

IN THIS ISSUE:

Working with the PE2003 Pulser



Pinpointing Ground Faults with Precise Accuracy

Eliminate Time and Frustration with a Little Know-How and the Right Tools

Even the most reliable automatic irrigation systems can experience electrical problems due to damaged buried wires. Knowing how to accurately locate ground faults – down to the smallest breaks in buried wires – can save tremendous time and frustration for anyone troubleshooting an electrical problem. After checking out the system with a volt-ohm meter and identifying and marking the field wire path with the help of a Wire and Valve Locator (refer to the Summer 2001 Technical Newsletter online at <http://www.rainbird.com/rbturf/resources/asc/ascnewsletter.htm>), you are ready to pinpoint leaks, nicks or breaks. One of the most effective tools to use is Progressive Electronics' Pulser Model 2003.

What Is the Model PE2003 Pulser?

The Pulser 2003 is an instrument designed to pinpoint all shorts to ground in direct buried wires, ranging from clean breaks to the smallest pinhole leaks in wire insulation.

- The portable transmitter **A** “pulses” a high voltage signal that radiates into the ground around each fault location.
- A receiver **B** mounted on an A-frame with a visual analog meter points to the source of the voltage. When the receiver is properly mounted to the A-frame, red and black leads should comfortably plug into the receiver. (see figure 1 on page 2)
- Red and black transmitter leads **C** connect to the field wiring and earth ground respectively.

Note: The Pulser does NOT locate field wire paths. Use Progressive Electronics' 521 Wire and Valve Locator to identify and flag the wire path before using the Pulser.

Isolate the Suspected Fault Wire

The Pulser 2003 operates most effectively when you isolate both ends of the wire you suspect has a fault. For instance, if you suspect a problem in the station wire, detach it from the controller and from the valve. If you suspect a problem in the common wire, isolate the wire between the valves that do not work and test the path between them.



PE 2003 Pulser

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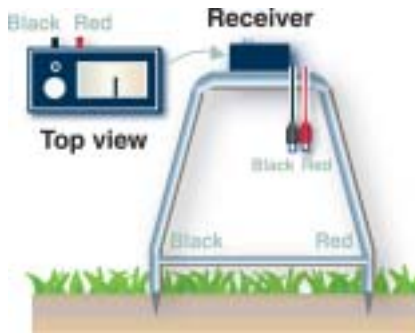


Figure 1 - Pulser receiver set-up

Transmitter Set Up - Establishing a Proper Ground

SAFETY TIP: The Pulser 2003 produces high voltages. Never touch the red or black transmitter leads while the unit is on!

The Pulser 2003 requires a good ground in order to operate properly.

- 1 Connect the red lead to the wire you suspect has a fault and the black lead to earth ground with the stake provided.
- 2 If the clock is indoors, the stake MUST be grounded where the wires exit the building. This often requires running wire to the outside. DO NOT use an inside "building" ground or water pipe. (See figure 2)
- 3 When on, the transmitter sends a burst of voltage every 3 seconds. This voltage travels through the wire, bleeds to the earth ground at the fault and returns in a straight line to the ground stake

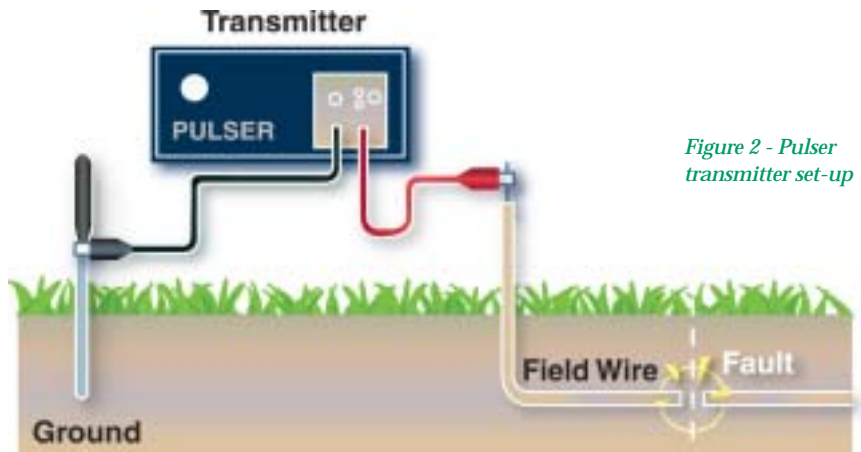


Figure 2 - Pulser transmitter set-up

or reference point. This is what the receiver tracks to locate the fault.

