

VHF/UHF

Operating considerations for backcountry travel

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Agenda

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- * What's in a repeater
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- * What is cross-band repeat
- * What is a band plan
- * How to read a band plan

What is a repeater

- * **It rebroadcasts signals it hears over a wide area**
- * Located at a designated site
- * Purpose-built for the need at a specific location
- * Owned and managed by individuals or clubs
- * Usually in operation 24/7

VE6HRB

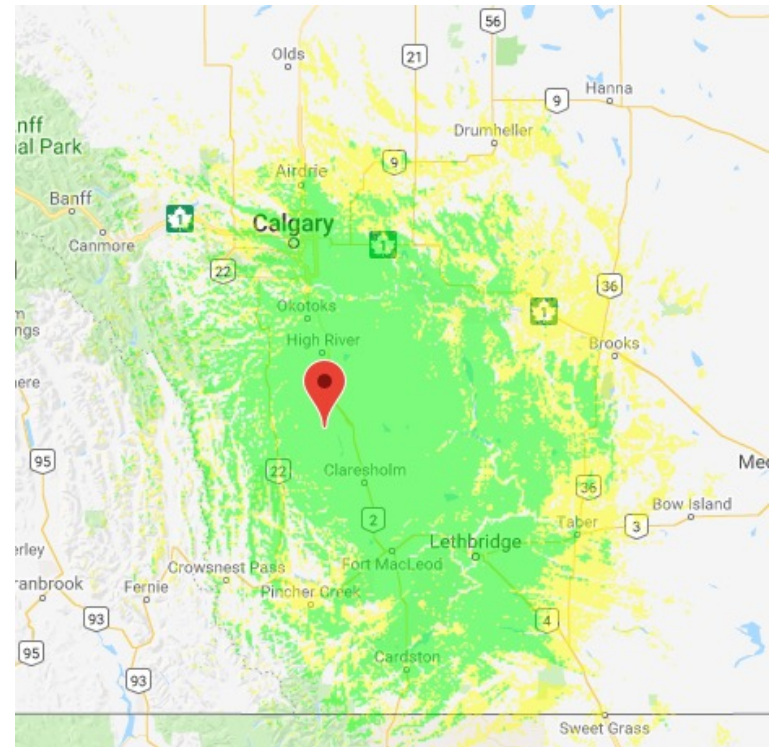
West of Nanton AB

Elevation 1400m/4600' AGL

Links to other repeaters between
30 and 90km (18 and 54mi)

