R9

DETECTOR
USER'S GUIDE

RECCO® AVALANCHE RESCUE SYSTEM

TABLE OF CONTENTS

TABLE OF CONTENTS

RECCO TECHNOLOGY

RECCO® ADVANCED RESCUE SYSTEM

The RECCO® Rescue System is advanced rescue technology that enables fast searching and directional pinpointing of a victim's precise location using harmonic radar. RECCO's two-part technology operates on the principle of frequency doubling. The RECCO reflector doubles the detector's signal and bounces it back resulting in precise directionality. The RECCO detector operator can actually hear where the person is located. The system works on a high frequency, which enables rapid pinpointing of the signal and directs rescuers on a straight path to the person.

The RECCO System does not prevent avalanches nor does it guarantee location or survival of a buried or lost person. RECCO's advanced technology assist organized rescue teams by enabling just a few rescuers to search large areas quickly. The search time is slashed from hours (and in some cases days) to minutes. The system provides a simple way to equip winter enthusiasts with a basic rescue system.

DETECTOR

This lightweight, hand-held radar gun is intended for organized rescue teams as it enables the quick locating of a RECCO reflector-equipped person.

Integrated into the new R9 Detector is an avalanche rescue beacon receiver (457kHz). This innovation allows one rescuer to search simultaneously for both RECCO reflectors and transmitting avalanche beacons.

RECCO detectors are used by resort ski-patrols, helicopter skiing companies, helicopter rescue services, national parks, and mountain rescue teams worldwide. This global network also enables the sharing of information, knowledge and skills that benefits all rescuers.

REFLECTOR

The RECCO reflector is a small, passive transponder consisting of a copper aerial and a diode surrounded by protective weatherproof plastic. This wearable technology weighs less than four grams. RECCO reflectors are factory mounted to gear that is unlikely to be torn off in the event of an avalanche.

The reflector never needs to be switched on, will never loose signal strength and needs no batteries to function. It requires no maintenance and has a virtually unlimited lifespan. The detector will work with all RECCO reflectors, anywhere in the world.

More than 200 manufacturers permanently affix the RECCO reflector into commercially available outerwear, helmets, boots, and protection gear.

R9 OVERVIEW

INTENDED USE

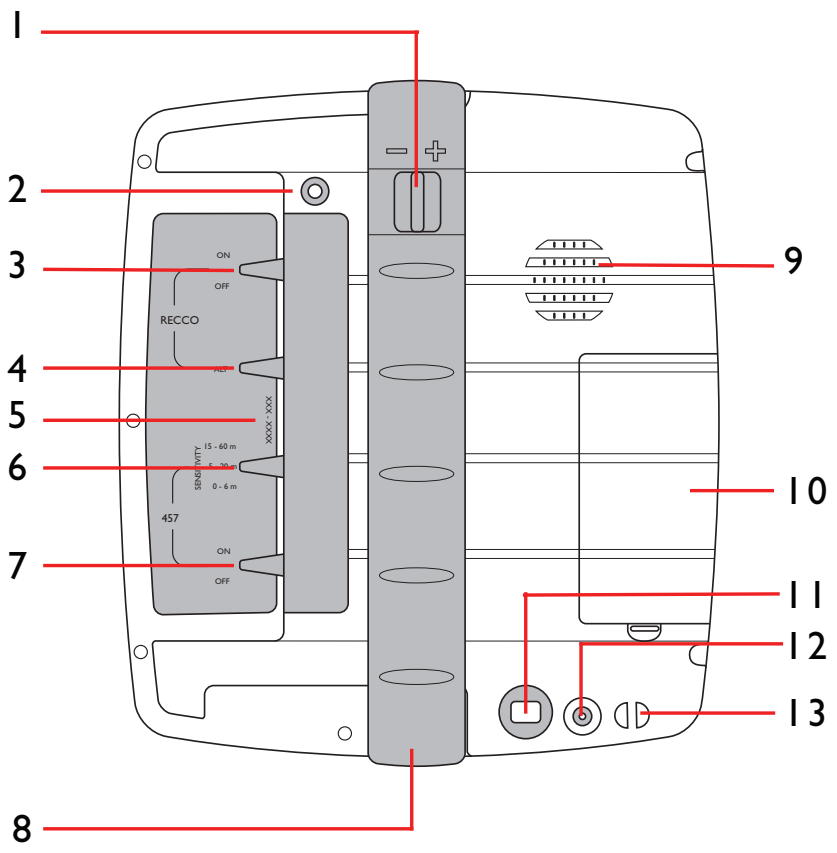
The RECCO R9 Detector equips organized rescue teams with advanced rescue technology to make the search for buried avalanche victims easier, faster, and safer. This *User's Guide* contains an introduction to the RECCO Rescue System and provides detailed information on the use of the R9 Detector, including a variety of training tips to help you become an effective detector operator. It is up to you to practice and develop the basic and advanced skills necessary to use the R9 Detector effectively in an emergency.

NOTE: Before using the R9 in an actual emergency response, the rescuer should have completed an appropriate avalanche-rescue training program.

FEATURES

- The R9 Detector is intended for use by organized rescue teams: ski patrols, mountain rescue, police, air rescue, park rangers, etc.
- The R9 Detector enables both the RECCO search and an avalanche rescue beacon search to be performed simultaneously. One rescuer can complete two jobs.
- The R9 Detector's slim size and lightweight allow for easy transport to an accident site.
- The R9 Detector uses lithium-ion batteries for long storage life and top performance in all conditions.
- The R9 Detector is compatible with all RECCO reflectors, no matter their age.

CONTROLS



RECCO R9 Detector controls.

DESCRIPTIONS

1. **Power Control Switch.** Controls the RECCO signal power. There are 5 power levels.
2. **Blue LED Light.** Indicates relative power setting of detector. Steady light means full power. Flashing light means less than full power.
3. **RECCO On/Off Switch.** Turns detector on to full power.
4. **ALT Switch.** Changes the RECCO channel for use when two RECCO detectors are being used simultaneously.
5. **Serial Number.**
6. **457 Sensitivity Switch.** Changes range of avalanche rescue beacon receiver.
7. **457 On/Off Switch.** Turns avalanche rescue beacon receiver on. Can only be used when RECCO system is also on.
8. **Handle.** Folds into detector for storage.
9. **Internal Speaker.** Provides acoustic signal of detected RECCO reflector and/or received avalanche rescue beacon signal..
10. **Battery Compartment and Battery.** The R9 uses a special lithium-ion battery.
11. **Headphone Jack.** For use of an external ear bud speaker.
12. **Charging Port.** Battery charger plugs into port.
13. **Security Strap Holder.** Provides attachment point for a user installed security strap or lanyard. *Important: RECCO detectors should always be attached to the operator when used from an aircraft.*

SPECIFICATIONS

Physical

Dimensions	21cm(L) x 19cm(W) x 5.5cm(H)
Weight	950g with battery pack

Audio

Speaker	Built-in 2 in 1 speaker
Headphone	external, 2-prong earphone

Controls and Lights

Switches	RECCO on/off ALT (RECCO channel change) 457(kHz) Receiver on/off 457(kHz) Power control, 3 steps
Buttons	RECCO power control: 5 steps
Lights	Blue LED: RECCO power indication **Steady** – full power **Flashing** – less than full power

Power Supply

Battery	1.6Ah Lithium-ion removable, rechargeable battery
Operating time	2 hours
Operating temperature	–20° to +20°C
AC charger	AC input/frequency: 100–240 VAC, 50/60Hz Rated output: 8VDC, 2A (typical)

Charging

Charging time	2 hours
Charging indicator	**red** – charging **green** – charged
Low battery alert	Beeping alarm to change the battery: 1. single long beep, followed by 2. two long beeps, followed by 3. continual beeping

THE BASICS

When you direct the RECCO detector toward a RECCO reflector you will hear a pulsating, chirp-like tone. The RECCO System works on a high frequency, which results in precise directionality. If the reflector is out of range, or if the detector is not pointed toward the reflector, you will only hear a slight background noise.

