PRS STATION PROFILE

WN564

MY UHF CB/PRS RADIO STATION

Porirua, Wellington Region, New Zealand

Oricom UHF · Techoman 6.5 dBi · Mt Climie repeater

“A simple station, correctly installed and operated, can provide many opportunities for communication and learning.”



477 MHz NZ UHF CB BAND	≈ 4 W MEASURED FORWARD POWER
6.5 dBi TECHOMAN VERTICAL	1.17:1 SWR AT 477.240 MHZ

73 DE WN564

WELCOME TO MY RADIO STATION!

Thank you for visiting my radio station page.

My interests include amateur radio, UHF CB/PRS communications, radio repeaters, antenna systems and radio-frequency technology.

I operate a UHF CB/PRS base station from the Porirua area of New Zealand, using an Oricom UHF radio connected to an outdoor Techoman 6.5 dBi vertical antenna.

I have created this description to share my radio installation with other enthusiasts and to help newcomers understand how a UHF CB base station works.

GOOD TO KNOW

You do not need extensive technical knowledge to enjoy radio. A simple station, correctly installed and operated, can provide many opportunities for communication and learning.



PHOTO 1 Oricom radio and Nissei RS-502 power meter

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1

OVERVIEW

MY COMPLETE UHF CB BASE STATION

My radio station consists of a fixed home operating position, an external UHF antenna and test equipment for monitoring the performance of the system.

The main equipment includes:

EQUIPMENT	DETAILS
RADIO	Oricom 80-channel UHF CB/PRS
OPERATING FREQUENCIES	New Zealand 477 MHz UHF CB band
TRANSMITTER POWER	Approximately 4 watts measured
RF POWER METER	Nissei RS-502
ANTENNA	Techoman 6.5 dBi vertical
COAXIAL CABLE	10 metres of RG213
ANTENNA TEST INSTRUMENT	SV4401A Vector Network Analyzer
MEASURED ANTENNA SWR	1.17:1 at 477.240 MHz
COMMUNICATION	Simplex and repeater operation

My Oricom is designed as a mobile radio but is used at home as a permanent base station.

A base station is simply a two-way radio installed at a fixed location.

This allows me to operate from my desk rather than using a handheld radio or operating from a vehicle.

How my equipment connects

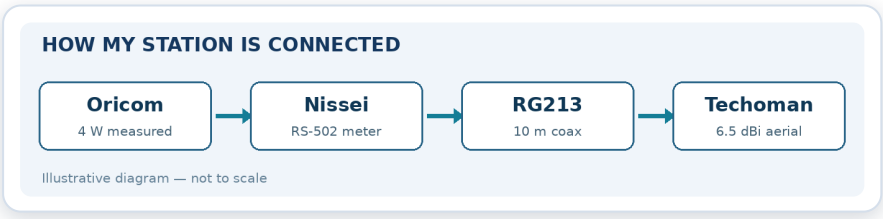
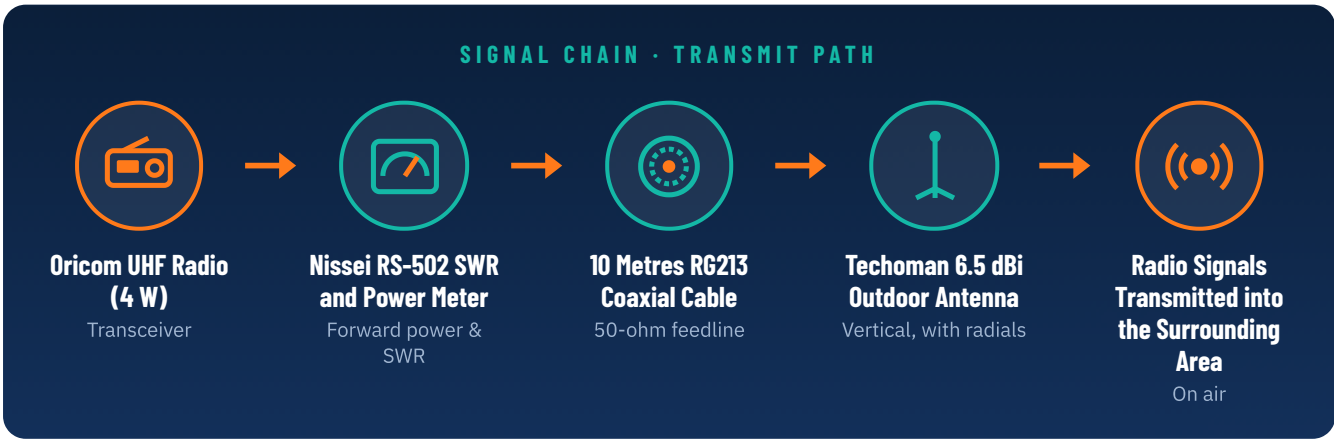


DIAGRAM 1 Complete radio station connection diagram

The signal travels through the following equipment:



Each component has a specific purpose, which I explain below.

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THE TRANSCEIVER

MY ORICOM UHF CB RADIO

The heart of the station is my Oricom UHF CB radio.

It operates on New Zealand's UHF Personal Radio Service (PRS), commonly known as UHF CB radio.

UHF stands for Ultra High Frequency.

The radio operates in the 477 MHz frequency band, where radio signals can be used for local direct communication and communication through repeaters.

My radio has a nominal maximum transmitting power of 5 watts.

However, when measured using my Nissei RS-502 power meter, it indicates approximately 4 watts of forward RF power.

This is quite suitable for my installation.

The difference between 4 watts and 5 watts is only approximately 1 dB, so increasing the power by that small amount would generally produce little noticeable improvement.

