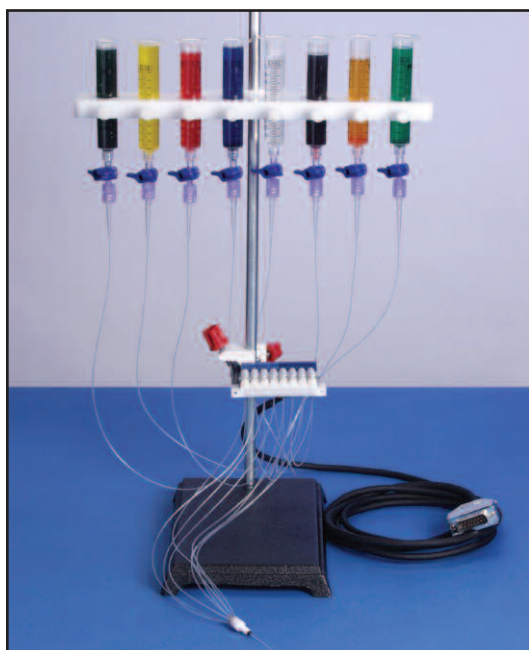


Perfusion Valve Controller

Model VC-8M



WARNER
INSTRUMENTS

A Harvard Apparatus Company

CE

Publication 5714-001-REV-A

WEEE/RoHS Compliance Statement

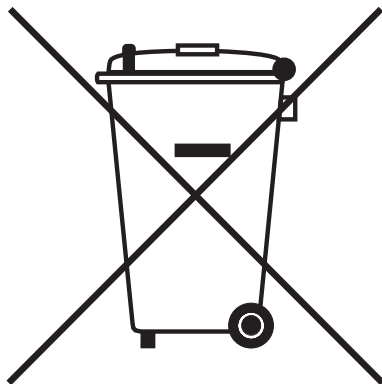
EU Directives WEEE and RoHS

To Our Valued Customers:

We are committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for our products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive - Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of our products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. We will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.



- **Do Not Dispose Product with Municipal Waste**
 - **Special Collection/Disposal Required**

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Introduction

The **VC-8M** Valve Control System lies at the heart of a multi-valve perfusion system designed to automate and control the delivery of solutions to Warner Instruments imaging and recording chambers. However, its flexible design allows the system to be used in many applications not using Warner equipment.

The complete system includes the valve controller, a valve bracket with mini valves, connecting cable, PE-50 tubing, an **ML Series** manifold, a ring stand, eight 10 cc syringes and an assortment of tubing connectors.

The miniature solenoid valve assembly is standard with the system. They are lightweight and made from rugged materials for long life. Valves are dual acting with both NORMALLY OPEN and NORMALLY CLOSED sides. The NORMALLY OPEN side is plugged with removable stoppers and when these are removed solution can flow to waste while the valve is in the *off* position.

A new and exciting feature to the **VC-8** system is the **Spill Sensor**. This probe is used to detect the presence of an overflow condition and, when activated, it will automatically shut off all valves protecting your microscope optics.

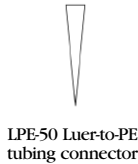
The controller can independently regulate the function of up to eight valves. Individual valves can be controlled via a manual switch, an external analog signal or an external digital (TTL) signal. An event marker pulse, generated each time a valve is switched on, is provided at the rear of the instrument for recording into your acquisition system. Valve transitions (opened or closed) occur at full power to insure rapid response times and are then held in place at less than half power to prevent heat transfer to solutions.

