

The RAC 2m Band Plan

or

How to channel your energy

by: Cam LeBlanc

VE9CAM

Bandplans.....WHY?

Radio Amateurs of Canada band planning committees coordinate the development of National Band Plans to provide guidance for the usage of the Canadian Amateur bands. These committees are made up of representatives from all regions of Canada. The committees prepare interim band plans after consulting with Amateurs across the country. These plans not only take into account the wishes of Canadian Amateurs, but are also coordinated with band usage in other countries through membership in the International Amateur Radio Union. Final versions of the band plans are published in *The Canadian Amateur* for last minute input and are then submitted to the RAC Board of Directors for approval.

ARRL

A band plan refers to a voluntary division of a band to avoid interference between incompatible modes.

All coordination and spectrum management by coordinators is based on “gentlemen’s agreements” and usage by all hams whether they are operators using FM repeaters, simplex, or packet digital using duplex packet modes or simplex. For spectrum management to continue to work successfully around the nation, operators must take the responsibility of working only frequencies in the mode in which that frequency is assigned.

This prevents chaos and interference and arguments. Using only those frequencies assigned prevents unwanted problems.

RAC 2m Band Plan : 144-148 MHz

144.000 - 144.100 MOONBOUNCE AND TERRESTRIAL CW

144.100 CW CALLING FREQUENCY

144.100 - 144.200 CW/SSB WEAK SIGNAL

**144.200 - 144.275 AM NARROW BAND MODES EXCLUSIVE SSB
(ACSSB, SSB, CW, TY)**

**other modes with bandwidth less than 3 kHz -
FAX, SSTV, RTCALLING FREQUENCY (1)**

(1) Once communications are established QSY off the frequency

144.275 - 144.300 PROPAGATION BEACON NETWORK EXCLUSIVE (Sable Is. 144.287)

Canadian Propagation Beacons

144.280	VE2FUT	15W+	Turnstile 550'ASL	FN 25wg	Rigeau Qc
144.281	VE4ARM	10W	3el yagi @ 53'to SE	EN 09jw	Austin MB
144.284	VE1CBC			FN 63NS	Yarmouth NS
144.285	VE6EMU	20W	5el yagi aimed N	DO33pa	Alberta
144.287	VE1SMU	10W	5 el yagi to W	GN03	Sable Is. NS
144.292	VE8BY	23W	8 bay dipole array	FP53rs	Iqaluit
144.295	VE1SMU	10W	Yagi pointed WSW	FN74os	Lake George NS
144.299	VE1SMU/H	15W	7el Yagi SW,FSK	FN84	Halifax NS
144.400	VO1ZA	250W	11 el yagi to Europe.	GN37js	Carbonear NF

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144.275 - 144.300 PROPAGATION BEACON NETWORK EXCLUSIVE

144.300 - 144.500 DIGITAL (2) (ARRL: New Oscar Sub-band) (144.310 & 144.340)

(2) Seven (7) frequencies on a 20 kHz channel raster 144.37, 144.39, 144.41, 144.43, 144.45, 144.47, 144.49. Occupancy to occur ONLY when available Digital frequencies within the sub bands 144.9 - 145.1 MHz and 145.59 - 145.79 MHz are exhausted. Consult with your local digital coordination body regarding maximum ERP, Bandwidth and coverage area within this sub band. Operation may occur on 144.31 MHz provided operating bandwidth, ERP do NOT cause harmful interference within the propagation beacon network sub band.

144.340 NATIONAL ATV COORDINATION FREQUENCY (1)

(1) Once communications are established QSY off the frequency.

144.390 NATIONAL APRS FREQUENCY (9) (9) Consult with your local coordination body.

144.100 CW Calling

144.200 USB Calling (QSY)

**144.310 Digital (Conditional on non-interference
to beacons)**

144.340 ATV Coordination (QSY)

144.350 CAS-3H FM Uplink

144.370 Digital

144.390 Digital (APRS)

144.410 Digital

144.430 Digital

144.450 Digital

144.470 Digital

144.490 Digital - ISS FM Uplink to 145.800

IARU Paper: APRS Harmonization and removal of OSCAR sub-band

IARU Region 1 has released the papers for the Interim Meeting to be held in Vienna April 15-17, 2016.

Among the [papers](#) for the [C5 VHF/UHF/Microwave Committee](#) is one on harmonizing APRS.

