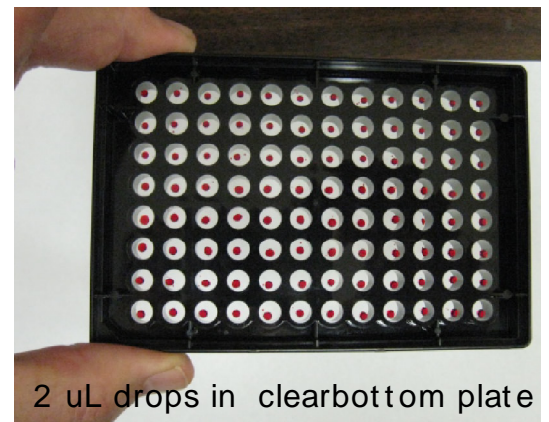
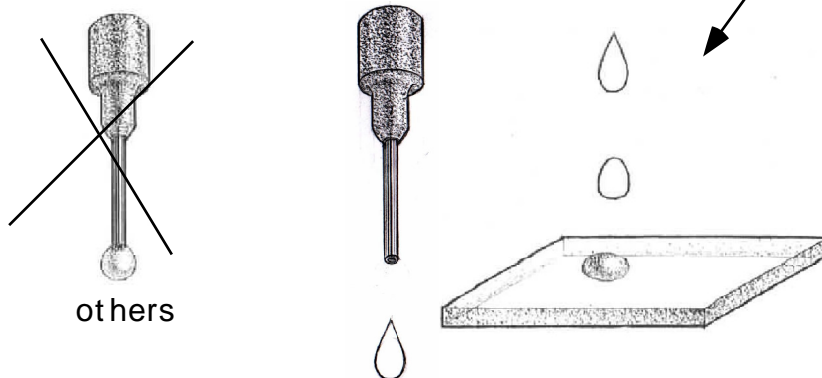


is the World's 1st DIFFERENTIAL PIPETTOR. It gives unprecedented **fine resolution** -- to accurately aspirate down to nanoliters -- along with built-in **high flow** to cleanly blow the samples off contact-free --even with disposable tips.

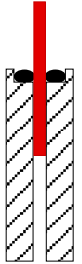


- compact bench-top unit run by PC and you, coordinated with vivid, intuitive graphics.
- 3 stations for microplates and tips slide smoothly in and out
- extremely reliable and low maintenance because the invention gives the uniquely long stroke needed for ultra-fine resolution without needing any fussy small piston or seal!
- easy and fast, for one run or many, with sparkling human/machine coordination that makes it a delight to use.
- brings cutting edge molecular biology, genomic and genetic capabilities to clinical research and life sciences laboratories as well as the megacenters.
- TEVIA factor -- revolutionary
Tip Escape Velocity control opens up applications optimization where it counts.



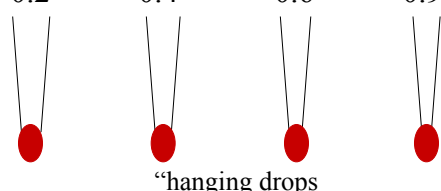

UNDERSTANDING DIFFERENTIAL PIPETTING requires understanding the *resolution* and *flow* dilemma which bedevils conventional pipettors.

Conventional pipettors use pistons of a single diameter which often compromise resolution vs flow.



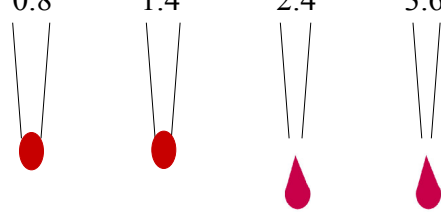
	Diameter (inches)	X Scn Area (in ²)	STROKE Resolution (mm/uL)	Flow rate Maximum (uL/sec)*	Maximum Tip Escape Velocity (meters/sec)* for tip diameters (inches)			
					0.020	0.016	0.012	0.010
Fine Conventional Pipettor	0.062	0.003	0.51	41	0.2	0.4	0.6	0.9 m/sec

This diameter is like a 100 uL syringe and its Stroke Resolution is pretty good for aspirating small samples, but its feeble flow can't blow those small samples off.