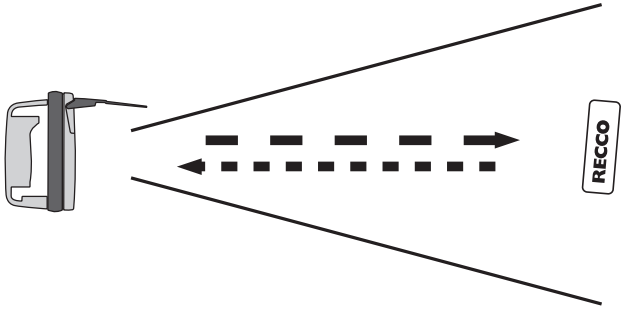
To activate the RECCO R9 Detector:

- Flip the RECCO ON/OFF switch to ON. The detector starts at full power.
- Slide the Power Control Switch at the top of the handle. Quickly tapping the switch to + increases power and to – decreases power. There are 5 power settings.
- Look at the blue LED light. A steady blue light means full power; a flashing blue light means less than full power.
- Activate the 457kHz (beacon) receiver function if necessary. The 457 function can only be used simultaneously with the RECCO function.

TIP: Be aware if demonstrating the R9 Detector that activating the detector inside a building (or next to people equipped with electronic equipment) may cause false signals in multiple directions caused by electronic interferences. Reducing the RECCO power by two to three levels will eliminate the false signals, but will also reduce significantly the range.

FREQUENCY DOUBLING

The RECCO Rescue System utilizes harmonic radar to precisely locate a person equipped with reflectors. The RECCO R9 Detector sends out a signal and when it hits the specially tuned RECCO reflector the frequency is doubled and bounced back.



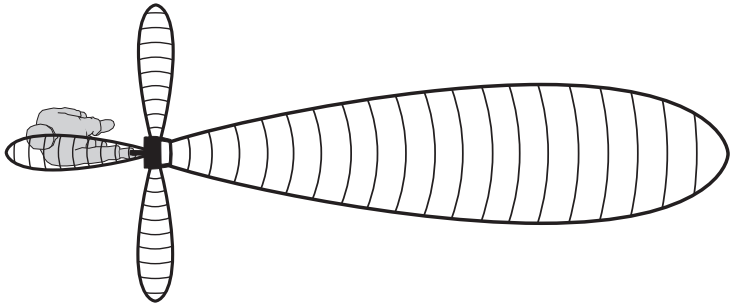
Frequency doubling. The opening angle of the antenna is about 30 degrees.

DIRECTIONALITY

The detector's high frequency and directional antenna uses harmonic radar to generate a directional signal that allows the rescuer to quickly detect and precisely locate a person equipped with RECCO reflectors. Once the signal is detected you can follow the distinct RECCO tone directly to the person. RECCO's directionality enables rescuers to search larger areas quickly and efficiently.

DETECTOR SIGNAL

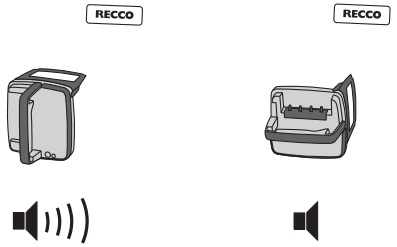
This simple diagram shows the working area of the detector. It is important you note that weaker signals are emitted to the sides and rear of the detector. These lobes can result in false signals (interferences) if a reflector, including other electronic equipment, is close to the detector. (See ***PERSONAL INTERFERENCES***.)



RECCO signal and working area of the detector.

POLARIZATION

To obtain optimal range the detector signal has been polarized, which means the orientation of the reflector to the detector has a considerable affect on signal strength. If you hold the detector antenna parallel to the long side of a RECCO reflector, the signal and range will be at maximum. If you rotate the detector 90 degrees, you will receive a minimum signal and the range is correspondingly less. You may even loose the signal.



Max signal Min signal

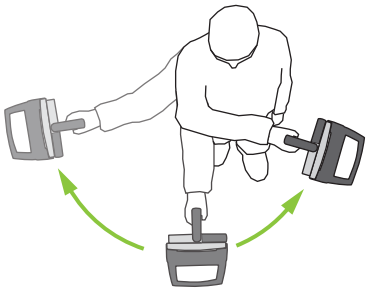
Orientation of the detector to the reflector has a significant affect on the RECCO signal.

TIP: To achieve the best signal and best range when searching you must seek the best polarization or orientation between the RECCO detector and RECCO reflector.

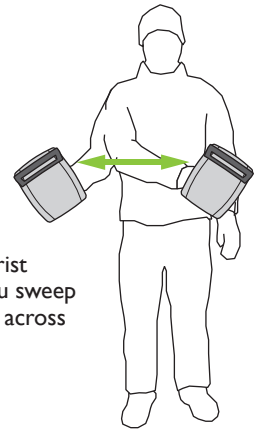
AIMING DETECTOR

Swing the detector slowly in front of you to your left and right for approximately 180 degrees across the front of your body. Be sure to direct the signal into the snow as if you are using a flashlight.

You should also turn your wrist 90 degrees as you swing the detector to benefit from the polarization of the signal.



Sweep detector across your body.



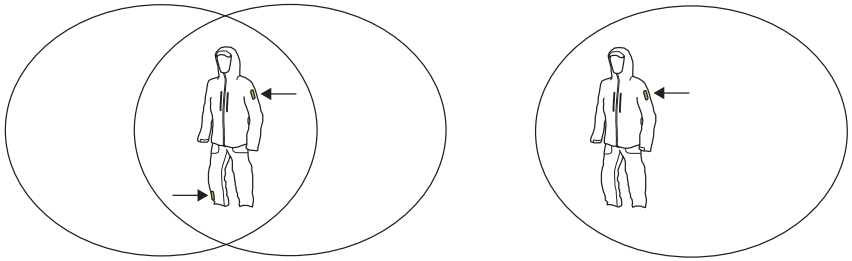
Turn your wrist slightly as you sweep the detector across your body.

When you hear the chirp-like return signal orient the detector to the maximum signal by rotating your wrist. Once you have the maximum signal do not change the orientation of the detector or move the detector as you follow the signal. Reduce power as needed as you approach the reflector.

Tip: Do not be in a hurry to turn down the power. Experienced operators generally turn down the power once before needing to pinpoint.

ONE REFLECTOR OR TWO REFLECTORS

RECCO recommends people always wear two reflectors, one on each side of the body to maximize the probability of detection and to increase range from all directions. In clothing the optimal placement is one reflector on the upper arm and one on the opposite lower leg.



Two RECCO reflectors improves detection and range.

RANGE

In simple terms the range of the RECCO System can be expressed as follows:

Air	up to	200 m
Snow	up to	20 m
Water	up to	0.2 m

Six factors affect the range of the RECCO System and for you to use the detector effectively and with confidence requires you to be aware of how and why range varies.

FACTORS AFFECTING RANGE

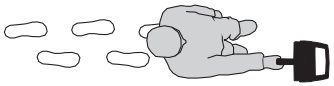
Power Settings

When you reduce the power—indicated by the flashing blue LED—the range will be reduced. The range may be reduced to zero if the power is set too low. A steady blue light means full power. A flashing blue light means less than full power.

Orientation of reflector to detector

When you hear a signal and the detector is oriented to the maximum signal, the range may still vary significantly depending upon how you approach the reflector. Approaching the long side of the reflector provides great range, but when you approach a reflector's short side the range is significantly less.

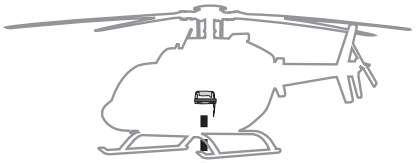
GETTING STARTED — RECCO



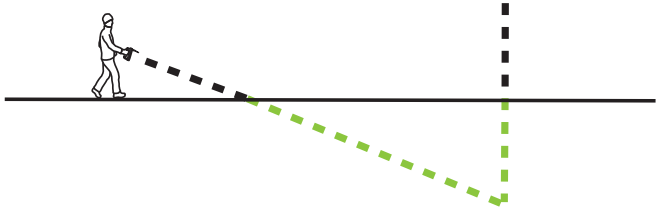
Direction to reflector also affects range.

