

Perfusion Systems

ALA Scientific's 4 and 8 channel perfusion systems fulfill the basic requirements of the student lab but can also be optimized to fit the most demanding applications of patch clamp recording and/or imaging. All VC³ systems provide electronic control of solution exchange which improves reproducibility over manual methods. These systems are designed to minimize electronic noise so sensitive electrophysiological recordings can be performed.

Key features of the VC³ 4 & 8 channel systems include:

- Choice of low-maintenance pinch valves or fast-response solenoid valves
- Customizable reservoir sizes and materials
- Bath or focal perfusion applicability
- Valve control through DAQ, VC³ software, or controller
- Spill sensor with automatic shutoff to protect microscope optics
- **MilliManifold™** and **MicroManifold®** outlet options for low volume and rapid applications
- Valve open and close timestamps via analog or digital output

VC³ systems have the option of integrating either pinch or solenoid valves. Three-way pinch valves have response times of 15-20 ms and are easy to clean because solution runs through the valve in removable tubing. Solenoid valves have response times of 1-2 ms and are made for high speed applications.

Unlike other competitive perfusion systems, all VC³ systems include Windows compatible command software which allows users to set protocols for opening and closing of specific channels for preset amounts of time. Protocols can be initiated by starting within software or by external trigger from data acquisition systems. Individual valves of the VC³ systems can also be controlled via analog or TTL input.



VC³ 4 channel controller



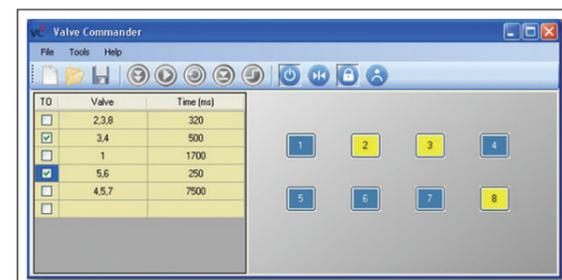
VC³ 8 channel controller

VC³ Controller Features:

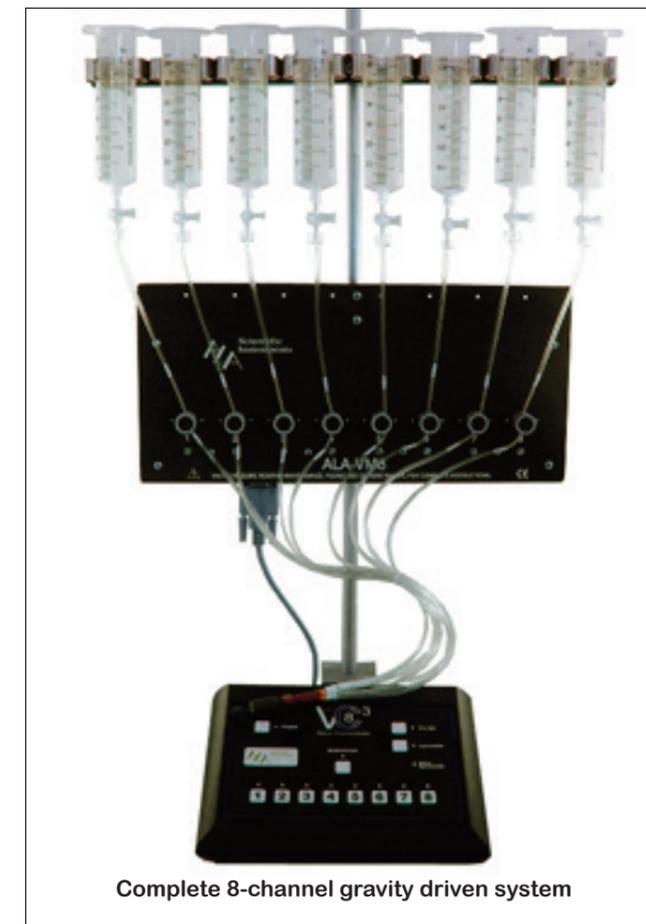
- Membrane front panel for touch control
- Automatic valve power reduction to 1/2 value after 50ms to prevent overheating
- Manual control: toggle on/off or momentary on/off
- Auxiliary valve control for automatic outlet clearing
- Sync output for valve open marking
- Programmable TTL input or output for even more flexible DAQ control
- Valve Commander software - USB 2.0 for PC control included free with updates available for download via ALA web site
- Lasso Spill Sensor™ to protect expensive microscope parts - audible alarm and automatic shut off when spill is detected
- Computer control: Analog input 0.5V per valve
- Control system from Pclamp, PatchMaster, and other DAQ systems