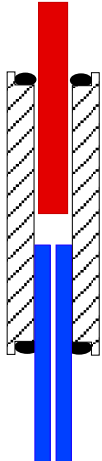
	Diameter (inches)	X Scn Area (in ²)	STROKE Resolution (mm/uL)	Flow rate Maximum (uL/sec)*	Maximum Tip Escape Velocity (meters/sec)* for tip diameters (inches)			
					0.020	0.016	0.012	0.010
Conventional Pipettor	0.125	0.0123	0.13	170	0.8	1.4	2.4	3.6 m/sec

This diameter is like a 500 uL syringe and does have the flow to blow samples off many tips, but its Stroke Resolution of only 0.13 mm/uL just can't aspirate tiny samples consistently to start with.



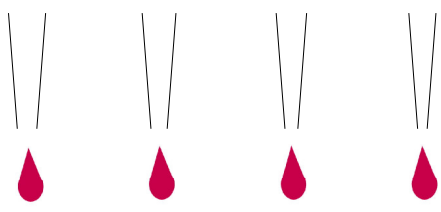
Conventional Pipettors Resolution, Flow and Tip Escape Velocity

Differential Pipetting uses 2 pistons of slightly different diameters to give extremely fine resolution for the small volumes that need it AND built-in large flow power for clean delivery.



	Diameter (inches)	X Scn Area (in ²)	STROKE Resolution (mm/uL)	Flow rate Maximum (uL/sec)	Maximum Tip Escape Velocity (meters/sec)* for tip diameters (inches)			
					0.020	0.016	0.012	0.010
Differential Pipetting					1.9	3.0	5.3	7.6 m/sec
Single Mode	0.184 0.187	0.026	0.062	390				
Differential	0.033	0.0009	1.8	12				

When the top 0.184" and bottom 0.187" diameter pistons move together, their tiny X-section area difference is that of a single 0.033" piston -- like a 34 uL syringe -- making available a huge 2 mm/uL Stroke Resolution excursion that gives unprecedented resolution and stability. One piston alone gives high flow to blow samples cleanly off contact-free.



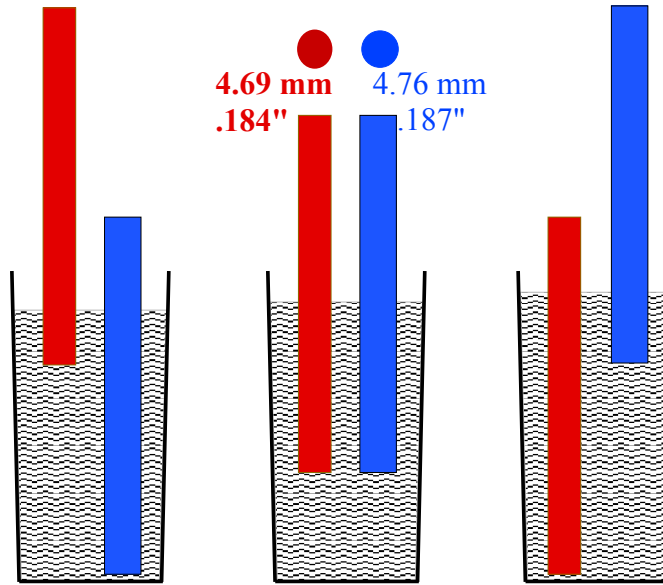
Differential Pipettor finer Resolution, higher Flow and abundant Tip Escape Velocity

* Maximum flow rates are standardized for pipette speed of 0.9 inches per second. 1.5 meters/second is used as the minimum Tip Escape Velocity for clean drop breakaway. 1.0 m/second may be considered adequate for pure aqueous solutions.

HOW NEPTUNE WORKS -- its unique *Differential Displacement™* and *Dual Resolution™* mechanism.