Passing through air versus snow

Air has little affect on the RECCO signal, so a helicopter is a great platform from which to search because the signal penetrates directly downward into the snow. Also the helicopter can search a much larger area faster and easier than for a rescuer on foot. When using the detector on foot the signal must pass through much more snow to reach a given depth. To reach a buried victim at the same depth the helicopter-based detector will have greater range.



Searching from the helicopter gives better range.

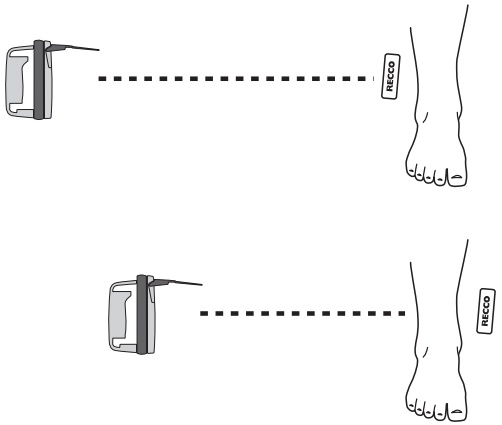


Density and water content of snow

Increasing snow density (or hardness) reduces the range; however, the most serious affect is from moisture or wetness caused by thaw or rain. Liquid water attenuates the signal and significantly reduces range. When snow turns *wet*—your gloves get wet making a snowball—range decreases notably.

TIP: You should train in all types of snow conditions, so you can adjust your search strategies and search strip widths to match snow conditions.

Possible shielding by victim's body



The body can shield the RECCO signal.

The largest component of the human body is water, which attenuates the RECCO signal. This is why RECCO reflectors are always located on or near extremities: near neck, upper arm, or on or near feet, *and* reflectors should always be worn in pairs: one on left side and one on the right side.

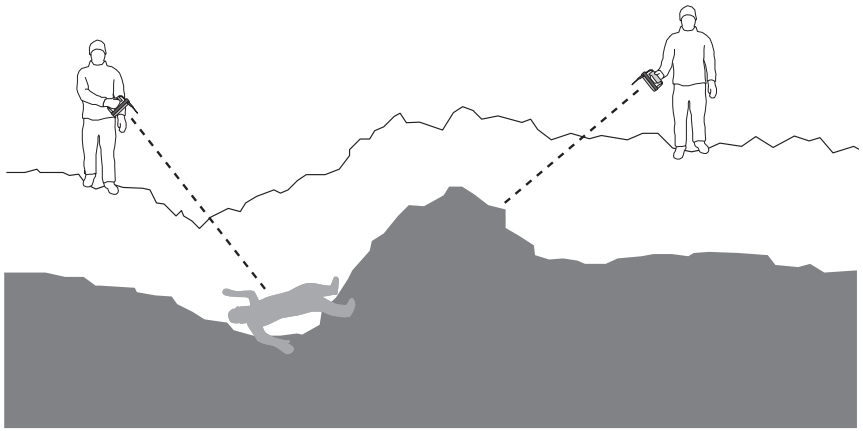
Knowing the body can block the RECCO signal the detector operator can use this knowledge to manage interference caused by rescuers and recreationalists who are also equipped with RECCO reflectors. Simply keeping the operator's body between the detector and other reflector-equipped rescuers will limit interference. (See ***PERSONAL INTERFERENCES***.)

Tip: Use your body as a shield between the detector and known reflectors to limit interference.

Possible ground affects

Rugged ground topography can make for challenging search settings. Avalanches covering rugged or irregular-shaped ground create depressions, mounds, and ridges of snow. In some cases the snow can be deep, while in other cases shallow snow may cover large terrain features. An avalanche victim pushed against a large rock can be difficult to find as rocks may shield the signal. The steep rocky sides of a narrow gully can also block the RECCO signal if you are searching too far to the side. If you know or suspect the victim is buried in an area with an uneven ground surface you will have to adapt your search strategies to match the challenge.

GETTING STARTED — RECCO



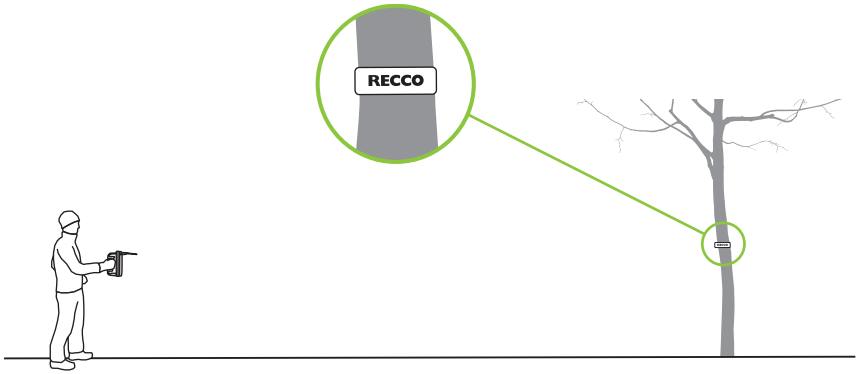
Terrain features can block the RECCO signal.

TIP: If the victim is buried in an area of rugged ground or if the surface of the avalanche debris is very irregular, use your RECCO detector as if you are searching with a flashlight. To conduct a thorough search you will need to get into depressions or search immediately along both sides of snow ridges.

FUNCTION AND RANGE CHECK

On a regular basis you should check the detector function and range. In an open area free of electrical devices place a reflector on a wooden post or tree 150 centimeters above the snow surface. The range should be about 80 meters.

Walk toward the reflector and turn down the power as needed. At the lowest power setting the range may drop to less than 1 meter.



Range check with a RECCO reflector. (If placing a reflector on a live tree, mount the RECCO reflector on a thin wooden board and then affix to the tree.)

You can also place a reflector on the ground with the long side toward the detector. The range should be at least 10 meters. The range will increase as the reflector is raised above the ground.

PERSONAL INTERFERENCES

Because RECCO detectors emit weak energy lobes to the back and sides, electronic devices worn on the operator can sometimes be detected creating false positive signals. You should remove as much personal electronic equipment as practical to eliminate false signals. Your avalanche rescue transceiver and handheld radio can be slipped around and worn on your back. Other electronic devices such as cameras, mobile telephones, pagers, GPS units, boot-heater batteries, etc. should be removed.

The wearing of RECCO reflectors by rescuers is discouraged, especially for the detector operator. In some garments reflectors are located in a small pocket and may be removed during rescues and trainings. If you cannot remove your reflector, the detector operator should completely cover the reflector with a RECCO Shield. This will enable you to perform the RECCO search.

To check for interferences always:

- Start at full power.
- Aim detector toward the sky, there should be no signal.
- If you hear a signal, scan yourself, reduce power as needed to locate interference.
- Remove or change the position of the offending device, or cover with a RECCO Shield.
- Return to full power.

Buried objects like electrical lines, large metal signs, or other large metal objects like construction supplies and equipment, and lift towers can result in false signals. If such objects are buried in snow, probing or digging will likely be the only way to identify these signals.

RECCO Shields are used to cover RECCO reflectors.

DETECTING ELECTRONIC DEVICES

In some circumstances the RECCO detector may detect other electronic devices such as digital cameras, mobile telephones, two-way radios, avalanche transceivers, high-frequency RFID lift passes, snowmobiles, cars, etc. Even if these devices are turned off their electronics may act as a weak reflector. The range from these devices varies typically from a few centimeters to several meters, considerably shorter range than the range provided by RECCO reflectors. Successful detection of buried victims because of "other" electronics occurs every winter, so performing a RECCO search any time a buried person is thought to carry electronic equipment can be effective. (See ***SEARCHING WITH RECCO*** > **Third Pass.**)

ALT SWITCH

If you use two RECCO detectors in close proximity their matching channels can cause signal interference. The ALT Switch on the back of the R9 Detector changes the RECCO channel. One detector's ALT Switch should be up and the other detector's switch in the down position. The position—up or down—on a single detector is not important.

