

## Do-it-yourself four-electrode probe for soil mapping (Landmapper ERM-01 and ERM-02 models)

### Materials

- ¾" PVC pipe, one section of 10'.
- 2 T-shaped PVC pipe fitting accepting ¾" pipe from all three ends.
- 2 ¾" PVC cups (optional).
- About 30' #18 AWG isolated stranded wire, preferably 2 colors (red and black), 15' of each.
- 1"x2" Velcro strip (optional).
- 3 #6 1.5" screws for wood (optional).
- 4-electrode probe kit (available from Landviser, Inc.) including:
  - 4 stainless steel electrodes (sharpened d= ¼" L=6" bolts)
  - 8 stainless steel ¼" nuts for connecting electrodes with the wires
  - 4 nylon isolated terminals for 18" AWG wire with 5/16" opening
  - 4 banana plugs (2 black, 2 red) for connecting with LandMapper terminals

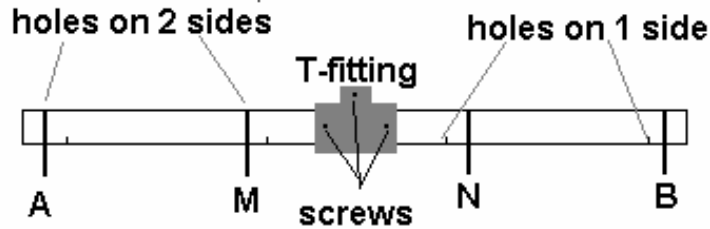
### Tools



- PVC pipe cutter
- Wire cutter
- Wire stripper
- Wire crimper
- Electric drill
- Rubber mullet (optional)

### Procedure (example for Wenner probe configuration)

1. Choose the inter-electrode distance **a** (assuming 10"). Calculate the length of the one shoulder of 4-electrode probe:  $L1=3*a/2+1\ 1/4\ ''=16\ 1/4\ ''$
2. Cut 2 pieces of the PVC pipe of length  $L1=16.5''$ . Cut 3.5' pipe for the handle.
3. Connect 2 pieces of length  $L1$  in T-fitting to form a straight line. Use rubber mullet to force tubes all the way into T-connection. Mark locations of A and B electrodes at the each end of the probe, at the 2" from the ends. Mark the locations of M and N electrodes at **a=10''** distance from A and B.
4. Drill ¼" diameter openings at the each mark through the both sides of the pipe for the electrodes (try to keep the drill bit perpendicular to the tube).
5. At approximately 1 inch from the each opening drill holes for the wires only at one side of the pipe.

6. Cut 4 pieces (2 black and 2 red) of wire in the length:  
 red for A or B --  $L_2 = a + a/2 + 4.5'$   
 black for M or N --  $L_3 = a/2 + 4.5'$



7. Put the wires through the holes in one side of the pipe (red for AB, black for MN) and lead them through the pipe out of the top opening in T-fitting.
8. Strip  $\frac{1}{4}$ " of the end of the each wire sticking from the holes for each electrode and crimp ring terminals to the wire ends.
9. Insert electrodes through the corresponding openings and tight each with a nut to the PVC pipe. Put ring terminals over the electrodes and secure them with the second nut so the ring terminal is positioned between the nuts.
10. Optional: Fit 2 cups at the ends, of each probe shoulder (near A and B electrodes).
11. Strip  $\frac{1}{4}$ " from the end of each wire and connect color-coded respective banana plugs to the wires as described on the banana-plugs' package.
12. Put wire ends with banana plugs through the PVC pipe handle. Insert the handle all the way into the top opening in T-fitting. You may want to use a mullet to force the handle into the fitting, but it will make the handle difficult to disassemble.
13. Optional: Drill small holes through T-fitting connecting the handle with the probe. Using three #6 1.5" wood screws secure the pipes to the T-fitting (see figure).
14. Run wires with banana plugs at the top of the handle through the shoulders of another T-fitting and mount it on the top of the handle.
15. Optional: put Velcro strips on the back of the LandMapper unit and on the top of the handle T-fitting to snap probe and the unit together.
16. Calculate the K coefficient for the new probe and enter it in the device memory (see OPERATION PROCEDURES).
17. Connect red AB banana plugs with  socket and black MN banana plugs with  socket. The device is ready for measuring electrical resistivity.