwest Territories!

(Editor's note: For all its amusing style of writing, when the chips were down, the writer, calling on his Amateur ingenuity, saved himself and his companions from a situation which could well have meant a lingering death in the sub-Arctic cold of a Northwest Territories winter. Charles Skelding VE2ABZ, now retired from Air Canada wrote this account fourteen years ago but it was misplaced for a number of years. It was brought to light and our attention by Ron Baker, VE2UE.)

This story was inspired by reading an exciting narrative by my good friend VE2SF Hartland Wilder, who gave an interesting insight into the trials and tribulations of a radio operator at sea in wartime. I have nothing nearly as romantic to offer; however the story does concern an incident in which radio played a very important part. This event took place not on the broad and briny ocean, but hard aground on terra-firma in a mining camp in the Northwest Territories.

It happened this way:

In 1937 I was working at the University of Toronto in the Department of Physiological Hygiene -- a real clean job, you should pardon the expression. The gentleman that got me this position at the University was Joe Brown VE3IN. Joe and I were in the way of being near neighbours radioAmateur-wise and monitored each others key clicks regularly. Joe probably got me the job in self defense likely figuring,and correctly so, I might add, that if I were working full time I couldn't get too far ahead of him in the DX game.

One of the primary requisites for the job was active Amateur status. The man in charge of things at the laboratory where I was to work was a very famous gentleman, Dr. Charles Best, the co-discoverer of Insulin. He said right away that although he didn't know too much about radio as such, he did know that radio Amateurs had the reputation of being able to build apparatus with just a ball of wire and a piece of solder and that this was certainly a useful characteristic. I told him I was completely familiar with building gear using no money. I got the job.

My work had to do with the building of high gain audio amplifiers to make nerve impulses both audible and visible by using a conventional loudspeaker and a mirror type galvanometer. Of course this is all old stuff these days but believe me in 1937 it was the latest thing in medical research.

I expect you are now wondering just what all this had to do with radio operating in the North West Territories. Well, one thing leads to another and I'll set to it in more or less chronological sequence.

The department of Geology was not too far away on the campus from where I worked and we used to get fairly frequent visits by Geology students and the occasional Professor as well. They were most keen on metal detection and analysis by electronic means in their department and I suspect they were quietly casing our department for useful information on high-gain amplifiers under the guise of neighbourliness.

Anyway, one day a Dr. William Brown, who was a geologist, asked me if I knew of anyone in the radio racket who would be interested in going up to the Northwest Territories to a place east of another place called Yellowknife. He explained that the job involved installing a base station and maintaining it, and also a couple of airborne radio-phones. "Oh, yes," he sort of added as an afterthought, "whoever applies must be an active radio Amateur as well as having the commercial ticket." There's that phrase again, I thought. He went on to say that "this Amateur requirement would be insisted upon because exper-

the Snow

ience has proved that you have to have someone who can use a soldering iron and be able to repair radio gear using only a ball of wire".

I figured that there must be a conspiracy afoot as all these guys seemed to have the same lines. I told Dr. Brown that I couldn't think of anyone right off hand but that I would pass the word around and let him know. After mentioning it to a few fellows on the air and at the local radio club, I didn't think too much more about it. I carried on with my job, watching vagus nerves, phrenic nerves and all sorts of other nerves with the odd de-cerebrate cat thrown in and trying to keep the water out of the switchboard generally.

I recall that, at the close of one working day, I emerged like a mole from my underground retreat. Oh, yes, I forgot to say that the lab where I worked was located three floors below street level; we had to get this far down to ensure that our delicate amplifiers, galvanometers and other such assorted junk would be exposed to as little terrestrial vibration as possible. To continue -- as I came out into the afternoon sunlight blinking and squinting my way towards my 1931 Plymouth, I wondered to myself, 'What the hell am I doing here? Why don't I take that Northwest Territories job myself and work out in the fresh air for a change?' How fresh it later proved to be, I had no way of knowing then. Before my resolution had time to cool, I called up Bill Brown who said "fine" or words to that effect, "go down to the offices of the Territories Exploration Company Ltd on Bay Street and get my name on a contract."

Everything, I found out, in the Mining business is done under contract or it just isn't done; it isn't a question of brotherly love, it's just that they don't trust anybody, that's all. Right away the thing that stuck out like a sore thumb was the lavish way in which the funds were spent. Following the poorhouse atmosphere of the University, they seemed to be spending money like a bunch of drunken sailors. I feel to this very day that I agreed on terms of salary, etc. much too easily, so easily in fact that the Office Manager was so surprised that he took the rest of the day off. I'm pretty sure of this because in spite of repeated trying he was nowhere to be found. I discovered later that I should have tried the Engineers Club right next to the Savarin restaurant.

