Automated Liquid Handling for Next Generation Sequencing Sample Preparation Applications

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1 Introduction

Next Generation sequencing technologies are enabling science at unprecedented rates. As the cost reduction and throughput increases of DNA sequencing continue, the number of applications for which sequencing data can be used is rapidly increasing. To support the growing numbers of samples and applications, the Caliper Sciclone NGS v2.0 was designed to provide a walkaway solution for next generation sequencing sample preparation applications. Key considerations include minimal user intervention, elimination of cross-contamination and user error, and flexibility for future application support.

2 Integrated Vision System

A vision system has been integrated into the pipetting head to verify the placement of consumables on the deck prior to a run. This will ensure deck setup is correct, and eliminate head collisions which can waste costly reagents and precious samples. The vision system has several applications, including detection of the correct plate type, presence or absence of disposable tips, and determination of the number of tip racks present in the recessed deck.

3 Recessed Deck for Tip Storage

The addition of a recessed deck allows for incorporation of up to 28 racks of 96 tips onto the deck of the Sciclone NGS Workstation v2.0. With applications, as the majority of applications require specific labware, ensuring labware and reagents to be properly configured on the deck at the beginning of a run. Complete elimination of the possibility of sample contamination is accomplished through the use of disposable barrier tips on the system. The new deck layout allows for additional tip reserves, which further reduces any need for user intervention. As a result, the Sciclone NGS is a true walkaway solution with validated methods for NGS applications including DNAseq, RNAseq, ChIPseq, targeted resequencing, and amplicon sequencing.

4 NGS Workflow Runner

The ability to lock down protocols for end user running is critical to ensure that protocols are not edited. Visualization tools allow for identification of in flight process steps, and real time information about the progress of the automated protocol. The NGS Workflow runner was created to generate a simple user interface to run validated protocols. The software tool enable end users to run protocols on the Sciclone, and enables features such as plate barcode tracking, process visualization, and enhanced error recovery. The software modularized the application protocol, and enables users to enter the protocol at a defined point. In the event of a system error, the process steps required to get the plate back to the subsequent module within the protocol.

5 Validated Protocols

The Sciclone NGS Workstation v2.0 offers validated protocols for a variety of applications, and supports several major reagent vendor kits. These protocols are optimized specifically for use in conjunction with automated liquid handling. In addition to off-the-shelf protocols, our expert team partners with the scientific community to create custom protocols and customization of existing protocols.

6 Summary

To support the growing numbers of samples and applications for next generation sequencing, the Caliper Sciclone NGS Workstation v2.0 was designed to provide a walkaway solution for next generation sequencing sample preparation applications. Key considerations for sample preparation applications for next generation sequencing include minimal user intervention, elimination of cross-contamination and user error, and flexibility for future application support. Key contributors to the flexibility of the system include the large number of deck locators (34), on deck magnet for magnetic bead purifications, integrated gripper, integrated thermal locators (3), and an integrated thermal shaking position. This open concept approach to automation removes the need for integrated stackers or other hardware and minimizes the number of axes of motion for the instrument, resulting in fewer opportunities for error and a more robust platform. The Sciclone NGS includes automated verification of method specific labware, ensuring labware and reagents to be properly configured on the deck at the beginning of a run. Complete elimination of the possibility of sample contamination is accomplished through the use of disposable barrier tips on the system. The new deck layout allows for additional tip reserves, which further reduces any need for user intervention. As a result, the Sciclone NGS is a true walkaway solution with validated methods for NGS applications including DNAseq, RNAseq, ChIPseq, targeted resequencing, and amplicon sequencing. This list continues to grow as we partner with customers throughout the community to enable science capable of meeting the challenges we face as a society.