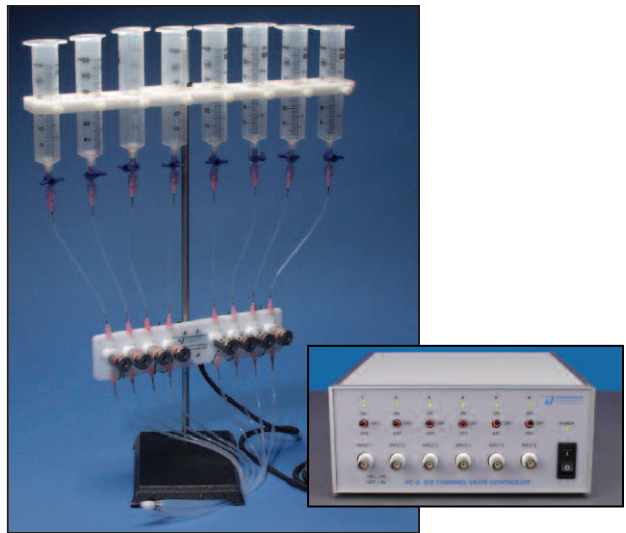


# Perfusion Valve Control System

*Model VC-6T*



**WARNER**  
INSTRUMENTS

A Harvard Apparatus Company

# WEEE/RoHS Compliance Statement

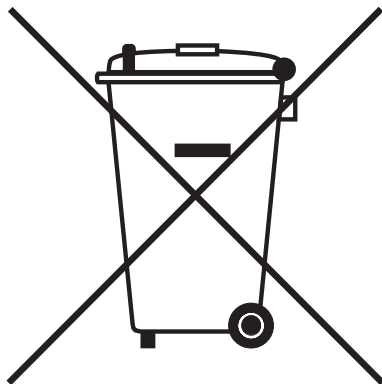
## EU Directives WEEE and RoHS

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

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The **VC-6T** 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. In addition, its flexible design allows the **VC-6T** to be used in many applications not using Warner equipment.

The complete system includes a valve controller, a valve bracket with Teflon® valves, connecting cable, an **MPP-6** manifold, a support stand, syringe holder, six 60 cc syringes, 25 feet of Teflon® tubing, 10 feet of **PE-160**, 18 blunt-ended 18-gauge syringe needles, and 6 stopcocks.

The controller can independently regulate the function of up to six valves. Individual valves can be controlled via 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

- Teflon® valves
- 6 channels, individually controlled
- Computer controllable

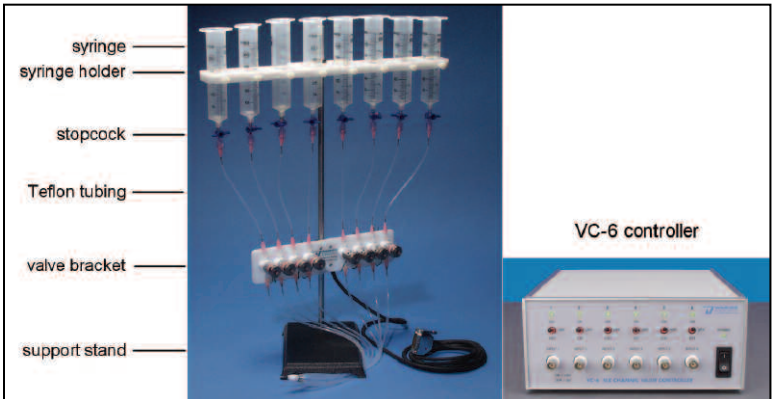
# Operating Directions

## Setup

### Components

Before beginning setup, take inventory of the supplied components. You should have:

- valve bracket with included Teflon® valves
- syringe holder
- support stand
- 18 blunt-end syringe needles
- stopcocks (6)
- Teflon® tubing (25ft)
- PE-160 tubing (10ft)
- MPP 6-port manifold
- VC-6 Valve Controller

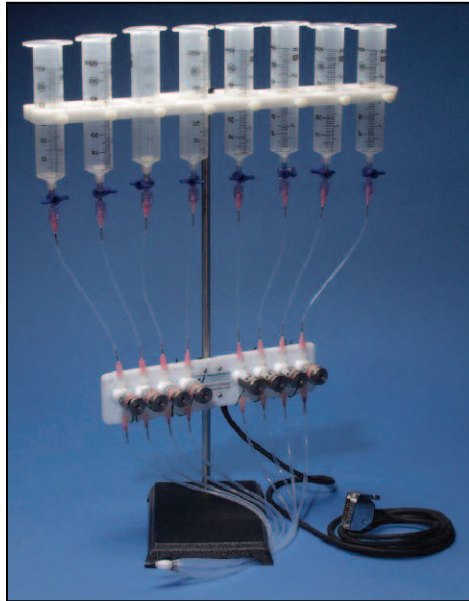


The VC-6T is designed to operate as a *stopped-flow* device where in the valve for each channel is either open (allowing solution to flow) or is closed. In general, the shortest response time for delivery of the selected solution will be achieved by keeping the tubing length between the MANIFOLD and sample as short as possible.