This contract part was great stuff; it spelled out my duties, wherein, whereas, viz and to whit! "The hereinafter named Skelding shall take Canadian National train number one to Edmonton at the 15th inst. and take lodging at the MacDonald Hotel. As early as possible he shall proceed to the Edmonton Municipal Airport and make contact with officers of the Mackenzie Air Services Ltd., particularly contact their communications manager Mr. Tony Earnshaw. He shall obtain from the said Earnshaw a status report on the installation of the RCA two-way radio equipment in the Company's aircraft as well as a progress report on the ground station equipment and report same to this office earliest. At a time to be later agreed upon, the said Skelding shall proceed into the Northwest Territories to a place not yet designated but hereinafter called the base, set up the radio station and open communications with the Government Signal Services and stand by for orders. He shall also maintain the equipments hereinbefore described including the airborne in a completely serviceable condition."

There was a whole lot of other fine print about next of kin, attacked by bears, foot and mouth disease, etc., but I skipped right on down to where it said in black and ink how much I was to get

"The biggest headache was locating and eliminating noise in the aircraft, mostly due to induced static ..."

for all this. The princely sum of $150 stood out plainly alongwith 'plus lodging, plus expenses, plus travel allowance'. By 1937 standards, Man! I would be really living. I quickly signed. I have found out a bit about contracts since, and hardly ever sign the first one presented.

In due course I got to Edmonton and eventually met Tony Earnshaw. Almost the first thing he said to me was "wind a tank coil for this thing," he indicated what was to be our base station transmitter, " to hit the 4355 kc airplane frequency." He then sauntered off and left me to my own devices. My first impulse was to tell him to go to hell, but thinking this may be some sort of test I refrained. Instead I consulted my ARRL handbook, without which I never made a move in those days, or since for that matter; they used to have a handy little nomograph in the Handbook.

No sooner said than done, and the coil resonated on the first try. This seemed to impress Tony (guess he had never seen this particular graph) and the atmosphere thawed considerably.

The Company's advance party, of which I was a member, consisted of two pilots, Rod Campbell and Charlie Lloyd, and the air engineer, Jack Barker. Jack was in charge of the group and I suppose technically my boss, however he confided that radio was a complete mystery to him anyway. 'Welcome to the club,' I thought, but after looking over the airborne equipment, it turned out to be quite straight forward and conformed pretty well to what Amateurs were using then.

Circuit-wise, the units used a pair of pentodes Class C modulated by a pair of pentodes, with a triode driver and a carbon microphone, crystal controlled on about six frequencies. On the receiver side, there was a standard superhet crystal controlled on the matching frequencies and having the broadcast band tunable. The ground station gear was simplicity in itself and had been constructed on the spot by Mackenzie Air Services staff under Mr. Earnshaw. It consisted of a 605 Pierce oscillator and a single 6L6 Class C modulated by a pair of 6L6's Class AB1. As I already said, it was straight Amateur type gear.

The biggest headache was locating and eliminating electrical noise in the aircraft, mostly due to induced static, the control cables and the staying and guying wires touching lightly in flight, vibrating in the slipstream. The pontoon staying wires were especially noisy. All had to be bonded together where and when found.

Naturally, there was a good deal of professional jealousy on the part of the Airways technicians and mechanics. One guy that I have in mind never quite got over it. One of the touchiest times occured following the final checkout of the airborne gear. We were troubled by a raspy hash that was only subdued by the very strongest signals. Even with my limited experience I knew that, when signal conditions became marginal, this racket would wash us right out of the picture.

My theory was that the multi-conductor connecting cable so thoughtfully supplied by RCA in a very long length to connect power supply and modulator to the RF stages was the culprit. This cable was at least 12 feet long and we only needed five feet; instead of cutting it to size as they should have done, the Mackenzie fellows had very cunningly wrapped the excess into about a four-turn coil six inches or so in diameter and oriented to get maximum noise from the engine compartment. When it became clear that they were not going to proceed any further in the direction of eliminating this noise, I insisted that they cut the connecting cable to correct size and reconnect the Jones plugs. "What?" they exclaimed, "Unsolder all of those lovely connections from that nasty old ten-pin Jones plug just to make the cable shorter? -- Are you out of your mind?"

To convince all a sundry that this was the thing to do, I did one myself and the result was little short of mir-

aculous. The noise level dropped to an imperceptible level and all of the previous bonding efforts now started paying off. Needless to say, I had no further trouble getting things done.

One day Jack Barker asked me if I could make him a small portable receiver with which he could entertain himself while in the barren lands and off duty from his usual job of looking for gold. I don't believe I mentioned that aside from his air-engineer job Jack doubled as a prospector as well; I have always thought that he would far rather prospect than air-engineer any time. It so happened that Hints and Kinks for 1937 had described a smallish receiver using a 249 regenerative detector and a 230 amplifier. It called for a 22 1/2 volt B battery and 2 volts on the filaments. All could be mounted in a very small space and was quite portable if you could stand the microphonics. This thing was actually designed by a VE4; I don't remember his call but his name was Lorne Usher, I think. I made the set up and assembled it complete with batteries in half of a Kraft cheese box 4X4X6 inches long. It worked well from the beginning. The reason I mention this little receiver at some length is because it looms large in the story at a later date.