BATTERY AND CHARGING

When fully charged the R9 Detector's lithium-ion battery:

- Provides 2 hours of search time.
- Can be recharged in 1–2 hours with the included AC charger. On the charger the **red** light means the battery is charging, and the **green** light means fully charged.
- Gives excellent cold weather performance.
- Can go at least 6 months between charges.

After any use, plug the R9 Detector back onto its charger. To restart the charging process, flip the RECCO On/Off switch from off to on to off.

IMPORTANT: Only use the R9 AC charger provided by RECCO to charge your R9 Detector battery.

LOW BATTERY WARNING

Lithium-ion batteries are smaller and lighter, provide more voltage, are less affected by cold temperatures, and hold a charge much longer than other types of batteries; however, when nearly discharged the battery quickly shuts down power to preserve the battery.

The R9 Detector provides you with a 3-level low battery alert.

1. One long beep —change/charge battery immediately
2. Two long beeps—change/charge battery immediately
3. Continuous beeping—no search capability

WARNING: Do not fully discharge the battery, this may damage the battery.

You should change the battery immediately upon hearing the first long beep, or plug the detector into its AC charger and power supply. Your available searching time is very short until the detector turns itself off.

If you need to change the battery, unclip the battery compartment on the back of the R9 Detector and carefully lift out the battery pack. You will have to pinch the connection clip to disconnect the battery from the detector. Inspect the fittings of the new battery pack and carefully made with the detector's connection. You should hear a "click" when the connection is secure. Carefully reset the battery and wires before closing the compartment.

RECCO recommends replacing the battery every 3 years regardless of use. To order new batteries, please contact RECCO AB (See **CUSTOMER SERVICE** for contact information.)

THE BASICS

The RECCO R9 Detector is also equipped with an analog avalanche rescue beacon receiver (457kHz). This innovation allows you to search simultaneously for both RECCO reflectors and transmitting avalanche beacons. Additional information about searching with the 457kHz function can be found in Chapter 6, **SEARCHING WITH RECCO AND 457.**

Rescuers practiced in using analog (acoustic-signal) beacons will quickly adopt this functionality. Rescuers with little or no practice with analog beacons will require training and practice.

The 457kHz antenna is located along the bottom of the detector's handle, perpendicular to the back of the detector.

To use the 457 function the RECCO function must be turned ON.

When the distinctive "beep" of the 457 signal is heard the R9 Detector operator may choose to locate the beacon with the detector, or use their own beacon. Another rescuer can also be assigned to locate the beacon.

TIP: Try using the RECCO function during the fine search phase, even if the person does not have RECCO reflectors. Some transceivers can act as weak reflectors and the RECCO function can make for a quick fine search.

457 RANGE

The range and signal strength for all avalanche rescue beacons is a function of the relative orientation of the antennas of the sending unit and the receiving unit. Maximum range is achieved when the antenna of the receiving unit is parallel to the magnetic field of the sending unit. If the receiving unit is positioned at some angle to the magnetic field the range is reduced.

When you perform a standard RECCO signal search and sweep the R9 Detector across your body you are changing the orientation of the 457 receiver antenna. This increases your chances of detecting a transmitting beacon.

The R9 Detector is equipped with 3 relative range settings for 457kHz searching:

- 15–60 meters
- 5–20 meters
- 0–5 meters

You can change the range settings as needed to maintain the received signal.

The RECCO Rescue System can be used effectively from foot, skis, and helicopters. Many different factors affect the way to search with the RECCO Rescue System. These recommendations are general and should be adapted to your organization's methods and to the actual avalanche. Your strategies and tactics will sometimes change as conditions and circumstances change.

There are four phases of any and all search operations, including searching with the RECCO Rescue System.

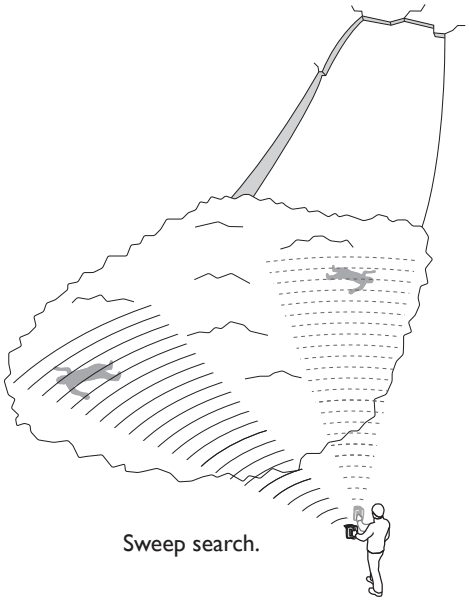
- Signal Search: detecting the signal
- Coarse Search: following the signal
- Fine Search: getting very close
- Pinpoint Search: precisely locating

You should first learn to use the RECCO System with confidence on foot before using the detector from other platforms like skis and helicopters. Searching on foot is the best way to learn to use the system as it allows for systematic and careful use.

SIGNAL SEARCH

Sweep

Your first attempt to detect a signal should be made before you move onto the debris. From some distance away—whether above, at the side, or from across a narrow gully—make several sweeps with the detector. At the same time turn your wrist to take advantage of the polarization. This technique is especially effective in small avalanches, but no matter the size of the avalanche, this simple search technique should always be tried when you first approach and reach the avalanche debris.



Sweep search.

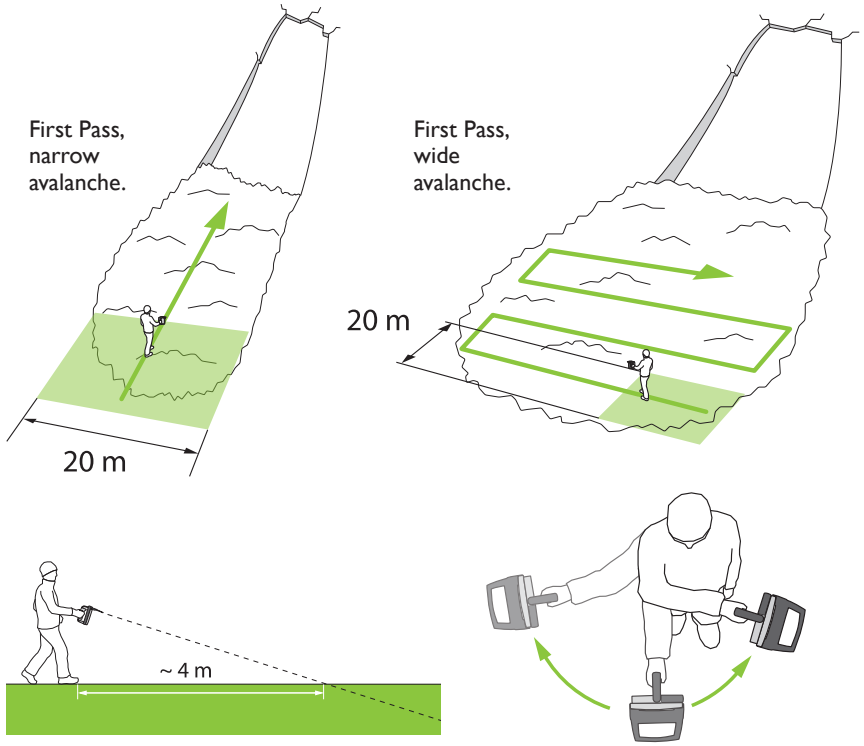
If you have no success with these first sweeps to detect a signal, the avalanche must be searched in a methodical and thorough manner.

First Pass

You should search the avalanche in corridors, and RECCO suggests making at least two passes, if necessary, to detect a signal. In some cases e.g., victim is not equipped with RECCO reflectors but may carry an electronic device, a third pass may be necessary. During each pass you walk a narrower search corridor and aim the detector more downward into the snow.

For the first pass, under typical cold, dry snow conditions, use 20-meter wide search corridors (10 meters to your right and 10 meters to your left). When searching on foot you should aim the detector at the snow surface approximately 4 meters in front of you. Imagine searching an avalanche in the dark with a flashlight.

As you walk swing the detector in front of you to your left and right for approximately 180 degrees across the front of your body. It is important you swing the detector equally in both directions. Swing the detector at a somewhat slower pace then you are walking.

