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# Automated robotic liquid handling assembly of modular DNA devices

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Ortiz, L., Pavan, M., McCarthy, L., Timmons, J., Densmore, D., Automated Robotic Liquid Handling Assembly of Modular DNA Devices. *J. Vis. Exp.* (130), e54703, doi:10.3791/54703 (2017).  
<https://hdl.handle.net/2144/27554>

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Materials List for:

# Automated Robotic Liquid Handling Assembly of Modular DNA Devices

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URL: <https://www.jove.com/video/54703>

DOI: [doi:10.3791/54703](https://doi.org/10.3791/54703)

## Materials

Name	Company	Catalog Number	Comments
<b>Hardware / Software</b>			
Freedom EVO 150 Liquid Handling Robot	Tecan		Custom liquid handler fitted with an 8-channel pipetting arm <a href="http://lifesciences.tecan.com/products/liquid_handling_and_robotics/freedom_evo">http://lifesciences.tecan.com/products/liquid_handling_and_robotics/freedom_evo</a>
Freedom EVOware Standard (Version 2.4 Service Pack 2)	Tecan		Software used to control the Freedom EVO 150 liquid handler <a href="http://lifesciences.tecan.com/products/software/freedom_eware">http://lifesciences.tecan.com/products/software/freedom_eware</a>
Echo 550	Labcyte		Acoustic Liquid Dispenser <a href="http://www.labcyte.com/products/liquidhandling/echo-550-liquid-handler">http://www.labcyte.com/products/liquidhandling/echo-550-liquid-handler</a>
Sorvall Legend RT	Sorvall		Large benchtop swing-bucket centrifuge
MasterCycler Pro	Eppendorf	950040015	Thermocycler with 96-well heat block <a href="https://online-shop.eppendorf.us/US-en/PCR-44553/Cyclers-44554/Mastercycler-pro-PF-5193.html">https://online-shop.eppendorf.us/US-en/PCR-44553/Cyclers-44554/Mastercycler-pro-PF-5193.html</a>
ECHOTHERM Chilling/Heating Dry Bath	Torrey Pines Scientific		Heating/Chilling block for EVO 150 deck <a href="https://www.torreypinesscientific.com/products/chilling-and-heating-dry-baths/echotherm-ric20-series-remote-controlled-chillingheating-dr">https://www.torreypinesscientific.com/products/chilling-and-heating-dry-baths/echotherm-ric20-series-remote-controlled-chillingheating-dr</a>
Tabletop Microcentrifuge 5418	Eppendorf	5418000017	Standard 18-well microcentrifuge <a href="https://online-shop.eppendorf.com/OC-en/Centrifugation-44533/Centrifuges-44534/Centrifuges-5418--5418R-PF-9257.html">https://online-shop.eppendorf.com/OC-en/Centrifugation-44533/Centrifuges-44534/Centrifuges-5418--5418R-PF-9257.html</a>
<b>Name</b>	<b>Company</b>	<b>Catalog Number</b>	<b>Comments</b>
<b>Resources</b>			
mcloassembly.com	Lattice Automation		Web-tool for combinatorial DNA assembly mcloassembly.com
CIDAR MoClo Parts Kit	AddGene	1000000059	Kit of bacterial glycerol stocks for all DNA parts used in this study

			<a href="https://www.addgene.org/cloning/moclo/densmore/">https://www.addgene.org/cloning/moclo/densmore/</a>
CIDAR ICE Registry	CIDAR Lab		Registry of plasmid DNA maps <a href="https://ice.cidarlab.org/folders/8">https://ice.cidarlab.org/folders/8</a> <a href="https://synbiohub.programmingbiology.org/public/bubdc_ice/">https://synbiohub.programmingbiology.org/public/bubdc_ice/</a> <a href="https://bubdc_ice_folder_8/current">bubdc_ice_folder_8/current</a>
<b>Name</b>	<b>Company</b>	<b>Catalog Number</b>	<b>Comments</b>
<b>Labware</b>			
50 µL Conductive Tips	Tecan	30 057 818	Sterile 50 µL conductive tips for Tecan liquid handler <a href="http://lifesciences.tecan.com/products/consumables/disposable_tips/liquid_handling_disposable_tips">http://lifesciences.tecan.com/products/consumables/disposable_tips/liquid_handling_disposable_tips</a>
2 mL Deep 96-well Culture Plates	USA Scinetific	5678-0285	Bacterial culture plates used for culturing of large numbers of samples <a href="http://www.thermoscientific.com/en/product/nunc-1-3-2-0ml-deepwell-plates-shared-wall-technology.html">http://www.thermoscientific.com/en/product/nunc-1-3-2-0ml-deepwell-plates-shared-wall-technology.html</a>
1.5 mL Microcentrifuge Tubes	USA Scinetific	1615-5599	Disposable microcentrifuge tubes <a href="http://www.usascientific.com/Seal-Rite-1.5-ml-tube-colors.aspx">http://www.usascientific.com/Seal-Rite-1.5-ml-tube-colors.aspx</a>
Breathe Easier sealing membrane	Sigma-Aldrich	Z763624-100EA	Breathable sealing membrane for bacterial culture plates <a href="http://www.sigmaaldrich.com/catalog/product/sigma/z763624?lang=en&amp;region=US">http://www.sigmaaldrich.com/catalog/product/sigma/z763624?lang=en&amp;region=US</a>
Full-Skirted, Low-Profile, 96-Well PCR Plates	GeneMate	T-3183-2	PCR plates used for all steps <a href="https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-3183-R">https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-3183-R</a>
Alluminum Sealing Foil for PCR Plates	GeneMate	T-2451-1	Alluminum seals for PCR plate storage <a href="https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-2451-1">https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-2451-1</a>
Polyolefin Sealing Film for PCR Plates	GeneMate	T-2450-1	Plastic seals for PCR plates during cycling <a href="https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-2450-1">https://www.bioexpress.com/store/catalog/product.jsp?catalog_number=T-2450-1</a>
PCR Cooler	Eppendorf	22510525	96-well cold block <a href="https://online-shop.eppendorf.us/US-en/Temperature-Control-and-Mixing-44518/Accessories-44520/PCR-Cooler-PF-55940.html">https://online-shop.eppendorf.us/US-en/Temperature-Control-and-Mixing-44518/Accessories-44520/PCR-Cooler-PF-55940.html</a>
<b>Name</b>	<b>Company</b>	<b>Catalog Number</b>	<b>Comments</b>
<b>Reagents</b>			
GenCatch Plasmid DNA Mini-Prep Kit	Epoch Life Sciences	2160250	Plasmid DNA purification kit <a href="http://www.epochlifescience.com/Product/PurificationKit/dna_mini.aspx">http://www.epochlifescience.com/Product/PurificationKit/dna_mini.aspx</a>
T4 DNA Ligase (HC)	Promega	M1794	High concentration T4 DNA Ligase <a href="https://www.promega.com/products/cloning-and-dna-markers/molecular-biology-enzymes-and-reagents/t4-dna-ligase/?catNum=M1794">https://www.promega.com/products/cloning-and-dna-markers/molecular-biology-enzymes-and-reagents/t4-dna-ligase/?catNum=M1794</a>