About the end of March we shoved off for Yellowknife. This was to be the intermediate staging point for the final destination somewhere "out yonder". I don't think anyone except Don Cameron who was in charge of the party, knew for certain. Don was a venerable old style prospector who had spent most of his working life in the bush looking for gold; he was full of little anecdotes in which the tenderfoot was always the fall guy. For some reason he took to calling me "The Professor" and this name stuck for as long as I was with this Company. The place "out yonder" turned out to be Fort Reliance which is located about as far east on Great Slave Lake as one could get. To be even more precise; Fort Reliance is on Charlton Bay, Great Slave Lake and quite close to the site of the original headquarters set up by Captain George Back who was up that way in the 1830's looking for the ill fated Franklin expedition.

We established ourselves in buildings that had been erected by Dominion Explorers Ltd. some years earlier and the business of looking for gold began in earnest. There wasn't really too much to my job as the airplanes were reasonably trouble free radio wise. We kept our schedules without difficulty not only with each other but with the Government radio stations operated by the Canadian Corps of Signals at Gordon Lake and at Yellowknife. They had stations at all of the principal points throughout the Territories using the prefix VE followed by a single letter. Gordon Lake and Yellowknife came in for most of our business. VEU Gordon Lake was operated by an amiable character by the name of Joe Benkhe. VEM Yellowknife had a whole staff of operators, it being the principal clearing station for most traffic to the outside. The man in charge was Sid McCauley but the operator that I worked mostly was Don Jorgenson.

It was a good summer and between one thing and another mostly to do with things radio, I kept busy. Between working periods, there being no nighttime to provide a natural division between work and play, I did get on the ham bands with the call sign VE5CV. I especially liked the very low noise level but my first encounter with an ionospheric disturbance caused me a real headache. No one knew too much about this phenomenon at that time and when I switched on one morning for a sked with Gordon Lake and found a completely dead frequency I right away fell to checking this and that and ended up with things pretty well dismantled, all needless of course! Things righted themselves the following day and I later learned to recognize the onset of these conditions by a peculiar even character in the background noise, not easy to describe but very easy to pick out.

Continued next issue

Next Issue: More Northern adventures from VE2ABZ

Social Season

June 7 Central Ontario Flea Market, sponsored by the Guelph ARC at the Centennial Arena. 8 am to 4 pm. Admission $1. Vendors $2 and bring own table. Followed by the famous Sidebanders Dinner. For info on that contact Jack Kirby VE3AFN. For dope on the flea market, contact Rocco Furfaro VE3HGC (519) 824-1157.

June 13-15 Lake Simcoe Hamfest, $5 at the gate; Molson's Park, Barrie, Ont. For reservations and $4 for pre-registration, write to Box 2283, Orillia, Ont. L3V 6S1. Auspices of Lake Simcoe Repeater Assoc. Inc. Flea market, displays, beer garden, barbeque.

July 5 Sixth Annual Ontario Hamfest, sponsored by Burlington Amateur Radio Club at the Milton Fairgrounds. $3 at gate. Camping, food, prizes, flea market. Gate open 1200 hrs July 4.

July 5-6 Hamfest 80, hosted by the Maple Ridge ARC at the Maple Ridge Fairgrounds, 30 miles west of Vancouver. Registration $4.00 for program. Banquet $10. preregistered. Camper space. For info: Bob Haughton VE7BZH, 114th Ave., Maple Ridge, B.C. V2X 1S7.

July 18-20 Glacier-Waterton Hamfest, Fort Macleod, Alta. Celebrating Alberta's 75th Anniversary. Town's Curling Arena. Pre-reg. $6; After July 8 $7. Many events planned. Mike Angyl, Box 148, Milk River, Alta. T0K 1M0.

August 1-4 Saskatchewan Hamfest sponsored by the Battleford ARC, celebrating Saskatchewan's 75th Birthday as a province. On-site camping. Info from Hamfest, Box 1980, Battleford, Sask. or phone Bert VE5BBH (306) 937-2389.

August 22-24 RAQI Annual Convention, Tadoussac, Que. Details later.

August 29 - Sept. 1 Maritime Hamfest, or 'Ham Ceilidh '80', the Maritime Hamfest reappears after a two-year absence, with a Gaelic title meaning 'gathering'. Hosted by Sydney ARC. Info and reservations, Box 1051, Sydney, N.S. B1P 6J7. Bring your own bagpipe and kilt. Haggis will **not** be featured at the banquet in deference to Sassenach stomachs.

October 2-4 RSO Convention at the Prince Hotel, Toronto. For information and registration write RSO Convention Committee, Box 997, Station B, Willowdale, Ont. M2K 2T6.