For UHF communication, antenna height, cable loss, antenna performance and terrain can be far more important.

Why my radio measures 4 watts instead of the advertised 5 watts

When I purchased my Oricom UHF CB radio, the packaging advertised a nominal 5-watt transmitter output. My own Nissei RS-502 meter indicates approximately 4 watts of forward power while transmitting. Although I would naturally prefer the radio to deliver the advertised 5 watts, that difference is quite small in everyday radio communication.



METER My Nissei RS-502 showing approximately 4 watts of forward RF power on the 5-watt scale (subject to the correct meter settings).

Understanding the difference in decibels (dB)

Radio signal changes are often expressed in decibels, abbreviated dB. A decibel compares two power levels. For my radio, $10 \times \log_{10}(5 \div 4) = 0.97$ dB. That means a 5-watt transmitter delivers only about 0.97 dB more power than a 4-watt transmitter, assuming the same antenna, cable, distance and propagation conditions.

0.97 dB
4 W VS 5 W

$10 \times \log_{10}(5 \div 4) = 0.97$ dB. On a reference scale of about 6 dB per S-point, 0.97 dB is only about one-sixth of an S-point.

At the receiving station, this would ordinarily represent about a 1 dB increase in received signal power—not an extra watt arriving at the receiver. A traditional S-meter is sometimes described as using about 6 dB per S-

point, although real radio meters vary considerably. On that reference scale, 0.97 dB is only about one-sixth of an S-point. It may be difficult to notice by ear, especially with normal signal fading or noise.

4 WATTS COMPARED WITH 5 WATTS

- **4 watts:** my indicated forward transmitter power
- **5 watts:** the nominal advertised output
- **Difference:** 1 watt, or 25% more power relative to 4 watts
- **Change in received power with all else equal:** approximately +0.97 dB
- **Practical result:** usually little audible change, not a guarantee of extra range

Even so, advertised specifications matter. I would be pleased if my radio measured the full 5 watts shown on the box. It is possible for other individual UHF CB radios to measure a little below or above their nominal rating, depending on manufacturing tolerances, supply voltage, calibration, temperature, test method and meter accuracy. My result is an example from one radio, not proof that all Oricom radios—or all UHF CB brands—produce only 4 watts.

The Nissei is an inline field meter rather than a laboratory measurement into a calibrated 50-ohm dummy load. A technician could verify my radio's output using suitable calibrated equipment, a stable power supply and a 50-ohm dummy load. Without that controlled test, I cannot say whether the 4-watt indication represents the exact transmitter output or a measurement variation.



PHOTOGRAPH The warning seal on my Oricom radio. I have not broken the seal or attempted to increase its transmitter output.

My radio has not been opened or internally adjusted by me since I purchased it. The photograph below shows the external seal warning on the casing. This supports my explanation that I have left the radio as supplied, although a photograph of a seal cannot independently establish its entire service history.

For me, the most important point is that a well-installed antenna, suitable coaxial cable and good operating position can matter much more than the 0.97 dB difference between 4 and 5 watts. I still believe that it is reasonable for buyers to expect a radio advertised as 5 watts to be close to that rating under its specified test conditions.

How a transceiver works

A transceiver is a radio that both transmits and receives.

When I press the microphone's push-to-talk button, the transmitter sends my voice through the antenna as radio waves.

When I release the button, the radio returns to receive mode, allowing me to listen to other stations.

Two-way radio communication is normally conducted one person at a time.

This is called simplex-style push-to-talk communication, even when the conversation is taking place through a repeater.

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TEST EQUIPMENT

THE NISSEI RS-502 SWR AND POWER METER

Between my Oricom radio and outdoor antenna, I have installed a Nissei RS-502 SWR and RF power meter.

The instrument has two important functions.



PHOTO 2 Rear connections of the Nissei RS-502

Measuring transmitter power

The meter indicates how much radio-frequency power is travelling from the transmitter towards the antenna.

My transmitter produces approximately 4 watts according to the meter.

The meter is installed before the main 10-metre RG213 antenna cable.

Therefore, the power reading is taken before the signal experiences most of the attenuation introduced by that cable.

Measuring standing wave ratio

SWR stands for Standing Wave Ratio.

SWR is a measurement that helps determine how well an antenna system is matched to the radio's transmission line.

Most UHF CB radios use a nominal 50-ohm antenna connection.

A properly matched antenna helps minimise reflected radio-frequency power.

IDEAL

An ideal SWR is 1:1.

VERY GOOD

An SWR around 1.5:1 or lower is generally considered very good.

REMEMBER

An SWR close to 1:1 is desirable, although a low reading alone does not guarantee good antenna radiation efficiency.

4

THE ANTENNA

MY TECHOMAN 6.5 dBi UHF ANTENNA

My outdoor antenna is a Techoman vertical UHF antenna with a stated gain of 6.5 dBi.

This is one of the most important parts of my installation.

The antenna is mounted outdoors, above many of the immediate surroundings, to help improve its radio coverage.

UHF communication is strongly influenced by antenna position, especially when hills, buildings and vegetation obstruct the path between stations.

A good antenna mounted in a suitable position can provide significantly better results than a poorly positioned antenna, even when both radios transmit at the same power.



PHOTO 3 Full outdoor Techoman antenna installation

Understanding antenna gain

The term dBi describes antenna gain relative to an ideal isotropic radiator, which is a theoretical antenna radiating equally in all directions.

My antenna's stated gain is 6.5 dBi.

This does not mean the antenna produces additional electrical power.

Instead, it concentrates the available radio-frequency energy into a particular radiation pattern.

A vertically omnidirectional antenna generally concentrates more energy towards the horizon, rather than radiating equally upwards and downwards.

