

## Double Depth Penetration with Standard Cable Sets

Double or more depth penetration resistivity surveys can be carried by combing two or more standard sets of electrode cables. Deep penetration requires long electrode cable layout surveys can be done either by using cable sets with longer electrode take-out separations, or multiple standard cable sets. For example, instead of using a cable set with 10 metre electrode separations it is possible to combine two cable sets with 5 meters take-out separation. The latter is often a good solution since it allows surveying to be carried out either with two separate standard mode data acquisition systems in different locations, or combining the two for a deeper survey. This solution also opens a choice to maintain the near surface resolution of the standard cables in the deep survey, or to skip every second electrode to increase the field productivity. It is also an advantage to have multiple sets of standard cables if a 3D survey is to be carried out. In order to use this solution one Terrameter SAS 1000/4000 is required, plus one Electrode Selector ES10-64C for each set of electrode cables. The ES10-64C units are linked with a signal and communication cable only, as illustrated in Figure 1.

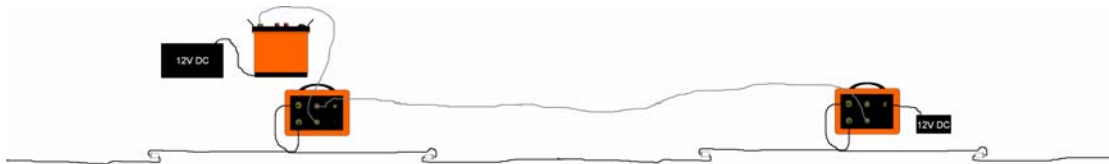


Figure 1. Sketch showing how to connect multiple electrode cable sets and units of Electrode Selector ES10-64C (not to scale).

A survey was carried out over a major fault zone on the edge of a horst close to Hardeberga in southern Sweden (Figure 2). Two combined sets of standard cables with 5 metres take-out separation were used, giving a total layout of 800 m. Note the large depth of investigation in combination good near surface resolution. Multiple gradient array protocol files were used, with some Wenner-Schlumberger measurements added for the longest electrode spacings (1444 data points in total). The data set was inverted with Res2dinv, using the robust inversion option.

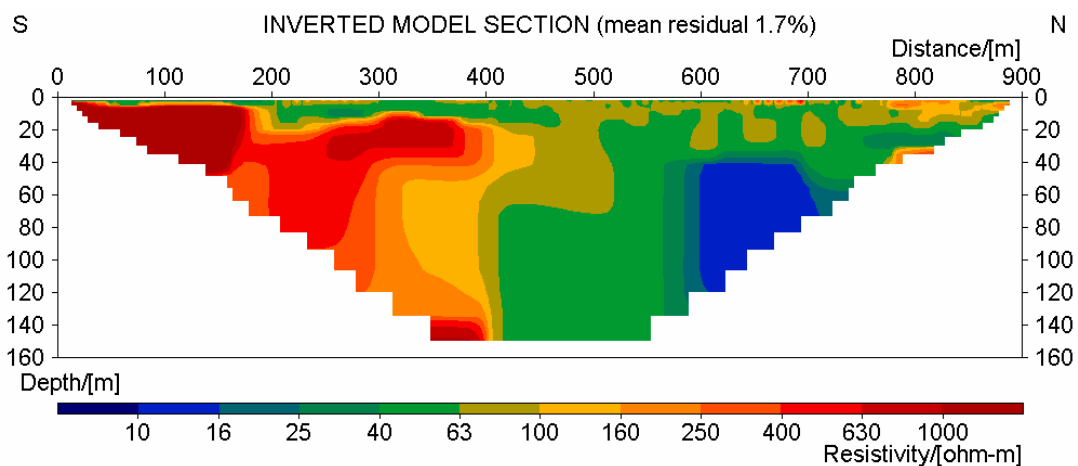


Figure 2. Example of inverted section from survey carried out with two combined sets of standard electrode cables with 5 metres take-out spacing.

## Equipment and software needed / recommended for a survey as presented above

### Data acquisition:

- ABEM Terrameter SAS4000 (1 unit)
- ABEM Electrode Selector ES10-64C (2 units)
- ABEM standard set of 4 cables with 5m take-out spacing (2 units, one extra cable recommended)
- Cable Joint (4-5 units)
- Steel electrodes (minimum 81, more than 100 recommended<sup>1</sup>)
- Cable Jumpers (minimum 81, more than 100 recommended<sup>1</sup>)
- Batteries 12V DC (1 unit min. 24 Ah, 1 unit ~5 Ah)
- Electrode hammers
- Multiple gradient array protocol (e.g. GRAD4LX2, GRAD4SX2)
- Walkie-talkies
- Electrically insulating boots and gloves
- GPS or levelling / surveying equipment (unless done by third party)
- Battery charger

### Data processing and presentation:

- Computer with Windows 2000 or later
- ABEM SAS utility software (delivered with equipment)
- Erigraph (delivered with equipment)
- Res2dinv

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<sup>1</sup> The optimal amounts depends on if all electrode take-outs or every second electrode take-out is used, but also on electrode grounding conditions (in dry ground more than one electrode may be used for each take-out) and field logistics (e.g. if driving is possible along the survey line or everything must be carried).