News Briefs

SYMPOSIA HELD

At least four regional symposia were held and their recommendations forwarded to CARF for discussion at the National Amateur Symposium held in Hamilton on May 17. The Montreal Metropolitan Radio Society, better known by its French abbreviation of 'UMS', the Nova Scotia ARA, the British Columbia ARA and a Kingston, Ontario group reported successful and enthusiastic one-day sessions.

NEW SASK-TEL TARIFFS

New telephone tariffs and legislation concerning equipment attached to Sask-Tel lines are said to be in the offing in Saskatchewan. Such a move by SaskTel may be of more than passing interest to Amateurs with patch facilities and to sellers of telephone equipment.

ON THE HEIR

Most Amateurs know that King Hussein of Jordan has been on the air as JY1 for a number of years, but the Arabic name of his youngest child, born in March, is 'Hamza', which to Western ears seems to confirm the king's interest in Amateur radio. (Tx VE3GCO)

Readers please note that items intended for the CRAG column should be addressed to CARF, Box 356, Kingston, Ont. K7L 4W2 for the next few months.

ON AIR MEETINGS

One way to keep provincial society members informed and interested is to have on-the-air meetings such as held by the Nova Scotia ARA and the Saskatchewan ARL. The former meets Mondays at 1800 hrs. Atlantic Time on 3762.5 kHz.

NEW VE3TCA SKEDS

Effective when Daylight Time comes in, here is a new schedule for the CARF News Bulletins transmitted from VE3TCA, the anchor station for CARF News Service: On Sundays (Zulu Time)

- Sideband on 14.140 MHz at 1745 Zulu;
- CW on 14.078 MHz at 1900 Z;
- Teletype 5-level, followed by 8-level, after CARFNET on 14.078 MHz at 2030 Zulu, and
- Sideband on 3755 kHz at 2200Z

On Tuesdays (Zulu Time):

- CW on 3630 kHz at 0000 Zulu;
- Teletype 5-level followed by 8-level, on 3630 kHz at 0030 Z.

Introducing the YAGOOP

(Something New in Antennas)

By Donald W. Clements VE3CDP/W9

After Yagi antennas, resonant loops are the most popular of Amateur HF end-fire arrays. Conventional Amateur wisdom includes many notions of loop performance, among which are the frequently heard "loops are band openers' and "loops are less subject to QSB". This article looks at some theoretical attributes of resonant loop antennas and outlines a variation of the delta loop radiator, the 'Yagoop'.

Full-sized loops have electrical wavelength sized perimeters, a constructional challenge at 20 metres but a definite assist to radiation efficiency and gain. Large radiating elements maximize delay effects between element currents and the associated radiated electromagnetic energies. This permits the transmission of more far-field energy per r.f. cycle with the consequence that less near-field energy is available to return to the radiator and its associated ground circuit to produce ohmic losses.

As a large element radiates proportionately more energy into the far field than is returned to the element, it is inherently a low-Q device, since circuit Q is the ratio of energy stored to energy lost (radiated) per cycle.

Thus a large radiator is less frequency selective and more tolerant of in-band excursions. Large element dimensions relative to wavelength also help the coupling of loops in an end-fire array, permitting considerable variation in element perimeters and spacing parameters while maintaining acceptable SWR values.

The radiation resistance of a loop array varies considerably, but is low enough that ohmic losses could easily become significant to the system. However, antenna currents flow through a continuous conductor loop and, provided the conductor and any connections are of low resistance, the system will exhibit high radiation efficiency. Also, loops minimize losses produced from 'end effects' which result from the high voltages at dipole and Yagi element extremities.

High front-to-back ratios are easily attained in even small arrays, but if a system is 'lossy' it will not attain its theoretical gain. Especially poor arrays may not even exhibit the modest gain of a dipole. The author is well aware of this failing in many electrically short, poorly-grounded, 80-metre end-fire arrays. The dramatic variations in signal strength observed while listening to many on-the-air 'east-west' switching experiments usually obscures the fact that few such systems actually possess gain. However, signals from large 80-metre verticals and loop arrays are consistently conspicuous, for example, the signals of ON4UN and PA0GMW.

Gain is also a significant aspect in signal reception. This parameter is closely related to antenna aperture, a measure of how well an antenna intercepts energy from a proximate electromagnetic wave. It is often mistakenly though that antenna profile (horizontal cross section) is tantamount to aperture size, i.e. that large loops intrinsically have large apertures.

Although these parameters are positively corelated, aperture is not the result of physical size but is a function of ohmic losses; low losses yield high radiation efficiency and concomitant high gain. However, as large radiators are more likely to possess high radiation efficiencies, physical size and aperture generally correlate.

Another popular concept holds that for a given boom height loops radiate more energy at a lower angle from the horizon than do Yagis. If the frequency of concurring testimonials is an affirmation of this phenomenon, then an explanation must be sought.

