

PA20

Multi-Probe Array

Introduction

Multi-probe array PA20 is a versatile modular frame system for use with the RM85, RM15 or RM4 Resistance meters. Different size beams clip onto the handle frame giving a wide range of probe arrays and detection depths. Stainless steel probes can be easily added, removed or interchanged to make up desired configurations. The PA20 can be configured into a number of different probe arrays including : Twin of spacing 0.25m, 0.5m, 0.75m, 1m, 1.25m, 1.5m, 1.75m or 2m, 0.5m Wenner, 0.5m Double Dipole, and mini-Schlumberger. You can easily vary the spacing of a Twin array configured with a PA20 probe array in order to optimise detection depth for a particular application - (see Performance for more details).

Addition of the optional RM85 multiplexer card or external MPX15 multiplexer for the RM15 opens up a much wider range of arrays and applications : parallel Twin arrays (2, 3 or 4) for much faster ground coverage, multiple Twin arrays of different spacings for depth investigations, simultaneous measurement of Wenner alpha, beta and gamma arrays etc. The multiplexers are also fully programmable allowing the user to configure and store their own measurement sequences and configurations. The auto-log modes of the RM85 and RM15 make multiplexing totally automatic, surveys even faster and more efficient, whilst reducing operator errors and fatigue (see RM85 and MPX15 data sheet for more details).

The Twin array is a popular configuration designed for rapid detailed area surveys, at depths roughly equal to the probe spacing - see figure on opposite page. It requires only two probes on a frame to be moved from station to station, whilst the remote pair of probes remain fixed. Placement, orientation and insertion depth of the mobile probes is non-critical. If combined with the auto-log mode of the RM85 or RM15, this results in a rapid data collection system.

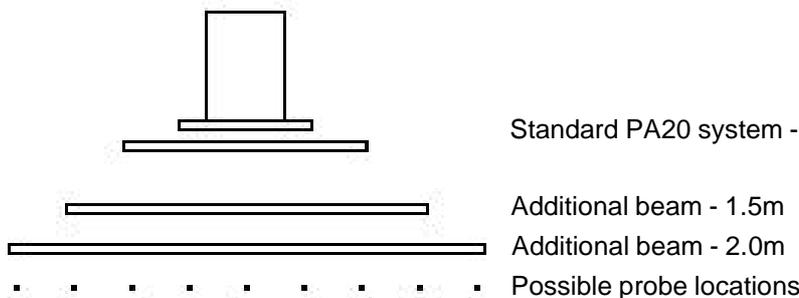
Probe Array Components

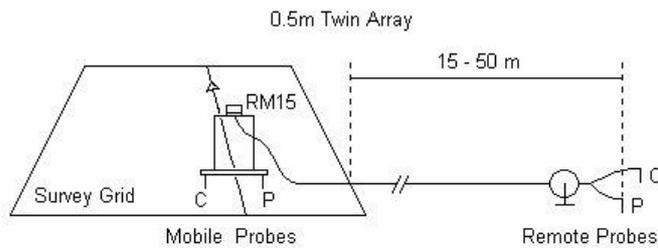
The standard PA20 array (017-020) comprises a clip-on handle frame with quick release latches (see figure), one 0.5m beam, one 1.0m beam, 2 stainless steel probes and associated fasteners, one cable drum containing 50m of heavy duty arctic grade twin cable, two stainless steel remote probes, cables to connect the remote probes to the cable drum. A variety of different length jumper leads are provided for connecting the probes to the frame terminals, depending on the lengths of additional beam sizes ordered. The standard PA20 array can be configured as a 0.25m, 0.5m, 0.75m, or 1m Twin.

