

History of the Avalanche Transceivers; their care and compatibility issues.

The History of Transceiver Development.

It is useful to understand the developments that the transceiver has gone through as your companions will not always have the same model as yours. Transceivers can be grouped into two types the analogue transceiver and the digital transceiver, they all work on the 457kHz frequency standard so are compatible.

Over the last 30 years' technology in transceivers has improved dramatically.

1. The first-generation transceivers have a single aerial and work only in analogue mode. The aerial transmits radio pulses at about one second intervals. The receiving device translates these radio pulses into audible beeps; the louder the beep the closer the transmitting device. This gives a basic and robust system which works very well if the user is highly trained and practices regularly. The Ortovox F1 was the best seller for this generation of transceiver. These transmitters "beep" for 300ms pulses on the 457KHz radio wave.

2. The second generation gave birth to the digital transceiver which uses two aerials. These enable the searching device to triangulate the position of the transmitting transceiver which is translated into a digital distance reading and direction arrow, as well as having an audible beep. This results in a much faster search especially for people who don't use them very often. The BCA tracker DTS mark 1 is an example of this generation of transceiver. These transmitters "beep" with a shorter 100ms pulse on the 457KHz radio wave as it is faster for the searching device to process the signal and easier to uniquely identify the transceivers in case of multiple burials.

3. The third and current generation of transceivers have three aerials. A flaw in previous transmitters led to a false minimum distance reading if the search transceiver and transmitter aerials were aligned 90\* to each other. The real minimum will be close to the false minimum, but you can spend unnecessary time investigating these false minimums. The third aerial adjusts for this effect, so you can be sure you are on the true minimum. Another big advantage of most third-generation devices is that in a multiple burial situation, they can isolate one signal from other transceiver signals and mark a signal (transmitter) so to ignore it. Once the first victim is located, this signal can be "marked" and then ignored, allowing the searcher to follow another signal, without any interference from the found transceiver.

These transmitters beep at the shorter 100ms pulses.

Examples of this type of transceiver are Barryvox S, Barryvox, The Mammot Pulse, Mammot Elements, BCA Tracker 2, Pieps DSP, Ortovox 3+ RECCO.

Compatibility Issues.

Unfortunately, there is an incompatibility between the first-generation analogue devices and digital devices which is important to bear in mind, especially in a multiple burial situation. The transmitting frequencies of these first-generation devices can tend to drift off frequency as much as by 80kHz from the standard 457kHz frequency. The digital transceivers (2<sup>nd</sup> and 3<sup>rd</sup> generation) are highly sensitive devices and can only focus on one narrow frequency band at a time. So, if there are analogue and digital transceivers buried, a searching digital transceivers will lock on to the first frequency they find and, if they are not all transmitting on the standard frequency, it will not pick up the other frequencies. So, if you have one of these first-generation devices been picked up at say 420kHz with a digital transceiver, the device can no longer detect the transceivers which are transmitting at 457kHz, until you switch off the first-generation transmitter or move the device in a location where the other devices have a stronger signal.

Also bearing in mind the change in beep timings from the first to second generation, it means that digital transceivers find it difficult to differentiate between the first generation analogue signals due to the longer 300ms beeps overlapping for a great time. The longer beep is perfect for the human ear to differentiate between multiple burials (transmitters) but not so the digital transceivers microprocessor.

Note: The Barryvox S has a pro group check function which will tell you the frequency drift which.

### Care of your Transceiver

Your transceiver should be stored in a dry place with the batteries removed to avoid battery leakage and corrosion. It is important to start the season with a fresh set of batteries. Always use good quality batteries which are of the same type and have are from the same batch (same expiry date). This ensures a steady voltage to the transceiver which improves efficiency in search mode. Poor quality (budget) batteries could leak which would corrode the terminals of the transceiver making it unreliable; A false economy, I would suggest. Also, budget batteries may not last as long and might be more susceptible to the cold. Rechargeable batteries should never to be used as their power profile drops of quickly and unpredictably, potentially leading to an unnoticed battery failure.

I like to use alkaline Duracell batteries which I replace at 40% on the battery indicator. This will have given about 250hrs of transmission service. At 20%; you have 10 hours transmission and 1hr search mode. Note that if available on your transceiver "true analogue" mode is much more energy efficient and can be used to extend your search time if you have a low battery.

Moisture is another issue for the transceiver, notably through sweating. There has been a documented incident where a skier passed the group transceiver check in the morning, but by the time he was avalanched later that day his beacon could not be detected. The battery terminals had shorted due corrosion caused by the presence of sweat and the group was not able to rescue the skier. It is clearly important to check the integrity of the battery terminals on your transceiver and keep them as dry as practically possible.

Transceivers are reasonably robust but care should be taken not to drop them. The graphite aerial may fracture on impact which will render the device defective. I always carry a spare transceiver when out skiing with a group in case of a malfunction, as it is a vital piece of safety equipment in avalanche terrain. I carry my transceiver in the holster provided by the manufacturer, with the screen facing my body to protect it, just above my base layer. This means that the transceiver is close to my body so it is protected if I am in a violent avalanche and it also keeps the devices batteries warm. I do try and keep any metallic objects such as mobile phones, foil energy bar wrappers away from my transceiver as the metal absorb the transmitted radio waves this will decrease the power and range of the transceiver. The transceiver are best worn with the harness provided so that it is close to the head, as the head will need to be found as quickly as possible, i.e. a trouser leg pocket is the worst location to wear the transceiver.

Before the start of the season I test that the transceiver is working properly in transmit mode and in search mode. There after each day we should test that the transceivers are transmitting and once a week I test it in search mode.

Which Transceiver Model is best for me?

For me, the main consideration is to buy a transceiver which has a long range in both transmission and search modes. The bigger the aerial the longer the range. So, if buried I would like to be blasting out the strongest signal which would be picked up further away; and if searching I would have the most sensitive device so that I can quickly locate buried victims.

Another consideration is that not all third generation have a true analogue search function which is an important consideration when purchasing as if the transceiver screen breaks you will no longer have a method to track the buried transceiver. There are some third-generation transceivers (such as the Mammut Barryvox and Pulse) that work in true analogue mode (audible feedback only), which means that you have a fall back should the screen break or become defective.

It is important to be well trained with your own transceiver as speed is the essence if you are unlucky enough to be involved with an avalanche.

I use and highly recommend the new Mammut Barryvox S (2017) which has an excellent range (70m digital and 100m analogue) and is intuitive to use.

For more help with transceiver training and ski touring risk management please consider the International School of Mountaineering (ISM) ski touring skills course <https://www.alpin-ism.com/courses/ski-touring-and-off-piste/ski-touring-skills> and <https://www.alpin-ism.com/courses/ski-touring-and-off-piste/advanced-ski-touring-skills>

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