This makes it suitable for many types of terrestrial UHF communication.

ILLUSTRATION – TECHOMAN 6.5 DBI CONCEPTUAL RADIATION PATTERN

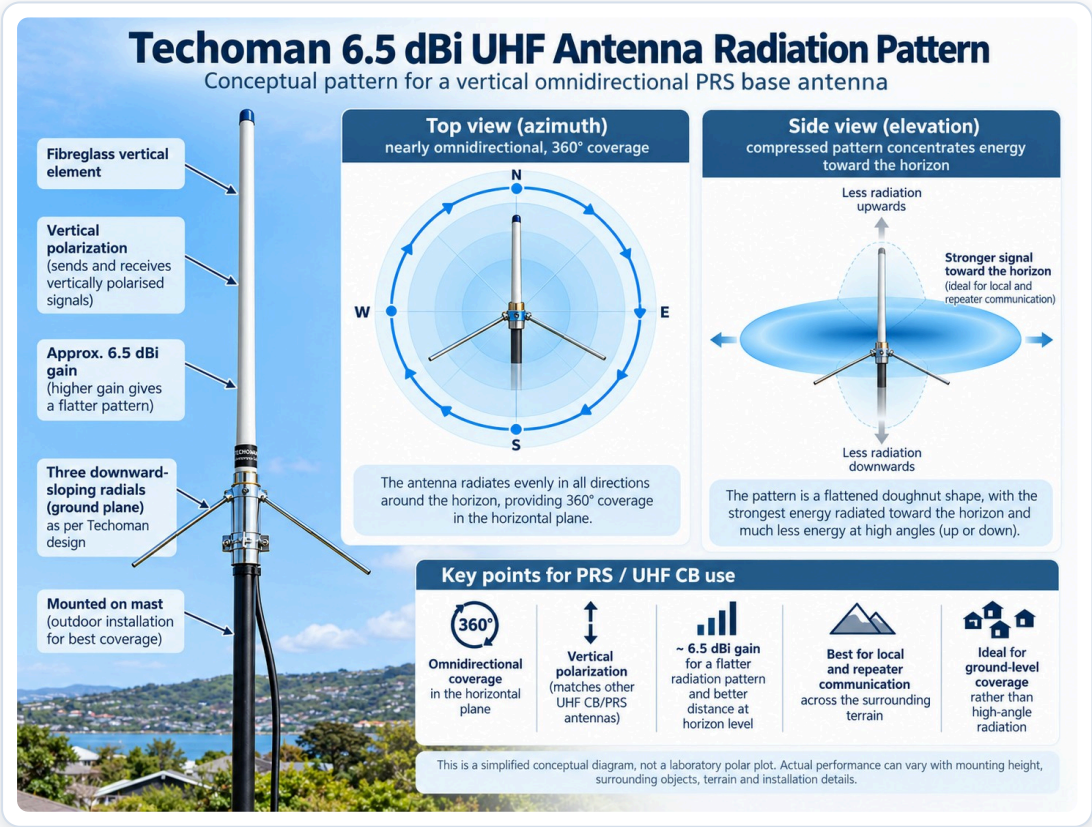

ILLUSTRATION Conceptual radiation pattern of my 6.5 dBi antenna

ILLUSTRATION – 3 DBI AND 10 DBI ANTENNA RADIATION-PATTERN COMPARISON

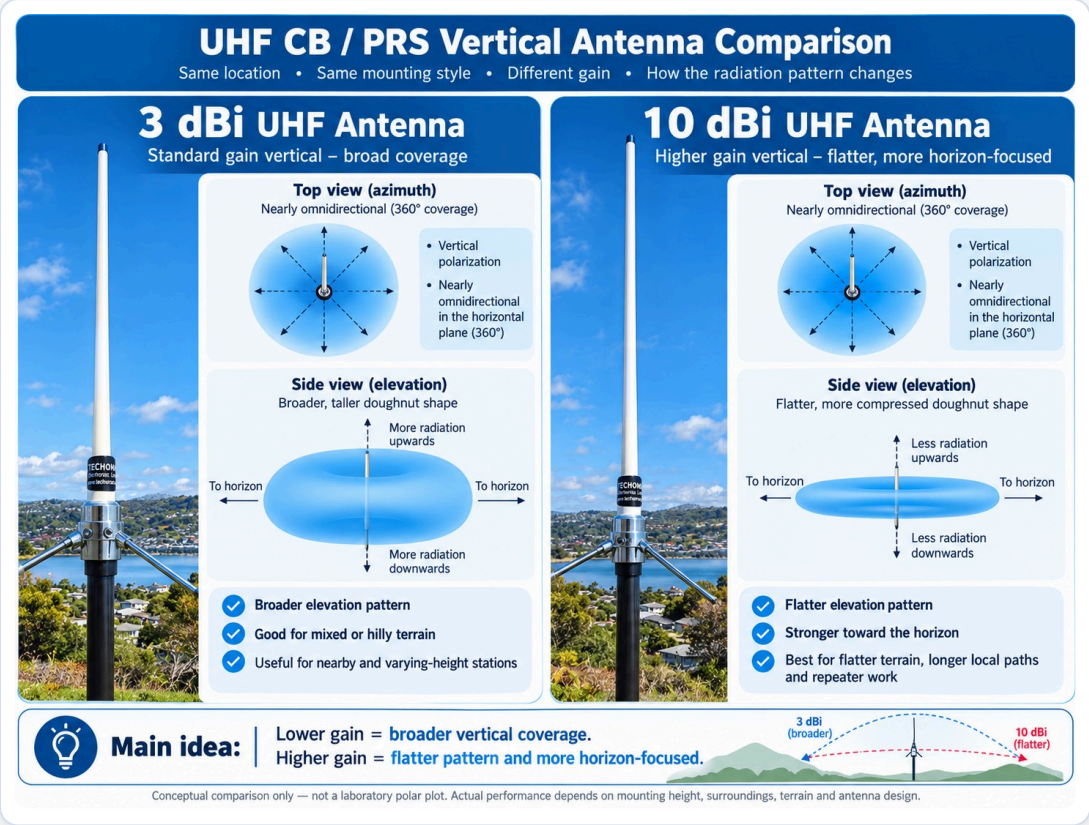

ILLUSTRATION Conceptual comparison of 3 dBi and 10 dBi UHF vertical antennas

Antenna ground radials



PHOTO 4 Close-up of Techoman antenna and radials

At the lower section of the antenna, three metal radials extend outwards.

