

How to Make a Fish Detector Electrode

Materials

Gray PVC tubing, ¼ inch schedule 80
Belden cable #8413: 2 conductor miniature shielded microphone cable
DIN connector, Lumberg 3 pin male, from Allied Electronics
Silver wire, 0.010 inch diameter (bare) or thicker
Pure silicone seal (in caulking gun size dispenser)
Electrical tape, 3M Super 88
Paper towels

Tools

Saw, (hack saw or band saw)
Lathe
Drill press (or electric drill)
1/8 inch drill bit
Cable tools:
Nipper; stripper or razor blade; push pin; small vise or wire holder
Soldering iron and rosin core solder
Forceps (with small but not tiny ends, to help get cable strands in place)
Metric ruler or tape measure
Fine file (to smooth solder joints)

Procedure

1. Cut a piece of gray PVC pipe about 10 inches long; leave a little extra so you can square up the ends on the lathe later.
2. Mark the center with a fine point Sharpie.
3. Mark points 100 mm to each side of center.
4. With the lathe, cut grooves around the electrode at the three marks. The grooves should be about 1/16 inch wide and about 1/16 inch deep (so the silver wire will be well seated and prevented from meandering). Use the lathe to square up the ends of the electrode, too.

5. Drill 1/8 inch holes, one in each groove, to provide access to the three strands of the Belden cable. Be sure the holes are “clean” so they will give as much work space as possible.
6. Determine the length of cable needed and then add a foot for the connections. Cut it off with the nippers.
7. Attach the 3 pin DIN connector to one end of the cable. Take your time and make good solder connections; be sure the shield and the two conductors are well isolated. For our “standard” electrodes, i.e. those used with the CWE amps, the + (positive) conductor will be the white wire and will attach to the DIN terminal #1. The – (negative) conductor will be the black wire and will attach to the DIN terminal #3. The cable shield will be attached to the DIN terminal #2. Use a small piece of shrink wrap on the shield wire to keep it isolated.
8. Prepare the other end of the cable for connection to the electrode body:
 - a) Remove about 10 inches of the outer insulation.
 - b) Using a push pin, unravel the shield keeping it as neat as possible.
 - c) Separate the black and white conductors.

The white lead will go to the front (+) end hole of the electrode.
The black lead will go to the rear (–) end hole of the electrode.
The shield will go to the center hole of the electrode.

Carefully twist up the shield so that it is a long flexible strand. Measure or eyeball the distance required for each of the three strands. Remove enough insulation from the white and black strands so that only the wire will exit the holes when the cable is inserted into the electrode body. Twist up the white and black wires so they can be easily manipulated, but do not solder them.

9. Thread the three resulting strands into the electrode body and pass them through the appropriate holes, using the forceps to help you. This is hard to do and can be frustrating. If all else fails, insert some fine flexible wires into the holes from the outside, push them up to the end of the electrode body, solder them to each strand, and use them to pull the strands through the holes. When all the wires are in place, you

may want to secure them with some tape to be sure they do not pull back inside!

10. Cut three 4inch pieces of the silver wire.
11. Wrap a piece of silver twice around the groove at the front (+) end of the electrode and twist up the ends with the bare end of the white conductor.
12. When everything is snug and even, solder the joint. Try not to melt the PVC with the hot iron!
13. Repeat with the shield strand and then with the black (-) conductor.
14. Carefully cut off any messy ends with sharp nippers and file if necessary to smooth the solder joint.
15. Tape the three joints tightly, going around 3 or 4 times with the electrical tape; try to confine the silicone seal to the lumen of the electrode during the filling.
16. Mount the tube of silicone seal in the caulking gun and prepare to fill the electrode from the positive end. Keep the nozzle of the sealant tube small; get help from someone if necessary to insure good filling. When the silicone seal begins to come out at the negative end, stop filling and take the pressure off the caulking gun so it will not keep extruding sealant.
17. Remove the electrical tape covering the solder joints and holes, and use a paper towel to remove any excess silicone seal. Smooth the sealant at the ends of the electrode to make it neat, and then set it aside to set and cure overnight, or longer if possible.

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