2m, 70cm, 5GHz

Voice, APRS (NANTON), TCP/IP



What's in a repeater

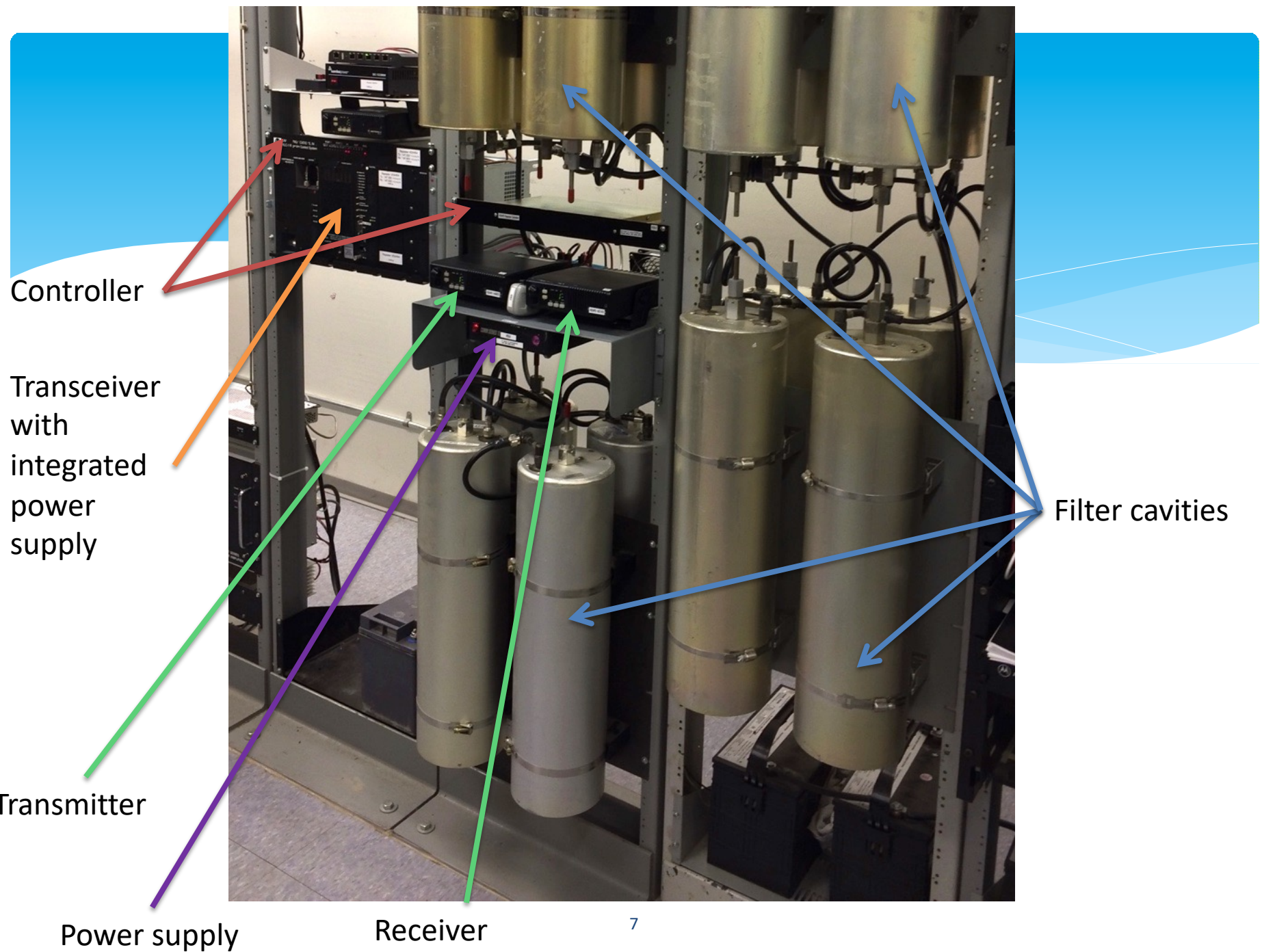
- * A receiver
- * A transmitter
- * A power supply
- * sometimes the above are in the same enclosure (Transceiver)
- * A repeater controller to add identification and timer control
- * Filter cavities to ensure spurious signals don't get introduced