These form part of the antenna's design and help establish the intended RF performance.

The antenna is installed vertically, matching the vertical polarisation commonly used for UHF CB communications.

Correct polarisation is important because a large mismatch between transmitting and receiving antenna polarisation can cause considerable signal loss.

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THE FEEDLINE

MY 10-METRE RG213 COAXIAL CABLE

My station uses approximately 10 metres of RG213 coaxial cable to connect the radio equipment to the outdoor antenna.

RG213 is a 50-ohm coaxial cable commonly used for radio-frequency installations.

It is thicker than RG58 and normally has lower attenuation at UHF frequencies.

All coaxial cable introduces some loss.

1.4–1.6 dB
10 M RG213 @ 477 MHZ

At around 477 MHz, 10 metres of typical RG213 may introduce approximately 1.4–1.6 dB of signal attenuation, depending on the manufacturer's cable specifications.

What happens to my 4 watts?

COMPONENT	APPROXIMATE POWER
Oricom radio output	`4.0 watts`
After 10 metres RG213	`2.8–2.9 watts`
Power accepted by antenna	Slightly lower, depending on matching

These figures are estimates and do not fully account for connector losses.

Good-quality connectors, weatherproof outdoor connections and careful cable installation are also important.

The purpose of using RG213 is to reduce unnecessary losses while providing a robust feedline for the antenna installation.

6

MEASUREMENT

TESTING MY ANTENNA WITH A VECTOR NETWORK ANALYZER

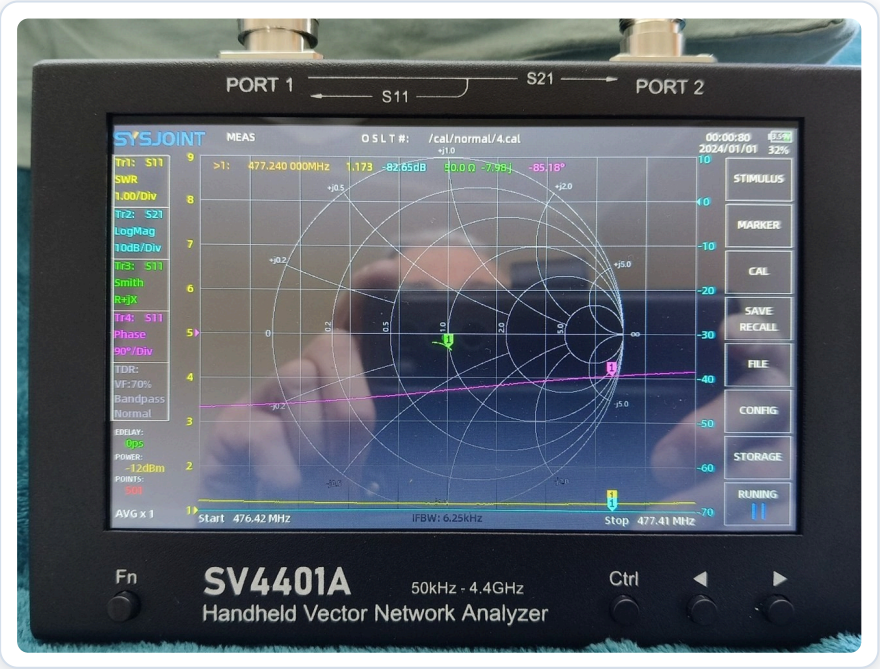

PHOTO 5 SV4401A Vector Network Analyzer displaying antenna measurements

I have also tested my antenna using an SV4401A Vector Network Analyzer.

A vector network analyzer, commonly abbreviated to VNA, is an instrument used to examine the electrical characteristics of radio-frequency equipment.

It can measure antenna impedance, reflection characteristics and standing wave ratio.

My recorded measurements were:

MEASUREMENT	RECORDED RESULT
FREQUENCY	477.240 MHz
SWR	1.173:1
RETURN LOSS	Approximately 22.65 dB
IMPEDANCE	Close to 50 ohms

SWR 1.17:1
@ 477.240 MHZ

An SWR of 1.173:1 is an excellent impedance-match result. At the measurement reference plane, it corresponds to approximately 0.5–0.6% of the forward power being reflected.

This confirms a very good match at the frequency tested.

However, antenna radiation efficiency, surrounding obstructions and the radio path are separate factors that also affect performance.

A VNA is particularly useful because it allows an antenna to be checked before relying on it for regular communication.

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THE NUMBERS

UNDERSTANDING EFFECTIVE RADIATED POWER

One of the interesting aspects of radio is the difference between transmitter output power and effective radiated power.

My radio transmits approximately 4 watts.

The coaxial cable reduces the power that reaches the antenna.

The antenna then distributes the available energy according to its radiation pattern.