VIE16_C5_41_1.pdf – 144 /435 MHz APRS Harmonisation

The paper covers global band planning considerations and among the recommendations says:

*Emphasise that spaceborne APRS must be confined to globally coordinated amateur satellite sub bands. Therefore items that are ambiguous and generate confusion in national band plans such as ‘**Space communications**’ and ‘**New Oscar Sub band**’ should be **removed as soon as possible in all Regions** in accordance with IARU-AC and Satellite Coordination guidance*

It is believed that ‘*New Oscar Sub band*’ refers to the USA’s [ARRL 144 MHz band plan](#) and ‘*Space communications*’ to the Australian [WIA 144 MHz band plan](#). These band plans, as well as those for some other countries, show **144.300 – 144.500 MHz** as being for Amateur Satellite use.

**144.500 - 144.600 REPEATER INPUTS PRIMARY, LINEAR TRANSLATOR INPUTS SECONDARY
144.510, 144.530, 144.550, 144.570, 144.590**

(10) Repeaters may include FM, ACSSB or digital modes of modulation. Consult with your local coordination body for frequency and modulation scheme allocations.

**144.600 - 144.900 REPEATER INPUTS(10) 144.610, 144.630, 144.650, 144.670,
144.690, 144.710, 144.730, 144.750, 144.770, 144.790, 144.810,
144.830, 144.850, 144.870, 144.890**

**144.900 - 145.100 DIGITAL (3) (3) Ten (10) frequencies on a 20 kHz channel raster.
144.91, 144.93, 144.95, 144.97, 144.99, 145.01, 145.03,
145.05, 145.07, 145.09. Consult with your local
coordination body.**

**145.100 - 145.200 REPEATER OUTPUTS PRIMARY, LINEAR TRANSLATOR OUTPUTS
SECONDARY (10) 145.110, 145.130, 145.150, 145.170, 145.190**

**145.200 - 145.500 REPEATER OUTPUTS(10) 145.210, 145.230, 145.250, 145.270,
145.290, 145.310, 145.330, 145.350, 145.370, 145.390, 145.410,
145.430, 145.450, 145.470, 145.490**

145.500 - 145.590 SAREX/ARISS LINKS (Shuttle Amateur Experiment/Amateur Radio on ISS)

145.590 - 145.790 DIGITAL (4)

(4) Eleven (11) frequencies on a 20 kHz channel raster 145.59, 145.61, 145.63, 145.65, 145.67, 145.69, 145.71, 145.73, 145.75, 145.77, 145.79 MHz. Consult with your local coordination body.

