



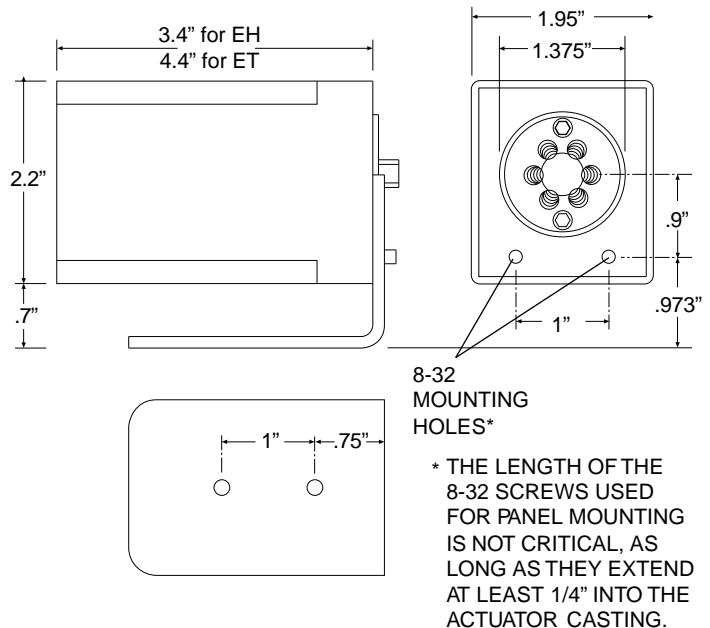
## Micro – Electric Two Position Valve Actuator

### Installation and Use

The micro-electric actuator consists of the control module, the stepper motor/gearbox assembly, a manual controller (use is optional), a 110 or 220VAC to 24VDC power supply, and the interconnecting cables. It is self-adjusting from 30° to 90° – no valve alignment is necessary. Once a valve is installed by tightening the single valve mounting screw, the actuator does everything automatically by sensing the positive stops within the valve.

### Connections

**Figure 2** on shows the functions of the various actuator cables. There are four connectors on the control module, keyed and sized to prevent incorrect connection. For easy reference, a chart showing all the pin signal assignments is on the last page.