Features

- Mini valve system
- 8 channels
- Spill sensor
- Manual and computer control

Operating Directions

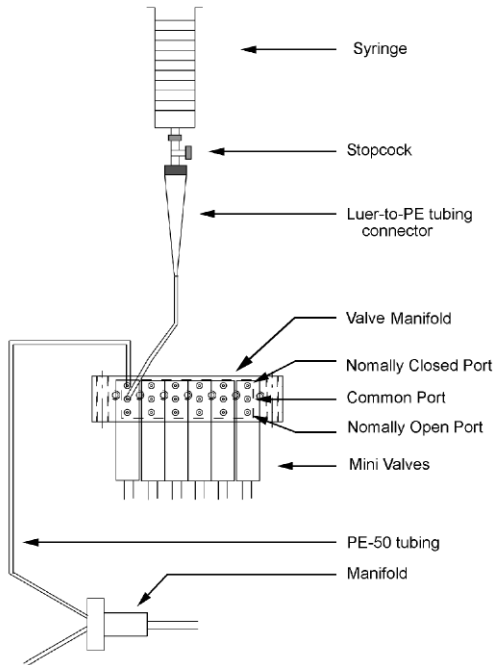
Before beginning setup, take an inventory of the plastic fittings supplied with the complete system. These fittings include eight (8) **LPE-50** tube-to-Luer connectors and eight (8) stopcock-with-Luer connectors. Connectors are shown below.



Setup

The diagram below shows connections for the **VC-8M Perfusion System**. The valve manifold comes with plugs to block flow to the **NORMALLY OPEN** flow lines. Remove these plugs and use these ports if a flow-to-waste system is desired.

In general, the shortest response time of the system will be achieved by keeping the tubing length between the **MANIFOLD** and sample as short as possible.

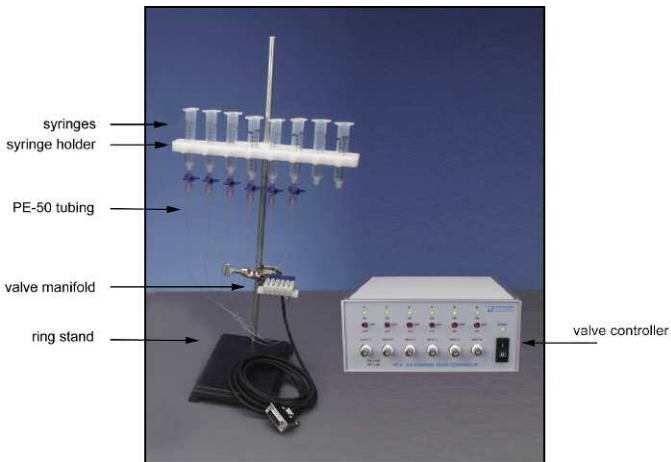


Operating Directions (Cont'd)

The **VC-8M Valve Controller** is assembled in the following manner:

First, attach the VALVE MANIFOLD to the RING STAND as shown below. This is followed by insertion of PE-50 tubing into the valve ports on the VALVE MANIFOLD. Depending on the flow arrangement you're using (on-off or flow-to-waste), cut either eight (8) or sixteen (16) pieces of PE-50 tubing long enough to reach from the VALVE MANIFOLD to the PERFUSION MANIFOLD and from VALVE MANIFOLD to the your waste container.

Attach cut tubing to the *output ports* on each MINI-VALVE on the VALVE MANIFOLD by gently pressing into place. Port positions are shown in the figure on page 4. Place flow-to-waste tubing into the waste container and attach sample tubing to the PERFUSION MANIFOLD.



Next, attach the SYRINGE HOLDER to the RING STAND. Affix a LUER-TO-PE-50 TUBING connector to each STOPCOCK-WITH-LUER connector. Mount SYRINGES into the SYRINGE HOLDER and attach a prepared stopcock assembly to each SYRINGE. Now cut six (8) pieces of PE-50 tubing just long enough to run from the LUER-TO-PE-50 TUBING connector (on the SYRINGE) to the *input port* on each MINI-VALVE.

Finally, make a connection between the perfusion MANIFOLD and your sample with PE-50 tubing. Plug the VALVE MANIFOLD into the VALVE CONTROLLER and the system is ready to use.

