Advanced Tutorial

Tracker DTS Advanced Tutorial

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-Tracker DTS Advanced Tutorial -

The Tracker DTS Advanced Tutorial provides detailed instruction on advanced techniques not included in our owner's manual and not usually taught in recreational avalanche courses. It is most effective when used with our vinyl flux diagram and the animated tutorials on our training video, "Tracker 101." These can be ordered from BCA by calling (800)670-8735.

For an efficient and fun practice environment, visit one of our Beacon Basin transceiver training parks. See www.bcaccess.com/beaconbasin to locate a site near you.

The Advanced Tutorial primarily addresses advanced pinpointing and multiple-burial techniques. It should only be used by instructors and students with extensive experience with the Tracker DTS. Those with experience with analog/audible based beacons must first have mastered the basic techniques addressed in the Tracker DTS owner's manual or Instruction Guide.

Target audience:

- Professional guides
- Avalanche educators
- Snow safety professionals
- Advanced recreationists

All must have extensive previous experience with the Tracker.

Lesson 1: Advanced "Pinpointing on a Line"

Pinpointing on a line is a basic technique that enables the searcher to reduce the area to be searched and probed to a single axis. Advanced pinpointing on a line reduces the area to be probed along this axis to a very specific point. This is done by analyzing "spike" signals and distance readings along this axis and determining the orientation of the transmitting antenna. This technique is especially useful in deep burials.

Before attempting this advanced technique, students must have mastered establishing a straight pinpoint line (see Tracker DTS Instruction Guide). They must also learn to recognize the "spike" signal. The "spike" is where the signal suddenly and temporarily becomes weak. This is because the horizontal searching beacon is perpendicular to the vertical aspect of the flux pattern of the transmitting beacon. It can be recognized by a sudden increase ("spike") in the distance reading and a fluctuation in the directional display, often followed by no reading or "SE" in the display. Illustrating this important feature is best accomplished using the BCA flux diagram.

Flux diagram usage: advanced pinpointing

1) To illustrate the spike signal, hang the BCA flux diagram vertically. Attach a transmitting beacon to the diagram using the Velcro strip provided, making sure to place the transmitting antenna over the core of the diagram (Figure 1). For simplicity the first time, orient the transmitting antenna horizontally (parallel to the snow surface), as shown in Figure 1. Note that the transmitting antenna on the Tracker is oriented 45 degrees from the long axis of the case (under the Tracker logo on the convex side).

2) Approach the diagram with the searching beacon and transmitting antenna on the same plane. Note that there is no spike signal, as the searching beacon is always aligned with the flux line coming straight from the antenna. This is unpractical, however, because it would represent a transmitting beacon that is on the snow surface.

3) Now approach the transmitter as if it were buried, searching along a horizontal line 1-2 feet above the antenna. Note how the signal "spikes" where the flux lines curve upward and meet the searching beacon in a perpendicular orientation. Note the minimum reading after the spike. Note the second spike reading if you continue forward.

