

## How to use a radio (CB - PMR)

Some basic tips to start with “free use” transceivers (no amateur radio license is required).

**Learning targets:** Get familiar with the use of CB/PMR radios.

**Material:**

- CBs with a proper antenna, or PMRs. If possible, each Scout/Guide should have a transceiver. In preparing the activity and finding radios, consider that CBs and PMRs work on different frequencies, so communications between a CB and a PMR are not possible. Before using CBs/PMRs, check the laws that govern the use of these devices in your country.
- A proper power supply, if CBs and PMRs don't have batteries.

**Time and preferred place:** 30 min.. While explanations could be done in a room, communication tests should be made outside, with sufficient distance to make voice communications impossible.

**Description:** Firstly, some basic information on CBs and PMR should be provided:

**CB**

- 40 channels (ch. number may vary from country to country) at about 27 MHz, 5 W maximum power. Transmissions are typically made in AM or FM.
- Unless it's a handheld device, the antenna is detached from the transceiver. A coaxial cable connects the transceiver and the antenna, transferring the radiofrequency in both directions with minimal losses and minimal intrusion of noise.
- Handheld, vehicular and station models are available.
- The transmission range is typically 3-4 km; occasionally, contacts of several hundreds kilometer can be performed (typically in summer, in the early morning or in the evening).

**PMR**

- 8 channels at about 446 MHz, 0.5 W maximum power.
- They are small and lightweight, battery powered, handheld devices. The antenna cannot be detached from the transceiver.
- Cost and dimensions are lower, but so is the transmission range. It's better suited to keep communications in a large local scout/guide event than in an excursion.

Many transceiver models are available in e-commerce websites, but most of them are not compatible with law requirements (eg. 5 W VHF/UHF transceivers, handheld “PMRs” with

detachable antenna, and so on). Check the laws of your country or get support from local radioscouts, before risking a fee!

It's useful to give Scouts/Guides an explanation of the basic "knobs and buttons" of a transceiver:

- Microphone: in vehicular CBs it's a handheld box, connected by a wire to the transceiver.
- PTT (Push To Talk): a button to be pressed (and kept pressed) to transmit.
- ON-OFF and volume regulation.
- Channel selector. The channel established the transmission/reception frequency to be used.
- AM/FM selection (modulation type).
- SQUELCH: listening to radio noise is boring and drains battery charge. The squelch knob/setting stops signals from being sent to the loudspeakers if the radio signal is too low. It should be set to block audio output when not necessary, but don't exceed, you may miss weak radio communications.
- RF GAIN: to vary the sensitivity of the receiver
- CTCSS tone: it's a sub-audio note that can be included in your voice transmissions. Once set, not only your transmissions will have that tone, but the receiving part of your transceiver will only output transmissions that have that same tone. It can turn out useful if you are on a busy channel, so you don't want to be bothered by the communications of strangers. Be aware, however, that you shouldn't talk over someone else's transmission, and vice versa, so if a channel is very busy, switch to another one.

Please note that not all these controls may be present in a transceiver; some of them may not be physical knobs or buttons, but settings to be changed with a dedicated software and a programming cable. Please refer to the **JOTA-JOTI Ham Radio Handbook** of your specific devices.

The basic rules to use a CB/PMR should also be explained:

- Battery powered radios should not be used "to the very last drop" of charge to preserve the battery life.
- Transmission times should be minimized as much as possible, keeping communications concise, to maximise the battery charge duration. If different transmission power levels can be set, use the minimum power which is sufficient to be heard by the other Scout/Guides.
- In case of CBs, the transceiver should always be connected to the antenna coaxial cable (unless a thunderstorm is approaching). Transmitting with no antenna connected can result in irreversible damages to the CB circuits.
- The antenna should be kept at maximum distance from any object and at maximum possible height. Transmitting inside a car or a room can severely reduce your transmission range. Reinforced concrete and metal objects, as well as geographic

obstacles as hills/ridges of rocks, etc. have a similar effect. The best condition is to have an optical connection between radio correspondents, as on top of hills or mountains.

- The orientation of antennas matters! Keep your antenna vertical, especially in case of handheld transceivers.
- When transmitting, don't keep the microphone stuck to your mouth, and don't shout; a too high voice level can spoil the readability of your transmission, as well as talking too low. Avoid noisy places to transmit. Talk plainly, don't rush but be concise.
- Before making an activity or excursion, please verify the radio coverage; the transmission range can vary a lot depending on obstacles.
- Before using radios, establish one or more channels to be used during the activities; in deciding the number of channels, keep in mind that you shouldn't talk over someone else's transmission, and that you cannot hear transmissions from channels different from the one you are using.
- All radios should be set to either AM or FM to maximise reception. FM should be preferred because it's more insensitive to radiofrequency noise (eg. lightning noise).
- With CBs, in case you need to replace the coaxial cable which connects the transceiver to the antenna, don't use 75  $\Omega$  TV cable, but 52  $\Omega$  cable, as the well known RG-58. Scouts and Guides can be guided in a practical activity to assemble their own cables, soldering the right connectors to the cable.

In case you are using radios for safety communications during an excursion, please consider:

- taking spare batteries with you;
- verifying the transmission coverage of the main excursion points before the excursion;

Moreover, check which conventional channels are kept free for emergency purposes. NEVER ASSUME that emergency communications can be made with any point in the land (which is true also for mobile phones), nor that there is always someone potentially listening to you. Maximize the number of ways you can communicate with people.

In the case of CBs, it's a useful practical activity to teach Scouts and Guides how to read SWR and adjust it. SWR indicates how properly the antenna and its cable are matched to the transceiver. SWR=1 means perfect matching, the higher it is the higher the amount of power that is not transmitted by the antenna and that it goes back to the transceiver, causing damage. SWR should never exceed 2. Using a factory built antenna does not mean that it's ok; obstacles around the antenna, especially walls and metal objects, can alter its properties. To adjust SWR the transceiver must be connected to a SWR meter/antenna tuner, and this in turn must be connected to the antenna. Please refer to the specific handbook of the antenna tuner on how to read the SWR and adjust it. Adjusting the SWR is a highly useful practical activity, because it enables you to build from scratch and use your own antenna.

To find information on how to manage a radio communication, please check a separately dedicated activity on the pack (Activity name: How to manage a radio communication) or consult the **JOTA-JOTI Ham Radio Handbook**.