VE6HRK voice



VE6HRA voice, VE6VPD voice



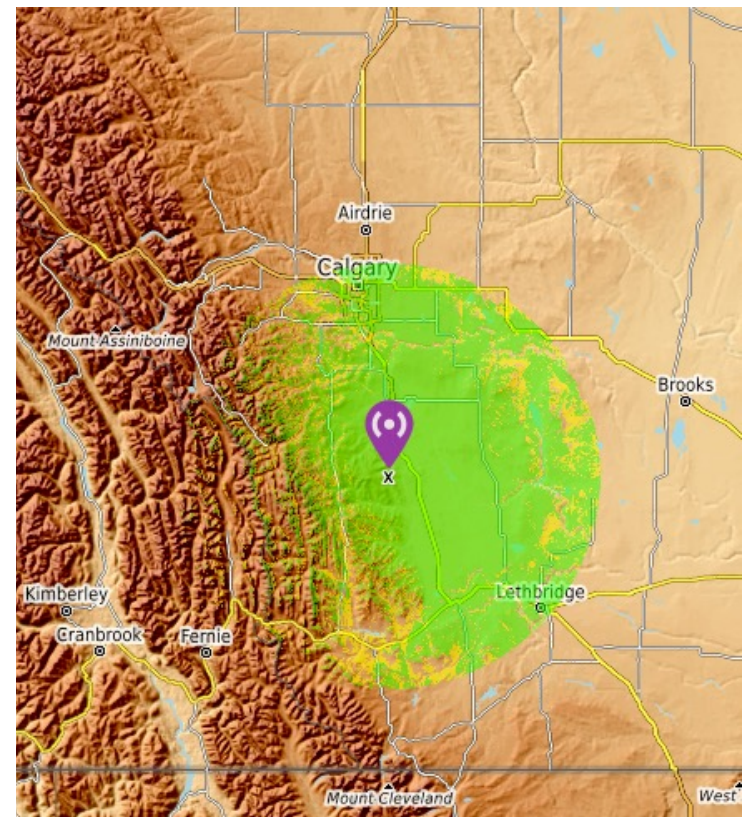
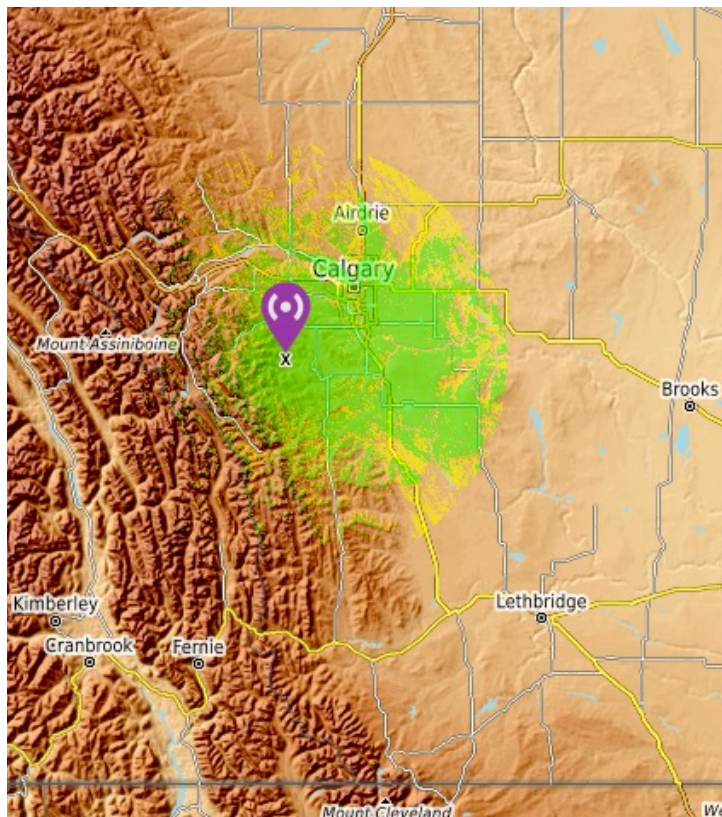
How to find a repeater

- * **Do your research before you leave home**
- * Some are listed on Repeaterbook.com, some on club websites, some in ARRL repeater handbook (North America)
- * Rarely do all listings 100% agree – use multiple sources
- * Calgary area – look at CARA and FARS website in addition to RepeaterBook. Outside of Calgary? Look for radio clubs in the area where you'll be travelling.

Repeater Coverage

- * **Coverage for every site varies; no two are the same**
- * Don't assume they are all the same, but safe to assume at least a 10km (6mi) radius from each site unless repeater's antenna is at a low altitude or set up for temporary use
- * Coverage can be a radius of up to 100km/60 mi if the site is well-placed *and* you have a decent mobile radio setup in your vehicle.
- * Remember that line-of-sight followed by TX power output dictates coverage more than anything else and hilly/mountainous terrain dramatically impacts coverage

Repeater Coverage – terrain impact



FM Analog Squelch basics

- * **Three types of squelch for FM** – without it, all you hear is white noise, so keep the squelch knob adjusted appropriately
 1. Carrier squelch (presence of carrier opens squelch)
 2. Tone squelch (presences of carrier *plus* CTCSS or PL tone opens squelch)
 3. DCS squelch (presence of carrier *plus* DCS code opens squelch)
- * FM Analog radios sold today do all of these modes
- * Tones can be required by either receiver (yours or the repeater's) in any combination

What to program in my radio

Example #1

- * Each repeater has it's base frequency, the offset and any CTCSS (PL) or DCS tones (screengrab from RepeaterBook)