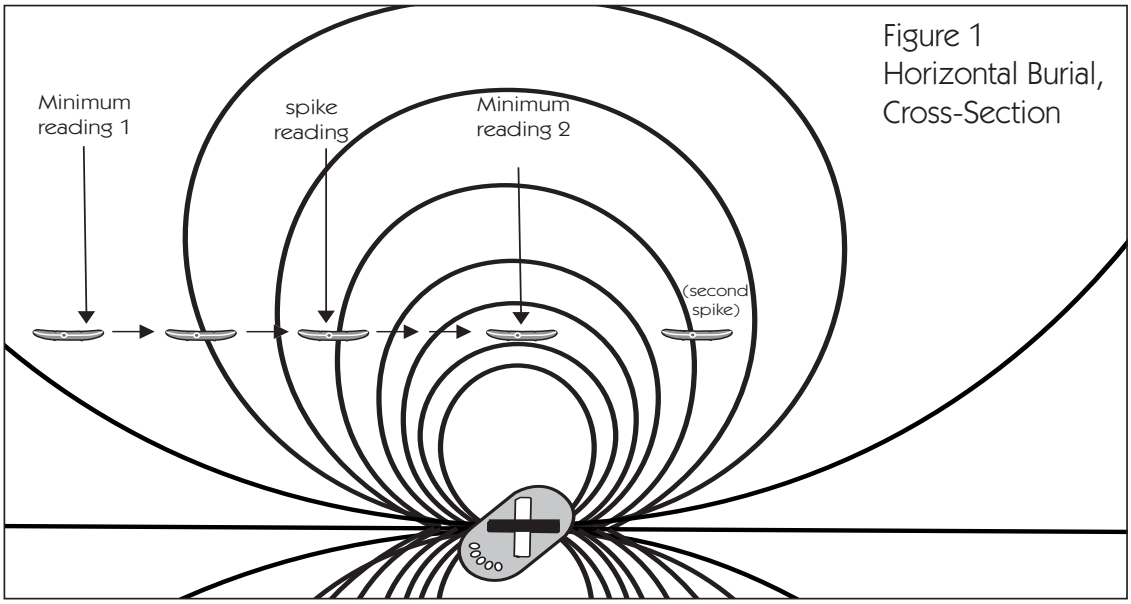

Figure 1
Horizontal Burial,
Cross-Section

4) If the transmitting antenna is buried horizontally, there will be two spikes and the lowest distance reading will be between them.

5) Now re-hang the flux diagram with the transmitting antenna oriented vertically. Note that there is only one spike reading and it is directly over the antenna. There are two minimum readings on either side that are very similar to each other.

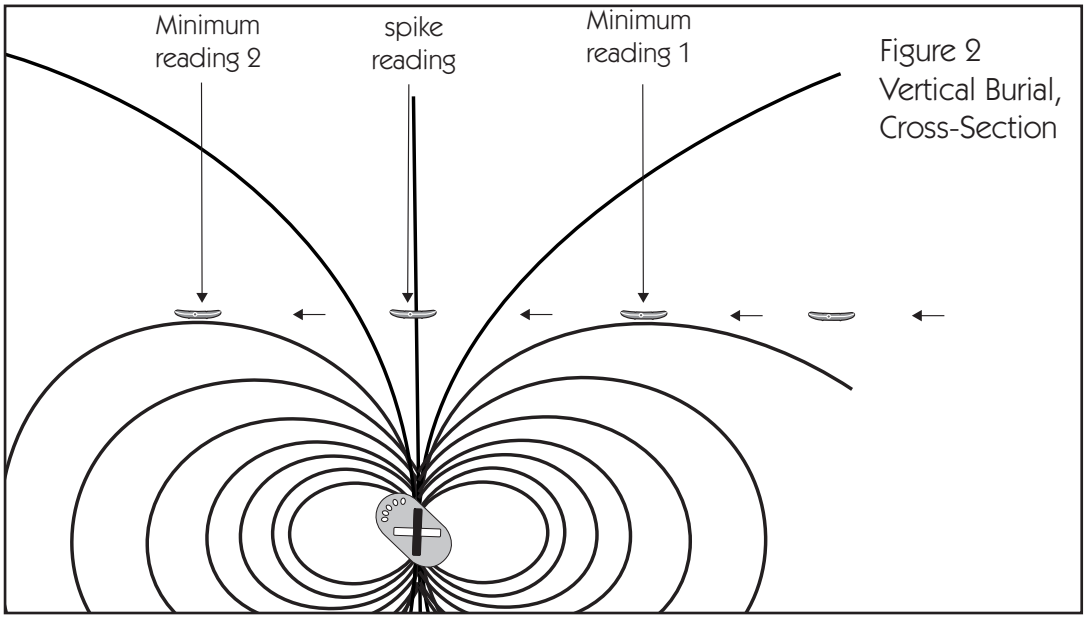

Figure 2
Vertical Burial,
Cross-Section

6) Observe the following rules of thumb:

- If there is one minimum reading and two spikes, the transmitter is roughly horizontal. At the lowest distance reading, keep the receiving beacon horizontal and bracket on either side of the flux line, ignoring the directional lights. Probe at the lowest reading found.
- If there are two minimum readings and only one spike, the transmitter is roughly vertical. Minimum reading 1 will be very similar to minimum reading 2. At the spike, orient the Tracker vertically and bracket on either side of the flux line, ignoring the directional lights. Probe at the lowest distance reading found. (Novices should keep their beacon horizontal and probe at the spike or either minimum in an expanding spiral pattern.)
- In most cases, the antenna will be oriented somewhere between horizontal and vertical. There will usually be two spikes (one more obvious than the other) and the minimum reading will be found closer to one. If the orientation is unclear, simply probe at the lowest distance reading.