This is sometimes achieved by considering loops (quad form) as essentially stacked Yagis. However, effective spacing for stacking purposes requires that apertures just touch, i.e. spacing should be about one-half wavelength. As opposite quad sides are spaced only ¼ wavelength, any benefits from this stacking effect are negligible.

Another school of thought promotes the belief that vertical antenna elements inherently produce low angle radiation. Although this observation is correct for verticals operating directly over ground or radials, it does not hold for vertically polarized elements in Yagis or loops at low heights above ground.

However, transmission paths using the ionosphere for refraction are capricious and frequently alter signal polarization between transmitting and receiving antennas. Thus an antenna with simultaneous vertical and horizontal modes is very likely to minimize QSB and will often be a 'band-opener'. (It should be noted that, with feed centred in a horizontal loop element, maximum current will occur in the horizontal elements.) In addition, a loop antenna is at least partly above boom height and, at the modest heights achieved by most Amateur booms, every yard above effective ground is significant in producing low angle lobes in conjunction with ground reflections. And a few extra feet in height often raises an antenna above interfering neighbouring conductors such as gutters and power lines. This reduces the possibility of mutual coupling and the resultant unwanted and unpredictable currents in antenna elements which cause antenna mismatch and reduce gain and effective aperture.

Now that you're thoroughly convinced as to the desirable qualities of loop antennas at HF, you are moved to construct a quad or delta loop at the earliest possible moment. But you reject this idea as you consider the well-known difficulties of keeping such devices operational. Don't despair, for there is an alternative approach to loop construction.

After the literature debut of the delta loop in the late 1960's, I was sufficiently inspired to attempt construction on 20 metres. Failure! Just try to attach something that big above a boom. Even in a mild breeze at ground level, the torque forces are phenomenal.

The delta loop is essentially a triangular antenna, and it finally became apparent to me that the conventional

3-Element Yagoop Array

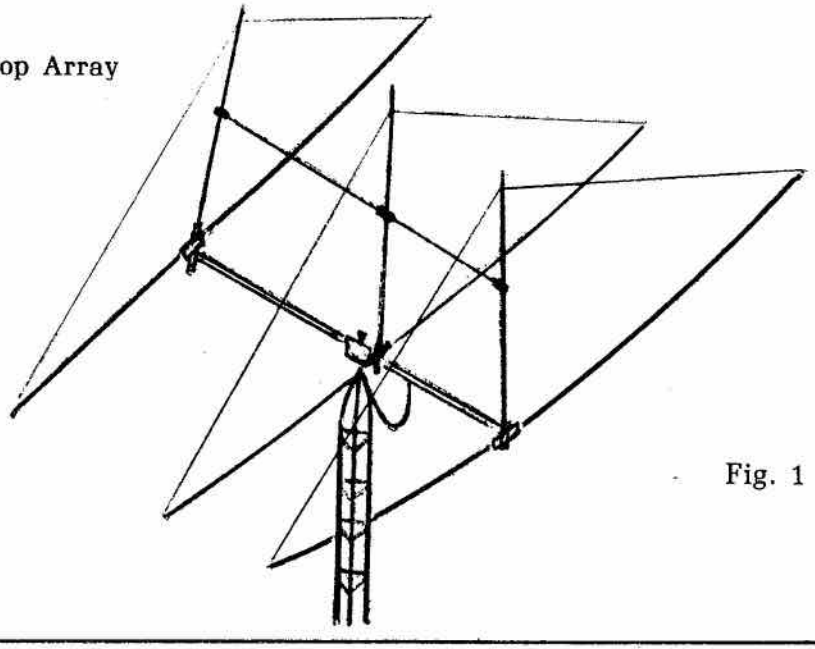


Fig. 1

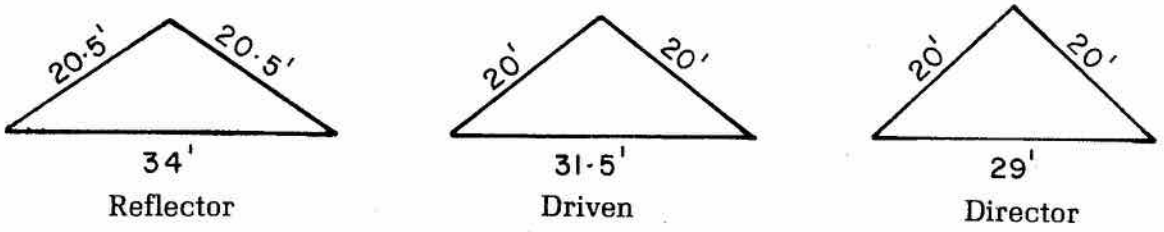


Fig. 2

posture is upside-down in terms of centre of gravity. In 1977, a 20 metre 3-element 'inverted' delta loop appeared over my QTH on a 40-foot-high boom. It is still there and has greater longevity than any quad I have owned. Near-tornadic midwestern winds and frequent winter ice storms demanded a different approach to the loop construction, thus the birth of the yagoop. (Fig. 1)

The yagoop element is a triangular loop with one vertex positioned at the top, thereby placing the bulk of the loop in the lower or gravity-stable position. Thus all of the radiator is above or at boom height.

