

Telesis Bio Gibson SOLA[®] Platform Automated on the Biomek Echo One Gene Synthesis Solution for Accelerating Therapeutic Discovery

Steve Valentino and Partha Banerjee
Beckman Coulter Life Sciences

Introduction

The Gibson SOLA[®] Platform transforms synthetic biology by giving researchers full control over high-fidelity DNA and mRNA synthesis—delivered overnight, directly in the lab. Unlike traditional chemical synthesis, which builds DNA one base at a time and accumulates errors over many cycles, the SOLA[®] platform uses a hybridization-based approach that enriches for the correct molecule at each step. This results in uniquely high-quality nucleic acids, enabling rapid, accurate and reproducible synthesis. The platform is fully automated on the Biomek Echo One Gene Synthesis Solution, which integrates a Biomek i7 Hybrid Workstation with an Echo 525 Acoustic Liquid Handler and includes integrations suitable for automated gene synthesis. This seamless automation enables scalable, walk-away workflows that adapt to varying throughput needs. The Echo 525 liquid handler's contactless, nanoliter-scale liquid transfers minimize reagent use and maximize precision, while the Biomek i-Series system provides robust, high-capacity liquid handling for reaction setup and processing. Together, the Gibson SOLA[®] Platform and Biomek Echo One system eliminate the bottlenecks of outsourced synthesis, empowering scientists to create the DNA they need, when they need it, for applications ranging from gene editing and protein engineering, to vaccine development and cell therapy.

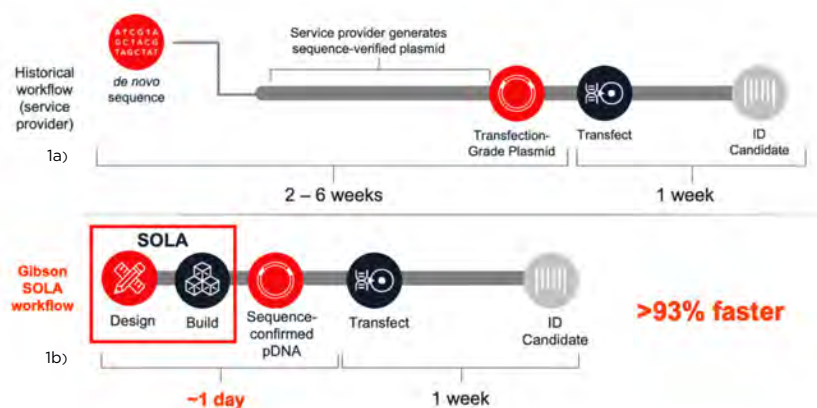


Figure 1. Telesis Bio Gibson SOLA[®] enables completion of projects more quickly. It eliminates bottlenecks and reduces dependence on external providers by building biology overnight. Historically, service providers can require up to 6 weeks to prepare transfection-grade plasmids (1a). The Gibson SOLA[®] Platform generates synthetic DNA in 1 day (1b).

Objective

The automated Gibson SOLA® Platform method uses the Biomek Echo One Gene Synthesis system, which features a Biomek i7 Hybrid Workstation integrated with an Echo 525 Acoustic Liquid Handler to enhance your DNA and mRNA synthesis workflows.

Chemistry Spotlight

Features of The Gibson SOLA® Platform include:

- **Universal oligonucleotide building blocks and software to build DNA and mRNA on demand**
- **Scaling of synthesis as needed to generate 10s to 100s kb of high-quality DNA or mRNA with over 80% full-length target molecules**
- **High-fidelity synthesis that ensures DNA fragments are practically free from errors**
- **Reduced costs: no paying for dedicated HPLC columns that can be required by traditional synthesis**
- **Creates molecules via block-based assembly that are difficult to manufacture with traditional synthesis approaches**
- **Accelerates DNA synthesis from weeks, with external providers, to days in-house**

Automation Spotlight

The deck configuration of the Biomek Echo One Gene Synthesis system for the Gibson SOLA® Platform is designed for flexibility, precision and scalability. It features a Biomek i7 Hybrid Workstation fully integrated with an Echo 525 Acoustic Liquid Handler, along with key accessories including a:

- **ColdPlate (QInstruments, CP1)**
- **BioShake D3000-elm (QInstruments, BS1)**
- **Automated Microplate Centrifuge (Agilent)**
- **On-Deck Thermal Cycler (Inheco, ODTCL1*)**
- **Cytomat 2C Incubator (Thermo Fisher)**

The system is powered by Biomek 5 Software, which offers intuitive protocol development and real-time run monitoring, and is further enhanced by SAMI Software for advanced scheduling and orchestration of complex workflows across multiple devices.