145.800 - 146.000 EXCLUSIVE AMATEUR SATELLITE SERVICE, ARISS

145.600 D-Star Simplex Calling

145.670 D-Star Simplex Working

USA ARRL

145.50-145.80 Miscellaneous and experimental modes

145.80-146.00 OSCAR subband

RAC 2m Band Plan 144 to 148 MHz

144.100 CW Calling		144.910 Digital Dartmouth LAN	145.500 – 145.590 SAREX/ARISS
144.200 SSB Calling (QSY)		144.930 Digital	145.590 Digital (145.600 D-Star Smpx Calling)
144.310 Digital - Use dependant on B/W		144.950 Digital	145.610 Digital
144.340 ATV Coord. (QSY)		144.970 Digital Hfx to SS BBS/LAN	145.630 Digital
144.370 Digital		144.990 Digital Greenwood LAN	145.650 Digital EMO Local B/U
144.390 Digital (APRS)		145.010 Digital Maritime Wide (Packet Backbone)	145.670 Digital D-Star Simplex Working
144.410 Digital		145.030 Digital N.NB & E.US Backbone	145.690 Digital Proposed TCP?
144.430 Digital		145.050 Digital Hfx/Drtmth/Smrsde LAN	145.710 Digital Proposed 9.6K Greenwood
144.450 Digital		145.070 Digital Truro/Yrmth/Mrmch LAN	145.730 Digital
144.470 Digital		145.090 Digital Blomidon LAN	145.750 Digital
144.490 Digital (ISS FM Uplink)		145.110 Repeater or L. T. Output	145.770 Digital
144.510 Repeater or L. T. Input	→	145.130 Repeater or L. T. Output	145.790 Digital
144.530 Repeater or L. T. Input	→	145.150 Repeater or L. T. Output	145.800 – 146.000 Exclusive Amateur Satellite Service / ARISS
144.550 Repeater or L. T. Input	→	145.170 Repeater or L. T. Output	
144.570 Repeater or L. T. Input	→	145.190 Repeater or L. T. Output	144.287 CW Sable Is. Prop. Beacon VE1SMU
144.590 Repeater or L. T. Input	→	145.210 Repeater Output	144.350 CAS-3H FM Uplink (437.200 Downlink)
144.610 Repeater Input	→	145.230 Repeater Output	145.800 ISS FM Downlink (144.490/437.050 Up)
144.630 Repeater Input	→	145.250 Repeater Output	145.825 ISS Packet
144.650 Repeater Input	→	145.270 Repeater Output	145.850 SO-50 FM Up 67.0Hz (436.795 Downlink)
144.670 Repeater Input	→	145.290 Repeater Output	145.880 AO-92 FM Downlink (435.350 Up 67.0) IO-86 FM Downlink
144.690 Repeater Input	→	145.310 Repeater Output	145.895 FUNcube FM Downlink (1263.5 Up)
144.710 Repeater Input	→	145.330 Repeater Output	145.900 Diwata-2 FM Uplink (437.500 Up)
144.730 Repeater Input	→	145.350 Repeater Output	ExceedSat FM Downlink (435.340 Up)
144.750 Repeater Input	→	145.370 Repeater Output	145.920 Fox-1Cliff FM Downlink (435.300 Up)
144.770 Repeater Input	→	145.390 Repeater Output	145.925 CAS-5A FM Uplink
144.790 Repeater Input	→	145.410 Repeater Output	145.960 AO-91 FM Downlink (435.250 Uplink)
144.810 Repeater Input	→	145.430 Repeater Output	145.970 Duchifat3 FM Uplink
144.830 Repeater Input	→	145.450 Repeater Output	145.980 AO-85 FM Downlink (435.170 Up 67.0 Hz)
144.850 Repeater Input	→	145.470 Repeater Output	K2SAT FM Uplink (435.835 Downlink)
144.870 Repeater Input	→	145.490 Repeater Output	
144.890 Repeater Input	→		

146.010 - 146.370 REPEATER INPUTS(10)

146.010, 146.025, 146.040, 146.055, 146.070, 146.085, 146.100, 146.115, 146.130, 146.145, 146.160, 146.175, 146.190, 146.205, 146.220, 146.235, 146.250, 146.265, 146.280, 146.295, 146.310, 146.325, 146.340, 146.355, 146.370, (146.385?) MHz.

146.400 - 146.580 FM SIMPLEX (5)(6)

(5) The frequencies 146.40, 146.43, 146.46 MHz continue to be used as repeater inputs in some areas. Consult with your local coordination body.

(6) Thirteen (13) Channels on a 15 kHz channel raster (146.400?), 146.415, 146.430, 146.445, 146.460, 146.475, 146.490, 146.505, 146.520, 146.535, 146.550, 146.565, 146.580, 146.595 MHz.

146.520 NATIONAL FM CALLING FREQUENCY (1)

(1) Once communications are established QSY off the frequency.

146.610 - 147.390 REPEATER OUTPUTS (10) (53 pairs)

(10) Repeaters may include FM, ACSSB or digital modes of modulation.

146.610, 146.625, 146.640, 146.655, 146.670, 146.685, 146.700, 146.715, 146.730, 146.745, 146.760, 146.775, 146.790, 146.805, 146.820, 146.835, 146.850, 146.865, 146.880, 146.895, 146.910, 146.925, 146.940, 146.955, 146.970, 146.985, 147.000 (5), 147.015, 147.030 (5), 147.045, 147.060 (5), 147.075, 147.090, 147.105, 147.120, 147.135, 147.150, 147.165, 147.180, 147.195, 147.210, 147.225, 147.240, 147.255, 147.270, 147.285, 147.300, 147.315, 147.330, 147.345, 147.360, 147.375, 147.390

(5) The frequencies 146.40, 146.43, 146.46 MHz continue to be used as repeater inputs in some areas.

147.420 - 147.570 FM SIMPLEX (30 kHz raster)(7)

(7) Six (6) Channels on a 30 kHz channel raster, 147.420, 147.450, 147.480, 147.510, 147.540, 147.570 MHz.

147.435 - 147.585 DIGITAL (30 kHz raster)(8)

(147.405?)

(8) Six (6) Channels on a 30 kHz channel raster 147.435, 147.465, 147.495, 147.525, 147.555, 147.585 MHz. Consult your local coordination body for available frequencies, ERP and bandwidth.

147.600 - 147.990 REPEATER INPUTS (10)

(10) Repeaters may include FM, ACSSB or digital modes of modulation. Consult with your local coordination body for frequency and modulation scheme allocations.

