

From Microarrays to Plate Arrays: Advances in Technology

Genomic Technical Note

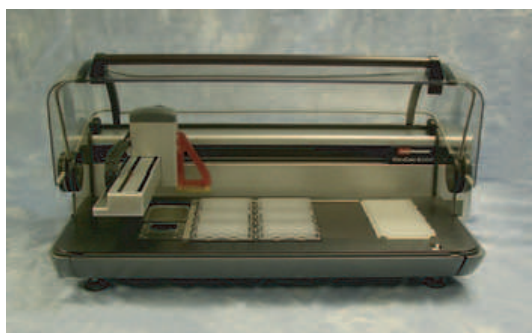
OVERVIEW

DNA and more recently protein microarraying onto slides are techniques that are widely used in scientific research. This slide-based approach provides the user with the opportunity to investigate thousands of genes or proteins present in a single sample. However, there is also a growing demand to multiplex assays to enable an improvement in throughput for assay production.

Genomic Solutions, the market leader in DNA and protein microarraying, now offers their Plate Arraying technology on the *BioRobotics*® MicroGrid II and the *GeneMachines*® OmniGrid Accent. This new option enables the production of DNA and protein microarrays in 96 and 384 well microplates and can allow the printing of over 1000 features within individual microplate wells. Such a multiplexed approach enables researchers to drive the advancement of microarray production into new application areas. Examples include micro ELISAs, diagnostic arrays and other protein-protein studies in a higher throughput format to that previously available.



BioRobotics MicroGrid II

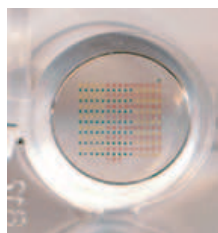


GeneMachines OmniGrid Accent

The *BioRobotics* MicroGrid II has the capacity to hold 16 microplates while the *GeneMachines* OmniGrid Accent is capable of holding 6 microplates. In both cases this enables a researcher to improve assay production by up to a factor of fifty, compared to current microarray methods.

PLATE ARRAYS – THE CHALLENGES

- Production of high density multiplexed arrays
- Increasing throughput to allow walk-away automation
- Depositing samples onto delicate surfaces
- Avoiding cross contamination
- Maintaining sample stability
- Minimize dust contamination within arrays



An array deposited into one well of a microplate

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PLATE ARRAYS - THE SOLUTIONS

Production of high density multiplexed arrays

Adapter plates are available for both instruments enabling the user to print arrays into individual wells of microplates rather than onto slides. The Digilab OmniGrid Accent can array into 6 destination plates whereas the Digilab MicroGrid II has almost three times greater capacity, holding 16 microplates. The Genomic Solutions microarray platform has been designed with flexibility as a priority and can accommodate many plate definitions. A library of plate definitions for the most commonly available microplates is available in the software, allowing the user to set up their array experiments simply and quickly.

In house research has shown it is possible to array and accurately quantitate at least 1000 DNA or protein spots in a single well of a 96 well microplate or 450 features in each well of a 384 well microplate. Arrays can be printed in either a circular or square format to ensure maximum use of well space.

Digilab provides flexibility in plate configuration enabling researchers to array from 96 wells into 384 wells and vice versa as well as between plates of the same format.

These high density arrays are produced using contact printing with Telechem 946 pins or MicroSpot 2500 or 10K split pins*. These split-pin designs load up to 250nl of sample into the pin by capillary action, covering the end of the pin tip with a thin layer and allow printing by simple surface tension and adhesion. This benefits the researcher by enabling samples to be deposited onto delicate surfaces with minimal contact between pin and substrate.

Due to the viscous nature of proteins researchers may choose to move away from split-pin technology for the plate arraying of proteins. Digilab can offer these scientists the option of proprietary MicroSpot solid pin technology.

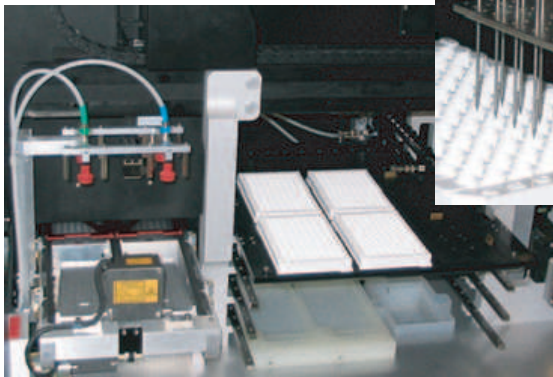


Plate Arraying layout on the Digilab MicroGrid II

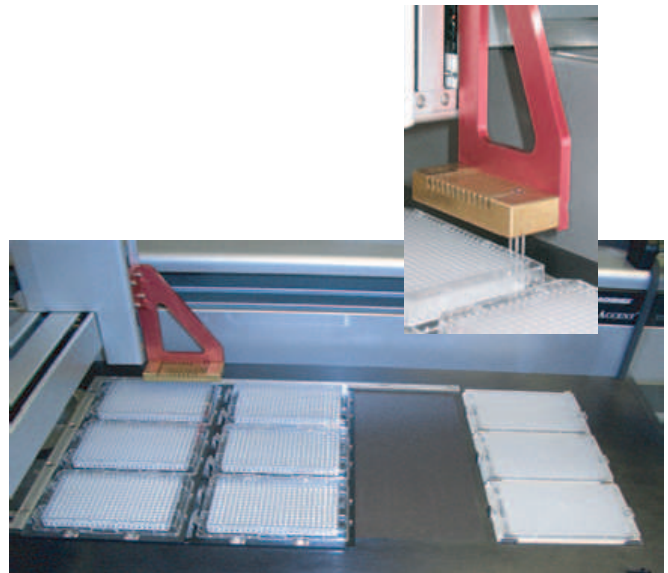


Plate Arraying layout on the Digilab OmniGrid Accent

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Increasing throughput to allow walk-away automation