Operating the Pulser

- 1 Using the A-frame, probe the earth on a path that is parallel to the marked path of the buried wire, moving away from the transmitter.
- 2 Every time the transmitter pulses, it sends a **loud audible and electronic tone**. Watch the meter on the receiver when you hear the tone. You will see a momentary kick (or movement of the needle) in the direction of the fault. If the needle bears to the right before returning to center, the fault is toward the right. If it bears toward the left, the fault is to the left (See figure 3). Move the A-frame in the direction of the fault. If the needle remains centered or does not move during the pulse, it is null and the equipment is straddling the fault (See figure 5).
- 3 The kicks decrease in strength or even

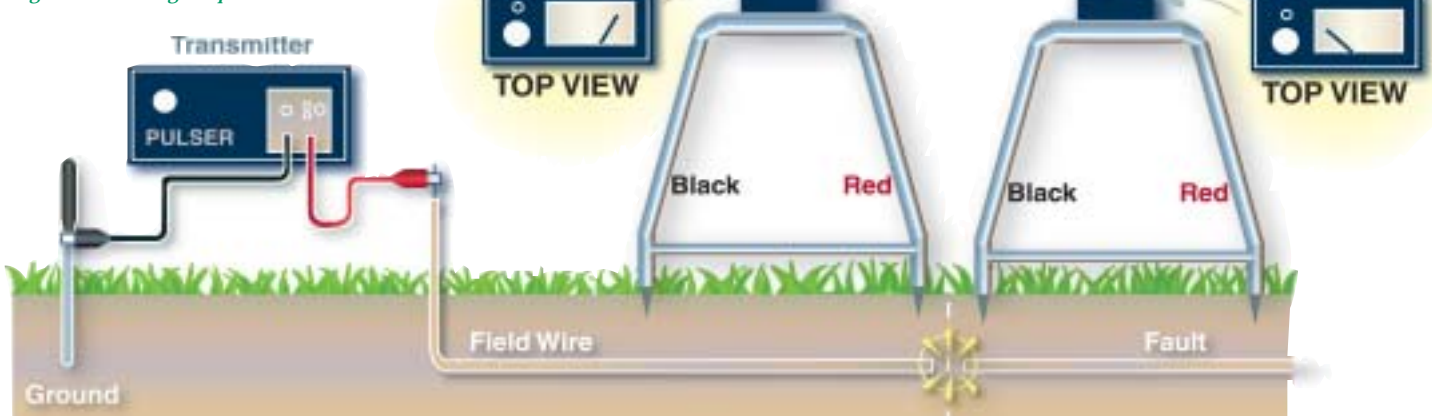
disappear completely as you move down the path away from the fault. They increase in strength (or reappear) as you approach the fault.

Identifying the General Location of the Fault

TIP: Learning how to accurately estimate where you should insert the A-frame into the ground allows you to cover more distance between insertion points and speeds up the locating process.

You can determine the approximate distance to the fault by analyzing the strength or weakness of the kicks. For example, if you are probing the path and lose the intensity of the kick 30 feet (9 meters) away, even after turning the receiver knob up all the way, you can usually move in 30-foot increments. If you walk 100 feet (30 meters) before you lose the intensity of

Figure 3 - Probing the path to find the fault



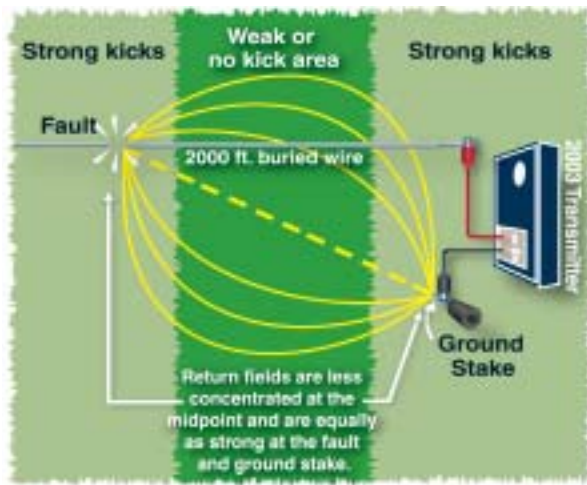


Figure 4

the kick, move in 100-foot increments.