Operating Directions (Cont'd)

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Warner Instruments Perfusion Valve Controller Model VC-8M

Overflow Sensor

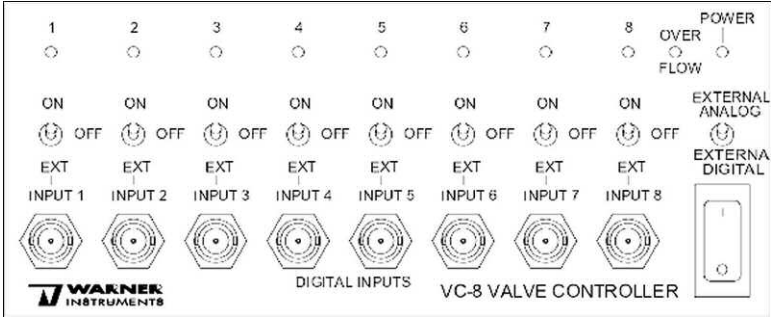
An overflow or spill sensor is has been provided to assist you in providing a level of protection to your microscope while using the **VC-8M** Valve Control System. The overflow sensor itself is a Ag/AgCl probe which grounds through the chamber bath. A resistance of 10 M Ω or less between the probe and bath will trigger the overflow circuitry.

Place the probe adjacent your perfusion chamber such that the maximum solution height (say, just prior to an actual overflow) is achieved when the solution contacts the tip of the probe. Contact between the probe and your solution will activate the overflow circuitry and close all the valves. The OVERFLOW SENSOR plugs into the OVERFLOW IN BNC on the rear of the controller.

Control Description

Front Panel

The front panel contains TTL inputs for each valve, a 3-position toggle switch for manually setting the state of each valve and an LED displaying the active status for each valve. There is also a 2-position toggle switch for selecting the *command input mode*, a SPILL SENSOR indicator, and a power switch with power on LED.



TTL Inputs

TTL inputs (front panel BNC's and ON/OFF TOGGLE SWITCHES) are provided for all 8 channels of the VC-8 controller. Operation of the front panel TTL inputs is selected by placing the 2 position COMMAND INPUT TOGGLE into *external digital* mode. Use of these inputs can allow the opening of more than one valve at the same time from a digital source such as your computer.

Placing the ON/OFF TOGGLE SWITCH into the *on* position places the associated valve into its open state. A lit LED indicates the open state of the valve. This setting is overridden by the overflow sensor.

Placing the ON/OFF TOGGLE SWITCH into the *off* position places the valve into its closed state. An unlit LED indicates the closed state of the valve.

Placing the ON/OFF TOGGLE SWITCH into the *ext* position activates the associated BNC inputs. A logic level *low* (0 V) applied to the BNC places the associated valve into the *closed* state. Correspondingly, a logic level high (3 to 5 V) places the associated valve into the *open* state. A lit and an unlit LED indicates the open and closed states of the valve, respectively. These settings can be overridden by the overflow sensor.

Command Input Toggle

The COMMAND INPUT TOGGLE is used to select between the front panel external digital controls and the rear panel *external analog controls*.

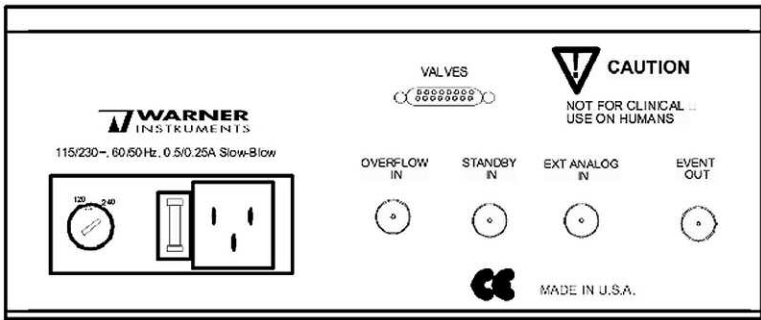
Control Description (Cont'd)

Overflow

The OVERFLOW LED indicates an overflow condition sensed by the OVERFLOW SENSOR. Activation of this circuit by an overflow condition immediately overrides all other settings and closes all valves.

