
Nanoliter Programmable Wave



Edited Partial Beta Prototype For Dispensing & 100% Input Efficient UPLC *

General Description:

The Nanoliter Programmable Wave is a low volume non-contact liquid dispense system, drop-on-demand, using proprietary IBF (induction based fluidics). This is a single channel system based on a standard 10ul or 100uL syringe with a provided disposable tip. It can also use UPLC and other Gaussian surfaces as demoed with U of Cincinnati at Asilomar 2016, ASMS 2017 and elsewhere, patented and poly-pending.

IBF can dispense to most targets with high precision over distance of 1-10cm. Requires only minimal air disturbance, clear path without adjacent materials. Limitations on viscosity and surface tension do apply.

Intended for analytical chemistry or other applications with precious analyte or non-contact drop delivery requirements.

Features:

- status LED
- integrated motor controller
- dispense frequency max 5Hz
- wired or wireless (Android Bluetooth) control using ASCII terminal

Application:

- Analytical Chemistry: Mass Spectrometer Sample Introduction LC, MALDI, ESI, and variants
- Diagnostics: Assays, High-Throughput Screening, Chip Insert
- R&D applications: Manufacturing, 3D Printing
- Sample Input: Syringe, LC column, Capillary

Functional Description w/o UPLC/ devices:



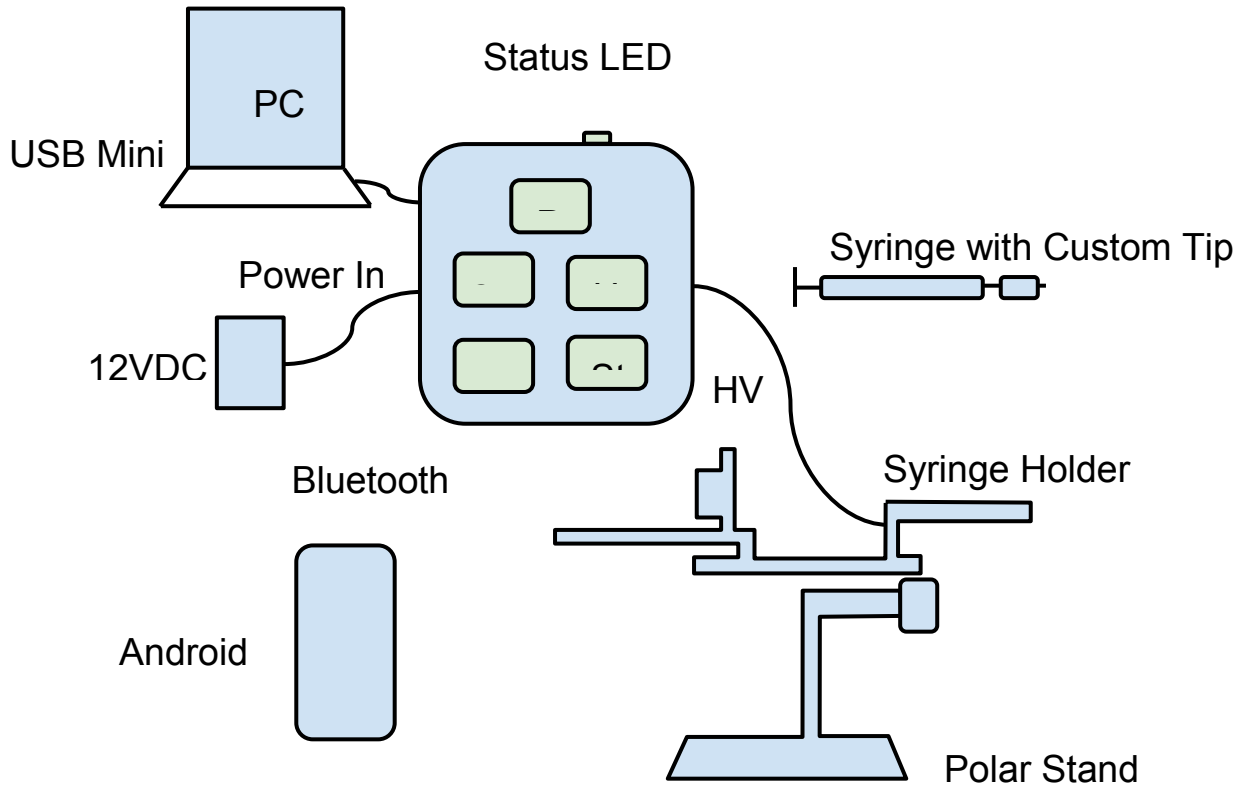
Shown

1. Electronics enclosure
2. Stand.
3. Android Bluetooth Controller

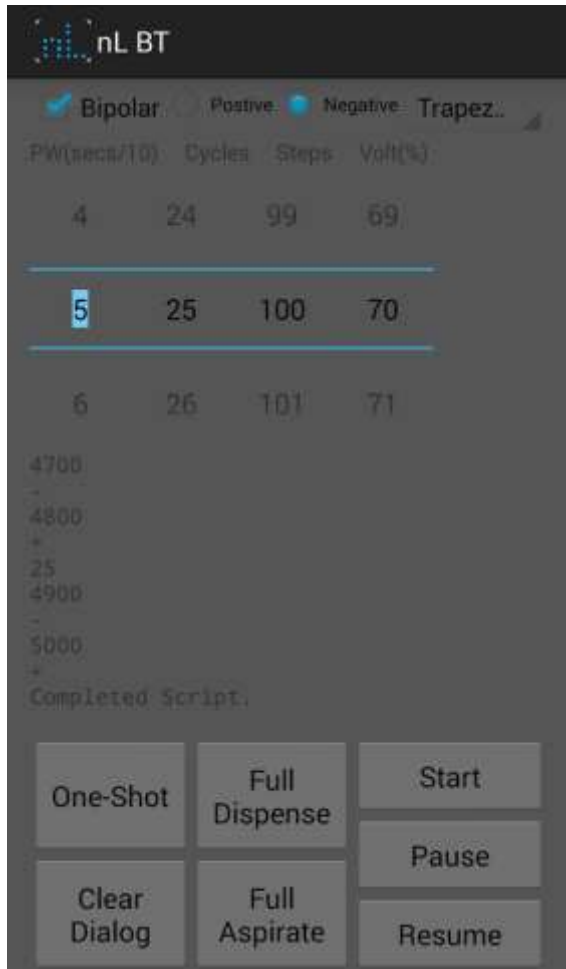
Connectors	
Wired USB	
HV connector	
Motor and Expansion GPIO	
Power	(Universal AC to 12VDC 0.5A included)

Dimensions	
Electronics Enclosure	
Polar stand	Z adjustment:
Syringe and Syringe Holder	Syringe, Custom Tip, Custom Syringe Holder. Not LC interface.
Android Device	Generic Android Device

Functional Block Diagram, Partial:



Interface:



Status LED	Action
Green	Ready
Red	Positive HV
Blue	Negative HV
Yellow	Motor Travel Aspirate
Cyan	Motor Travel Dispense

Android	Description	Units
Polboxx		-
Radio Button	Selects E	-
PW	Waveform pulse-width (longer pulse-width provide better positional precision)	Seconds / 10
Cycles	Number of dispenses	each
Steps)	Selects number of motor steps to travel	~1nL / step
Voltage	Scales the HV output	% of max
Scroll View	Displays ASCII communication from controller	-
Clear Dialog	Erases the Scroll View	-
Full	Used for D/A	-
Start/Pause/Resume	Used to start/pause/resume a script	-
One-shot button	Single dispense, uses polarity radio button	-

Command Syntax:

Example of script...

S01751011001x (press enter) *positive voltage, 75% voltage, 1 sec pulse width, trapezoid, 100nL each, dispense*
 s02751001001x (press enter) *negative voltage, 75% voltage, 1 sec pulse width, trapezoid, 100nL each, dispense*
 s0999x (press enter) *start script run for 999 cycles*

Example of single shot...

s00855001501x (press enter) *single shot, negative voltage, 5 sec pulse width, trapezoid, 50nL, dispense*

Example calibrate stepper...

s010000x (press enter) *set stepper absolute position to 10,000*

Queue Command

s (start byte) __ (script index) __ (voltage%) __ (pw) _ (polarity) _ (waveform) _ _ _ _ (step) _ (direction) x (stop byte)

start byte	s
script index (00 single-shot)	__
Voltage	__
pulse width	__
polarity (1 = positive)	0 or 1
waveform 0 = square 1 = trapezoid 2 = triangle 3 = sawtooth	0 to 3
Step (1 step ~ 1nl)	_ _ _ _
step direction 0 = aspirate 1 = dispense	0 or 1
end byte	x

Script Command

s (start byte) _ (function) _ _ _ (cycle count) x (stop byte)

start byte	s
function 0 = start 1 = resume	_
cycles	_ _ _
end byte	x

Config Command

s (start byte) _ (function) _ _ _ (cycle count) x (stop byte)

start byte	s
function 0 = set plunger position 3 = move plunger max 4 = move plunger min	_
step position	_ _ _ _ _
end byte	x

Pause Command

p (pause)

(pause will stop any motor movement or script execution, after current cycle fire completes)