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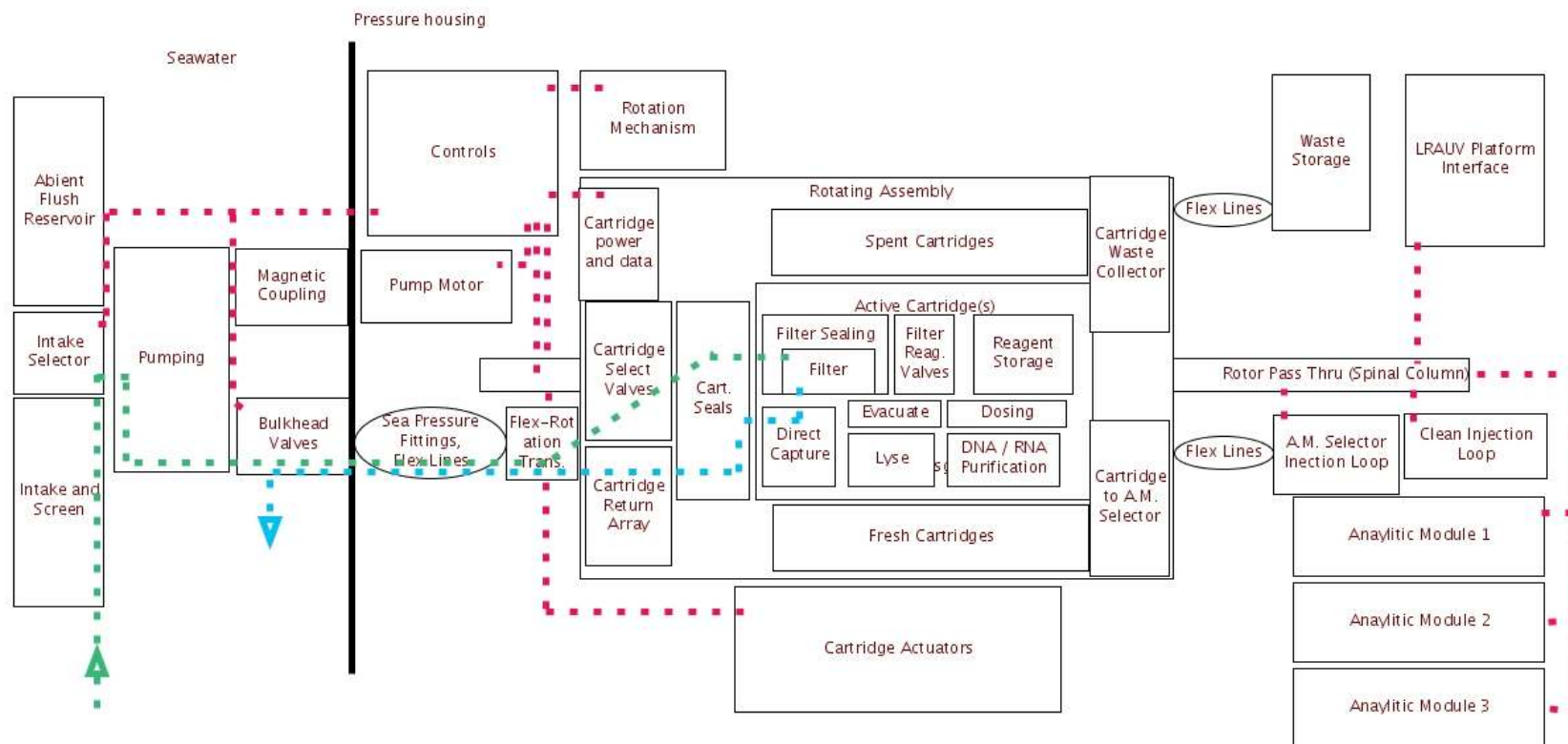
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Added by [Douglas Pargett](#), last edited by [Douglas Pargett](#) on Jul 03, 2012 ([view change](#))