VC³ rear panel



Gravity Perfusion Systems



Complete 8-channel gravity driven system

Perfusion is critical in most biological applications, both for maintaining the viability of preparations and establishing experimental conditions. Electronic control of solution exchange improves fluid delivery and enhances reproducibility over manual methods. With the VC³ systems, you can configure systems for the basic requirements of the student lab or you can optimize them for the most demanding applications of patch-clamp recording and/or imaging.

VC³ systems can drive fluid by using gravity.

Gravity driven systems are ideal for use with larger diameter tubing and can be used to perfuse bath preparations to maintain viability and establish experimental conditions. Gravity systems include **Minimanifold™**, valve manifold with solenoid or pinch valves, 60 ml reservoirs, VC³ controller, power supply, Luer valves, magnetic stand, spill sensor, manual flow control valve (FCV-1), USB cable, and software. An optional DB9-BNC Cable is available.

VC³ Gravity System Highlights

- 4 & 8 channel versions
- Easy and fast setup
- Includes MiniManifold™ outlet & FCV-1 flow control valve
- Electronics compatible with electrophysiology
- Low maintenance pinch valves or fast response solenoid valves
- Comes complete with all tubing



Complete 4-channel gravity driven system

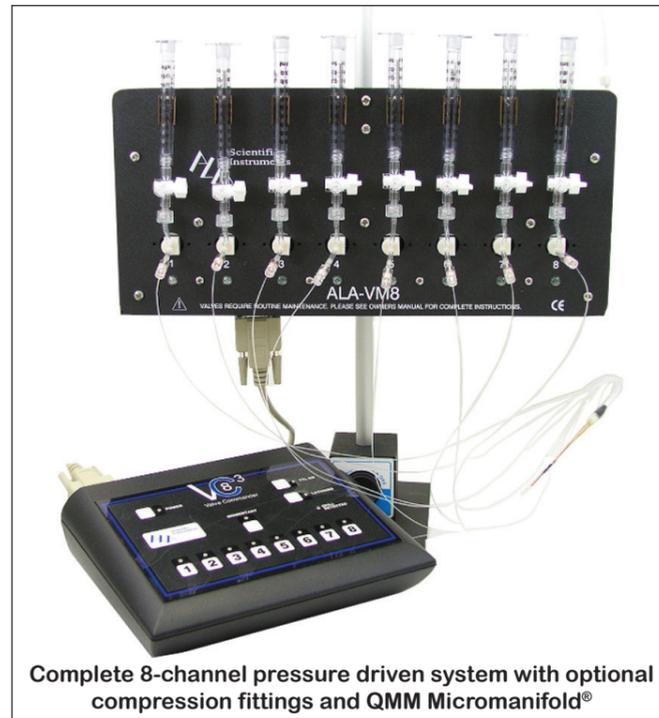
Gravity flow rate specifications assuming 60ml reservoirs are full and FCV-1 valve is not attached

Height (cm)	w/ MilliManifold™ (ml/min)	w/ Minimanifold™ (ml/min)
90	11	37
80	10	31
70	9	29
60	8	25
50	7	22

VC³ Fast Focal System Highlights

- Easy and fast setup
- 4 & 8 channel versions
- Use with ALA's QMM Micromanifold® for rapid solution exchange and low dead volume (<90nl)
- Low maintenance pinch valves or fast response solenoid valves
- Electronics suitable for electrophysiology recording

Sample pressurized flow rate:
1ml in 9 minutes
 at 10 PSI/ 70kPa
 through
QMM Micromanifold® with 100µm
 ID tubes



Rapid focal perfusion is critical for establishing experimental conditions, such as dose response curves. Electronic control of solution exchange is the only way to ensure rapid fluid delivery and reproducibility. By using a VC³ system with focal outlet, you can configure the system for very basic perfusion requirements or you can optimize the system for the most demanding applications of patch-clamp recording and/or imaging.