**147.600, 147.615, 147.630, 147.645, 147.660, 147.675, 147.690,
147.705, 147.720, 147.735, 147.750, 147.765, 147.780, 147.795,
147.810, 147.825, 147.840, 147.855, 147.870, 147.885, 147.900,
147.915, 147.930, 147.945, 147.960, 147.975, 147.990**

**List of Maritime 147 MHz repeaters using minus offsets
When within range of these repeaters please refrain from
using their input frequencies for simplex purposes**

Repeater Output	Repeater Input	Location
147.000	146.400	Springhill NS
147.060	146.460	Bridgetown NS
147.060	146.460	Perth (Kintore) NB

146.010 Repeater Input	→	146.610 Repeater Output	147.000 Repeater Output	←	147.600 Repeater Input
146.025 Repeater Input	→	146.625 Repeater Output	147.015 Repeater Output	←	147.615 Repeater Input
146.040 Repeater Input	→	146.640 Repeater Output	147.030 Repeater Output	←	147.630 Repeater Input
146.055 Repeater Input	→	146.655 Repeater Output	147.045 Repeater Output	←	147.645 Repeater Input
146.070 Repeater Input	→	146.670 Repeater Output	147.060 Repeater Output	←	147.660 Repeater Input
146.085 Repeater Input	→	146.685 Repeater Output	147.075 Repeater Output	←	147.675 Repeater Input
146.100 Repeater Input	→	146.700 Repeater Output	147.090 Repeater Output	←	147.690 Repeater Input
146.115 Repeater Input	→	146.715 Repeater Output	147.105 Repeater Output	←	147.705 Repeater Input
146.130 Repeater Input	→	146.730 Repeater Output	147.120 Repeater Output	←	147.720 Repeater Input
146.145 Repeater Input	→	146.745 Repeater Output	147.135 Repeater Output	←	147.735 Repeater Input
146.160 Repeater Input	→	146.760 Repeater Output	147.150 Repeater Output	←	147.750 Repeater Input
146.175 Repeater Input	→	146.775 Repeater Output	147.165 Repeater Output	←	147.765 Repeater Input
146.190 Repeater Input	→	146.790 Repeater Output	147.180 Repeater Output	←	147.780 Repeater Input
146.205 Repeater Input	→	146.805 Repeater Output	147.195 Repeater Output	←	147.795 Repeater Input
146.220 Repeater Input	→	146.820 Repeater Output	147.210 Repeater Output	←	147.810 Repeater Input
146.235 Repeater Input	→	146.835 Repeater Output	147.225 Repeater Output	←	147.825 Repeater Input
146.250 Repeater Input	→	146.850 Repeater Output	147.240 Repeater Output	←	147.840 Repeater Input
146.265 Repeater Input	→	146.865 Repeater Output	147.255 Repeater Output	←	147.855 Repeater Input
146.280 Repeater Input	→	146.880 Repeater Output	147.270 Repeater Output	←	147.870 Repeater Input
146.295 Repeater Input	→	146.895 Repeater Output	147.285 Repeater Output	←	147.885 Repeater Input
146.310 Repeater Input	→	146.910 Repeater Output	147.300 Repeater Output	←	147.900 Repeater Input
146.325 Repeater Input	→	146.925 Repeater Output	147.315 Repeater Output	←	147.915 Repeater Input
146.340 Repeater Input	→	146.940 Repeater Output	147.330 Repeater Output	←	147.930 Repeater Input
146.355 Repeater Input	→	146.955 Repeater Output	147.345 Repeater Output	←	147.945 Repeater Input
146.370 Repeater Input	→	146.970 Repeater Output	147.360 Repeater Output	←	147.960 Repeater Input
146.385 Repeater Input	→	146.985 Repeater Output	147.375 Repeater Output	←	147.975 Repeater Input
146.400 FM Simplex or	→	147.000 Repeater Output	147.390 Repeater Output	←	147.990 Repeater Input
146.415 FM Simplex			147.405 Digital		
146.430 FM Simplex or	→	147.030 Repeater Output	147.420 FM Simplex		Moncton LAN
146.445 FM Simplex			147.435 Digital		Proposed 9.6K Greenwood
146.460 FM Simplex or	→	147.060 Repeater Output	147.450 FM Simplex		VE1YAR Yarmouth NS
146.475 FM Simplex			147.465 Digital		VE1NSC Gore NS
146.490 FM Simplex Westcumb Simplex Rptr			147.480 FM Simplex		Proposed Link AEH to DRG
146.505 FM Simplex			147.495 Digital		Fredericton BBS
146.520 FM Simplex Nat'l Calling (QSY)			147.510 FM Simplex		PEI LAN
146.535 FM Simplex			147.525 Digital		C4FM (Fusion) Simplex
146.550 FM Simplex			147.540 FM Simplex		New Glasgow LAN
146.565 FM Simplex			147.555 Digital		St John & Sydney LAN
146.580 FM Simplex (EMO)			147.570 FM Simplex		Parrsboro Gateway
146.595 FM Simplex			147.585 Digital		Halifax BBS