# Operating Directions (Cont'd)

## Assembly

1. Begin assembly of the **VC-6T** by first attaching the **VALVE BRACKET** to the **SUPPORT STAND**. Place the **VALVE BRACKET** near the base of the **SUPPORT STAND** as shown below.
2. This is followed by attaching the **SYRINGE HOLDER** to the top of the **SUPPORT STAND**. Place the **SYRINGE HOLDER** near the top of the **SUPPORT STAND** as shown below.



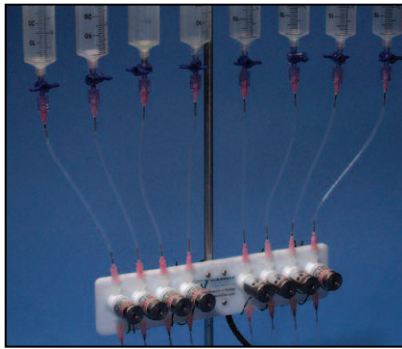
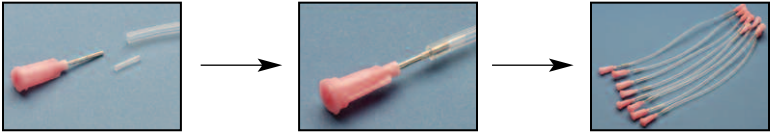
3. Remove the plungers from the six supplied 60 cc syringes and place the syringes into the **SYRINGE HOLDER**. Attach **STOPCOCKS** to each syringe.
4. Cut six (6) pieces of Teflon® tubing long enough to run from the stopcocks to the input ports on the Teflon® valves.
5. Attach one (1) blunt-end, 18-gauge syringe needle to both ends of each length of Teflon® tubing to provide Luer connection points. Insert a short section of **PE-160** onto the needle tip to facilitate a tight seal between the Teflon® tubing and the syringe needle.

# Operating Directions (Cont'd)

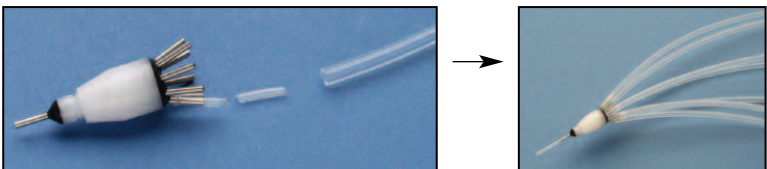
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Warner Instruments Perfusion Valve Control System Model VC-6T

- Using the Luer-ended Teflon® tubes formed in step 5, make a connection between the stopcock on each syringe to the associated *input port* on each Teflon® valve. Proper tubing lengths, Luer connector attachments, and tubing placements are shown in the montage below.



- Cut six (6) pieces of Teflon® tubing to run from the output ports of the Teflon® valve to the supplied **MPP** manifold. The required tubing length is left to the discretion of the user but should be sufficient to allow for a short connection between the manifold and the sample chamber. Attach the remaining blunt-end syringe needles to one end of each section of Teflon® tubing.
- Prepare the **MPP** manifold to accept the Teflon® tubing by first sliding a short length of **PE-160** tubing over the *input ports* on the **MPP** manifold.
- Now make a connection between the *output port* on each Teflon® valve and one *input port* on the **MPP** manifold. Connection should be made using the Teflon® tubing described in step 7. Attach the Luer fitting to the valve and the open end to the manifold.



# Operating Directions (Cont'd)

10. Run a short length of **PE-160** tubing from the *output port* on the MPP manifold to the *input port* of sample chamber.

**NOTE:** If desired, you can also run Teflon® tubing between the manifold and your chamber. Prepare the manifold to accept the Teflon® tubing by first sliding a short length of **PE-160** tubing over the output port on the **MPP** manifold.

11. Finally, connect the VALVE MANIFOLD to the **VC-6** CONTROLLER using the attached cable.

## AC Conversion

### ATTENTION

**PLEASE READ BEFORE APPLYING POWER TO YOUR UNIT!!**

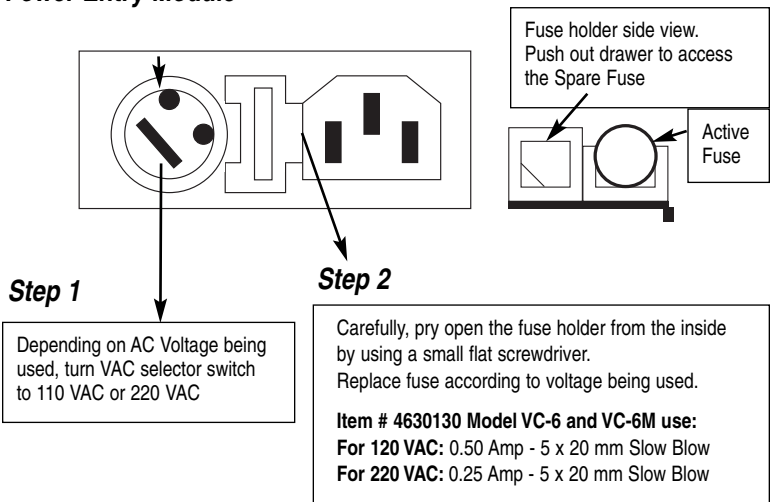
The unit has been set to be used with 120 VAC.