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	G3 Function	Requirements	Technologies / Development needs	Manufacturers/ Collaborators	Score*
1	Ambient Flush Reservoir	• Mixtures, chemicals? • Volume (s) • Material compatibility • Dilution with SW? • Flush fluids as well?			1
2	Intake point and Screen	• Single intake? • CU screens? • Location on LRAUV • Min bore size?			2
3					
4	Intake Selector Valve Ambient Sea/Flush	• Number of ports (intakes and ambient storage)? • 3-way valve • Min bore size? • pressure neutral • 15 psid	• Solenoid • oil compensated • multi port • flipper style • Rocker style		3
5	Bulkhead valves	• Isolation of seawater path • Up to 500 psi • Min bore size? • Non-corroding • Fail closed • Wattage? Power budget? • Small scale, Size: less than c-battery	• Direct lift solenoid valves • Custom body valves (thread into a SAE 4 port) • Axial flow thru valves • Turn or axial pull valves • Multi port valves • Automated actuators of above valves.		3
6	Cartridge Selection valves	• Chemical suitable • 500 psi • Min bore size? • low power • flush free	• Ladder/Looper options • 2 position spool valves • Direct lift solenoid valves • Custom body valves • 1/4 Turn • Axial pull • Automated actuators of above valves. • Multiple bank valves integrated on a manifold	• In house design, manifold w/ Axial pull spool valve 1/4 turn	4
7	Cartridge Return Array		• check valve • part of Selection valve •	• LeeCo • Parker	4
8	Sea Pressure fittings/Tubing	• 500 psi • 1mm min thru • sea water and reagent stable • vibration resistant • reliable seal	• 1/4-28 flat bottom fittings • Testing process, procedure • Vibration testing?	• Dibafit • Upchurch • LeeCo	1
9	Filter holder sealing	• 500 psi	•		2

		• sea water and reagent stable • vibration resistant • reliable seal • Seal validation prior to filtering			
10	Filter selection valving (transition from sea to reagents)	• 500 psi • sea water and reagent stable • vibration resistant • reliable seal	• Rotary valve, reagent select, part of filter holder •		4
11	Cartridge Seals	Connection between spool valves, cartridges to cartridge			2
12					
13					
14	Filter Media	• 25mm dia (effective) area •	• Durapore • Supore		1
15	Filter Pumping	• 75 psi (5 bar bubble point) • Variable speed • Max flow at least 4L/hr (@22psi) • Min flow 300mL/hr • Dosing accuracy <1% • Positive displacement (or flow measuring) • seawater suitable • Minimal shear damage to microbes. • Bidirectional (not required, but valuable) • Size (with drive mech, but not motor) < soda can	• Piston pumps • Rotating piston (Similar to DWSM) • Syringes (with or without flow valves) • Gear pumps (low expectation) • Peristaltic (low expectation) • Progressive cavity (typically large frame) • Diaphragm • Others?		3
16	Filter Evacuate	• Need to remove seawater <5% of lysis volume. • In G2, remaining seawater needs to be <100uL • For 1mL lysis volume, <50uL, or <1 drop. • Test numbers: Dry filter +holder, 9.91g • wet filter (filter holder dry) 9.95g (40 uL) • no change if vacuumed, no change w/ single 10ml blow thru • after 3X 10mL blow thru, 9.92g (10 uL) • filter appeared to be mostly dry	• Air pressure evac (G2 method) • Vacuum assist below filter? • Filter holder is piston assembly, w/ small dead volumes • Displacement with other fluid?		4
17	Lyse	• Up to 1mL of buffer w/ w.o beads • Sample particles on filter • Qiagen Lysis buffer RLT, RLT+, >RNA & DNA • SPR buffer Aq Methanol	• Bead Beating • Heating • Integrated heater/filter fit or holder • Grinding • Magnetic driven beating/grinding • Acoustic/Sonic • Sequential Chemistry • Automation of the above in closed volumes •	DNA/RNA: • (4) Microsonic (8/10 lyse) w/ w.o beads • (4) Magnet flipper • (4) Bead Mill • Grinder • (2) Heat (5/10 lyse) • Ref Bead Beat (10/10 lyse)DA/rRNA: • (2) Heat	4
18	DNA/RNA purification	• Purification of 500-1000uL of lysate • RNA and DNA in single sample desired.	• RNA and DNA extraction from one sample • Magnetic bead Need sources, size and coating • Glass bead/fiber columns	• (3) Qiagen Membrane Single use only Mock up on MFB May need a pressure sensor	3