146.610 – 147.390 Repeater Outputs

147.405 Digital

147.420 FM Simplex (Moncton LAN)

147.435 Digital (Proposed 9.6K Greenwood)

147.450 FM Simplex (VE1YAR Yarmouth)

147.465 Digital (VE1NSC Gore)

147.480 FM Simplex (Proposed link AEH – DRG)

147.495 Digital (Fredericton BBS)

147.510 FM Simplex (Charlottetown LAN)

147.525 Digital (C4FM (Fusion) Simplex)

147.540 FM Simplex (New Glasgow LAN)

147.555 Digital (Saint John & Sydney LAN)

147.570 FM Simplex (Parrsboro Gateway)

147.585 Digital (Halifax BBS)

147.600 – 147.990 Repeater Inputs

CHANNEL SPACING - Why 15 kHz vs 20 kHz

FM parameters we use today were originally designed for 30 kHz channels in the 1970's

Soon we were quickly running out of channels for new repeaters in metro areas

Easy choice – Cut channel steps in half.....but 15 kHz pinched a little too hard

FM occupies about 16 kHz of spectrum – Receivers are designed to separate signals pretty well at about 20 kHz

To make 15 kHz work, adjacent channel repeaters need to be about 50 miles or more apart. This worked pretty well but relieved the pressure only temporarily.

Eventually the FCC (followed by the DOC back then) allowed repeaters in the 144.5 to 145.5 segment . Repeater councils agreed that to avoid the problems of 15 kHz steps, these new channels should use 20 kHz steps. This yielded more usable channels in metro areas.

Some parts of the US and Canada chose to apply 20 kHz steps to both repeater segments thus eliminating the 50 mile requirement for adjacent channels.

Carson's Rule for FM Bandwidth.

An approximation for the bandwidth of an FM signal is given by
 $BW = 2(\text{Maximum frequency deviation} + \text{highest modulated frequency})$

$$\text{Bandwidth} = 2(\Delta f_c + f_m) \quad \text{Carson's Rule}$$

$$BW = 2(5 \text{ kHz} + 3 \text{ kHz}) = 2(8) = 16 \text{ kHz}$$

ARRL 2 Meters (144-148 MHz)

144.00-144.05	EME (CW)
144.05-144.10	General CW and weak signals
144.10-144.20	EME and weak-signal SSB
144.200	National calling frequency
144.200-144.275	General SSB operation
144.275-144.300	Propagation beacons
144.30-144.50	New OSCAR subband
144.50-144.60	Linear translator inputs
144.60-144.90	FM repeater inputs
144.90-145.10	Weak signal and FM simplex (145.01,03,05,07,09 are widely used for packet)
145.10-145.20	Linear translator outputs
145.20-145.50	FM repeater outputs
145.50-145.80	Miscellaneous and experimental modes
145.80-146.00	OSCAR subband
146.01-146.37	Repeater inputs
146.40-146.58	Simplex
146.52	National Simplex Calling Frequency
146.61-146.97	Repeater outputs
147.00-147.39	Repeater outputs
147.42-147.57	Simplex
147.60-147.99	Repeater inputs

Linear "transponders" are repeaters with a difference; there is no signal limiting circuitry and no audio processing. They are, in essence, linear systems where the signals are received, amplified linearly and re-transmitted with no modifications made to the signal except a change in frequency.

A close examination of Fig. 1 will reveal how simple the system actually is. A familiar superhet receiver (with AGC) and a transmitter coupled together at the IF stage. Following the signal path from input to out-put it can be seen that at no point is the signal demodulated. The lowest frequency is the IF which is then transverted to the output frequency by the second mixer. The receiver has AGC to enable it to handle a wide range of signal strengths and remain in linear operation. The overall principle is simpler than the average FM repeater.