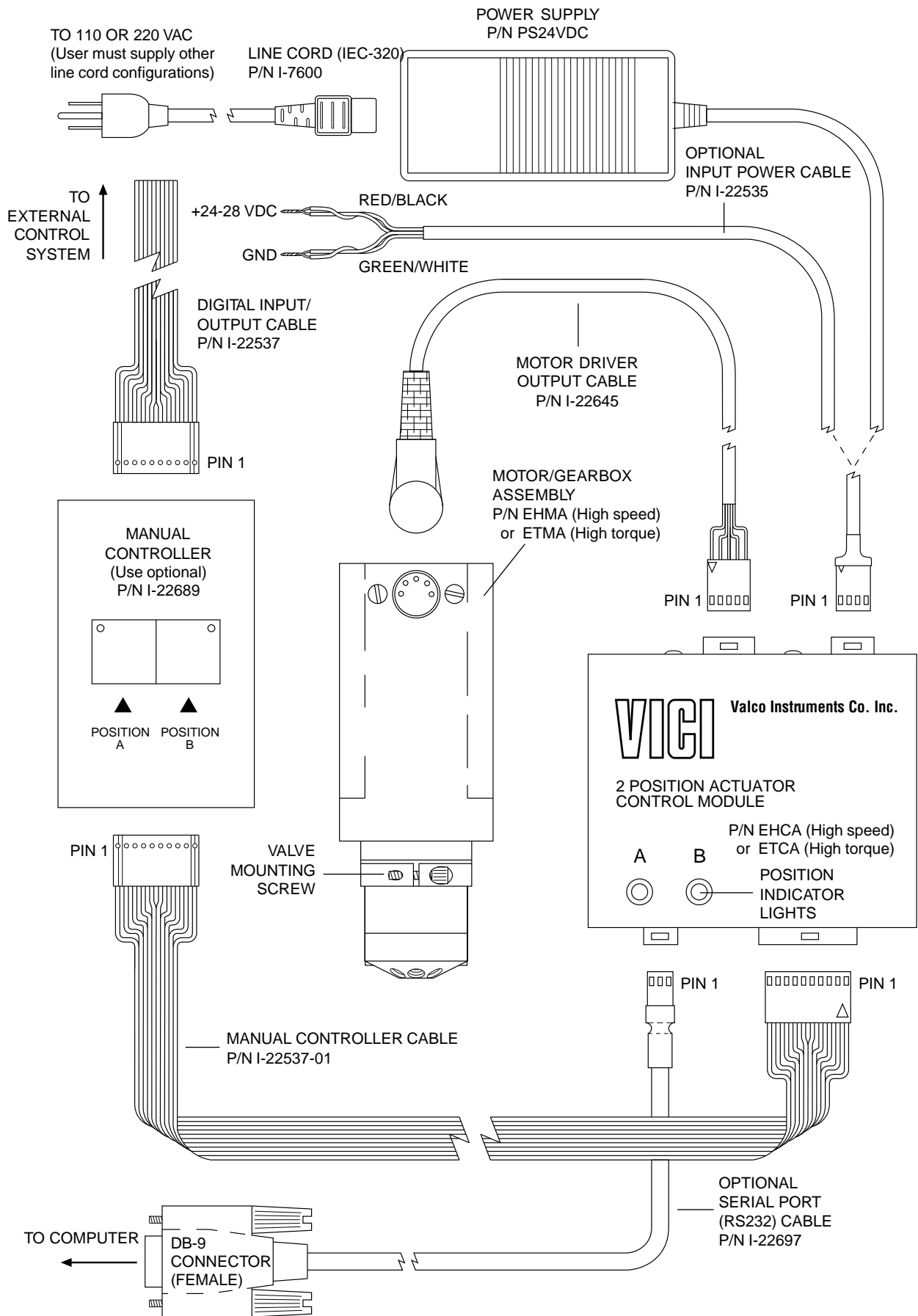


**Figure 1:** Mounting dimensions

**Input power** (20 – 30 VDC, with 24 – 28 VDC preferred) is supplied through a four-pin connector: pins 1 and 2 are positive inputs; 3 and 4 are negative inputs. The four wires of the power supply cable are functionally paired to provide the lowest possible impedance. We *strongly* recommend that all four wires be connected to the power supply source to prevent any loss of torque. Average DC current requirement is 2.5 amps, with transient peaks as high as 4 amps. Standby current draw is 60 milliamps. The actuator should not be connected to a power supply that is also used to power other noise-sensitive electronics. The high current draw can cause problems.

**Motor driver output** is through a five-pin connector: pins 1, 2, 4, and 5 carry the stepper motor phase drive signals. Pin 3 is grounded and tied to the cable shield to reduce electrical noise.

A three-pin connector is for a serial **RS232 interface**: pin 1 is ground, pin 2 is the serial input from the host computer, and pin 3 is the serial output to that host. (Refer to the section entitled **Serial Control of the Actuator**.) The ten-pin connector is for the **manual controller** or **digital input/output** signals. (The actuator can be controlled by *either* or *both*.) The manual controller has a through port, so an additional cable can provide simultaneous control by an external system. (Refer to the section entitled **Digital Control of the Actuator**.)



**Figure 2: Actuator and controller connections**

## Initialization

Whenever the valve is removed and reinstalled, or if a different valve is installed, the actuator must be initialized. To initialize the actuator:

1. Cycle the actuator twice with no valve on it or with either end of the motor driver output cable unplugged.
2. Plug the cable back in, or put the valve back in the clamp ring. Orient the valve as desired and tighten the valve mounting screw.

The valve and actuator are essentially ready for use at this point. For the first few cycles the actuator will move at half its normal speed while it looks for the valve stops. Once it determines the proper stroke, the actuator returns to normal speed. If you don't hear a change in speed, make sure that the valve mounting screw is tight.

## Serial Control of the Actuator

### Establishing Serial Communications

*Items required:*

- Valco cable assembly I-22645 or equivalent
- Terminal emulation, or communication software such as QMODEM, PROCOMM, or WINDOW'S TERMINAL, running on a PC-compatible computer

1. Connect the I-22645 cable to the actuator as indicated in **Figure 2**.
2. Set the serial port at 9600 baud, no parity, 8 data bits, 1 stop bit, with no hardware or software handshaking.
3. The software must establish a bi-directional communication link between the keyboard/monitor of the computer and the serial port. With the software running, check the serial link by typing **VR<enter>**. If the link is functioning and an actuator ID has not been set, a message similar to the following will appear on your monitor:

**I-PD-ETX88RF  
30-Sep-94**

This is the program number and date of the actuator firmware.

*Programmer's note:* To permit multiple actuators to share the same computer serial port, the actuator serial port output is deactivated when not in use. At the beginning of a message the first character transmitted is sometimes lost due to a framing error. To avoid this, a NULL character (zero value byte) is sent at the beginning of each message. Most terminal programs will ignore the NULL character, but custom software may require a character trap to delete it.

### Serial Communication Protocol

Serial communication with the actuator is based on an ASCII string protocol. Carriage return (OD hex) characters parse the communications by defining the end of each command. Line feed characters (OA hex) are ignored. The hardware interface utilizes only ground, transmit, and receive signals, on connector J3 pins 1, 2, and 3, respectively. Software flow control (Xon/Xoff) is not supported. The serial port output (transmit line) of the actuator is disabled (high impedance) when not in use. With the software-settable device "ID" feature, as many as ten actuators can be controlled from a single serial port by a host processor such as a personal computer.