Frequency ▲▼	Offset ▲▼	Tone Up / Down ▲▼	Location ▲▼	Country ▲▼	▲▼	Call ▲▼	Use ▲▼	Mode ▲▼	[T]
145.2900	-0.6 MHz		Calgary, CFCN Tower	CA	AB	VA6CTV	OPEN	FM	+

- * Frequency – set your radio to 145.290, set your offset to -600KHz or -0.6MHz
- * Tones – This repeater does not require tones

What to program in my radio

Example #2

- * Each repeater has it's base frequency, the offset and any CTCSS (PL) or DCS tones (screengrab from RepeaterBook)

Frequency ▲▼	Offset ▲▼	Tone Up / Down ▲▼	Location ▲▼	Country ▲▼	▲▼	Call ▲▼	Use ▲▼	Mode ▲▼	[+]
147.2400	+0.6 MHz	CSQ / CSQ	Calgary	CA	AB	VE6QCW	OPEN	FM	+

- * Frequency – set your radio to 147.240, set your offset to +600KHz or +0.6MHz
- * Tones – This repeater does not require tones (says CSQ, same as Carrier Squelch or no tones)

What to program in my radio

Example #3

- * Each repeater has it's base frequency, the offset and any CTCSS (PL) or DCS tones (screengrab from RepeaterBook)

Frequency ▲▼	Offset ▲▼	Tone Up / Down ▲▼	Location ▲▼	Country ▲▼	▲▼	Call ▲▼	Use ▲▼	Mode ▲▼	[?]
147.3900	+0.6 MHz	131.8	Calgary, Hailstone Butte Lookout	CA	AB	VE6WRT	OPEN	FM	+

- * Frequency – set your radio to 147.390, set your offset to +600KHz or +0.6MHz
- * Tones – This repeater requires only a T or TONE of 131.8Hz

What to program in my radio

Example #4

- * Each repeater has it's base frequency, the offset and any CTCSS (PL) or DCS tones (screengrab from RepeaterBook)

Frequency ▲▼	Offset ▲▼	Tone Up / Down ▲▼	Location ▲▼	Country ▲▼	▲▼	Call ▲▼	Use ▲▼	Mode ▲▼	[T]
147.0000	+0.6 MHz	110.9 / 110.9	Aldersyde, Gladys Ridge	CA	AB	VE6HRA	OPEN	FM	+

- * Frequency – set your radio to 147.000, set your offset to +600KHz or +0.6MHz
- * Tones – This repeater requires T.SQ1 or ToneSQL or ToneUP and ToneDN of 110.9Hz

Best approach for radio memories

- * **There isn't a single best approach** – do what makes sense for you
- * Some place memories in Callsign order
- * Some place memories in Frequency order
- * Some place memories in Groups by location (ie. Home province/state in slots 1-50, neighbouring areas in slots 51-75 and so on)
- * Some have no order that anyone else can discern 😊

What if you didn't pre-program

- * **Always travel with your radio's manual**
- * Always travel with a list of repeaters for where you are travelling to (*you did do your research, right?*)
- * Rehearse how to enter VFO frequencies at home before you leave
- * **How** to do this is specific to each radio.

What is Cross-Band Repeat

- * **Usually this is a reference to a radio that has a built-in capability**
- * A regular repeater is “in-band” ie. From 2m to 2m but some dedicated repeaters go “cross-band” or between two bands
- * Ensure your license class allows this. Canada requires Basic, USA requires Technician. Before you travel, understand any rules restriction when operating away from your home country.
- * Basic and Technician class – this is not an issue for VHF and UHF but there are cases where a cross-band repeater has been established between HF and VHF – be aware of the repeater setup before you transmit.