Horizontal portions of loop elements are constructed of aluminum tubing to provide the strength of Yagi fabrication, ergo yagi + loop = yagoop. The remaining two sides of each loop are formed of wire (No. 14 stranded copperweld for strength) with the apex supported by a vertical double-walled fibreglass and aluminum support arm. A driven element perimeter is found from L (feet) = 1020/f (MHz). Parasitic reflectors and directors are about 5% longer and about 4% shorter respectively. Table 1 provides element lengths for two selected 20 metre frequencies.

TABLE 1

Element	Frequency	
	14.225 MHz	**14.025 MHz**
Director	69.0 ft	70.0 ft
Driven	71.5 ft	73.0 ft
Reflector	75.0 ft	76.5 ft

It is not necessary to contruct equilateral triangle loops, in fact a longer base results in greater physical strength and stability. My version, centred at 14.225 MHz, is as shown in Fig. 2. The apex support is about 14 feet high in each case and all supports are tied together with a rod to increase rigidity. Aluminum tubing used in the elements has an o.d. of 1½ inches for the centre section (double walled for extra strength) tapering to ¾ inch at the ends. A 17 foot section of 4 inch o.d. aluminum irrigation pipe serves as the boom with about 0.15 wavelength spacing between elements.

Symmetry may be slightly compromised in order to find a balance point for the boom-to-mast coupling. Boom ends are plugged to minimize wind drag. All couplings are constructed of heavy sheet aluminum stock and U-bolts. The driven element tube is split in the centre to permit 50-ohm coax feed, and insulation is provided by a plastic pipe. See Fig. 3.

Detail of Driven Element Feed Point and Boom to Element Coupler.

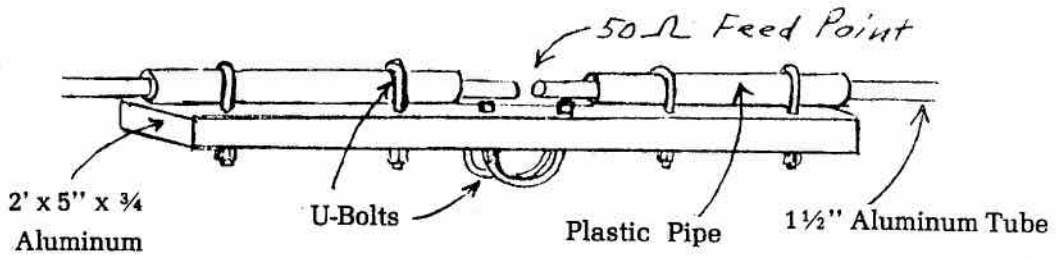


Fig. 3

Popular wisdom frequently holds that wide spacing (0.2 wavelength or greater) of array elements inherently results in greater gain. This is not the case. Nevertheless, wide spacing results in lower Q and consequent higher radiation resistance. It is easier to minimize ohmic losses and thus achieve gain with wide spacing. Also, arrays with widely-spaced elements are more forgiving of sloppy element tuning and often more easily matched to a feed line. However, my option for a smaller, more manageable 17-foot boom has not proven to be detrimental.

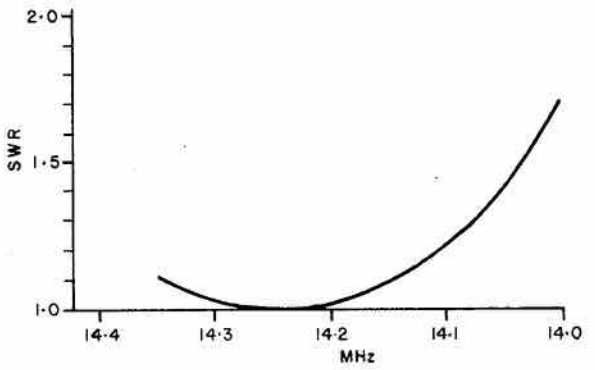


Fig. 4

Slight pruning of the driven element may be required to bring the system into resonance. Amazingly, my array held in tune from near ground until in place at the 40-foot boom height. Fig. 4 shows measured SWR values taken with all three elements in place, although removal of the reflector had little effect. Some SWR degradation from 1:1 is experienced while rotating the array relative to nearby metallic objects.