Using the advertised gain of 6.5 dBi, the estimated performance is:

MEASUREMENT	APPROXIMATE FIGURE
Radio transmitter output	4.0 W
Cable attenuation	1.4–1.6 dB
Power at antenna	2.8–2.9 W
Antenna gain	6.5 dBi
Equivalent isotropic radiated power	12.5–13 W EIRP
Effective radiated power	7.6–7.9 W ERP

These calculations are theoretical and assume the stated antenna gain is accurate.

The transmitter does not physically generate 13 watts.

The EIRP figure expresses the maximum directional field strength relative to an ideal isotropic reference antenna.

THE LESSON

The important lesson is that antenna gain and feedline attenuation are both significant parts of the overall radio system.

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GOING FURTHER

MY LOCAL UHF PRS REPEATER – MT CLIMIE



DIAGRAM 2 My base station communicating through the Mt Climie repeater

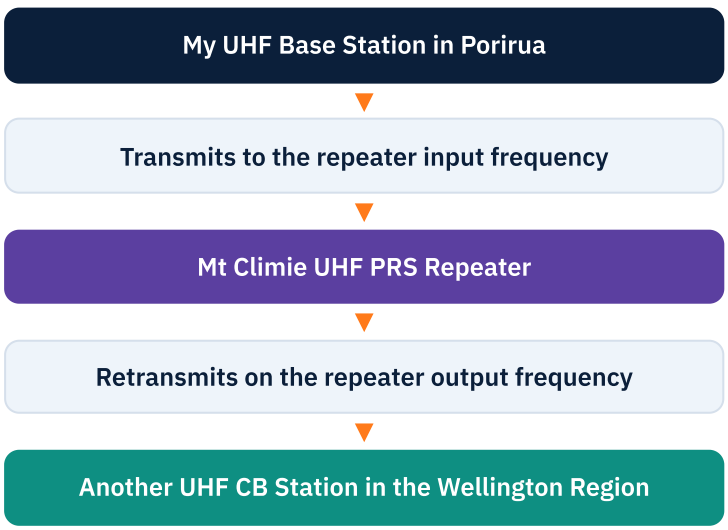
One of the repeaters I enjoy using is located at Mt Climie, near Upper Hutt in the Wellington region.

This repeater operates on UHF CB repeater Channel 5.

A repeater is a radio station that receives a signal and retransmits it, generally from a high location.

This allows communication between stations that might otherwise be unable to contact each other directly.

How repeater communication works



For Channel 5 on the standard 80-channel UHF CB system:

REPEATER OUTPUT	REPEATER INPUT	FREQUENCY SEPARATION
Channel 5, 476.525 MHz.	Channel 35, 477.275 MHz.	750 kHz.

With duplex enabled, the radio automatically uses the correct pair of frequencies for the repeater channel.

Why repeater height matters

~860 m
MT CLIMIE

Mt Climie rises to approximately **860 metres (2,822 feet)** above sea level. The documented NZART radio repeater site on the mountain is listed at **858 metres (2,815 feet)** above sea level.

At UHF frequencies, high locations can improve the radio horizon and help signals travel over large areas.

The Mt Climie repeater has been heard or reported across locations including Porirua, Tawa, Wellington City, Lower Hutt, Upper Hutt, parts of the Kāpiti Coast and Wairarapa.

Actual coverage depends on local geography, station equipment and propagation conditions.

I have received the repeater clearly from inside my home using a handheld radio, and my own transmissions have been reported as loud and clear.

This demonstrates the practical benefits of repeater operation.

9

LOCATION

THE IMPORTANCE OF MY ANTENNA LOCATION



PHOTO 6 View across the surrounding Porirua landscape

My antenna installation is situated in the Porirua area, where the surrounding landscape includes hills, residential buildings and coastal terrain.

UHF signals generally benefit from clear paths between antennas.

Hills and buildings may obstruct signals, while diffraction and reflections can sometimes allow communication even without a completely clear line of sight.

The antenna's elevated position helps reduce some local obstructions.

This is one reason why outdoor antenna installations can perform considerably better than small antennas used inside buildings.

NEWCOMER TIP

For someone new to radio, my advice is to consider antenna location before concentrating solely on transmitter power.

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MODES

SIMPLEX AND REPEATER COMMUNICATION

There are two common ways to communicate using UHF CB radio.

SIMPLEX COMMUNICATION

This is direct radio-to-radio communication.

Radio A ↔ Radio B

Both stations transmit and receive on the same frequency.

It is useful for nearby stations and direct local conversations.

REPEATER COMMUNICATION

This uses an intermediate repeater station.

Radio A ↔ Repeater ↔ Radio B

The two radios communicate through the repeater, which may extend the area of communication.

Repeaters are particularly valuable in areas with hilly terrain.

PLEASE NOTE

However, repeater availability is not guaranteed, and UHF CB should not be treated as a substitute for dedicated emergency communications.

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ON THE AIR

MY APPROACH TO RADIO COMMUNICATION

I enjoy keeping my radio communications simple, friendly and respectful.

I prefer to speak in a natural voice rather than speaking unnecessarily loudly.

On PRS radio I identify as Wellington 564 only. My usual call is:

> “Wellington five six four, any calls, standing by.”
>
> MY USUAL CALL · WELLINGTON 564

This lets other users know I am available for a conversation.

I enjoy the relaxed nature of radio communication.

Some operators enjoy lengthy conversations, while others prefer brief contacts or simply listening.

I believe everyone should be able to enjoy the hobby in their own way while respecting other channel users.

My Two Channels

When operating my Oricom UHF CB base station, I use two channels: the Mt Climie repeater for regional communication, and a local simplex channel for direct conversations.

CH 5

MT CLIMIE REPEATER

I use this for longer-distance communication through the repeater.

