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

WEEE/RoHS Compliance Statement

EU Directives WEEE and RoHS

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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 (open 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 MAN-IFOLD 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.
6. 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.

![Montage showing connections between syringes, stopcocks, and input ports on Teflon® valves.]

7. 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.

8. 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.

9. 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.

![Connection between Teflon® tubing, Luer fitting, and MPP manifold.]

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Publication 5712-001-REV-C
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**

- **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.

**Item # 4630130 Model VC-6 and VC-6M use:**
- **For 120 VAC:** 0.50 Amp - 5 x 20 mm Slow Blow
- **For 220 VAC:** 0.25 Amp - 5 x 20 mm Slow Blow
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
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)

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.

<table>
<thead>
<tr>
<th>Reservoir height</th>
<th>Approximate flow rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>61 cm (24 in)</td>
<td>14 ml/min</td>
</tr>
<tr>
<td>30 cm (12 in)</td>
<td>9 ml/min</td>
</tr>
<tr>
<td>20 cm (8 in)</td>
<td>5 ml/min</td>
</tr>
</tbody>
</table>
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

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

<table>
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<tr>
<th>Valve Bracket:</th>
<th>Delrin, mounts on 3/8&quot; or 1/2&quot; ring stand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Valves</strong></td>
<td>Teflon®, 12 VDC/0.25 A to maintain pinch</td>
</tr>
<tr>
<td><strong>Connection Cable</strong></td>
<td>2.4 meter (8 ft) connecting cable terminated with quick disconnects on valve end and 15 pin male &quot;D&quot; type connector on controller end.</td>
</tr>
<tr>
<td><strong>Tubing</strong></td>
<td>Teflon®, 1/8 OD x 1/16 ID tubing</td>
</tr>
<tr>
<td><strong>Reservoirs</strong></td>
<td>60 cc capacity syringes</td>
</tr>
<tr>
<td><strong>Reservoir Holder</strong></td>
<td>Delrin. Holds six syringes with thumb screws for each reservoir.</td>
</tr>
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</table>

### Valve Controller:

<table>
<thead>
<tr>
<th><strong>Switch Selection</strong></th>
<th>Manual, Off or External</th>
</tr>
</thead>
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<tr>
<td><strong>External Input</strong></td>
<td>+5 V TTL-compatible (BNC Connector)</td>
</tr>
<tr>
<td><strong>Event Marker</strong></td>
<td>Logic level pulse 500 ms nominal (rear panel BNC connector)</td>
</tr>
<tr>
<td><strong>Manifold</strong></td>
<td>2/1, 4/1 or 6/1 nominal dead space</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>110 to 130 or 200 to 250 VAC, single-phase, 50/60 Hz, 20 W</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>10° to 40°C (50° to 104°F)</td>
</tr>
<tr>
<td><strong>Dimensions, H x W x D</strong></td>
<td>89 x 203 x 305 mm (3.5 x 8.0 x 12 in)</td>
</tr>
<tr>
<td><strong>Weight / Shipping Weight</strong></td>
<td>3.7 kg (8 lb) / 4.6 kg (10 lb)</td>
</tr>
</tbody>
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Declaration of Conformity

CE MARKING (EMC)


Standards to which Conformity is Declared:
- EN55022 Class A
- EN61000-3-2
- EN61000-3-3
- EN50082-1:1992
- EN61000-4-2
- EN61000-4-3
- ENV50204
- EN61000-4-4
- EN61000-4-8
- EN61000-4-11

Manufacturer’s Name: Warner Instruments
Manufacturer’s Address: 1125 Dixwell Avenue
                      Hamden, CT 06514
                      Tel: (203) 776-0664

Equipment Description: Valve Controller
Equipment Class: ITE-Class A
Model Numbers: VC-6T

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

Place: Hamden, Connecticut USA
Signature: [Signature]
Full Name: Burton J. Warner
Position: President
Declaration of Conformity

CE MARKING (LVD)


Standards to which Conformity is Declared: EN61010-1:1993

Manufacturer’s Name: Warner Instruments

Manufacturer’s Address: 1125 Dixwell Avenue
Hamden, CT 06514
Tel: (203) 776-0664

Equipment Description: Valve Controller
Safety requirements for electrical equipment for measurement and laboratory use

Equipment Class: Class I

Model Numbers: VC-6T

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

Place: Hamden, Connecticut USA
Signature: [Signature]
Full Name: Burton J. Warner
Position: President

Warner Instruments
A Harvard Apparatus Company