This loss of intensity occurs because the ground return field is less concentrated at the mid-point, with stronger signals when the receiver is close to either the fault or the ground stake. (See figure 4)

Continue probing the path until a “reversal” or “black kick” occurs. At that point, the fault lies between the last ground reference point and your current position.

To close this distance, slowly move the A-frame back toward the direction of the black kick. Continue in this direction until a “red kick” occurs. When this happens, the fault lies somewhere between the two ground probes of the A-frame. The meter should be null or be straight up and down when the A-frame straddles the fault. Mark this spot. (See figure 5 to the right)

Pinpointing the Specific Location of the Fault

Now that you know the general area of the fault, you need to pinpoint the location. After marking the spot, turn the A-frame until it is at a right angle to the path you were just following and mark where the second null occurs. For example, if you were heading north/south, now move east/west. (See figure 6-back page)

The two marks form an “X” and the fault lies directly beneath the X. When you use this method to cross-hair the fault, you can narrow down the location of the break and nick to an area the size of a fist. With the right, moist soil condi-

tions and operator experience, the Pulser can be extremely accurate.

To double-check the location of the fault, you will need to check the area from four directions. Divide the area surrounding the marked, suspected fault into four “quadrants.” Re-orient the A-frame by turning it at a 90-degree angle in each quadrant around the suspected fault (See figure 7-back page). If it’s an actual fault, the meter will kick toward the center or suspected fault in each quadrant.

If the meter does not kick toward the center in one of the quadrants, it could be a false reversal. See *Special Problems* section below.

Special Problems You May Encounter When Locating Faults

False Reversals

These false readings occur when the path of the buried wire with the fault turns and crosses the ground return line or path that the voltage takes on its way back from the ground fault to the ground stake. (See figure 8-back page)

To insure you have located an actual fault and not a false reversal, re-orient the A-frame in quadrants around the suspect-

ed fault as described earlier. If it’s a false reversal, the meter will not kick in the direction of the suspected fault in one of the quadrants. This indicates that the actual fault is down the line in the direction of the quadrant that did not kick.

Multiple Faults

More than one fault in the buried wire can cause the receiver to reverse or kick in the opposite direction at each fault. The most solid fault will produce the strongest signal or kick. Try repairing the first fault, then reconnect the Pulser and locate the next until you’ve repaired all of them.

High Resistance Faults

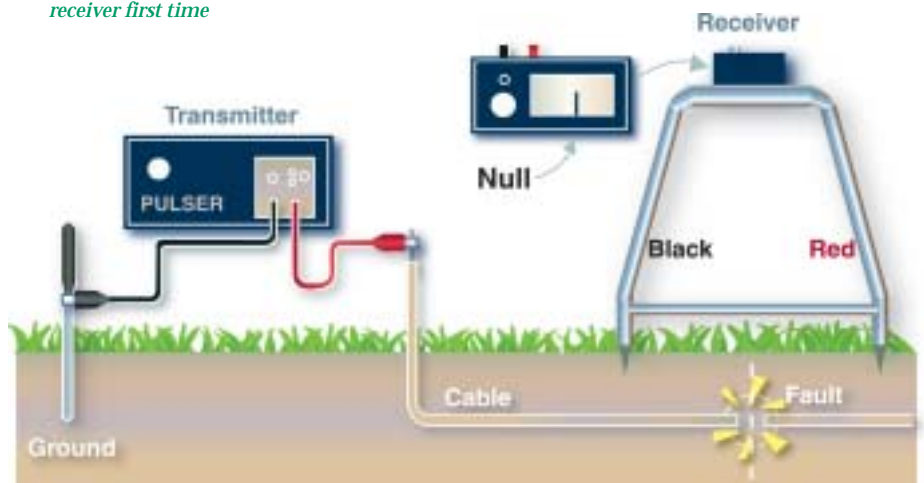
A very high resistance will only produce a weak kick. To pinpoint this type of fault, turn the sensitivity knob clockwise or all the way up. This makes the high resistance fault easier to pinpoint.

Faults under Paved Areas

You have located a fault that is under a paved area if the kicks point toward the paved area on one side of the pavement and point in the opposite direction, toward the pavement, on the other side. Your most cost effective and time efficient option is to excavate both sides and pull a new wire through that existing conduit. If that’s not possible, pinpoint the exact location of the fault from the top of the paved area.

