MONROE ELECTRONICS

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Application Note APNE-0007
Isoprobe® Accuracy Limitations

BEWARE – STRAY ELECTROSTATIC COUPLING

NOTE:

For most applications of Monroe Electronics' probes, where probe-to-surface spacing is less than 3mm (1/8"), the effects of stray electrostatic coupling is negligible and accuracy of better than 0.2% is maintained. However, intense sources in close proximity to the probe aperture can influence the electrostatic field at the sensitive aperture and cause errors.

Monroe Electronics ISOPROBE® instruments provide excellent accuracy as a function of probe-to-surface spacing **providing that** undesired coupling to surfaces other than the surface-under-test is negligible.

If undesired coupling to a grounded surface or a charged surface exists, the probe will function to assume that potential which will produce a null in the electric field **at the sensitive aperture**. (Note: any field that might exist on other portions of the metallic probe surface does not influence the operation of the instrument.)

In a typical, real world situation, it is very common for grounded surfaces or charged surfaces to exist which will create additional electric field components which will produce the above described errors. See Figure 1.

This is particularly true of miniature probes such as the Monroe Electronics Model 1017 as their dimensions adjacent to the sensitive aperture are much smaller relative to the probe-to-surface spacing.

This effect can be greatly reduced, however, by attaching a conductive shroud to the probe which extends the plane conductive surface in which the sensitive aperture exists. This shroud will effectively shield the sensitive aperture from the stray fields while having little influence on the desired coupling to the surface-under-test. See Figure 2.

These effects are dramatically illustrated by the curves of Figure 3.

- **Curve A** is a plot of output error versus probe-to-surface spacing at 1000 volts on the surface-under-test – that surface being a one meter square ("infinitely large") conductive surface. An effort was made to keep all other surfaces better than one meter removed from the probe.
- **Curve B** applies to a case where, in addition to the one meter square conductive source at 1000 volts, a one meter square grounded surface is positioned 2.5cm (one inch) above this surface with the probe "looking" at the charged surface through a clearance hole in the center of the grounded metal plate. The same plot of error versus probe-to-surface spacing is shown. Note the substantial degradation in accuracy.
- **Curve C** uses the electrode configuration of B above but with a 5cm square shroud attached to the probe in the same plane as the sensitive aperture with the sensitive aperture in the center of the shroud. The shroud must be electrically connected to the probe body.

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Note the obvious improvement in the independence-of-spacing characteristic in Curve C – the shrouded probe.

As previously noted, the curves reveal a probe-to-surface spacing of 3mm (1/8") or less will introduce less than 0.1% additional error.

It may not be possible to utilize a shroud of 5cm dimensions but any increase in the effective dimension of the probe bottom will clearly be beneficial.

FIGURE 1

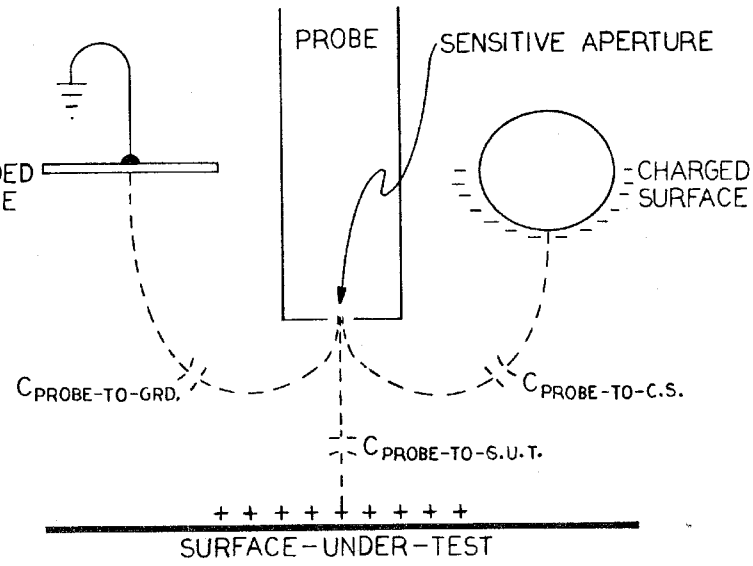

FIGURE 2

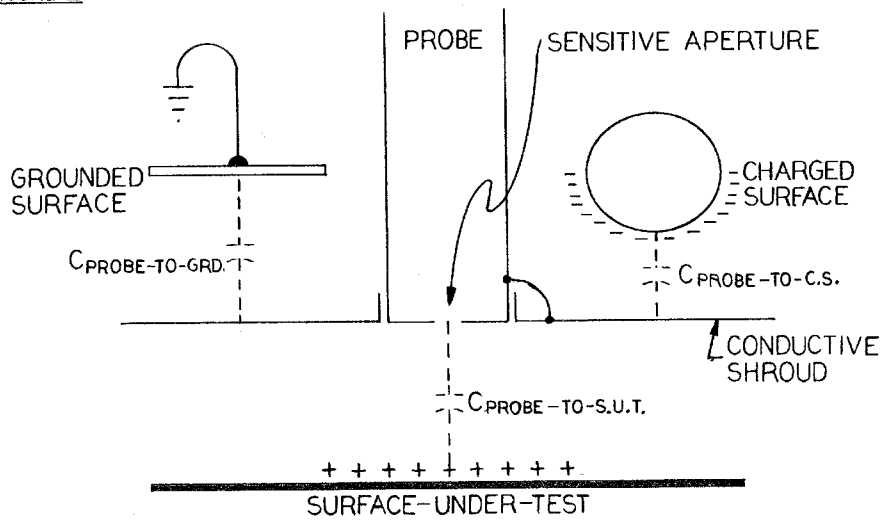

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FIGURE 3