Large numbers of local and skip tests have indicated the yagoop to be a winner. Front to side and front to back ratios are 40 dB and 25 dB respectively. Although gain figures are not measurable, the consistency of worldwide S9+ reports indicates that all is well with this parameter. Comparisons with the performance of local stations has been gratifying. Reports from DX stations compare favorably with those of local stations using equal power and 4 element monoband Yagis at comparable heights. In receive mode, the yagoop's performance is particularly gratifying, frequently making the difference between solid contacts and no copy at all.

In response to those who summarily dismiss this type of antenna because of its size, I suggest a two-element version. My yagoop has been an excellent performer with one parasitic loop removed, and with only two elements on an 8-foot boom the turning radius is comparable to that of a shortened, trap-loaded Yagi.

Radio frequency energy is limited by law and generator efficiency. Moreover, it is expensive to generate. Why waste it in an inefficient antenna system? The yagoop is an alternative high efficiency radiator, stronger than most quads, gravitationally stable, all at or above boom height; it possesses excellent front to back ratio and gain, is easily matched to a feedline, and is relatively cheap to make. A decade ago, the delta loop held such promise, but it is virtually an impossibility at 20 metres. The yagoop can fulfill these promises.

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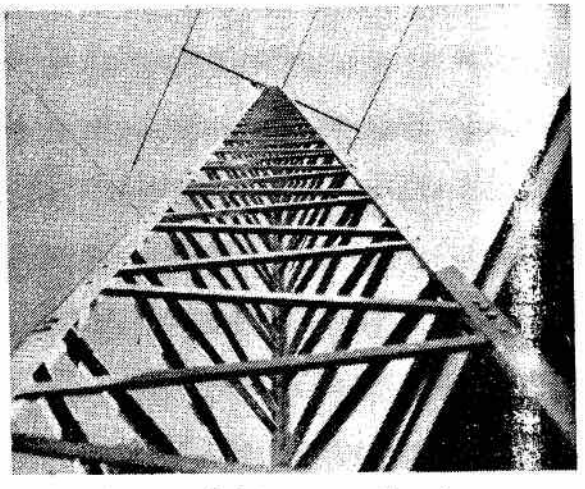

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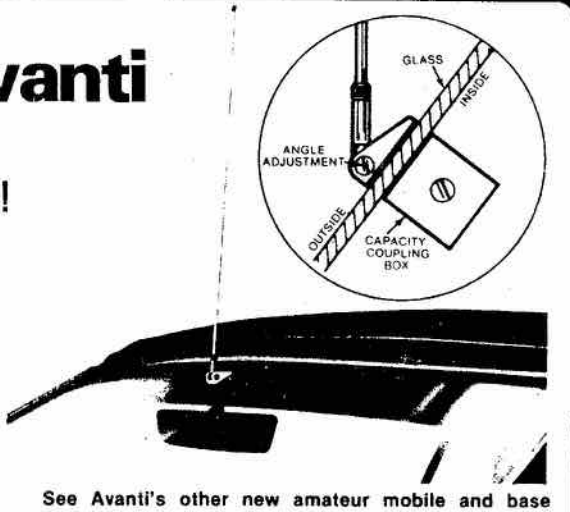

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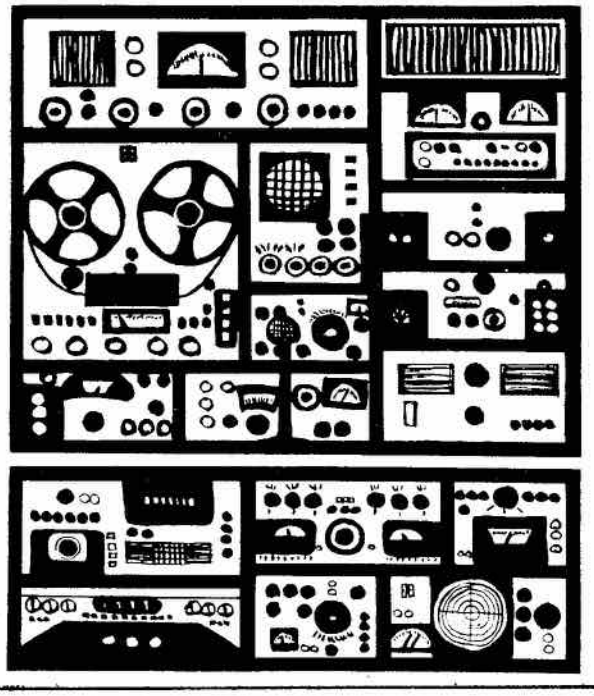