Rear Panel

The rear panel contains the power input module with fuse, a 15 pin D-connector for the VALVE SET, and 4 BNC connections for OVERFLOW IN, STANDBY IN, EXTERNAL ANALOG IN and EVENT OUT.



D Connector

A 15 pin "D" type female connector is used to connect the VALVE BRACKET (and valves) to the CONTROLLER.

Overflow In

This BNC is used to connect the OVERFLOW SENSOR to the controller. Place the sensor into position and plug it into this BNC.

Standby In

This BNC is provided to allow the placing of the VALVE CONTROLLER into *standby mode*. *Standby mode* disables EXT ANALOG IN inputs and closes all valves.

Activation of this input is selected by placing the FRONT PANEL COMMAND input toggle into *external analog* mode and a TTL level *high* (3 to 5 V) places the instrument in *standby*.

Control Description (Cont'd)

Ext Analog In

This BNC is used to operate valves using analog voltage settings. The voltage applied to this input selects the valve to open. All other valves are closed. Switching voltages closes the open valve and open the other. Valve selections are overridden by the OVERFLOW SENSOR and the STANDBY BNC.

The table below indicates the selection scheme.

Applied Voltage (V)	Valve Selection
0	standby
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

Event Out

The Event Marker output produces a 500 ms logic-level output (+5 V) each time a valve is turned on. At all other times the Event Marker output is low (0 V).

Power Input Module

A polarized, 3-conductor, IEC320/CEE-22 connector is used for line (mains) power input to the instrument. A removable cordset, terminated with a NEMA 5-15P connector, is standard. A fuse holder contains a protective fuse in series with the high side (brown or black wire) of the mains. The holder accepts 5 x 20 mm fuses of the type indicated.

Control Description (Cont'd)

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Warner Instruments Perfusion Valve Controller Model VC-8M

AC Conversion

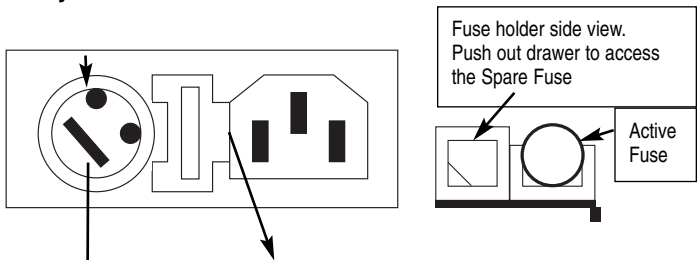
ATTENTION

PLEASE READ BEFORE APPLYING POWER TO YOUR UNIT!!

The unit uses only one fuse; the second one is sent as spare.

Follow these instructions to change the unit(s) from 120 VAC or 220 VAC:

Power Entry Module



Step 1

Depending on AC Voltage being used, turn VAC selector switch to 110 VAC or 220 VAC

Step 2

Carefully pry open the fuse holder from the inside by using a small flat screwdriver. Replace fuse according to voltage being used.

For 120 VAC: 0.50 Amp - 5 x 20 mm Slow Blow
For 220 VAC: 0.25 Amp - 5 x 20 mm Slow Blow

Fuse holder side view. Push out drawer to access the Spare Fuse

Active Fuse

Instructions for Use

Flow Adjustment

Flow rates can be adjusted by raising or lowering the reservoir holder, as well as by adjusting the height of each reservoir within the holder.

The table below lists the approximate flow rates for a reservoir at the specified height with the supplied Teflon® tubing.

Reservoir height	Approximate flow rate
61 cm (24 in)	14 ml/min
30 cm (12 in)	9 ml/min
20 cm (8 in)	5 ml/min

Flow rates as a function of reservoir height.