VC³ systems can drive fluid by using pressure.

Pressure driven systems can perfuse solution through tubing with very small ID's, therefore, are ideal for use in focal applications where only a small amount of solution is needed around the preparation and pressurization also means a faster switch rate at the cell membrane. This focal application is especially useful for researchers looking for dose response curves. Pressurized systems include valve manifold with solenoid or pinch valves, 5ml pressurized reservoirs, VC³ controller, power supply, magnetic stand, spill sensor, USB cable, and software. Quartz Micro-Manifold® (QMM) perfusion outlet, DB9-BNC cable, compression fittings (CF), and PR-10 Pressure Regulator, are sold separately.



Ordering & Specifications

Ordering Information for the VC ³	
All VC ³ systems include controller, power supply, magnetic stand, valve manifold, spill sensor, valve bank to controller cable, and software	
VC ³ -4PG	4 Channel incl. 4 pinch valves, 4 x 60ml reservoirs, 4 Luer valves, flow control valve, and MMF-4
VC ³ -4SG	4 Channel incl. 4 solenoid valves, 4 x 60ml reservoirs, 4 Luer valves, flow control valve, and MMF-4
VC ³ -8PG	8 Channel incl. 8 pinch valves, 8 x 60ml reservoirs, 8 Luer valves, flow control valve, and MMF-8
VC ³ -8SG	8 Channel incl. 8 solenoid valves, 8 x 60ml reservoirs, 8 Luer valves, flow control valve, and MMF-8
VC ³ -4PP	4 channel pinch valve system w/ pressurized 5ml reservoirs. 4 x CF-1's and QMM-4WT or MLF-4 and tubing not included; MUST be purchased separately.
VC ³ -4SP	4 channel solenoid valve system w/ pressurized 5ml reservoirs. 4 x CF-1's and QMM-4wt or MLF-4 and tubing not included; MUST be purchased separately.
VC ³ -8PP	8 channel pinch valve system w/ pressurized 5ml reservoirs. 8 x CF-1's and QMM-8wt or MLF-8 and tubing not included; MUST be purchased separately.
VC ³ -8SP	8 channel solenoid valve system w/ pressurized 5ml reservoirs. 8 x CF-1 and QMM-8wt or MLF-8 and tubing not included; MUST be purchased separately.

Specifications for the VC ³	
Valve Controller:	
Dimensions/Weight	8"/20.32cm x 6"/15.24cm x 2.5"/6.35cm / 1.5lbs/0.68kg
Power	15VDC/3.15A
Computer Control Input	Analog input 0.5V/valve; TTL high 1 bit/valve; USB 2.0 command
Computer Output Monitoring	Analog output 0.5V/valve; Sync TTL high; TTL high 1 bit/valve
Manual Control	Membrane switch 1/valve; mom on/off or toggle on/off
Valve Manifolds:	
Pinch Valves	12VDC/0.25A ea.- 3 way normally open/normally closed pinch valve
Pinch Valve Opening Speed	15 to 20 ms
Pinch Valve ID Tubing	0.020"/0.5mm for pressurized systems/.040/1mm for gravity
Solenoid Valves	12VDC/0.08A ea.- Lee OEM Inert Solenoid Valve
Solenoid Valve Opening Speed	1 to 2 ms
Reservoirs Pressure	5ml Luer lock pressurized syringe with 3-way stop cock valve/other sizes available
Reservoirs Gravity	60ml Luer lock syringe