Exercise I: Deep burials/pinpointing on a line

1) Bury a transmitter at least one meter beneath the snow surface. Closer to the surface, place a backpack, shovel blade, or wooden target that can be recognized as a body when probing.

2) Approach the pinpoint area from various distances and directions and clearly identify the spike signal. If the flux line is still curving when you first encounter the spike, step back and try again until a straight approach is defined. (Note that the display will flash “SE” when rapidly moving the Tracker backward. This should not be confused with the spike.) Once a straight line has been established, draw a line or place a long object on the snow in that direction.

3) Now identify the location of the second spike signal and/or the minimum readings along the flux line. You should then be able to determine the orientation of the buried transmitter. After bracketing once perpendicular to the line, you should be able to strike the target with a probe.

Lesson II: Advanced Multiple Burials/Special Mode

Advanced multiple burials primarily involve situations in which there are more victims than beacon searchers, and it is not possible to turn off the found victims’ beacons. These mainly concern commercial guiding operations where guests are not trained to aid in the beacon search and one guide must locate several victims.

Special (SP) mode is an advanced feature which can significantly reduce the time spent searching for a second signal during a multiple burial. It is only used after pinpointing the first signal, and if that transmitter can’t be turned off. SP mode provides the searcher with information which allows the searcher to "break away" from the closer, stronger signal without having to perform the three-circle method (see Tracker DTS Instruction Guide) or return immediately to the primary search path.

Special mode deactivates the Tracker's signal strength filter, enabling it to display the distance and direction of weaker signals that are farther away. It also makes the Tracker more directionally sensitive by narrowing the Tracker's search "window" to the center three lights. This way, you can "mask" out the found beacon by rotating away from its flux line.

Exercise II: Special mode

1) To illustrate proper use of SP mode, place two transmitters about five meters apart, visible on the snow surface. First, place their transmitting antennas in the perpendicular orientation, as shown in Figure 3, so the two signals clearly appear in different directional windows. (The black rectangle represents the transmit antenna within a single-antenna beacon and a Tracker, respectively.) If possible, use transmitters of different brands, as shown. This will enable students to experience various pulse rates.

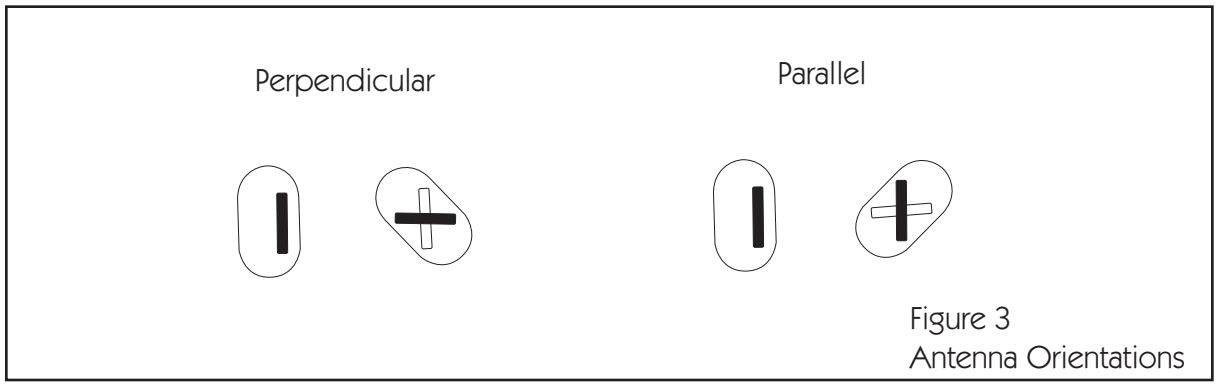

Figure 3
Antenna Orientations

2) After pinpointing the first signal, remain at the point where you obtained your lowest distance reading. It is essential to avoid entering SP mode at the spike.

3) With the center search light still engaged, enter SP mode. Keep the first signal centered in the display for several pulses. This will prevent losing track of the first signal or confusing it with the one for which you are searching.

4) Slowly rotate the Tracker in search of another signal. The first signal will disappear once it is no longer inside the reduced Special mode window.

5) Rotate the Tracker slowly in your hand. Do not sweep it with the arms. If you rotate too quickly, you can pass right over the signal of the beacon being searched. Sweeping will unnecessarily alter the distance readings and potentially cause the searcher to lose track of the first signal.