Using a wire at least twice as long as the paved area, strip both ends and attach one end to the ground stake on one side of the pavement. Attach the other end to the

Figure 5 - Nulling receiver first time



inside leg of the Pulser A-frame. Insert the outside leg of the A-frame into the ground on the side of paved area opposite the ground stake. Move outward in small increments, watching for the reverse kick on the meter. When it reverses, move the inward leg in small increments until the meter needle shows null. Gather the slack in the wire and attach it to the outside leg of the A-frame. Bring the A-frame to the ground stake on the other side and insert the lead leg into the ground next to the ground stake. Holding the wire, which is now doubled over, walk back to the slab. The fault is below the end of the loop in your hand.

Repairs and Re-checks Complete the Job

Once you have located and completed repairs, always recheck the system. The system should have continuity and the valve(s) should come on. Remember, don't pull the marker flags until the system is up and running on every station or you may create more work!

With a little practice, both the Wire and Valve Locator and the Pulser 2003 can eliminate the guesswork and significantly reduce the time involved in field wiring repair.

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for more information

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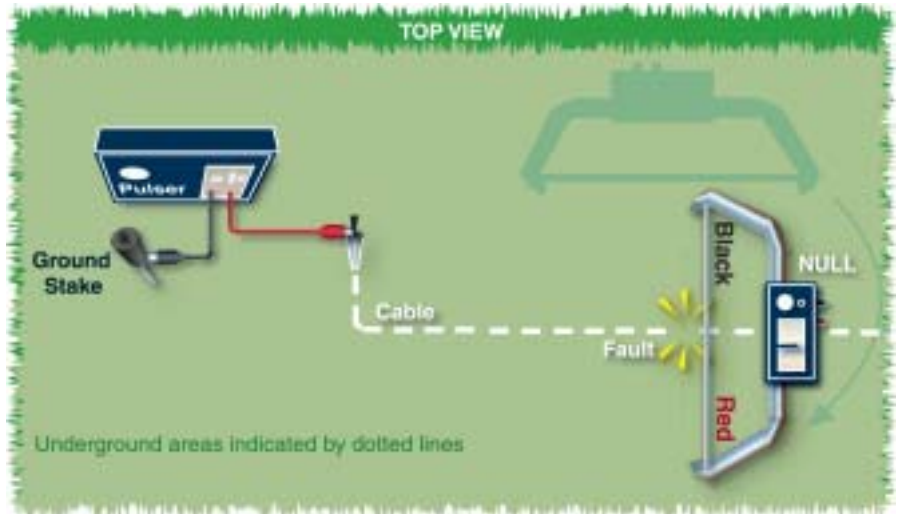


Figure 6 (above) - Nulling receiver second time

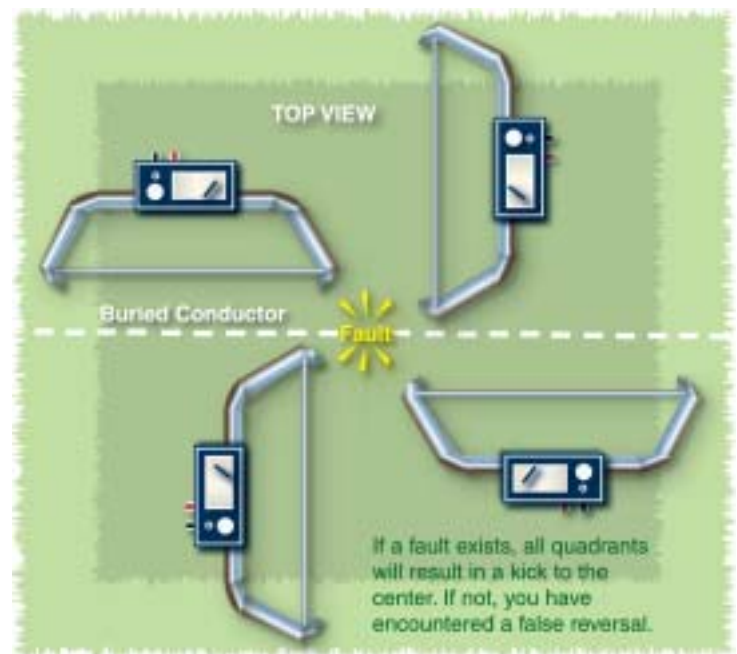


Figure 7 (right) - Kick to center in four quadrants

Figure 8 (below) - False reversals