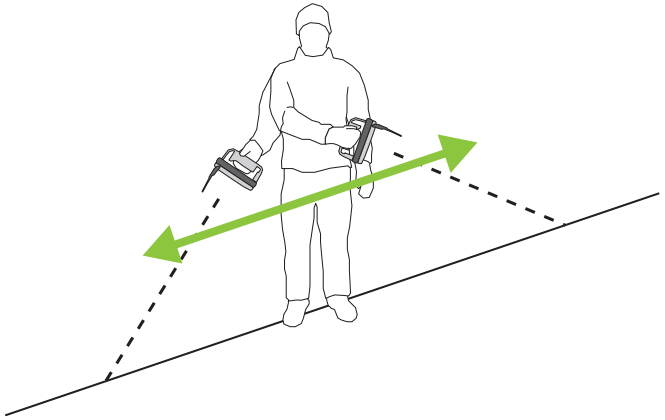


Aiming the detector during the First Pass.

Sweep the detector completely across body during the First Pass.

It is important to align your arm movements to the angle of the slope. If you do not, you run the risk of searching only the air rather than the snow.

When no signal is detected on the First Pass, RECCO recommends a second pass and narrowing the search corridor by half.

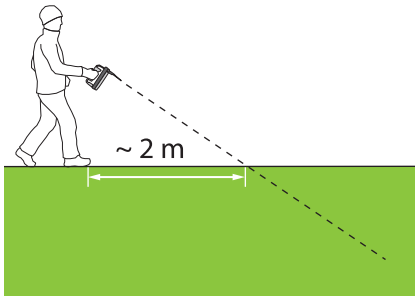


Align your arm movements to the angle of the slope.

TIP: Have a second rescuer accompany the RECCO detector operator. This assistant follows several meters behind the operator and manages radio traffic, marks the search route with flags, and provides an extra set of eyes and ears to the detector operator. A marked first pass improves the quality of the second pass and highlights any not-searched areas.

Second Pass

For your second search pass reduce the corridor width by half to 10 meters (5 + 5 meters) and aim the detector more downwards, aiming about 2 meters in front of you. Also, only swing the detector about 90 degrees across your body.

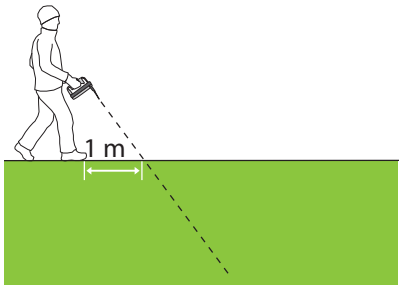


Aiming the detector during your Second Pass.

Use less swing across body during the Second Pass.

Third Pass

In some incidents involving very deep burials, wet snow, or when the buried subject is not equipped with RECCO reflectors but is thought to carry some type of electronic device (digital camera, mobile telephone, two-way radio, turned-off transceiver, etc.) a third pass may be needed. During your third pass, aim the detector only 1 meter ahead and swung 1 + 1 meters to both sides creating a 2-meter wide search corridor.



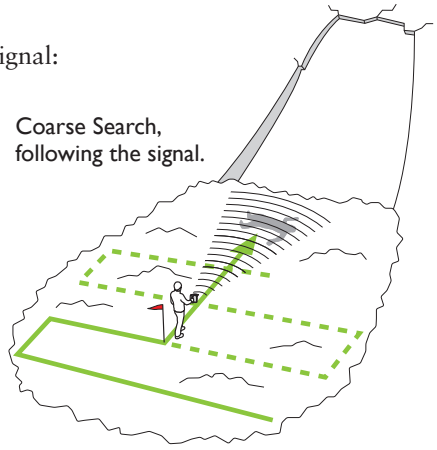
Aiming during Third Pass.

Sweep the detector only slightly across body.

COARSE SEARCH

When you hear the tone, a chirp-like signal:

1. Mark the spot.
2. Orient the detector to the strongest tone.
3. Follow the signal. Do not turn or move the detector and do not reduce power too soon.



Coarse Search, following the signal.

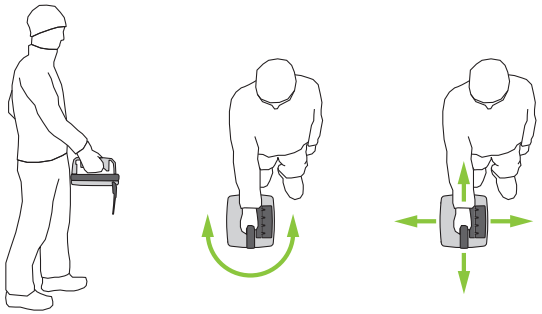
FINE SEARCH

As you get closer to the buried person:

1. Reduce power as needed.
2. Walk until the tone disappears. You should now be right above the victim.

PINPOINT SEARCH

1. Hold the detector vertically.
2. Turn wrist to optimize polarization and signal.
3. Reduce the power control.
4. Make rapid crisscross movements.
5. Mark the spot with the strongest signal.



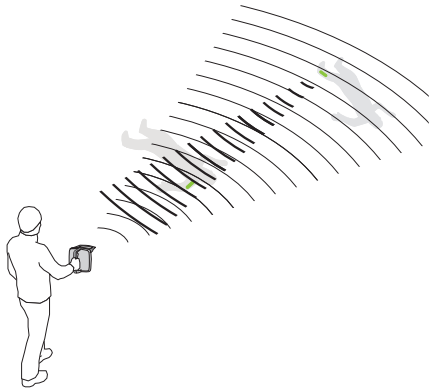
Pinpoint search.

Unlike a transceiver search that requires a probe pole to pinpoint the target, RECCO's directionality eliminates the need for a probe pole. However, a probe pole may be invaluable to confirm the victim's location, to indicate burial depth, and to provide a reference mark for digging to the victim.

TIP: Generally, faster crisscross movements make it easier to pinpoint the strongest signal.

MULTIPLE VICTIMS

RECCO's directional search beam makes the search for multiple victims easier. Though the technology makes the search easier, to successfully find all victims requires careful and systematic searching by the operator to be sure all areas have been thoroughly searched. In some situations depending upon the orientation of reflectors to the detector, you may detect a distant reflector than a close-in reflector.



It may be possible to detect a distant reflector than a close-in reflector.

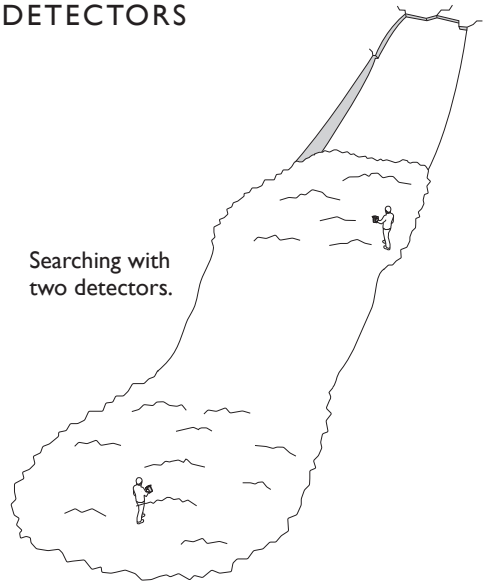
When multiple victims are known or suspected you will have to:

- Search the immediate area around the found victim, and
- Search back to the marked spot from where you first heard a signal to continue searching the rest of the avalanche.
- Continue Signal Search pattern until all victims are found or the area is deemed to be clear.

To search for additional victims who might be very close you may adopt techniques—Three Circle and Micro-Search Corridors—that are sometimes used in transceiver searches for multiple victims. Searching for multiple victims requires considerable practice.

SEARCHING WITH TWO DETECTORS

When searching a large avalanche two detectors may be used. Use the Alt Switch to set each detector to a different RECCO channel. On one detector set the Alt Switch up and on the other detector set the switch down. This will eliminate potential interference if the detectors get too close to one another. It is also helpful to mark the searched routes with flags to identify not-searched areas.



Searching with two detectors.