CH 13

LOCAL SIMPLEX

I use this for direct conversations without a repeater.

If I make contact through the Mt Climie repeater and the other operator is close enough for reliable direct communication, we can agree to move to Channel 13 simplex. A shorter, clear radio path can provide a strong direct signal, and moving away from the repeater leaves it free for stations that need its wider coverage. Direct simplex is not automatically stronger in every situation; terrain and antenna placement still matter.

My simple arrangement is Channel 5 for regional repeater communication and Channel 13 for local simplex conversations.

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GETTING STARTED

ADVICE FOR NEWCOMERS

If you are new to UHF CB radio, a home base station can be a rewarding project.

A suitable installation generally consists of a compliant UHF CB transceiver, an appropriate power supply, a correctly installed antenna and a good-quality coaxial cable.

Antenna height, proper mounting, weatherproofing and suitable RF connections are important.

It is also worth learning how SWR, cable attenuation, antenna gain and repeaters work.

STAY COMPLIANT

Always follow the applicable New Zealand UHF CB/PRS licence conditions and use appropriately compliant equipment.

You do not need extremely high transmitter power to enjoy the hobby.

A relatively modest radio installation can perform very well when properly designed and positioned.

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WRAPPING UP

FINAL THOUGHTS ABOUT MY STATION

My UHF CB base station combines a straightforward Oricom transceiver with an outdoor Techoman 6.5 dBi vertical antenna, 10 metres of RG213 cable and an inline Nissei RS-502 SWR/power meter.

I have also used an SV4401A Vector Network Analyzer to verify the antenna's impedance matching.

The station has demonstrated useful communication through the Mt Climie UHF PRS repeater.

For me, the enjoyment comes not just from speaking to other radio users, but also from understanding the technical side of radio communication.

Testing equipment, learning about radio propagation, improving antenna installations and making friendly contacts are all enjoyable parts of the hobby.

I hope this description provides newcomers with a useful introduction to how a home UHF CB/PRS base station works.

Thank you for taking the time to visit my radio station page.



PHOTO 7 Final photograph of the complete elevated antenna and mast

73 **Best wishes, 73, and happy radio communications from Porirua, New Zealand!**

14

REFERENCE

ILLUSTRATED GUIDE TO UHF PRS CHANNELS AND BANDWIDTH

A colour-coded reference for the WN564 radio-station biography. The diagrams below explain which frequencies have which purposes, why the 80-channel system was introduced, and how 12.5 kHz narrowband FM differs from older 25 kHz wideband FM.

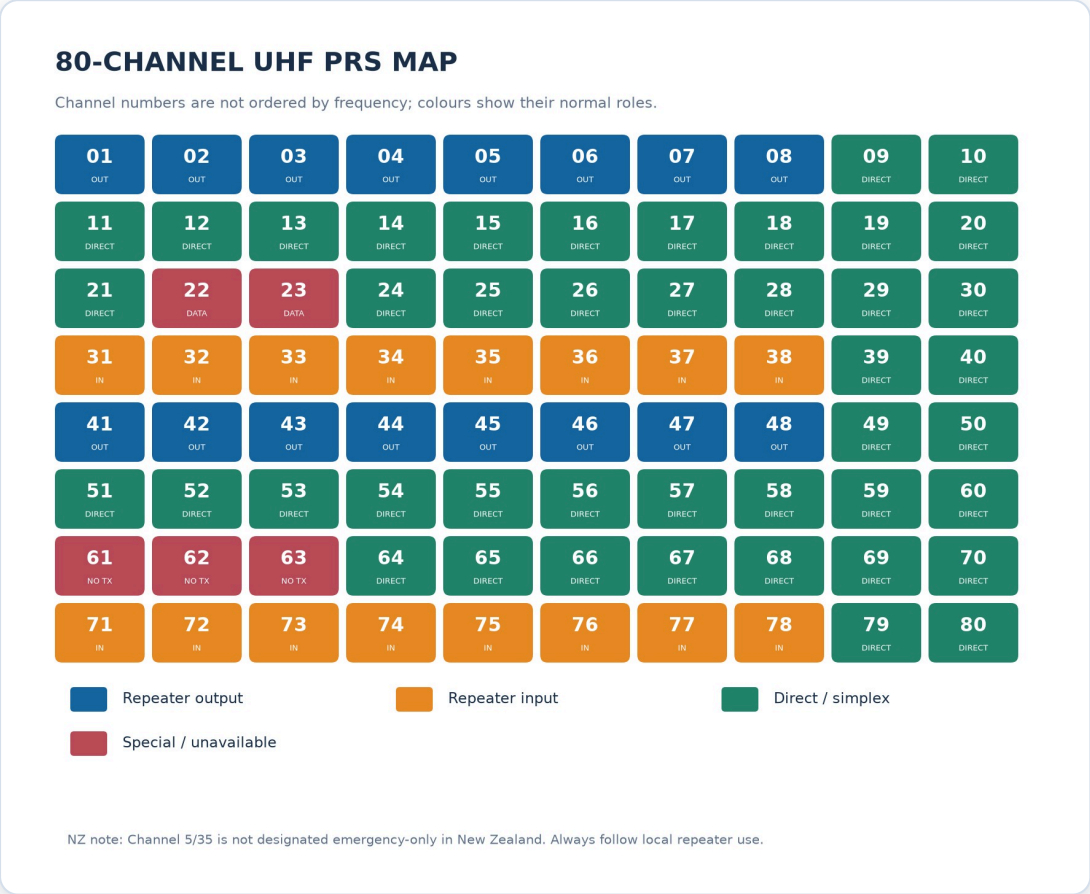

FIGURE A Channel-purpose map: blue outputs, orange inputs, green simplex, red special/unavailable.