Additional beams may be purchased to configure other arrays, such as Wenner, Double Dipole, or multiplexed arrays. Their relative sizes are shown opposite, along with the standard beams for comparison. Additional beam sizes are 1.5m (019-019) and 2.0m (019-020). Longer beam lengths are available to order. Where more than the standard 2 probes are required additional stainless steel probes (019-023) must also be ordered (a maximum of six probes can be mounted at any one time). An Adapter or MPX15 multiplexer is required to interface the PA20 to an RM15 or RM4 resistance meter. The RM85 can interface directly to the PA20 but adapters will be required if the multiplexer option is not present and for the Pole-Pole array.



Photo showing : quick release system for beams and jump leads from handle frame terminals to probes.





Adapters

The lead from the PA20 frame terminates in a 6-way plug which must be connected to the 2-way connector on the RM15 or RM4 resistance meters. This may be achieved using either individual adapters for different arrays or the MPX15 multiplexer (RM15 only) which will interface virtually all arrays. The RM85 can connect directly to the PA20 so an AD1 (see below) is not required.

AD1, AD3, AD5 The most popular adapter is the AD1 (029-020) which is suitable for configuring a single Twin probe array of any spacing (0.25m to 2m). The next most popular adapter is the AD3 (029-022) for the RM15 or AD5 for the RM85 with no multiplexer option, which enables a 0.5m Wenner, 0.5m Double-Dipole or mini-Schlumberger array to be configured (the remote probes and cable are not used in these cases, but two additional stainless steel probes, 019-023, are required).

AD2, AD6 The Gradient array adapter, AD2 (029-022) for the RM15 or AD6 for the RM85 with no multiplexer option, connects the two potential pins of the resistance meter to the frame, and connects the two current pins of the resistance meter to leads terminated with 4mm socket. Two additional 50m small cables (019-015 for a pair) are required to connect these to two remote current probes which can be the pair provided with the standard system. Alternatively, two of the leads and probes from the PA3 probe array (see separate data sheet) may be used instead.

AD4 The AD4 adapter (029-023) will convert all Twin arrays into the Pole-Pole equivalents. This adapter converts the "Remote Probes" two-pole connector on the RM85, RM15, RM4 or MPX15 into two separate leads (current and potential), each terminated in a flying 4mm socket. As for the AD2, two additional 50m small cables (019- 015 for a pair) are required to connect these to the remote probes. The AD4 may be used with both the RM85 multiplexer, MPX15 multiplexer and AD1 adapter.

Extension Leads

Remote probe Extension leads, each 25m long, are advised when using longer beams in order to minimise variation of readings over a grid due to geometry effects. They will enable larger areas to be surveyed from the same remote probe position and can simplify grid matching if a wide remote probe spacing (5-10m) is used.

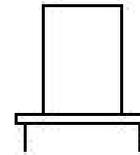
MPX15 Multiplexer (RM15 only)

The MPX15 multiplexer effectively integrates adapters AD1, AD2 and AD3 into one box, though an AD4 will still be required for the Pole-Pole array, and additional 50m cables will be required for both Pole-Pole and Gradient arrays. The AD1 may still be a useful lightweight addition to your system if a single twin probe array is to be used frequently. Of course, the MPX15 offers much greater scope than is possible with just single measurement sequences and adapters. The MPX15 may be used to configure single, parallel or multiple arrays, offering much faster or more detailed area coverage, or depth investigation (see MPX15 data sheet for more details).

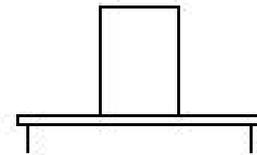
Environmental Considerations

Great care has been taken to maximise the conditions in which the PA20 can be used. However, regular cleaning by the user is required to avoid tracking problems in wet and muddy conditions. Since all probes need to make simultaneous contact, some terrains may cause problems, especially if there are 6 probes on a wide frame. For example very dry, hard and stony ground may be difficult to survey, especially with a 2m frame. However, on more moist ground, surface contact is usually sufficient to obtain good readings, even in auto-log mode.