WET SNOW

The wetness of the snow—liquid water present—can have a significant affect on range. It is important that you practice in wet snow conditions so you can judge the approximate range of the RECCO System. In general you will need to significantly narrow your search corridors depending upon wetness. The more wet the snow the narrower you should make the search corridors. Your methods are best gained from practice and experience.

TIP: When searching wet snow you should make your search corridors one-half the width of dry snow conditions.

To use the 457kHz function the R9 Detector must be turned ON. If wearing an avalanche rescue beacon, your beacon needs to be worn on your back so your body can shield the RECCO signal, *and* if using the 457kHz function your beacon must be turned OFF so not to interfere with the beacon search. Be sure to turn your beacon back to ON when the transceiver search is completed.

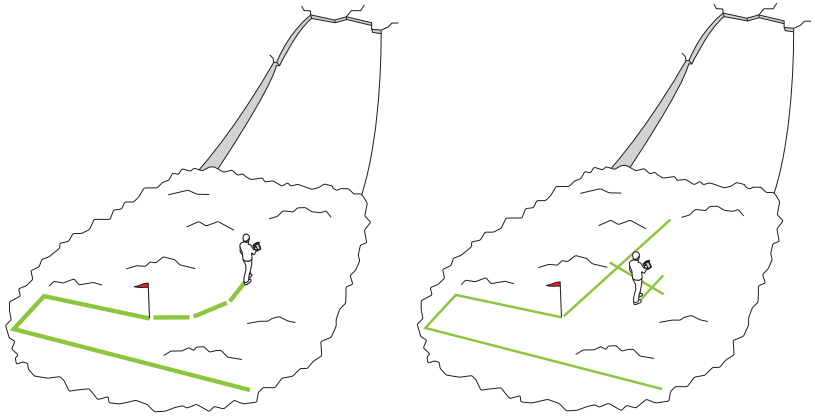
NOTE: Always consider cautiously the hazards and risks of turning off a rescuer's avalanche rescue beacon.

457KHZ SEARCH WITH R9 DETECTOR

The experienced analog-transceiver user will quickly adapt to using both the RECCO and 457 functions; however, rescuers with little or no experience with analog transceivers will need additional transceiver training and practice.

With the RECCO function ON:

1. Set 457 range to 15–60 m.
2. Search in 20-meter wide (10+10) corridors.
3. Aim and move R9 Detector as in performing a RECCO Signal Search.
4. If a 457kHz signal is detected the operator will hear the distinguishing "beep" that differs from the RECCO chirp-like sound.
5. Mark the spot.
6. Follow the beacon signal by using either the "tangent-line" or the "bracket/cross" method to complete the Coarse and Fine Search phases, or you may use your own transceiver.



Use either the tangent-line or bracket/cross methods to follow the beacon signal.

7. Pinpoint the buried victim's precise location with a probe pole.
8. Return back to the marked spot to continue the rest of the RECCO and transceiver search.

When a 457 signal is heard you can continue conducting the transceiver search—Coarse and Fine Search phases by using either the grid or tangent methods—or you may ask for a second rescuer, if available, to finish the beacon search.

Tangent-Line

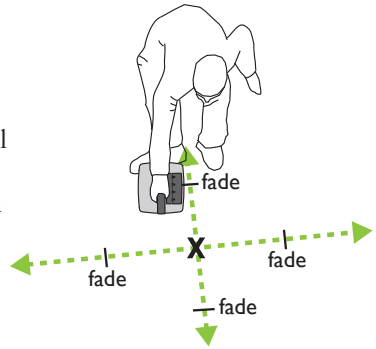
The Tangent-line method can be used during the Coarse Search phase to follow the signal. When a beacon signal is detected:

1. Stop, hold steady the R9 Detector at belt level.
2. Turn body from side to side to confirm the strongest beacon signal.
3. Follow strongest signal for about 5 meters (~ 8 steps).
4. Repeat steps 1 to 3 several more times to follow the signal.
5. Switch down the 457kHz sensitivity, if possible before walking a new line.
6. When the signal fades in all directions, start Fine Search using *Bracket/Cross* method.

Bracket/Cross

The Bracket/Cross method can be used to complete both the Coarse and Fine Search phases:

1. Stop, and orient the R9 detector to the strongest beacon signal. Do not change this orientation.
2. Walk a straight line. As long as the signal gets stronger you are going toward the buried beacon. (If immediately the signal fades, turn around and walk the other direction.)
3. If the signal gets stronger, try decreasing the 457kHz sensitivity one step.
4. When the signal fades take 2–3 more steps to be sure the signal truly fades. If the signal increases again, take several more steps until the signal truly fades.
5. Mark this spot.



Fine Search using the cross method.

SEARCHING WITH RECCO AND 457

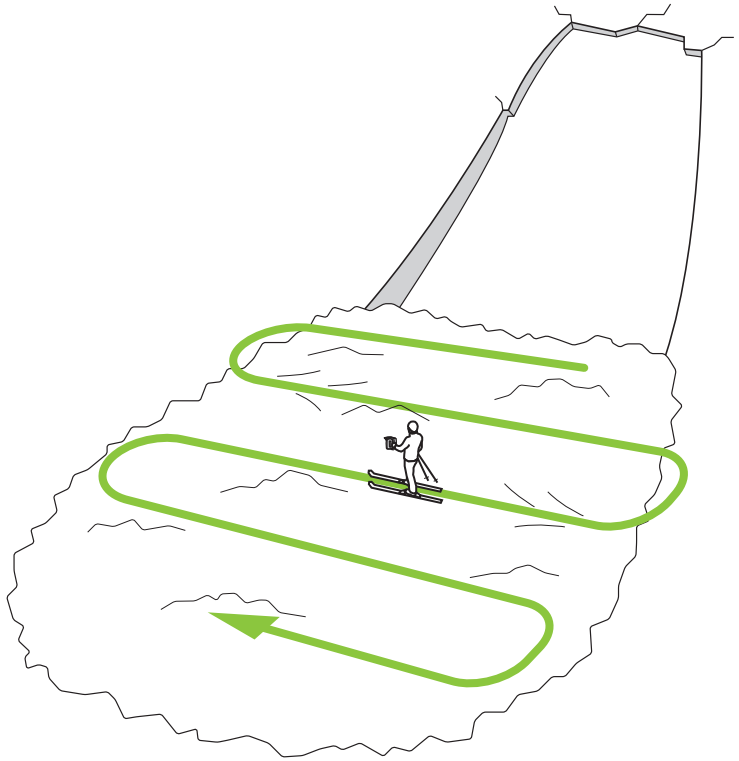
6. Do not change the orientation of the R9 detector, turn around and walk back along same line until the signal fades.
7. Go to the mid point between the two fade points.
8. Do not change the orientation of the R9 detector and turn 90 degrees.
9. Walk a straight line perpendicular to your previous pass and go until the signal fades.
10. Repeat steps 4 to 9 several times. After 3 crosses you will be ready for the Fine Search.
11. Perform the Fine Search with the R9 Detector close to the snow surface.
12. Typically with 2–3 additional crosses you will be ready to use your probe pole to pinpoint the buried person.

TIP: Even if the transceiver-equipped victim does not have RECCO reflectors, performing the Fine Search phase with the RECCO function may be faster than using a transceiver, if the RECCO detector can detect the transceiver.

SEARCHING ON SKIS

The fundamentals of using the RECCO detector do not change when you use the detector from skis or a snowboard*, but some adjustments in your technique are required because on skies you typically travel faster.

- Decrease the width of your search corridors.
- Reduce the sideways swinging of your arm.
- Aim the detector 2–3 meters ahead of you.
- Adjust your search/skiing speed.