Repeater outputs: 1-8 and 41-48. Corresponding inputs: 31-38 and 71-78. New Zealand has no official calling channel; Channel 11 is commonly used as one by convention. Channels 22-23 are reserved for telemetry/telecommand (not ordinary voice). Channels 61-63 must not be transmitted on. Other eligible channels are generally available for direct (simplex) conversation, subject to current licence conditions.

> **NEW ZEALAND DISTINCTION**
>
> Unlike Australia, Channel 5/35 is not designated as an emergency-only pair in New Zealand. Check local rules; do not assume Australian channel-use conventions apply unchanged.

How 40-channel wideband became 80-channel narrowband

Older equipment used 25 kHz channel spacing. The revised channel plan uses 12.5 kHz spacing and places additional channel centres between the older positions. The 80-channel numbering scheme is not a simple ascending-frequency sequence: channels 41-80 are interleaved with channels 1-40.

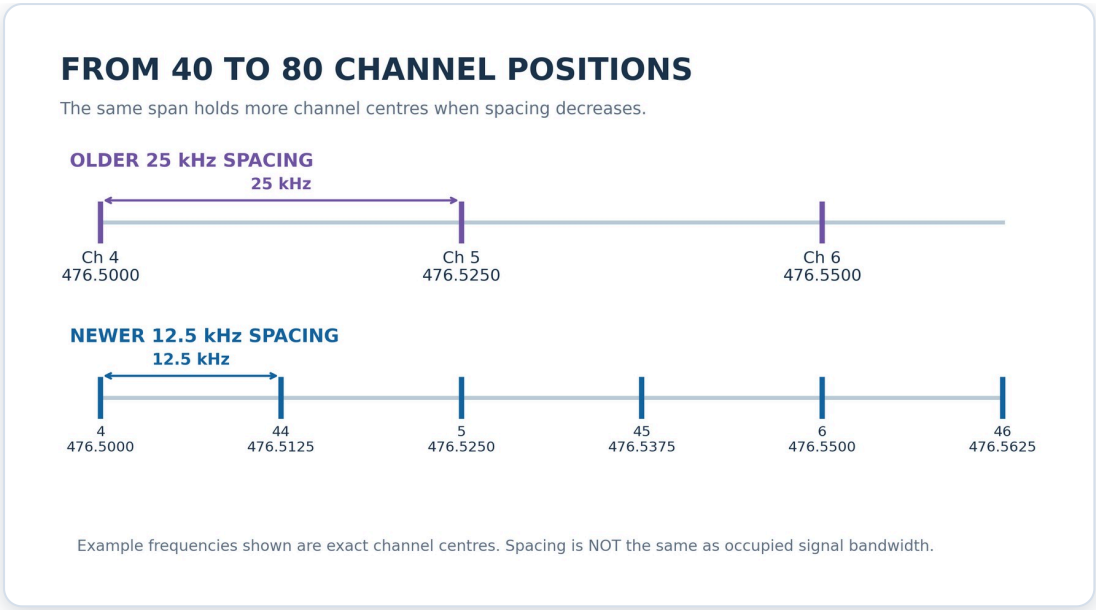

FIGURE B Exact channel-centre frequencies illustrate 25 kHz and 12.5 kHz spacing.

IMPORTANT

Channel spacing is the distance between assigned channel centres. It is not itself a measurement of actual transmitted RF bandwidth. The amount of occupied bandwidth also depends on FM deviation, audio spectrum and transmitter design.

What changes in the transmitted FM signal?

In analogue FM, your voice makes the transmitter frequency move slightly above and below its centre frequency. For typical 25 kHz wideband speech systems, peak deviation is around +/-5 kHz; for typical 12.5 kHz narrowband speech systems, it is around +/-2.5 kHz. Radios also use filtering matched to their channel format.

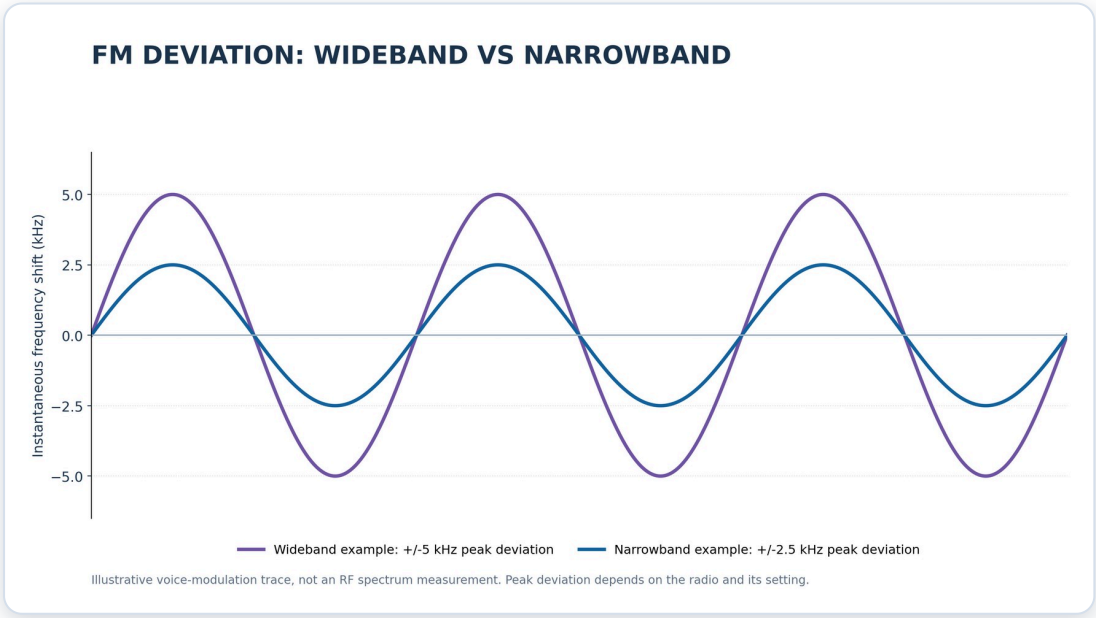

FIGURE C Two examples of frequency deviation for the same speech-like modulation.