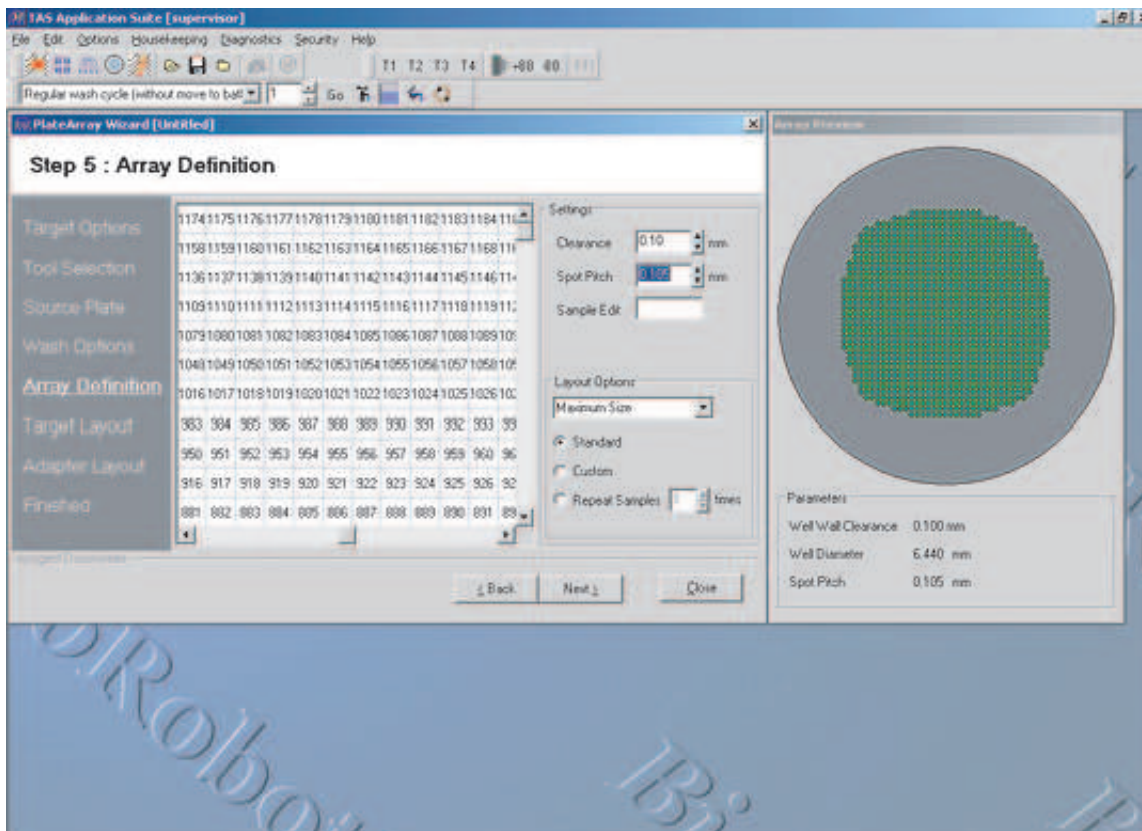
The Digilab OmniGrid Accent can hold 3 source plates and 6 target microplates. The Digilab MicroGrid II has almost three times the target plate capacity and can hold 24 source plates in a cooled environment. These configurations enable a researcher to improve assay production by up to a factor of fifty, compared to standard slide production methods. Both instruments are compatible with 96 and 384 well microplates.

To enhance walk-away operation further, Digilab has also developed microarray software for plate-based applications. Both instruments have flexible software offering a fully customizable array design feature. A simple wizard guides the operator through target plate selection, pin tool configuration and source plate options. The user is then taken through array design and layout as well as pin washing options. After a summary of the parameters selected the plate-arraying run will begin.

A sample tracking function within the software ensures traceability from source plate well to individual spot location within each microplate well by the production of a .gal file.

Depositing samples onto delicate surfaces

Control of spotting speed using Digilab proprietary Soft Touch feature allows precise and gentle printing onto the surface of the well. This is particularly useful when arraying onto a coated surface. Soft Touch improves spot morphology, reduces pre-spotting and enables higher throughput to ensure valuable sample is not wasted.



A screen shot from Digilab MicroGrid II Plate Array software

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Avoiding cross contamination

Thorough pin cleaning is extremely important for successful arraying, especially for protein applications. To overcome this potential issue, Genomic Solutions offers pin sonication in addition to multiple wash stations.

Maintaining sample stability

Genomic Solutions arrayers can include source plate cooling. This is especially important for helping to ensure that proteins remain stable prior to transfer to the substrate surface. Both the Digilab MicroGrid II and the Digilab OmniGrid Accent have humidification as standard to prevent sample evaporation.

Minimise dust contamination within arrays

Both the Digilab MicroGrid II and the Digilab OmniGrid Accent use HEPA filtration to minimize dust contamination within the system, ensuring the printing of clean, high quality arrays.

SUMMARY

In conclusion, there are several challenges to the production of plate arrays. Genomic Solutions can now offer high quality plate arraying as an option or upgrade to the existing Digilab MicroGrid and the GeneMachines OmniGrid Accent. This technology is part of a suite of products from Genomic Solutions designed to assist the researcher in meeting the challenges of achieving a multiplexed approach to DNA and protein microarraying.

For a demonstration of this new technology or advice on your current microarray applications, please contact us at: arraydesign@genomicsolutions.com

**MicroSpot split pins not available in USA or Canada*

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