Cleaning

Do not use alcohol, aromatic hydrocarbons or chlorinated solvents for cleaning. They may adversely react with the plastic materials used to manufacture the system. If salt solution spills on the valve assembly it should be cleaned as soon as possible with a soft cloth dampened with a mild solution of detergent and water.

NOTE: Teflon and Lee Mini Valves must be completely flushed with distilled water after each use. Permanent damage will result if saline solution is allowed to crystallize inside the valve.

The exterior of the CONTROLLER may be cleaned periodically to remove dust, grease and other contamination. It is not necessary to clean the inside. Use a soft cloth dampened with a mild solution of detergent and water. Avoid abrasive cleaners.

Warranty

The **VC-8M** is warranted to be free from defects in materials and workmanship for a period of two years from the date of shipment. If a failure occurs within this period, we will repair or replace the faulty component(s) at our discretion. This warranty does not cover failure or damage caused by physical abuse or electrical stress (e.g., exceeding specified input limits).

Shipping charges to the factory are the customer's responsibility. Return shipping of the repaired unit will be paid by Warner Instruments.

Appendix

Specifications

Valves:	12 VDC/0.46 A solenoid type
Tubing	PE-50
Valve Bracket	Teflon. Mounts on 3/8" or 1/2" ring stand
Connection Cable	2.4 meter (8 ft) connecting cable terminated with quick disconnects on valve end and 15 pin male "D" type connector on controller end.
Reservoirs	10 cc capacity syringes
Reservoir Holder	Delrin. Holds eight syringes with thumb screws for each reservoir.
Valve Controller (front panel):	
Power	Two position on/off with power-on LED
Input Select	Two position selecting analog or digital inputs
Switch Selection	<i>On (manual), Off or External</i>
External Input	+5 V TTL-compatible (BNC Connector)
Overflow	LED indicating overflow condition
Valve Controller (rear panel):	
Overflow In	BNC connection to OVERFLOW SENSOR. Triggered when sensed resistance falls below 10 MΩ.
Standby In	BNC connection to activate <i>standby mode</i> . TTL <i>high</i> closes all valves.
Ext Analog In	In BNC connection for valve selection. Active valve opened by analog voltage.
Event Marker	Logic level pulse 500 ms nominal (rear panel BNC connector)
Manifold	2/1, 4/1 or 6/1 nominal dead space
Power	110 to 130 or 200 to 250 VAC, single-phase, 50/60 Hz, 20 W
Operating Temperature	10° to 40°C (50° to 104°F)
Dimensions, H x W x D	89 x 203 x 305 mm (3.5 x 8.0 x 12 in)
Weight / Shipping Weight	3.7 kg (8 lb) / 4.6 kg (10 lb)
Operating Conditions:	
Temperature	0 to 40°C
Altitude	Sea level to 2000 m
Relative Humidity	0 to 95%

Declaration of Conformity

CE MARKING (LVD & EMC)

**Application of Council Directive: 73/23/EEC
89/336/EEC**

Standard(s) to which
conformity is declared:

*EN61010-1:1993
EN55022 Class A
EN61000-3-2
EN61000-3-3
EN50082-1:1992
EN61000-4-2
EN61000-4-3
ENV50204
EN610000-4-4
EN610000-4-8
EN610000-4-11*

Manufacturer's Name:

Warner Instruments, LLC

Manufacturer's Address:

*1125 Dixwell Avenue
Hamden, CT 06514
T: (203) 776-0664*

Equipment Description:

Valve Controller

Equipment Class:

Class I, ITE-Class A

Model Numbers:

VC-8 Controller

***I, the undersigned, hereby declare that the equipment specified above
conforms to the above Directive(s) and Standard(s).***

Place: Hamden, Connecticut U.S.A.

Signature: *Ralph Abate*

Full Name: Ralph Abate

Position: Business Manager

 **WARNER**
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