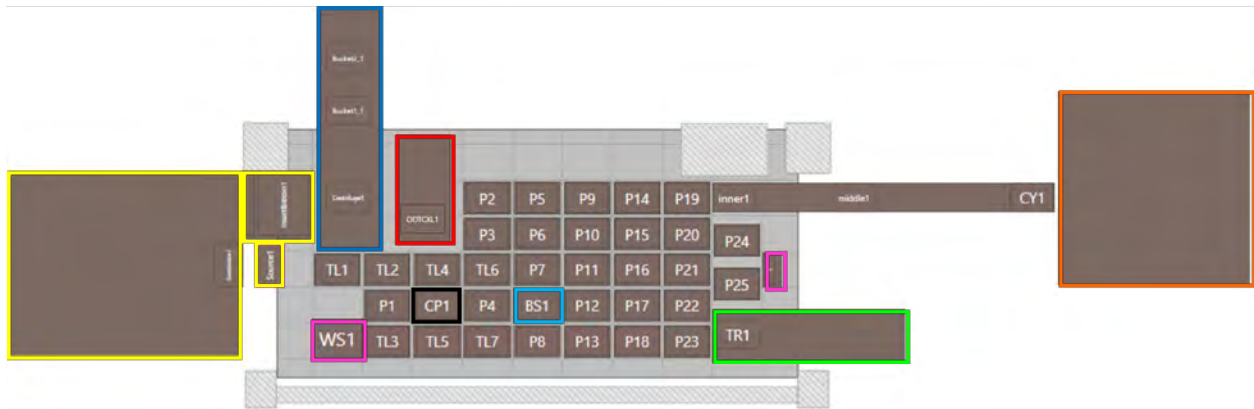
Additional features of the Biomek i7 Hybrid Workstation include:

- **384 Multichannel head with 0.5-60 µL pipetting capability**
- **Enhanced Selective Tip Pipetting to transfer custom number of samples**
- **Independent 360° rotating gripper with offset fingers**
- **Quick installation with ready-to-implement methods**
- **Guided Labware Setup (GLS) and DeckOptix Final Check to ensure accurate system setup and reagent calculations**

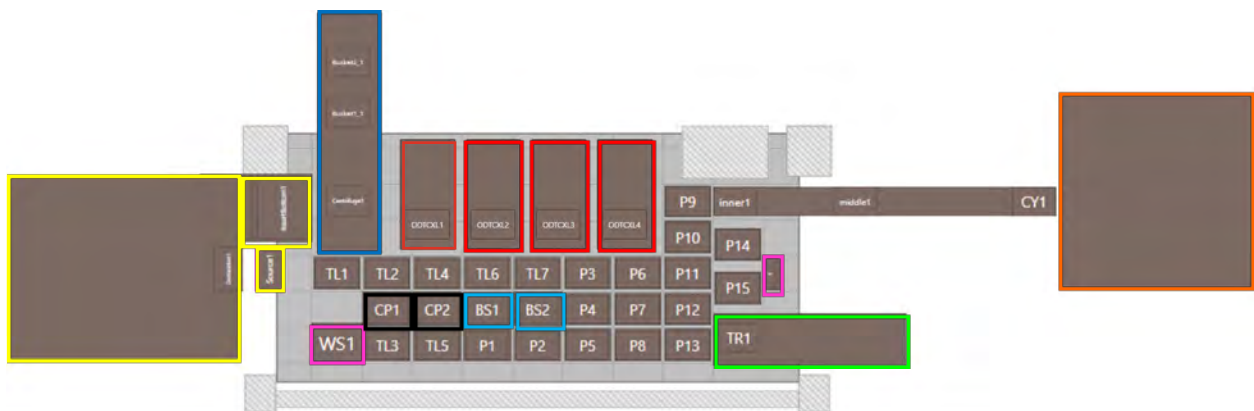
*The number of On-Deck Thermocyclers (ODTCs) can be scaled up to 4 units to support higher-throughput workflows.