FEATURE	OLDER WIDEBAND EXAMPLE	MODERN NARROWBAND EXAMPLE
Channel spacing	25 kHz	12.5 kHz
Typical maximum FM deviation	+/- 5 kHz	+/- 2.5 kHz
General result	Wider transmitted signal	Narrower transmitted signal
Suitable reception	Wideband receiver	Narrowband receiver

A narrowband radio heard on a wideband receiver can sound quiet. A wideband transmission heard on a narrowband receiver can sound very loud, distorted or clipped and may cause adjacent-channel interference. These are potential effects, not an automatic failure of every mixed-bandwidth contact.

NB ≠ SHORTER RANGE

NARROWBAND DOES NOT AUTOMATICALLY MEAN SHORTER RANGE. Antenna height, receiver sensitivity, noise, terrain and the radio path remain major factors.

How the Mt Climie Channel 5 repeater works

A properly programmed duplex UHF PRS radio receives the Mt Climie repeater on Channel 5 at 476.5250 MHz and transmits to its input on Channel 35 at 477.2750 MHz. The separation between the two frequencies is 750 kHz. This illustration assumes the Channel 5/35 pair reported for the Mt Climie repeater.

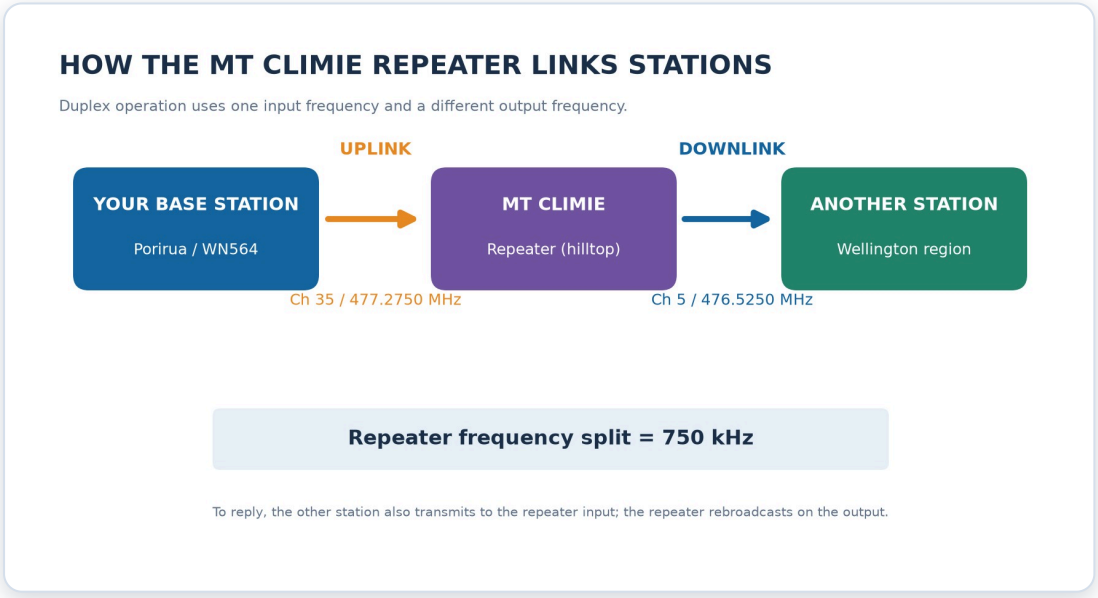

FIGURE D Radio-to-repeater uplink and repeater-to-radio downlink.

The Mt Climie repeater has been described by the station operator as using 12.5 kHz narrowband FM. A radio configured for the same bandwidth normally produces appropriately matched transmitted audio and reception. Other repeater installations may be licensed for different channel bandwidths; verify each repeater separately.

Wellington 564: my two-channel operating plan

I use Channel 5 for the Mt Climie repeater and Channel 13 for local simplex. For a longer local conversation, stations that can hear each other directly may agree to move to an available simplex channel, freeing the repeater for wider-area use. Clear direct contact is not guaranteed simply because the stations are nearby; terrain and antenna position still matter.

A few rules worth remembering

GROUP	CHANNELS	PRIMARY ROLE
Repeater output	1-8, 41-48	Receive repeater transmission
Repeater input	31-38, 71-78	Transmit to repeater when duplex is on
Telemetry/telecommand	22-23	Special purpose; no normal voice
Unavailable	61-63	Do not transmit
Other permitted voice channels	e.g. 13	General simplex as appropriate

The label "80-channel" describes channel numbering; five numbered channels (22, 23, 61, 62 and 63) are not normal voice channels. Repeater inputs should not be used for ordinary simplex where that would interfere with repeaters.

Sources and technical notes

RSM New Zealand - Citizen Band GURL: rsm.govt.nz/licensing/frequencies-for-anyone/citizen-band-radio-gurl

RSM New Zealand - Radio Licence Policy Rules (PIB 58, 2025), section 9.4: rsm.govt.nz

Techoman New Zealand - UHF PRS frequency/channel plan: techoman.co.nz/pages/licence-free-radios

Icom UHF CB manual - bandwidth compatibility: adelaide-uhf.com (IC-455 manual)