6) Once the second signal is engaged, center it in the search lights and note the distance. Move slowly in the direction the Tracker is pointing and pay careful attention that the number in the display window is decreasing. If the number increases, go in the opposite direction.

7) Once you know the approximate distance and direction of travel, look for trends in the shape of the flux line. As you move forward, if the lights to the right of center engage, you know the beacon is off to the right. Similarly, if the trend is a sharp curve to the left, you know the beacon will be sharply to the left. It is helpful to follow the flux line until it stops curving.

8) With distance, direction and curving trend information, you should have enough information to get close enough to the second beacon to isolate it using SE mode. When you believe you are closer to the second beacon than the first, toggle back to SE mode (Figure 4).

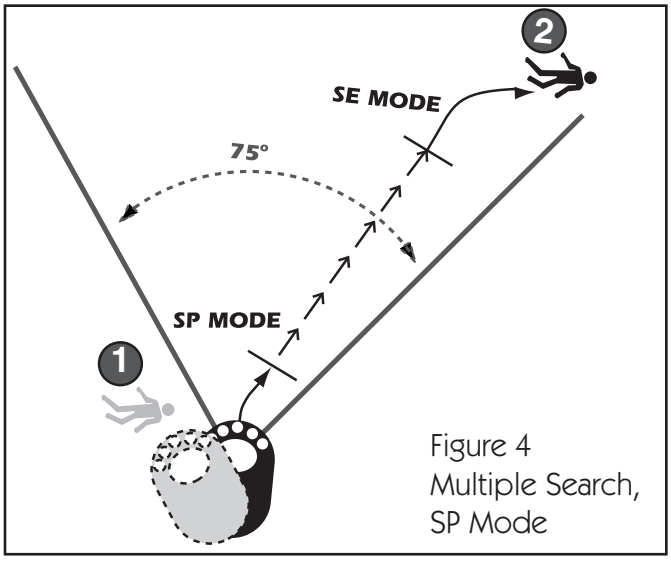

Figure 4
Multiple Search,
SP Mode

9) Often, while moving along the flux line in SP mode, you will encounter an area where the flux patterns of the two signals will be parallel; directional information will be shown in the same directional window. At some point the distance readings might be very similar, making it difficult to determine which signal is the one for which you are searching. In this case, "punch" through this intersection and continue in the direction you have been searching. Toggle back into SE mode once you believe you are closer to the second beacon.

10) A good rule of thumb is to move 3/4 of the distance between the two beacons before switching back to SE mode.

11) Next, place the transmitting antennas parallel to each other (Figure 3), so that both signals will appear in the center search window, with differing distance readings. Carefully follow the curving flux line until you can isolate the second beacon.

12) Sometimes it can be difficult to see the second signal if the two signals are parallel or if the searcher is slightly out of range of the second beacon. In shallow burials, it is possible for the found beacon's signal to "overpower" the other beacon. If no other signal is detected in SP mode, stand up and try again at chest height. If still no signal is detected, take three steps back or to the side. If still no signal is detected, return to the primary search.

13) Note that you might encounter slightly reduced receive range in SP mode. This is because the directional lights are less stable at long range and are less likely to stay centered in the center three lights, in which case the signal is not displayed.

Lesson III: Three or More Burials Within Range

Primary search

1) In complex multiple burials, it is especially important to maintain your primary search—even after picking up a signal. Maintain your 20-meter search strip width until you are within less than 20 meters of the closest signal. By not abandoning your primary search too early, you will ensure that no areas will be left unchecked uphill of the victims. This can save time if the terrain is steep or difficult to navigate. This is especially important if the closest transmitter is buried vertically (and/or has a "drifted" transmitter or weak batteries) and the others are buried horizontally. In this case, any transceiver will favor the one with the better orientation and stronger signal, even though it is farther down the slope. This technique also helps eliminate terrain from the search, which will simplify the process under stress.

Proponents of analog beacon technology suggest reducing the search strip if several signals are captured within a certain radius. This step is unnecessary when using SP mode (or the three-circle method in SE mode). It is more efficient to locate the first victim and begin excavating than to interrupt the search and alter the search strategy before locating the first victim.