BbsI Restriction Enzyme	New England Biolabs	R0539L	BbsI enzyme at 10,000 units/ml <a href="https://www.neb.com/products/r0539-bbsi">https://www.neb.com/products/r0539-bbsi</a>
BsaI Restriction Enzyme	New England Biolabs	R0535L	BsaI enzyme at 10,000 units/ml <a href="https://www.neb.com/products/r3535-bsai-hf">https://www.neb.com/products/r3535-bsai-hf</a>
T4 DNA Ligase Buffer Pack	Promega	C1263	10x T4 DNA ligase buffer <a href="https://www.promega.com/products/cloning-and-dna-markers/cloning-tools-and-competent-cells/t4-dna-ligase/">https://www.promega.com/products/cloning-and-dna-markers/cloning-tools-and-competent-cells/t4-dna-ligase/</a>
Isopropyl-β-D-thiogalactopyranoside (IPTG)	Zymo Research	I1001-25	0.5M IPTG Solution <a href="http://www.zymoresearch.com/buffers-solutions/chemicals/isopropyl-ss-d-thiogalactopyranoside-iptg">http://www.zymoresearch.com/buffers-solutions/chemicals/isopropyl-ss-d-thiogalactopyranoside-iptg</a>
5-bromo-4-chloro-3-indolyl β-D-galactopyranoside (X-GAL)	Zymo Research	X1001-25	20 mg/ml X-GAL solution <a href="http://www.zymoresearch.com/buffers-solutions/chemicals/5-bromo-4-chloro-3-indolyl-ss-d-galactopyranoside-x-gal">http://www.zymoresearch.com/buffers-solutions/chemicals/5-bromo-4-chloro-3-indolyl-ss-d-galactopyranoside-x-gal</a>
Kanamycin Sulfate	Zymo Research	A1003-25	35 mg/ml Kanamycin solution <a href="http://www.zymoresearch.com/buffers-solutions/antibiotics/kanamycin-sulfate">http://www.zymoresearch.com/buffers-solutions/antibiotics/kanamycin-sulfate</a>
Carbenicillin (Disodium Salt)	Fisher	BP26481	1 g Carbenicillin (Ampicillin analog) <a href="https://www.fishersci.com/shop/products/carbenicillin-disodium-salt-fisher-bioreagents-3/p-25005#?keyword=carbenicillin">https://www.fishersci.com/shop/products/carbenicillin-disodium-salt-fisher-bioreagents-3/p-25005#?keyword=carbenicillin</a>
SOC Broth Media	Teknova	S0225	Powder media used to make SOC broth <a href="http://www.teknova.com/SOC-BROTH-MEDIA-p/s0225.htm">http://www.teknova.com/SOC-BROTH-MEDIA-p/s0225.htm</a>
LB Broth (Lennox) Media	Sigma-Aldrich	L3022-1KG	Powder media used to make LB broth <a href="http://www.sigmaaldrich.com/catalog/product/sigma/l3022?lang=en&amp;region=US">http://www.sigmaaldrich.com/catalog/product/sigma/l3022?lang=en&amp;region=US</a>
LB Broth with agar (Lennox) Media	Sigma-Aldrich	L2897-1KG	LB with agar mix used for making solid media plates <a href="http://www.sigmaaldrich.com/catalog/product/sigma/l2897?lang=en&amp;region=US">http://www.sigmaaldrich.com/catalog/product/sigma/l2897?lang=en&amp;region=US</a>
Alpha-Select Gold Efficiency Competent Cells	Bioline	BIO-85027	High efficiency chemically competent E. coli cells <a href="http://www.bioline.com/us/alpha-select-gold-efficiency.html">http://www.bioline.com/us/alpha-select-gold-efficiency.html</a>
<b>Name</b>	<b>Company</b>	<b>Catalog Number</b>	<b>Comments</b>
<b>Primers</b>			
Primer VF			5'-TGCCACCTGACGTCTAAGAA-3' Primers used for Sanger sequencing and colony PCRs
Primer VR			5'-ATTACCGCCTTTGAGTGAGC-3' Primers used for Sanger sequencing and colony PCRs