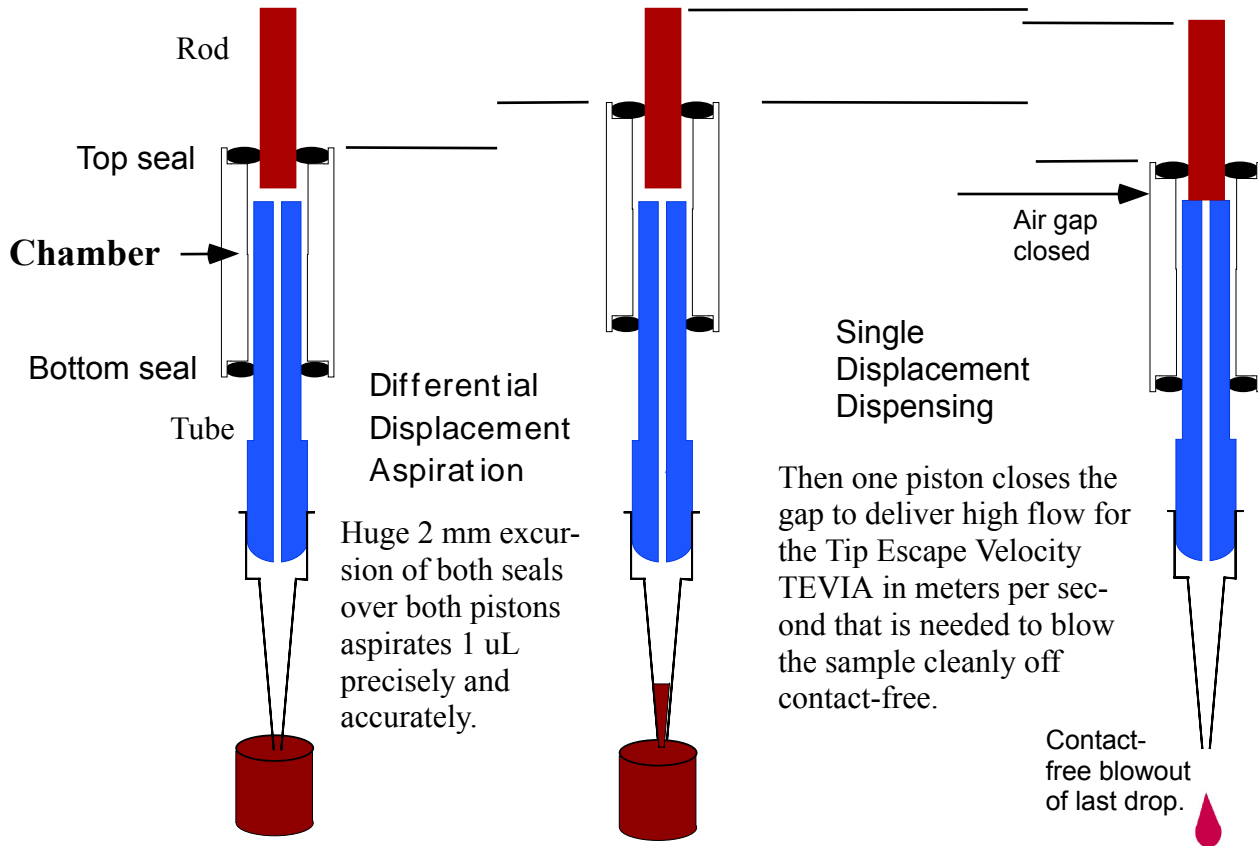
THE PRINCIPLE

See-saw NEPTUNE's 2 stout pistons in a glass of H₂O and the H₂O would rise or fall by the DIFFERENCE in piston cross section area. THIS IS DIFFERENTIAL DISPLACEMENT.



Superimpose the two cross sections and their tiny area difference will show as a thin annular ring. Another single piston with that same area could displace the H₂O the same amount. But such a needle-like rod is very hard to seal and has almost no flow power, so NEPTUNE 96 gets the same long stroke and resultant fine resolution with its 2 husky pistons and seals.

GRAPHIC CROSS SECTION of 1 of the 96 channels SHOWS BOTH PISTONS LINED UP IMPLEMENTING THE PRINCIPLE



HOW YOU and NEPTUNE WORK TOGETHER

NEPTUNE and the YOU/IT. Operation is pure common sense. It respects and harnesses the best in that human *you* and the robot *it*. Open and accessible, accountable and transparent, a pleasure. Freedom from busybody, marauding machinery. And freedom from shrouds of protection from anything theoretically getting stabbed or crushed (or even poked). NEPTUNE's motors maintain consistent speed contours and placement to assure high precision aspiration and clean TEVIA delivery. And NEPTUNE's cultivated graphic software coordinates. We'll all actually be optimizing your applications together. Feels organic.

GET YOUR TIPS

With NEPTUNE INSERTER model



Use the power handle to lower the Deska mandrels to seize the tips (Neptune's elliptical motor will peel used tips off).

With CLAMPER model



Insert a tip cartridge and the elliptical motor clamps it up against the sealing gasket (and releases it when done).

ASPIRATE YOUR SAMPLE -- slide your samples (middle tray) into position and lower the probes, then press the PC Enter key and NEPTUNE takes over to do the precision aspiration.



Both pistons are swept by their seals in the fine Differential mode -- with unheard of long stroke excursion of 2 mm per microliter and unprecedented precision.