Additional features of the Echo 525 Acoustic Liquid Handler include:

- **Nanoliter-scale transfers: Enables accurate, precise and robust transfer of small volumes**
- **Non-contact acoustic dispensing allows for faster pooling and normalization, up to 100 times quicker than traditional methods**
- **Support for a wide range of fluids including high-viscosity and high-surfactant reagents**
- **Reduced plastic consumables with the use of tip-free dispensing**



The Biomek Echo One system for the Gibson SOLA Platform with one ODTC Thermocycler.



The Biomek Echo One system for the Gibson SOLA Platform with four ODTC Thermocycler.

Figure 2. Biomek i7 hybrid workstation with integrated Echo 525 acoustic liquid handler (yellow), ColdPlate (QInstruments, CP1 & CP2, black), BioShake D3000-elm (QInstruments, BS1 & BS2, blue), Automated Microplate centrifuge (Agilent, blue), on-deck thermal cycler (Inheco, ODTCXL1-4, red), Cytomat 2C (Thermo Fisher, orange), Biomek Wash Stations (pink), and High Capacity Trash (green)..

The Gibson SOLA® Platform on the Biomek Echo One Gene Synthesis system delivers a scalable, high-fidelity workflow for on-demand DNA or mRNA synthesis directly within customer laboratories. This fully automated method requires only a single user interaction to set up the instrument deck and offers complete walk-away capability from start to finish. The workflow is divided into five modular method sections, each with safe stop points, enabling users to run the entire process in one session or as discrete workflows aligned with the user guide (Figure 3).

The complete synthesis can be completed in < 24 hours, significantly reducing turnaround time compared to traditional service providers. The Echo 525 acoustic liquid handler dispenses universal short oligonucleotide building blocks based on a picklist generated from the desired sequence design, while the Biomek i7 workstation manages centrifugation, shaking, thermocycling, and large-volume reagent dispensing throughout the synthesis. The entire process is powered by **Biomek 5 Software**, which enables intuitive protocol setup, real-time monitoring, and error handling. Additionally, a **SAMI Software solution** has been designed and tested to support **scaling across up to four synthesis families**, providing advanced scheduling and orchestration for high-throughput workflows.

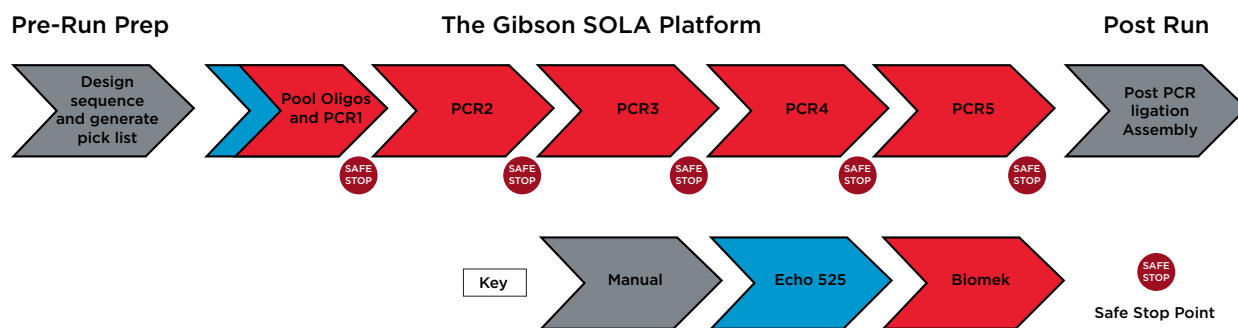


Figure 3. Workflow for the Biomek 5 Software standalone automation of the Gibson SOLA® Platform.

Experimental Design

To demonstrate the robustness of the automated Gibson SOLA® Platform on the Biomek Echo One Gene Synthesis system, a 384-well plate was processed to synthesize three gene fragments in duplicate. The automated method followed the Telesis Bio instruction manual for the [Gibson SOLA Platform](#).