			- Non-centrifuge wash processes. - Automated systems that perform the above.	(4) iFast May or may not be renewable Currently using RLT For DA: pass beads to SPR For NA: no beads pass (3) Current silica column Renewable (3) Chip Shop Mag bead	
19	Direct Capture				
20	Reagent storage	- Bulk storage to 500mL - Single use storage 50uL to 1mL	Blister packs Prefilled syringes Imbedded syringes Lyophilized Dry powder (beads)		4
21	Reagent dosing	- Deliver 50-750uL doses of liquid reagent - Deliver single shot reagent doses - Deliver/dose powder (beads)	Compressed gas systems Linear or cam actuators of blisters/syringes Actuation methods for any of the above storages, such as Dissolving/melting pills or isolators.		4
22					
23	Rotating Assembly	- Spindle, supporting 30+ cartridges - Structurally supports actuator forces - Support g loads - Retains cartridges against g loads, pressure - Thur bore sufficient for wiring harnesses - Mech should sin freely, but operate +180/-180	- Cantilever spindle - large diameter alignment bearing - Between bearings (req's end support structure) - Cam followers - Additional support at actuator point.		2
24	Rotation Mechanism	- Align cartridges to actuators - Align cartridges to fluid transfer positions - Accuracy: .020 at 11" dia - Torque: drag/stiction of alignment bearings - Specific qty of stop positions or near infinite alignments?	- Anti backlash - Worm drives - Direct gear drives - Geneva mechanism - No-backdrive - DC motor, - Stepper motor - servo controller - direct position sensing		2
25	Flex Line/Cable Rotation Trans.	+180/-180 motion - maintain fitting/seals 2 high pressure (intake, exhaust) 1 low pressure (waste) - Possibly 3+ AM handoffs? - Cable bundle from controls	- Snake pit, coil wrap - torque coil	http://www.igus.com/wpck/default.aspx?Pagename=TwisterBand	
26	Cartridge Actuators				4
27					
28	Cartridge Waste Collector				4

29	Waste Storage		- On Cartridge No collector/flex lines, limited vol. - Off Cartridge Higher Vol, req collector/flex lines	2
30				
31	TRANSFER TO AM			
32	Cartridge to AM Selector	90+ ports in 3 ports out.	Mega-multi port valves. (90+ ports) Chip based valve to make multiport system Low pressure, robotic open/seal fittings.	5
33	AM Selector Injection Loop			4
34	Clean Injection Loop			4
35	Rotor Pass-Thru			2
36	LRAUV Platform Interface			2
37	LRAUV Pressure Housing	- No tie rods thru housing - Seal to tube section - Maintain Structural support of nose/drive section	- In house design - Lock ring to tube	See model G3LRAUVHousing.sldasm 2
38				

Scored as follows:

- 1: COTS components, or process, readily available, used right out of the box, without modifications.
- 2: New designs, with known technology and variables (no prototype testing needed, can directly design deployment hardware.)
- 3: OEM components, or modified COTS.
- 4: New prototype and designs, with known theory/physics, but unknown technologies and variables. (prototypes need to be designed and tested prior to deployment hardware design.)
- 5: New design needed, but no theory/physics are yet known that would enable the technology.

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