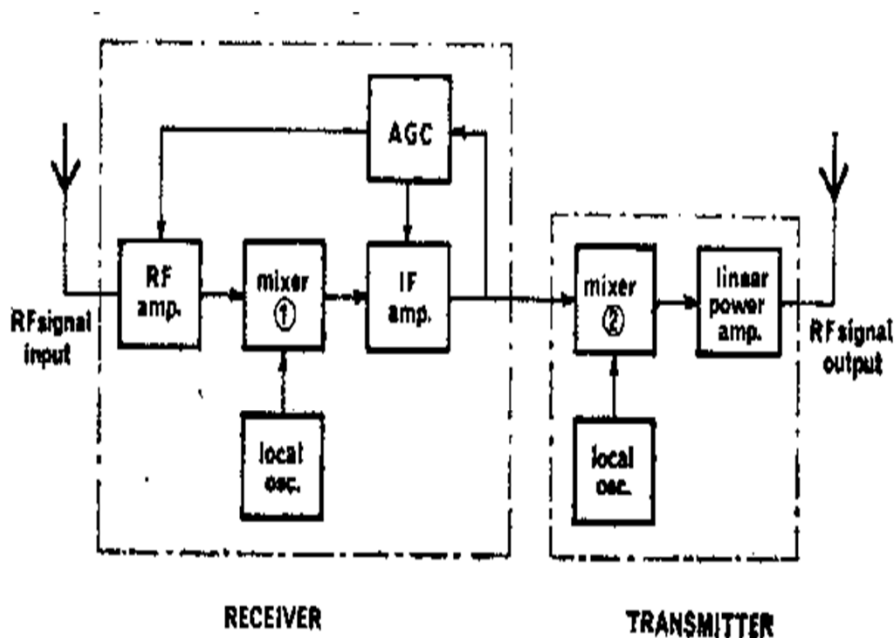


Fig. 1. Block Diagram of a Linear Transponder.

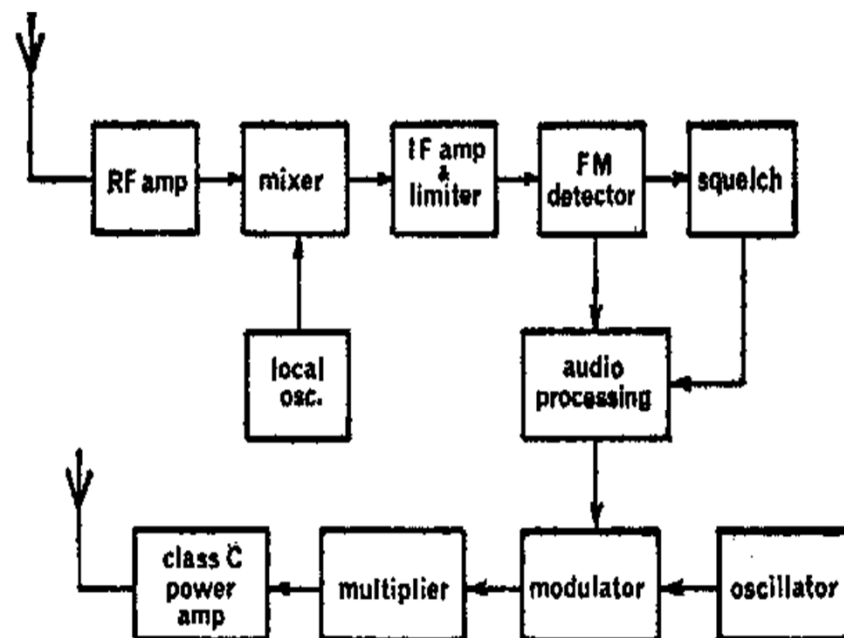


Fig. 2. Block Diagram of a Typical FM Repeater.

**Canada and the US have
73 repeater pairs.**

**Guess how many there
are in the UK?**

UK 2m Repeater Channels (16)

RV 48	145.0000	→	145.6000
RV 49	145.0125	→	145.6125
RV 50	145.0250	→	145.6250
RV 51	145.0375	→	145.6375
RV 52	145.0500	→	145.6500
RV 53	145.0625	→	145.6625
RV 54	145.0750	→	145.6750
RV 55	145.0875	→	145.6875
RV 56	145.1000	→	145.7000
RV 57	145.1125	→	145.7125
RV 58	145.1250	→	145.7250
RV 59	145.1375	→	145.7375
RV 60	145.1500	→	145.7500
RV 61	145.1625	→	145.7625
RV 62	145.1750	→	145.7750
RV 63	145.1875	→	145.7875

THE END