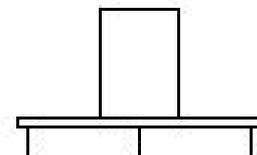
Some possible PA20 and MPX15 configurations



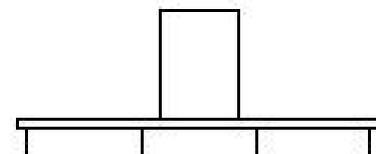
Single 0.5m Twin



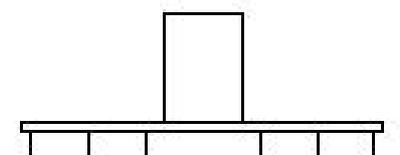
Single 1.0m Twin



Multiplexed 0.5m, 1m Twin
Parallel and Multiple



Multiplexed 0.5m Wenner
and Double-Dipole



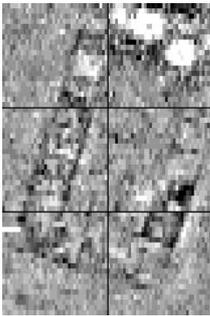
Multiplexed 0.5m, 1m, 1.5m Twin
Aligned centres

PA20 
Multi-Probe Array System

PA20 Performance

The standard 0.5m Twin array finds greatest application in archaeological surveys as many features are near surface, and speed, ease of use, simple response and excellent resolution (approximately 0.5m) is often of greater importance than detection depth limitations (0.5m - 0.75m for typical archaeological targets). Where more substantial structures are involved, such as capped mine shafts, detection depth can be greater. Detection depth can be improved by increasing the Twin array size, giving a commensurate increase in detection depth. However, this will be at the expense of resolution, and if there are near surface features present, narrower than the array dimensions, these may give rise to multiple responses (or artifacts). Nevertheless, providing one remains aware of such possibilities during interpretation, useful information at greater depths can be achieved. The standard PA20 can be configured as a Twin array up to 1m wide, whilst the addition of beams can increase the array size up to 2m, giving up to a four-fold increase in detection depth.

A survey at the the Roman town of Wroxeter highlights the value of resistivity surveying with different probe configurations and separations. An RM15 resistance meter, MPX15 multiplexer and PA5 probe array with medium wings was configured with six probes, to make simultaneous 0.25m, 0.5m, 0.75m, 1.0m, 1.25m and 1.5m Twin measurements, along with 0.5m Wenner and Double-Dipole measurements at each reading station - the newer PA20 can be configured in the same way with a 1.5m beam. These data sets, shown below, reveal different structures at the different probe separations. The narrower spacings emphasise the cellular nature of the buildings and internal partitions whilst the wider spacings reveal more substantial, underlying internal structures, along with lines of external colonades. All data sets have been despiked, edge-matched, high-pass filtered, normalised and interpolated using Geoplot.



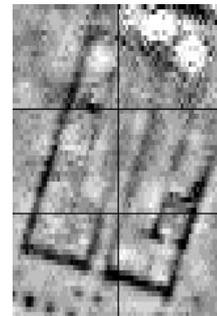
0.25m Twin



0.5m Twin



0.75m Twin



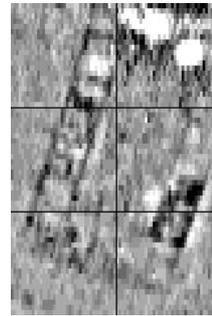
1.0m Twin



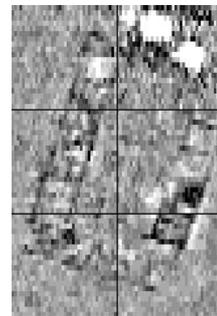
1.25m Twin



1.5m Twin



0.5m Wenner



0.5m Double-Dipole

Typical Specification - subject to change

Dimensions configured as 0.5m Twin (including probes)

Height 980mm, max width 665mm

Dimensions configured as 1m Twin (including probes)

Height 980mm, max width 1165mm

PA20 weight (configured as 0.5m or 1m Twin)

3.3 Kg (0.5m Twin), 3.9 Kg (1m Twin)

Cable Drum and remote probes weight

4.1 Kg

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