Cross-band function in mobiles

- * **Not all radios do cross-band repeat** – this is a premium feature in a radio
- * Allows short-range extended coverage for when a HT cannot hit a desired repeater site but the mobile can usually due to higher power and better antenna vs. the HT
- * Used so that operators can step away from their vehicle with a HT and still hit the “main” repeater site
- * Typical use is with the main repeater on 2m and HT on 70cm however it can be the other way around too
- * Not designed for 100% full-duty transmit
- * Whenever a signal is being received *it is also being retransmitted*

Cross-band best practices

- * **Assumes VHF repeater and UHF HT:**
- * Use lowest TX power on VHF side for solid copy to repeater [battery life on vehicle, heat dissipation on TX]
- * Use lowest power on UHF side – even 1W will get you 1km/0.6mi of coverage typically [battery life on HT]
- * Always use a time-out-timer of 90 seconds Max on mobile radio [prevents tying up VHF repeater, overheat on mobile radio]
- * Always use CTCSS tone squelch on UHF side
- * Always turn UHF receiver squelch up full
- * Read your radio manual and *rehearse* getting into and out of crossband repeat mode
- * Avoid use of crossband repeat in city – missing one step above (sadly common) can tie up an entire repeater network

What is a band plan?

- * **It is a combination of national regulation and regional agreement**
- * Canada – refer to RAC website for the band plan and search for any Provincial agreement or variance
- * USA – refer to Regulations Part 97 then find the State agreement

How to read a band plan and find repeaters and simplex frequencies

145.100 – 145.500	FM / Digital / Linear Repeater Outputs. See Note 7.
145.500 – 145.590	ARISS Links – Space Communication Exclusive.
145.590 – 145.790	Wide Band Digital Modes. See Notes 1 and 9.
145.790 – 145.800	No transmissions. Guard Band to protect Satellite Sub-band.
145.800 – 146.000	Amateur Satellite Uplink / Downlink and ARISS Exclusive.
146.000 – 146.010	No transmissions. Guard Band to protect Satellite Sub-band.
146.010 – 146.370	FM / Digital / Linear Repeater Inputs. See Note 7.
146.400 – 146.595	FM Simplex. See Notes 10 and 11. 146.520 – National FM Calling Frequency. See Note 4.
146.610 – 147.390	FM / Digital / Linear Repeater Outputs. See Note 7.
147.420 – 147.570	FM Simplex and Digital Hotspots using a 30 kHz raster. See Notes 12 and 13. Note that Digital channels are interwoven between these FM Simplex channels.
147.435 – 147.585	Wide Band Digital. See Notes 1 and 14. Note that these Digital channels are interwoven between the FM Simplex channels at 147.420 – 147.570.
147.600 – 147.990	FM / Digital / Linear Repeater inputs. See Note 7.

Note 4: Once contact is established on a Calling Frequency, operators should QSY to another frequency. For 144.200 MHz it is generally down for CW, and up for SSB. For 146.520 MHz FM, it is to any other clear FM simplex channel.

Note 7: Repeaters include FM, Digital (DMR, Fusion, DSTAR and related) and linear modes. Consult with your local coordination body for frequencies and modulation scheme allocations specific to your area, if available. Hotspots are not to be used on Repeater frequencies.

Note 10: The frequencies 146.40, 146.43 and 146.46 MHz continue to be used as repeater inputs in some areas. Consult with your local coordination body.

Note 11: Thirteen channels on a 15 kHz channel raster: 146.415, 146.430, 146.445, 146.460, 146.475, 146.490, 146.505, 146.520, 146.535, 146.550, 146.565, 146.580 and 146.595 MHz.

Note 12: Six channels on a 30 kHz channel raster, 147.420, 147.450, 147.480, 147.510, 147.540, 147.570 MHz.

Note 13: The use of Digital Hotspots is not recommended on 2m. If they are used however, maximum power output should not exceed 500 mW. Gain antennas should not be used. The control operator must monitor the Hotspot whenever it is operating.

How to change frequencies as a group

- * **This is a matter of group coordination, not regulatory**
- * Plan before you travel ie. “If for whatever reason the repeater stops working, all stations move to 146.550MHz simplex”
- * Rehearse this frequency change before you travel. This sounds basic *but in times of stress it becomes important to have muscle memory to operate your radio*
- * Talk to others and decide to move off repeater to a mutually agreed frequency

Summary

- * **Backcountry radio operation in a group is easy and fun if you plan and rehearse before you go**

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