If the VAC needs to be changed to 220 VAC, enclosed you will find a kit (power cord (1) and fuses (2)) to be used to convert the unit from 120 VAC to 220 VAC.

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





# Operating Directions (Cont'd)

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Warner Instruments Perfusion Valve Control System Model VC-6T

## Front Panel

The front panel of the **VC-6 Valve Controller** contains TTL inputs for each valve, an associated 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 3-position toggle switch for selecting the command input mode and a power switch with power on LED.



### Command input toggle

A COMMAND INPUT TOGGLE SWITCH is provided for each of the 6 channels of the **VC-6 Controller** to allow selection between internal and external commands.

Placing a COMMAND INPUT TOGGLE SWITCH into the *on* position drives the associated valve into its open state. A *lit* LED indicates the open state of the valve. In a similar manner, placing a COMMAND INPUT TOGGLE SWITCH into the *off* position drives the associated valve into its closed state. An *unlit* LED indicates the closed state of the valve.

### TTL Inputs

TTL inputs (front panel BNC's) are provided for external control for each valve channel. Use of these inputs can allow for the simultaneous opening of more than one valve from a digital source (e.g., a computer).

Placing a COMMAND INPUT TOGGLE SWITCH into the *ext* position activates the associated TTL BNC input. A logic level *low* (0 V) applied to the BNC places the associated valve into the *closed* state. Correspondingly, a

# Operating Directions (Cont'd)

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.

## Rear Panel

The rear panel contains the power input module with fuse, an EVENT MARKER OUTPUT, and a 15 pin D-connector for the VALVE CONTROL BRACKET.



### To Valves

A 15 pin, "D" type female connector is used to connect the cable from the VALVE BRACKET to the CONTROLLER.

### 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.

# Operating Directions (Cont'd)

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## 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 Tygon, tubing.

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

## 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 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 this instrument 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 and avoid abrasive cleaners.

### ***Stuck or leaky valves***

One possibility for a stuck valve is that the valve assembly was not completely flushed out at the end of the day. While excessive salt build-up can result in a stuck valve, a more significant condition is the potential formation of small pits in the valve seals, which will result in a leaky valve.

A valve bound with salt can be loosened by flushing with warm water to see if the crystals will dissolve or loosen. ETOH may be used for sticky buildups and dilute acetic acid may be used to loosen any mineral deposits.

With the valve in the open position inject the selected cleaning solution into the flowpath using a 10 cc syringe. Inject so solution flows from the input to output ports. Repeat as often as necessary, usually 3 to 4 washes are sufficient. Use an empty syringe to blow air through valve to remove any remaining cleaning solution from the valve interior.

If the valve remains stuck, or continues to leak, after repeated attempts of this cleaning procedure then the valve should be replaced.

# Warranty

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The **VC-6T Valve Control System** 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, Inc.

# Specifications

## Specifications

<b>Valve Bracket:</b>	Delrin, mounts on 3/8" or 1/2" ring stand
<b>Valves</b>	Teflon®, 12 VDC/0.25 A to maintain pinch
<b>Connection Cable</b>	2.4 meter (8 ft) connecting cable terminated with quick disconnects on valve end and 15 pin male "D" type connector on controller end.
<b>Tubing</b>	Teflon®, 1/8 OD x 1/16 ID tubing
<b>Reservoirs</b>	60 cc capacity syringes
<b>Reservoir Holder</b>	Delrin. Holds six syringes with thumb screws for each reservoir.
<b>Valve Controller:</b>	
<b>Switch Selection</b>	<i>Manual, Off or External</i>
<b>External Input</b>	+5 V TTL-compatible (BNC Connector)
<b>Event Marker</b>	Logic level pulse 500 ms nominal (rear panel BNC connector)
<b>Manifold</b>	2/1, 4/1 or 6/1 nominal dead space
<b>Power</b>	110 to 130 or 200 to 250 VAC, single-phase, 50/60 Hz, 20 W
<b>Operating Temperature</b>	10° to 40°C (50° to 104°F)
<b>Dimensions, H x W x D</b>	89 x 203 x 305 mm (3.5 x 8.0 x 12 in)
<b>Weight / Shipping Weight</b>	3.7 kg (8 lb) / 4.6 kg (10 lb)