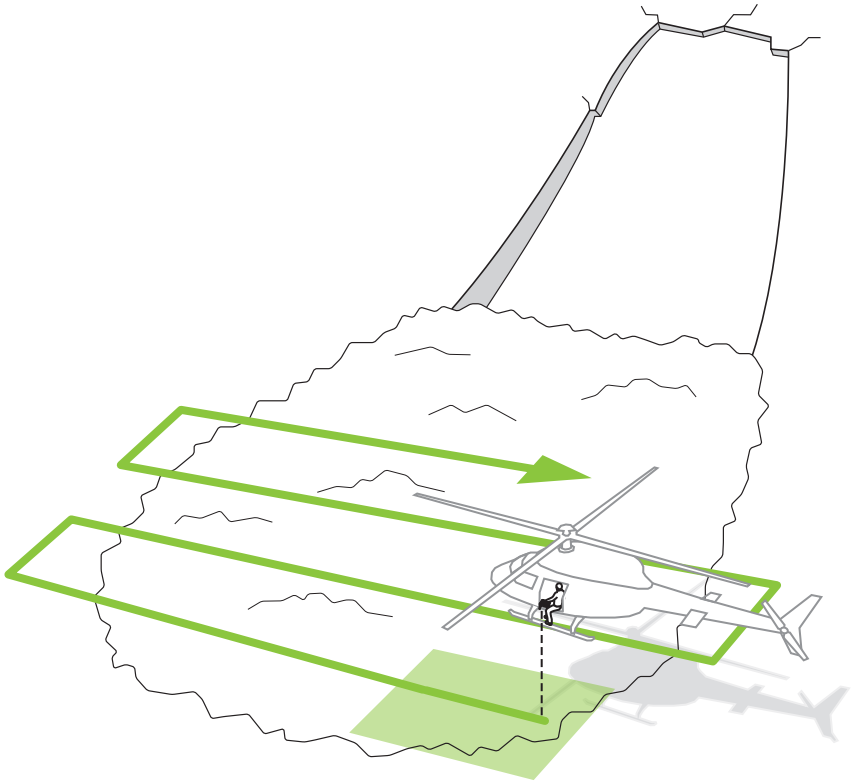


Searching from skis requires less-wide search corridors and the detector should be aimed more downward into the snow.

* Riding a snowboard across actual avalanche debris may be difficult, and you may find it nearly impossible to maintain a systematic and effective search pattern.

SEARCHING FROM HELICOPTER

The RECCO detector is a very effective search tool when used from a helicopter as long as the operator is proficient and the pilot has awareness of the basic RECCO search strategies. The most effective results are obtained when the pilot has first been trained to use the detector on the ground. Before attempting to search from a helicopter, please contact RECCO AB for additional training materials and tips.



Helicopter searching with the RECCO detector.

When using the R9 Detector from a helicopter the 457kHz (beacon) antenna will be positioned in or near the vertical position. The operator will only need to rely on changes in signal volume. The vertical 457 antenna means the received signal strength will be independent of the sending unit's orientation.

You should start with simple search drills and experience multiple successes with the R9 Detector before adding difficulty and complexity. Your initial drills should be done in large, open, flat areas, away from potential electrical interferences. As your experience and confidence increase, drills should be made more challenging.

Performing detector drills and including the RECCO search in all rescue simulations increases competency and proficiency.

Below are some suggested drills that when done regularly will improve your ability and confidence with the RECCO Rescue System.

FIRST TIME

DIFFICULTY:

Objectives: To learn the basics of using the RECCO Rescue system: orientation, range, body shielding.

Personnel: 2 people, one detector operator and one assistant.

Equipment needed: 1 RECCO detector. 1 RECCO training reflector

Setup: A flat, open area free of electrical interference (buried or above ground power lines, buildings, lifts, or vehicles).

Actions:

1. Operator holds the detector steady and aimed forward at full power while an assistant holds a training reflector at shoulder height from about 20 to 30 meters away.

2. Assistant slowly turns the reflector 90 degrees, presents the short end, and covers the reflector with their hand. The assistant can also walk a line perpendicular to the detector going in and out of range. This will reveal the opening angle of the RECCO signal in air. In snow it will be less.

3. Assistant should then hold the reflector still while the operator stands in place and swings the detector across his or her body while rotating their wrist. When the RECCO tone is heard, they should stop swinging the detector, but reorient the detector to the strongest signal. The operator should always take advantage of the polarized signal and seek the detector position that produces the strongest tone.

PINPOINT

DIFFICULTY:

Objectives: To learn the basics of pinpointing with the RECCO detector.

Personnel: 1 person

Equipment needed: 1 RECCO detector

1 training reflector

1 probe pole — optional

Setup: A small, flat, open area free of electrical interference (buried or above ground power lines, buildings, lifts, or vehicles).

Actions:

1. Place a training reflector on the snow surface and stand over the reflector while holding the RECCO detector vertically. Reduce the detector's power and make rapid crisscross movements. The strongest signal will be directly over the reflector.

2. Stand 5 meters away with detector power at a low setting. Follow the signal toward the reflector and step over reflector. The signal will disappear. Turn around (or back up) and pinpoint as in action 1.

3. Bury the reflector (in a backpack or on a target board) about 1 meter deep and repeat actions 1 and 2.

WALK THE LINE

DIFFICULTY:

Objectives: To experience how orientation affects range.

- To learn to walk systematic search patterns.
- To learn to use RECCO directionality to find multiple targets.

Personnel: 1+ (3 or more make setup go faster)

Equipment needed:
1 RECCO detector
12+ flags
1–4 training reflectors
1+ transmitting avalanche rescue beacon(s) – optional

Setup: In a 100 x 100m area place wands/flags in a 20 x 20m grid. Mount reflectors to small blocks of wood or foam and randomly scatter in the search area.

Actions:

1. For initial search passes the reflectors should be visible on the snow surface. This allows novice operators to see and compare the orientation of reflectors with detection distance.
2. First search pass is done following the flags to establish 20x20m search corridors. A second search pass can be performed using the flags to guide operator in a 10x10m corridor. (If snow conditions are wet, search corridors should be reduced.)
3. To add difficulty, bury reflectors.
4. To increase difficulty, bury reflectors at different depths.

SEARCH DRILL

DIFFICULTY:

Objective: To actively learn to use the RECCO detector to search a confined area, like an avalanche debris zone.

Personnel: 1 person

Equipment needed:
RECCO detector
1+ training reflector(s)
1+ transmitting avalanche rescue beacon(s) – optional
1 probe pole

Setup: A reasonably open 50 x 50m area (or larger) with a marked perimeter.

Actions:

1. Bury reflector(s) and transceiver (optional) separately under 1+ meter of snow. To provide reasonable probe targets to confirm the precise location the reflectors can be placed into backpacks or tethered and suspended beneath a 30x30cm board.
2. The detector operator can enter the search area from any location and conduct the RECCO search.
3. Difficulty and complexity can be added by adding buried reflectors/transceivers, increasing the search area, and/or burying "other" electronic devices such as a radio, a digital camera, turned-off avalanche transceiver, or working amongst numerous trees, etc.

NOTE: Whenever creating a search drill including "other" electronic devices, remember the detection range will be very limited to only a few meters at best. Be sure to carefully note the location of your buried devices.

INTERFERENCE BY RESCUERS

DIFFICULTY: 

Objective: To experience the affects of and working around a few RECCO reflector-equipped rescuers.

Equipment needed:
RECCO detector
3+ training reflectors
3+ backpacks (empty)

Setup: A reasonably open 50 x 50m area (or larger) with a marked perimeter.

Actions:
1. Place reflectors in backpacks but bury only one backpack. The other two backpacks should be placed and visible near the sides of the search area.
2. When experiencing a "rescuer's" (backpack) signal the operator should practice adjusting his or her search pattern by using their body as a signal shield by keeping the other "rescuers" (backpacks) to their back.

Variations: Instead of using reflector-equipped backpacks, reflectors can be placed knowingly on a fellow rescuer who purposely but periodically walks into the way of the detector operator.

SEARCHING AMONGST PROBE LINES

DIFFICULTY: 

Objective: To learn how to search around a probe line with RECCO reflector-equipped rescuers.

Equipment needed:
RECCO detector
7+ training reflectors (1 buried reflector and 6+ reflectors on probe line.
6+ pieces of bamboo poles (1.8m tall)
1 roll of first aid tape

Setup: An open 50 x 50m area (or larger).