Available Gibson SOLA DNA Synthesis Kits for Biomek Echo System	SKU
Gibson SOLA DNA Synthesis kit Module 1, 2.4kb	GS-10111001-01
Gibson SOLA DNA Synthesis kit Module 1, 12kb	GS-10111001-02

For more information, visit telesisbio.com or contact your Telesis representative.

The kit includes foil-sealed stamp plates for each reagent, simplifying deck setup and minimizing user error. The Echo 525 acoustic liquid handler dispensed oligonucleotides off-deck, while the Biomek i7 workstation managed all on-deck operations including centrifugation, shaking, thermocycling, and large-volume reagent dispensing. During the synthesis, the 384 input wells were consolidated into 48 final wells (Figure 4). Following the automated workflow, gene fragments were assembled using homology-based assembly and amplified on the BioXp® system. The resulting constructs were further analyzed using full-length Plasmidsaurus Premium Oxford Nanopore Technologies (ONT) sequencing to confirm sequence integrity and completeness.

The synthesized products from PCR5 and the assembled gene fragments were analyzed on Invitrogen 4% agarose E-Gel EX. Each PCR5 product represents 100 bp of de novo synthesized DNA from the building blocks. Since the PCR5 products are flanked by universal adapters, they resolve at 249 bp on the E-Gel EX. These universal flanks are removed to expose the homology regions between adjacent 100 bp DNA subunits to generate gene fragments. For this demonstration, the Biomek Echo One system generated the 100 bp subunits and the BioXp® system assembled the 100 bp subunits into gene fragments.



Figure 4. Plate layout after PCR5. Fragment 1 is green, fragment 2 is blue and fragment 3 is orange; the samples were run in duplicate left to right.

Following the synthesis of 100 bp subunits on the Biomek Echo One Gene Synthesis system, the PCR5 reactions were pooled with equal volume as shown below before proceeding to fragment assembly and amplification steps.

Gene Fragment	PCR5 wells pooled	Number of 100bp subunits pooled
Frag1	A01 - A04	7
Frag2	B04 - A09	10
Frag3	B09 - B12	7

Results



Figure 5. PCR5 products on an Invitrogen 4% E-Gel show consistent synthesis. PCR5 fragments are resolved at 249 bp on this E-Gel because of the presence of universal adapters, which will be removed during the gene assembly process. Ultra Low Range DNA Ladder (ThermoFisher Scientific) was used to assess PCR5 sizes. The PCR5 bands resolve between 300 bp (top band) and 200 bp (second from the top band).

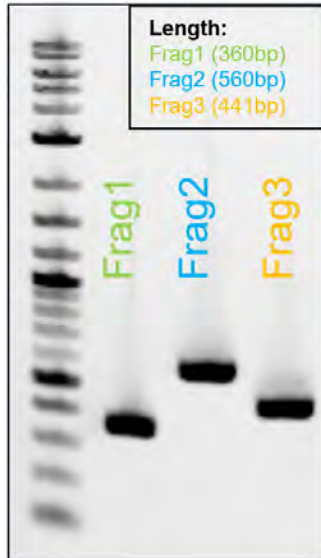


Figure 6. Assembled fragments on an Invitrogen 2% E-Gel show consistent synthesis. All three fragments were synthesized on the BioXp® system using homology-based method. Upon resolving on a 2% E-Gel, all the fragments were found to be synthesized at the expected molecular weight. 1 kb Plus DNA Ladder (New England Biolabs) was used to assess size of the gene fragments

