



Automation of Illumina DNA Prep Kit on Biomek NGenius System

Introduction

Sequencing of DNA is used to identify variations in individual genes, regions and entire organisms. Over the past 40 years, massively parallel sequencing has revolutionized DNA sequencing by drastically reducing the cost of sequencing. As a result, whole genome sequencing has become a common laboratory practice. Illumina's DNA Prep Library kit is a popular kit that is used to prepare DNA libraries for whole genome sequencing. The kit protocol involves tagmentation, cleanup and amplification steps (Figure 1).¹ In this application overview flyer, we demonstrate the automation of an Illumina DNA Prep kit on Beckman Coulter Biomek NGenius next generation library prep system. The automated protocol reduces hands-on time and the errors associated with manual sample preparation.



Figure 1a. Illumina DNA Prep kit workflow. Red highlighted step is performed offline and not with the Biomek NGenius system.
1b. Biomek NGenius next generation library prep system

Biomek NGenius Highlights

- **Reduce errors**
 - Dynamic DeckOptix System reduces deck setup errors
 - Automated Reagent ID and aliquoting prevents manual reagent pipetting errors
- **Minimize Hands-on time**
 - Input carousel and temperature-controlled reagent storage zones reduce manual pipetting of reagents
 - Standard on-deck thermocycler reduces hands-on time
 - Selective Tip Type pipetting head handles both 96 and 384 tips
- **Ease of Use**
 - Portal Software allows you to set up batches and monitor the system virtually
 - Batch Set Up process requires no programming skills
 - Work Aid generates a simple checklist for reagent preparation and labware selection
 - Input Dial simplifies instrument programming
- **Flexibility**
 - Run any number of samples from 4-24
 - Complimentary library of demonstrated NGS applications
 - Ability to use partial tip boxes



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Experimental design

16 samples of Coriell DNA (NA12878 10 ng and 500 ng) were processed in the Biomek NGenius system starting from the sample dilution step, all the way to cleanup and pooling. The cloud-based Biomek NGenius portal software was used virtually to set up the automated processes (Figure 2). Then the method was run on the Biomek NGenius instrument with its user-friendly user interface (Figure 3). After completion of the run, the libraries were analyzed on an Agilent Bioanalyzer.

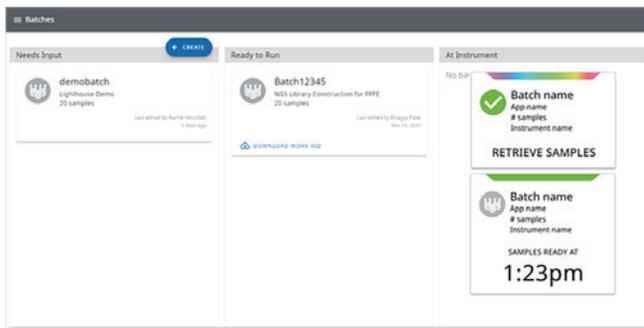


Figure 2a. Biomek NGenius Portal Software: Biomek NGenius Portal Software is used for setting up the automated processes to be executed on the instrument. The Batches main page provides an at-a-glance status of all batches.

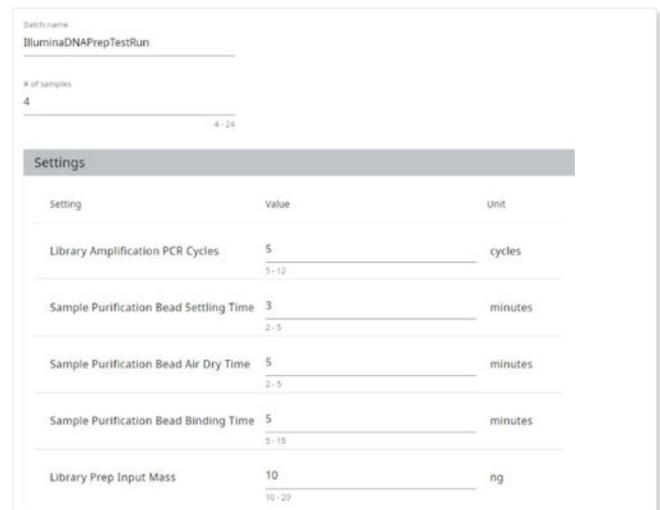


Figure 2b. Configuration Run Screen: Configuration Run screen allows users to define settings (e.g., number of samples, volumes, input concentrations) for a batch run. Sample data can be entered in .csv format.