Actions:
1. Use tape to affix a single reflector onto a single bamboo pole so that when pole is stuck into snow the reflector will be above the snow surface anywhere from 10cm to 150cm.
2. Place poles about 1m apart as if in a probe line.
3. Bury 1 reflector some distance away from the probe line.
4. With the RECCO detector search for the buried reflector while approaching the probe line from different directions.
5. Practice using your body as a shield between other rescuers, and practice aiming the detector to reduce interferences.

TRAINING EXERCISES

MULTIPLE VICTIMS

DIFFICULTY:

Objective: To learn how to search for multiple and close by RECCO reflectors by practicing the Three Circle and Micro Search Corridor methods.

Equipment needed: RECCO detector

2+ training reflectors buried within 2 to 10 meters of each other

2+ marking flags

Setup: An open area 50 x 50m (or larger).

Actions:

1. Mark the spot were you first hear a RECCO tone.
2. Find, pinpoint, and mark first RECCO target.
3. Practice either or both the Three Circle and Micro Search Corridor methods to locate additional close by RECCO targets.
4. Mark these targets.
5. Return back to the spot where you first heard the RECCO tone and continue the Signal Search across the rest of the search area.

SELF TEST — PROFICIENCY

DIFFICULTY:

An experienced detector operator should be able to locate two buried reflector-equipped targets (1m deep) in a 50x50 meter area in 5 minutes.

RESCUE SIMULATIONS

Experience shows that rescue teams successful with the RECCO Rescue System train regularly by performing detector drills and rescue simulations. Drills will instruct you to become a better RECCO detector operator. Rescue simulations will help you become a better rescuer by practicing in realistic avalanches and by integrating RECCO's Advanced Rescue Technology with other technologies such as rescue dogs, transceivers, and probe lines, and rescuers. The RECCO Rescue System becomes efficient for rescuers—making your job easier, faster, and safer—when the detector is practiced in *all* rescue simulations.

The purpose for rescue simulations is to implement a general rescue strategy by integrating people and technology to solve the four key elements of avalanche rescue:

- Locate
- Access/Extricate
- Stabilize
- Transport

Before undertaking any rescue simulation, organizers should have pre-established goals to be gained from the exercise. Simulations can be conducted in real time (as in an actual rescue) or in stop-action where specific components are run in real time, but then the activity is stopped and reviewed before moving onto the next element. All simulations should be made as realistic as possible. Here are some tips to improve realism to any avalanche rescue simulation.

- Search area should be about 100 x 100 meters. (This may seem large, but the median dimensions of the debris area for avalanche accidents in Switzerland are 90 x 90 m.)
- Buried targets should be at least 1 m deep, about the average burial depth of avalanche victims.
- Work on actual avalanche debris, when available.
- Work in difficult weather conditions.
- Define simulation goals so the success of the simulation can be measured.
- Include a medical component so rescuers practice excavating, assessing, and caring for an injured victim or victims.
- Involve other rescue or support teams to build and improve cooperation.

CARE OF R9 DETECTOR

DRYING THE DETECTOR

After using the detector for a prolonged period in wet snow or rain, wipe off excess moisture with a soft, dry, lint-free cloth. Leave the detector out overnight in a warm—room temperature—area before placing back into it's carrying case.

CLEANING THE DETECTOR

To clean the outside of the detector, use a soft, damp, lint-free cloth. Avoid getting moisture in any openings. Do not spray liquids directly onto the detector, and do not use aerosol sprays, solvents, or abrasives that might damage the detector.

STORING THE DETECTOR

If leaving the detector in an equipment cache for a month or two, no special handing conditions are need. However, if you are going to store your detector for an extended period of time, say during the summer months, keep it in a cool, dry location (0°C to 20°C).

COMMON MISTAKES

Success with the R9 Detector and your confidence in the RECCO Rescue System is a direct function of your knowledge and practice with the detector, *and* with the level of integration of the RECCO System into your own rescue organization's response plan.

All technologies have limitations and practice with those devices in all types of conditions is the best way to identify potential limitations. The same is true of using the R9 Detector.

Below are some common mistakes made by rescuers that limit their ability to utilize RECCO's Advanced Rescue Technology to its fullest.

Mistake	**Corrections**
Inexperience by individual rescuers and rescue leaders.	• Train regularly and in all types of conditions. • Participate in all rescue simulations so RECCO operator works efficiently with all other rescue components.
Personal Interference by improperly carrying electronic devices.	• Operator should remove all unnecessary electronic devices (mobile phones, cameras, pagers, batteries for boot heaters, etc.). • Necessary devices like beacon and radio should be repositioned onto the operator's back. • Use RECCO Shields to cover reflector-equipped gear.

COMMON MISTAKES

Mistake	Corrections
Missed Signal—signal search—caused by: • searching with reduced power. • not searching entire debris area. • aiming detector into air. • subject not equipped with RECCO reflectors.	• Adjust power setting to full. • Think of the using the detector like you would use a headlamp. Irregular debris areas with significant mounds and depressions should receive extra search time. • Search systematically and mark search route. • Slow down your traversing search speed, especially when searching on skis. • Be sure the detector is aimed toward the snow on your downhill side and not into open air. • Narrow your search corridors when the snow is wet. • Occasionally turn around and sweep detector behind you. • Conduct a 3rd search utilizing 2m (1+1m) corridor.
Lost Signal—coarse search	• Seek the best polarization by orienting to the strongest tone and then hold the detector still: do not keep swinging the detector. • Do not turn down power too quickly. • Pause for a moment when turning down power to be sure the signal tone is maintained.
Weak Signal—coarse search	• Orient to the strongest tone. • Increase the power setting. • Raise the detector above your head. This can increase range and also reduces the length of snow the RECCO signal must penetrate.

COMMON MISTAKES

Mistake	Corrections
Lost Signal—fine and pinpoint searches	• Hold detector in hand away from large computer watches and or metal bracelets. • Aim away from skis, snowboard, boot buckles, boot heaters, etc. • Use RECCO Shields.
Interferences—fine and pinpoint searches	• Increase power. • Aim away from skis, snowboard, boot buckles, boot heaters, etc. • Use RECCO Shields.
Interferences by Rescuers	• Search with your back to other rescuers. • Aim detector more downward into the snow, especially on your downhill side.
Dropped Detector	• Use wrist leash attachment to secure detector to operator.

DETECTOR

Problem	Likely Cause	Solution
Detector does not turn on	Dead battery	• Check to be sure charger is plugged in to AC source and working properly. • With R9 Detector connected to charger, turn charger on by turning detector on–off–on.
Limited search time	Old battery Weak battery Bad battery	• RECCO recommends replacing the battery every 3 years. (Every battery is dated.) • Change battery. • Charge battery. • Contact RECCO immediately.
Limited range	Missing antenna	• Contact RECCO immediately. The R9 Detector will function but with reduced range.
Repeated long beep signal	Weak battery	• Change battery. • Charge battery.

INTERFERENCE

Problem	Likely Cause	Solution
Personal reflectors	R9 Operator equipped with RECCO reflectors.	• Cover reflector with RECCO Shield. • Cut off reflector or cut open and cut antenna in two. • Remove reflector from special pocket. (Option in some uniforms.)
Personal interferences	R9 Operator carrying other electronics: transceiver, radio, cell phone, camera, battery-powered boot heaters, boot buckles, etc.	• Move necessary devices to your back where your body can act as a shield. • Remove unnecessary devices. • Hold detector in other hand. • Aim away from feet/skis.
Other rescuers	Rescuers equipped with reflectors.	• Search with detector early before many other rescuers arrive. • Stand with back to other rescuers using your body as shield. • Point the detector more downward into the snow. • Search marked sectors of the debris away from other people. • Turn power down (last resort).

CUSTOMER SERVICE

CUSTOMER SERVICE

The R9 Detector is a rescue device. You should ensure it is working properly by regular testing and inspection of the detector and charger.

Effective use of the R9 Detector is directly related to your knowledge and practice. Active participation in drills and rescue simulations on a regular basis will better prepare you for real-world rescues.

If you have any questions or concerns about your R9 Detector or the RECCO Rescue System, please contact RECCO AB immediately.

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AVALANCHE RESCUE SYSTEM

RECCO®

RECCO.COM