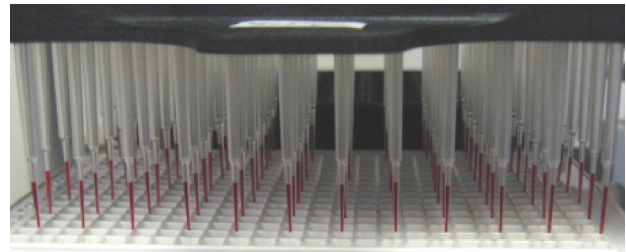
The software interface includes the following sections:

- Pump:** A diagram showing the internal piston and seal mechanism.
- Position:** A vertical slider with buttons for Home, Prime, Clamp, and Unclamp. The current position is 8412 Steps.
- Speed and Flow:** A graph showing speed contours. Controls include:
 - Speed in inches per second: 0.045
 - Tip Diameter: 0.305 mm
 - TEVIA in meters per second: 0.27
 - Dual Piston: 0.65 $\mu\text{L}/\text{sec}$
 - Single Piston: 19.71 $\mu\text{L}/\text{sec}$
 - Tip Selection: Longthin

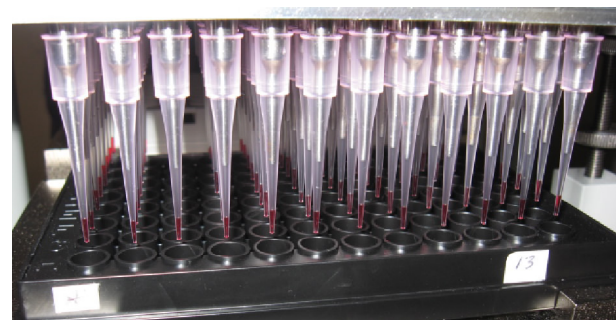
HOW YOU and NEPTUNE WORK TOGETHER

POISED FOR DELIVERY

now lift the metering head up, push the front tray with your destination plate into position, and lower the probes. You typically set the Stop to hold the tips a few mm above the bottom of the wells (or receiving surface). Your Stop height setting can be very approximate because the contact-free Blastoff™ capability eliminates the need for fine (Z axis) height settings.

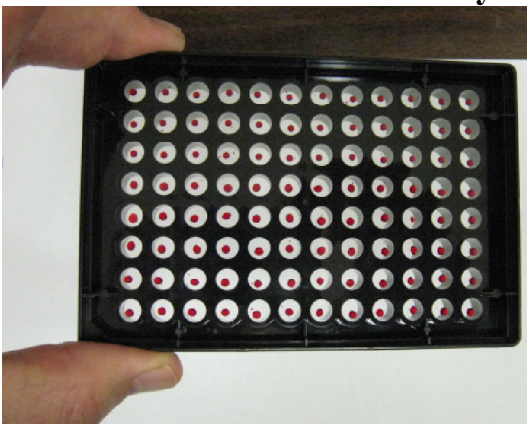


Longthin tips with 2 uL poised above a 384 plate quadrant.



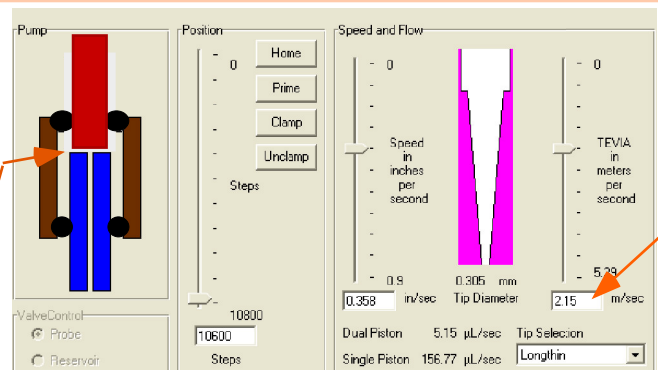
DesKa Magenta tips with 2 uL poised above a clearbottom 96 plate.

DISPENSE -- contact-free if you want.



Press the PC Enter key and NEPTUNE delivers cleanly. The bottom piston alone has closed the space to give the high flow needed for the clean contact-free delivery.

2.2 m/sec reflects the contact-free but gentle “plopoff” desired for this kind of liquid in this tip. TEVIA is adjustable for different drop morphologies as well as viscosities and materials.



The power of TEVIA Tip Escape Velocity control facilitates unprecedented Applications Optimization where you need it -- within the tip or at the tip delivery site. The entire “plopoff-to-splatoff morphology spectrum” means that, for whatever viscosity fluid you are using, you can make the drops

- Hang: hang neatly and consistently
- Plopoff: break off and drop off very gently so as not to damage genetic materials
- Shootoff: travel intact but fast enough to penetrate the surface of a receiving liquid
- Splatoff: you know this.