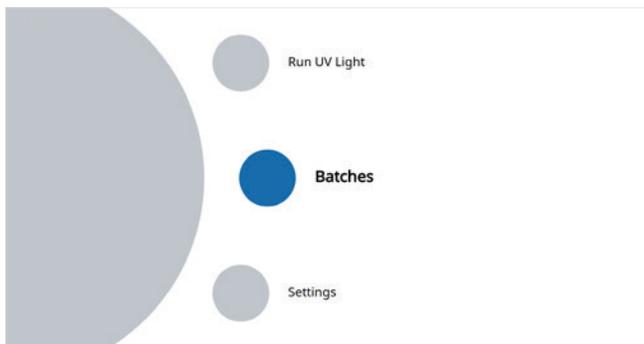


Figure 3a. Instrument User Interface: The intuitive instrument User Interface allows interaction with the instrument by turning and pressing the Input Dial.

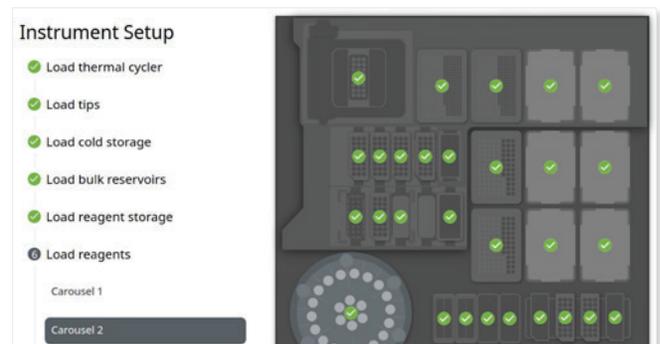


Figure 3b. Deck setup: A step-by-step series of prompts is directed by the application with the Dynamic DeckOptix system confirming correct labware placement while advancing steps through to completion in real-time.



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Results

The Biomek NGenius system prepared libraries were in the range of manufacturer's recommendations indicating successful library preparation (Figure 4, 600 bp libraries).^{1,2} The automated method processed 8 samples in 5 hrs and 20 minutes. This includes reagent aliquoting from original vials (Table 1).

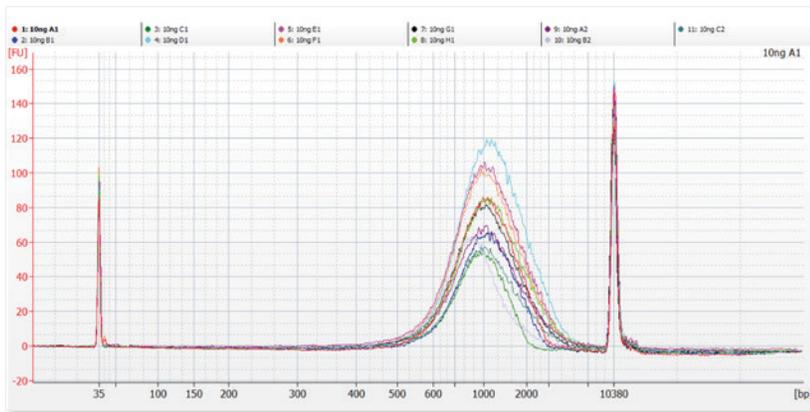


Figure 4: Bioanalyzer traces from the libraries prepared on Biomek NGenius system 10 ng run.

Process	Time
Instrument Setup*	20 mins
Method Run (8 samples)	5 hrs
Total Time	5 hrs 20 mins

Table 1. Estimated run times for automated Illumina DNA Prep kit workflow on Biomek NGenius next generation library prep system.

* Timing does not include reagent thawing.

References

1. Illumina DNA Prep Reference Guide Document 1000000025416 V09, June 2020, https://sapac.support.illumina.com/content/dam/illumina-support/documents/documentation/chemistry_documentation/illumina_prep/illumina-dna-prep-reference-guide-1000000025416-09.pdf
2. Illumina Nextera DNA Flex Library Preparation Kit Technical Data Sheet, <https://www.illumina.com/content/dam/illumina-marketing/documents/products/datasheets/nextera-dna-flex-data-sheet-770-2017-011.pdf>

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