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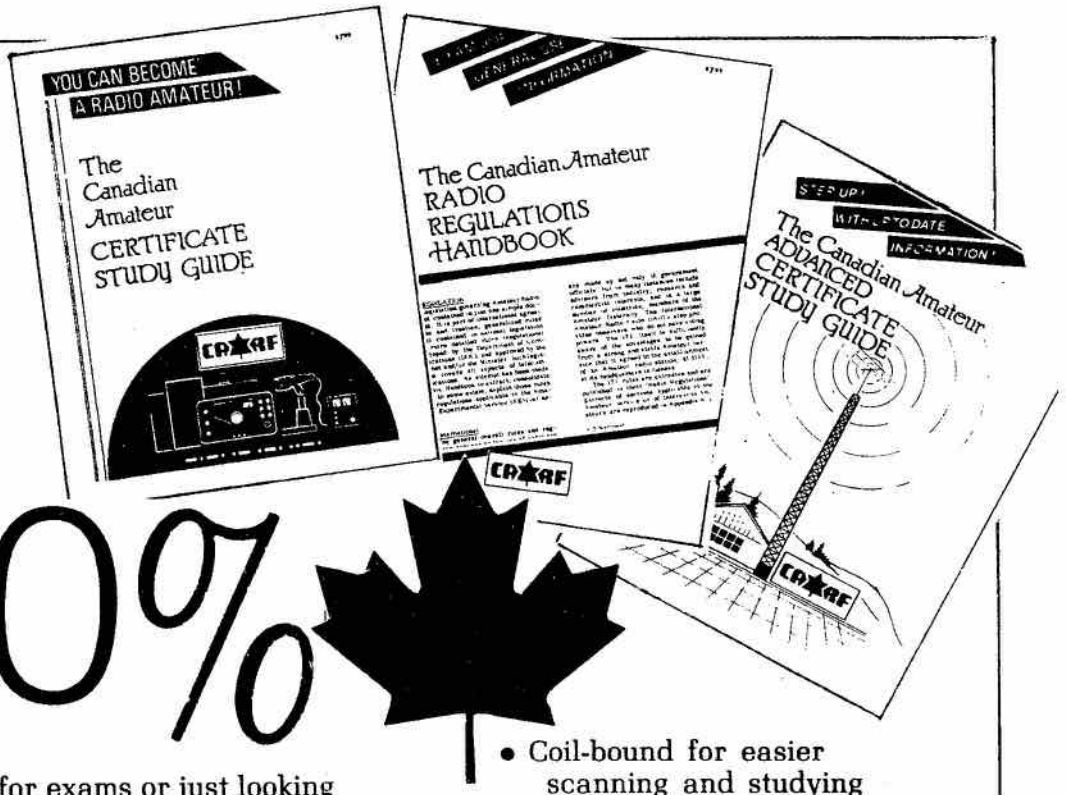

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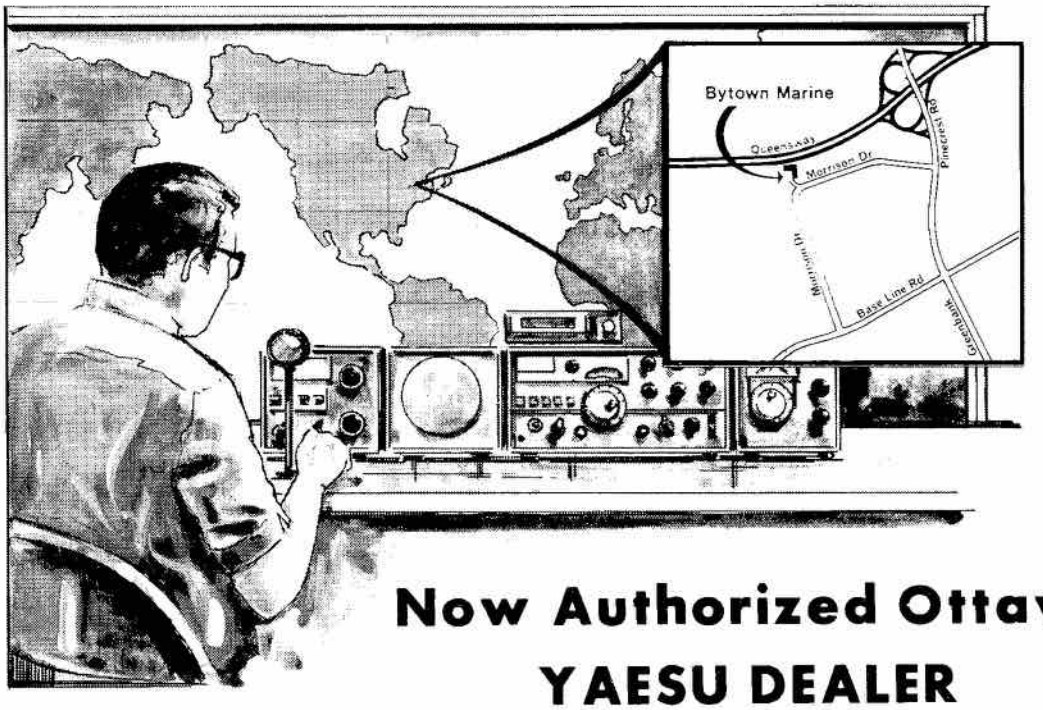

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