Secondary search

With any transceiver, the more transmitters that are buried, the more complex the secondary search becomes, especially if they are all within the receive range of the searching unit. For simplicity, it is helpful not to stray too far from the primary search pattern–and to return to that pattern after each secondary search.

1) Once you have detected and pinpointed the first victim, look for the next closest victim using SP mode. If the next signal is within 20 meters, attempt to isolate and pinpoint that signal. If the distance reading is greater than 20 meters, continue on your 20-meter primary search grid.

2) Once the second signal is pinpointed, and no more signals are detected using SP mode, return to your original fine search point (where you abandoned the primary search) and resume your original primary search pattern.

3) In close-proximity situations, it is essential to go into SP mode as close as possible to the found beacon. Enter SP mode at the lowest possible distance reading, as close to the snow surface as possible. This creates a more noticeable difference in the distance readings for each transmitter.

4) In situations where many beacons are buried all within a small area, it can be difficult to pinpoint on a line. This is because you will be starting the search for each beacon from a very close distance; therefore the flux lines will probably be curved and overlapping. In multiple burial situations, it is often simpler to pinpoint using the bracketing method.

"Backup" techniques

In close-proximity multiple burials, it can sometimes be difficult to isolate signals by "breaking away" with SP mode, then isolating in SE mode; upon re-entering SE mode, you may find yourself back at the first signal. This is most likely to happen when the two beacons' antennae are oriented parallel to each other (as shown in Figure 3).

If you experience this difficulty, use the three-circle method discussed in the Tracker DTS Owners Manual and Instruction Guide. However, only one circle will be necessary, as you have already determined the approximate distance to the next signal (using SP mode). Enter SE mode and walk in a radius about 3/4 of that distance. When the second signal is detected, pinpoint by bracketing as close to the snow surface as possible.

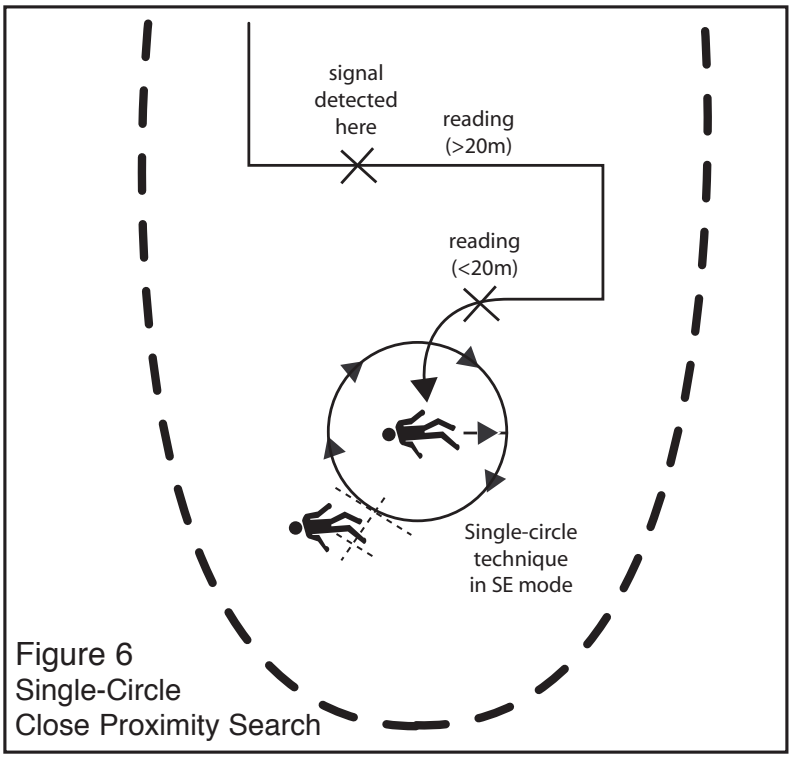

Figure 6
Single-Circle
Close Proximity Search

Remember that distance readings will always be greater for a vertically buried transmitter than for a horizontal one, even if they are buried the same distance from the searcher. For this reason, it is always important to maintain a tight circle; a victim with a vertically oriented transmit antenna may be closer than their distance reading indicates.

In worst case scenarios, you may encounter a phenomenon called "flux line salad." This is when several signals are detected all in close proximity, using SP mode, and the distance readings are similar enough so they are difficult to distinguish from each other. In this case, use the three-circle method, with a radius 3/4 of the lowest distance reading, then expand the radius accordingly.