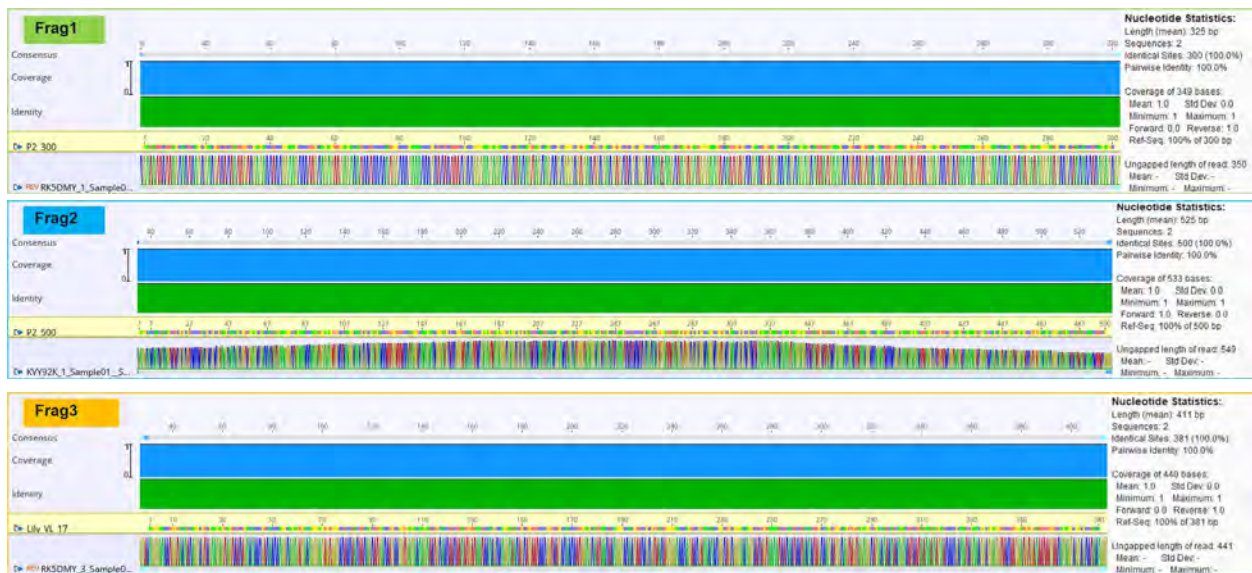


Figure 7. Oxford Nanopore sequencing of the amplicons generated at the end of the gene assembly process confirmed the presence of full-length products and 100% fidelity of the consensus sequence against the target sequence.

Summary

We have demonstrated that the fully automated workflow for the Gibson SOLA® Platform—spanning from the dispensing of universal oligonucleotide building blocks to the final PCR—can be completed in just 14 hours for a 384-well plate using the Biomek Echo One Gene Synthesis system. This walk-away workflow significantly reduces hands-on time and is markedly faster than the days typically required to manually process an equivalent number of samples. The Biomek Echo One Gene Synthesis Solution combines two powerful systems into a single, integrated platform: the Echo Acoustic Liquid Handler and the Biomek i7 Workstation. Together, they deliver robust, reliable, and flexible execution of high-throughput DNA i7 assembly workflows with the Gibson SOLA® Platform. This capability to synthesize DNA or mRNA in-house not only accelerates iterative design-build-test cycles but also ensures greater control and confidentiality over synthesized products—critical advantages for research and development environments.

Biomek Automated Workstations and Echo Acoustic Liquid Handler are not intended or validated for use in the diagnosis of disease or other conditions.

Beckman Coulter makes no warranties of any kind whatsoever express or implied, with respect to this protocol, including but not limited to warranties of fitness for a particular purpose or merchantability or that the protocol is non-infringing. All warranties are expressly disclaimed. Your use of the method is solely at your own risk, without recourse to Beckman Coulter. This protocol is for demonstration only; and is not validated by Beckman Coulter.

ECHO is a trademark or registered trademark of Labcyte Inc. in the United States and other countries. Labcyte is a Beckman Coulter company. All other trademarks are the property of their respective owners.

© 2025 Beckman Coulter, Inc. All rights reserved. Beckman Coulter, the stylized logo, and the Beckman Coulter product and service marks mentioned herein are trademarks or registered trademarks of Beckman Coulter, Inc. in the United States and other countries. ECHO is a trademark or registered trademark of Labcyte Inc. in the United States and other countries. Labcyte is a Beckman Coulter company. All other trademarks are the property of their respective owners.

For Beckman Coulter's worldwide office locations and phone numbers, please visit Contact Us at [beckman.com](https://www.beckman.com)
2025-GBL-EN-108621-V1