SPECIFICATIONS

Channels: 96 simultaneous pipetting channels operating in both Differential and Single modes

Size: 45 lbs (18 kg) 13" wide X 17" high X 17" deep

Electrical: 24 V DC, 2 amps typical, 4 amps max

Interface: CAN/RS-232

Software: Visual Basic with Access Data Base linked to graphic 6-pack Favorites.

Differential Mode: Volume up to 5 uL. Long stroke resolution 1.8 mm per microliter, 14.37 uL/inch, same as a 34 microliter syringe. Aspiration standard deviation is typically 5 nanoliters, corresponding to CV < 1% for volumes from 0.5 uL to 5 uL, CV < 2.5% for volumes from 200 to 500 nanoliters, and CV of 5% at 100 nanoliters.

Bulk or single Mode:

Maximum volume 40 uL with appropriate disposable tip. Resolution 437.5 uL/inch (17.25 uL/mm), same as a 1 mL syringe. Precision standard deviation typically 0.15 uL, corresponding to CV < 2.5% for volumes from 6 uL to 14 uL and CV < 1% for volumes from 15 uL to 40 uL. Flow rate up to 400 uL/sec.

Tip Escape Velocity (TEVIA) greater than 1.5 meters/sec for tips up to 0.022" diameter, 5 - 8 meters/sec for tips in the 0.012" diameter range.

Resolution Multiplier: Differential mode resolution is 30 times finer than Bulk mode

Precision after contact-free delivery may be up to twice that of the aspiration precision

Maintenance: Seal replacement typically 500,000 - 1 million cycles

PRECISION and ACCURACY are reflected in the following run for aspirating 2 uL and delivering it dry by contact-free Blastoff™. 81321-02 NEPTUNE96 with disposable tips, program NB2000-00D-0, Artel red dye as sample, TEVIA Tip Escape Velocity 2.2 meters/second.

Plate Reader:

ARTEL MVS Report

Date: 5/18/2011
 Time: 1:43:51 PM GMT-4
 Liquid Handler Device ID: Neptune 96
 Liquid Handler Device Description: Neptune 96-well pipettor
 Layout ID: 2.0uL Neptune 96
 Layout Description: 2.0 uL
 Channels: 96

Reader Type	Serial Number	Calibrated
Artel ELx800NB®		5/18/11 11:57

Materials:

Item Description	Lot or Serial No.	Expiration Date
Calibrator Plate	1005	1/28/12
Baseline Solution	Z1021411150129288	5/14/12
MVS Verification Plate - Baseline	08211026-02475	4/8/16
Range C Solution	RC02111115017721	5/11/12
Diluent Solution	U1041911150112735	7/19/12
MVS Verification Plate 1	08211026-02473	4/8/16

COLOR LEGEND



	1	2	3	4	5	6	7	8	9	10	11	12
A	2.012	1.936	1.994	2.062	1.998	1.962	1.962	2.095	2.082	1.958	2.06	2.074
B	2.1	1.98	1.937	2.074	1.923	1.928	2.042	2.083	2.074	2.074	2.033	2.077
C	2.113	2.087	1.892	1.994	2.003	2.003	2.082	2.105	1.972	2.06	2.121	1.971
D	1.967	2.087	2.012	2.052	2.082	2.043	1.958	2.073	2.069	2.021	2.064	1.945
E	2.06	1.936	2.06	2.055	1.936	2.06	2.086	2.086	2.051	2.064	1.989	2.055
F	2.033	2.033	2.047	1.91	2.034	2.065	2.047	2.029	2.011	2.073	2.095	2.1
G	2.029	1.985	2.078	1.914	2.069	2.117	2.086	2.028	2.104	2.144	1.997	1.967
H	2.086	2.046	2.099	2.073	1.927	2.05	2.064	1.997	2.064	1.972	1.971	1.962

Data Manager 2.4.0.25
 NIST Traceable Results

System Specifications
 Inaccuracy: Less than 3%
 Imprecision: Less than 1% CV

Plate 1 Statistics:

Mean Volume (µL)	2.032
Relative Inaccuracy	1.60%
Standard Deviation (µL)	0.058
Coefficient of Variation	2.85%

Run Statistics:

Target Volume (µL)	2
Target Solution	Range C
Number of data points per channel	1
Mean volume for all Channels (µL)	2.032
Relative Inaccuracy for all Channels	1.60%
Standard Deviation for all Channels (µL)	0.058
Coefficient of Variation for all Channels	2.85%
Relative Inaccuracy Pass/Fail Limit	10%
Coefficient of Variation Pass/Fail Limit	5%
Status based on channel results	Passed
Status based on run statistics	Passed
Notice	Limits changed

Channel Relative Inaccuracy:

	1	2	3	4	5	6	7	8	9	10	11	12
A	0.60%	-3.20%	-0.30%	3.10%	-0.10%	-1.90%	-1.90%	4.75%	4.10%	-2.10%	3.00%	3.70%
B	5.00%	-1.00%	-3.15%	3.70%	-3.85%	-3.60%	2.10%	4.15%	3.70%	3.70%	1.65%	3.85%
C	5.65%	4.35%	-5.40%	-0.30%	0.15%	0.15%	4.10%	5.25%	-1.40%	3.00%	6.05%	-1.45%
D	-1.65%	4.35%	0.60%	2.60%	4.10%	2.15%	-2.10%	3.65%	3.45%	1.05%	3.20%	-2.75%
E	3.00%	-3.20%	3.00%	2.75%	-3.20%	3.00%	4.30%	4.30%	2.55%	3.20%	-0.55%	2.75%
F	1.65%	1.65%	2.35%	-4.50%	1.70%	3.25%	2.35%	1.45%	0.55%	3.65%	4.75%	5.00%
G	1.45%	-0.75%	3.90%	-4.30%	3.45%	5.85%	4.30%	1.40%	5.20%	7.20%	-0.15%	-1.65%
H	4.30%	2.30%	4.95%	3.65%	-3.65%	2.50%	3.20%	-0.15%	3.20%	-1.40%	-1.45%	-1.90%

PARTS and Ordering

81321-1 NEPTUNE 96

Mandril tip pickup

“Inserter model



With PN 56002 96-channel NanoBlast96 Insert\$42,000. USD
 with downward-gripping Deska filler mandrils for tip pick up
 Visual Basic Software with data-bases
 Favorite 6-packs for different pipetting volumes
 One case (10 boxes with 96 tips each) of PN 84124 disposable tips
 User Manual
 On-site installation and training within continental United States
 24/7 Service and applications support.
 Requires PC unless you elect PN 6001 integrated PC

81321-2 NEPTUNE 96

Disposable cassette gasket

seal “Clamper model



With PN 56001 96-channel NanoBlast96 Insert\$42,000.
 for upward-pressing gasket tip seal.
 Visual Basic Software with data-bases
 Favorite 6-packs for different pipetting volumes
 One case (10 cassettes with 96 tips) of PN 84125 disposable tips
 User Manual
 On-site installation and training within continental United States
 24/7 Service and applications support.
 Requires PC unless you elect PN 6001 integrated PC

- 84124 Tips. One case (10 boxes with 96 tips each) of disposable tips for Neptune model 81321-1\$220.
 DeskaMagenta tips, tip ID 0.016" (400 microns) for 56002 Insert
- 84125 Tips. One case (10 cassettes with 96 tips each) of disposable tips for Neptune model 81321-2\$280.
 Longthin tips, tip ID 0.012" (300 microns) for 56001 Insert
- 84126 Tips. One case (10 cassettes with 96 tips each) of disposable tips for Neptune model 81321-2\$350.
 LS4 tips, tip ID 0.014" (350 microns) for 56001 Insert

- 56001 Insert. NanoBlast96 Insert, 96 channel, for upward-pressing gasket tip seal in model 81321-2\$16,000.
 56002 Insert. NanoBlast96 Insert, 96 channel, for downward-gripping mandril tip pick-up with Deska\$16,000.
 mandril in model 81321-1.

[Inserts are interchangeable between the two NEPTUNE96 models]

- 6000 Annual Service Contract after Warranty period. Includes refurbishment and replacement of worn\$4,000.
 parts and seals.
- 6001 Integrated PC with camcorder and video conferencing for 1 year\$5,000.
- 6002 On-site bi-annual P & A quality verification and Applications Optimization review, per year\$11,000.
- 6003 Promotional early-bird combo of 6001 and 6002 if purchased within 60 days of\$11,500.
 your receipt of NEPTUNE

Warranty 18 months warranty against defects in materials or workmanship.

DRD Liquid Handling, 12 Oakland Street Amesbury, Mass 01913 USA
 (978) 879-9014 DRDLiquidHandling.com Sales@DRDLiquidHandling.com