Command set options include commands to move to a position, display the current position, set device ID, and report the firmware version. The table on the next page gives a description and explanation of each command:

Serial Commands	
<b>CP</b> <enter>	Displays the current actuator position
<b>CW</b> <enter>	Sends the actuator to Position B
<b>CC</b> <enter>	Sends the actuator to Position A
<b>GO</b> = <i>n</i> <enter>	Sends the actuator to Position <i>n</i> , where <i>n</i> is A or B
<b>TO</b> <enter>	Toggles the actuator to the opposite position
<b>TT</b> <enter>	Toggles the actuator to the opposite position, waits a preset delay time, then rotates back to the original position
<b>ID</b> <enter>	Displays the current device ID setting
<b>ID</b> = <i>n</i> <enter>	Sets the device ID to value <i>n</i> , from 0 to 9 <b>NOTE:</b> When the ID feature is enabled, all commands to the device must be prefaced by the ID number. (Entering ID=* disables this feature, as discussed below.)
<b>ID</b> =*<enter>	Clears the ID variable
<b>SM</b> <enter>	Displays the current digital input mode (See section entitled <b>Digital Control of the Actuator</b> , subhead <b>Input Modes</b> )
<b>SM</b> = <i>n</i> <enter>	Sets the digital input mode to Mode <i>n</i> , where <i>n</i> is 1 or 2
<b>DT</b> <enter>	Displays the current delay time in milliseconds
<b>DT</b> = <i>n</i> <enter>	Sets the delay time from 0 to 10,000 milliseconds <b>NOTE:</b> The total delay time equals $n = 2$ milliseconds.
<b>VR</b> <enter>	Displays the part number and date of the firmware

### Using the Device ID Feature

Actuators are shipped from the factory with this feature disabled. When it's enabled with the ID command, the actuator responds only to commands which begin with the correct ID prefix, allowing up to 10 actuators to be controlled from one serial port. A single command can be broadcast to all actuators by using an asterisk (\*) as the command prefix. Do NOT broadcast any command which elicits a response from the serial port (such as \*VR or \*ID1). Such a command doesn't cause any damage, but the response will be unintelligible.

#### Caution:

When installing or replacing actuators on a shared serial port, make sure that no two devices have been set to the same ID number.

### ID Setup

To set the ID of an actuator, connect it to an RS232 serial port according to the steps outlined in the section Establishing Serial Communications. Enter the ID command as shown in the Serial Commands chart. If there is no response, the ID has already been set. If this ID is unknown, start with the command **0ID**, following with **1ID**, **2ID**, etc., until there is a response. At that point, the number can be cleared by assigning an asterisk; that is, if the ID is determined to be 4, enter **4ID\***. Or, a new number can be assigned by typing **4ID*n***, where *n* is an unassigned ID number from 0 to 9.

ID settings are saved when the power is off.

## Digital Control of the Actuator

### Protocol

Pins 1 and 2 provide ground and +5 volt outputs, respectively; pins 3 and 4 are TTL outputs for Position A and Position B, and are considered asserted at 0 volts and deasserted at 5 volts. (This is sometimes referred to as “negative true logic”.) Pins 5 and 6 are digital inputs for switching to Position A and Position B. They can be driven either by 5 volt TTL/CMOS logic or by contact closure to ground (Pin 1). Isolated contact closure outputs are available at Pins 7 and 8 for Position A and Pins 9 and 10 for Position B. If there is a positioning error due to valve sticking, clamp ring slippage, etc., the output is set to “0” (all lines high for a negative true output).

### Input Modes

Two input mode options are provided to expand the control flexibility of the actuator. **Mode 1** (the default mode) sets the digital inputs to be compatible with the standard Valco AC actuator. Asserting input pin 5 causes the actuator to go to Position A, and asserting input pin 6 sends it to Position B. In **Mode 2**, asserting pin 5 causes the actuator to toggle from the current to the opposite position. Asserting pin 6 causes the actuator to toggle to the opposite position, delay for a preset period of time (the default is 100 ms), and toggle back to the original position.

### Mode Setup

To set the mode of an actuator, connect it to an RS232 serial port according to the steps outlined in the section Establishing Serial Communications. To see the current setting, enter the **SM** command as shown in the Serial Commands chart. To change the mode, enter **SM=*n***, where *n* is 1 or 2. The **DT** command displays the current delay time setting. This setting can be changed with the **DT=*n*** command, where *n* is the desired time from 0 to 10,000 milliseconds.

Mode settings are saved when the power is off.

Pin #	Signal Description
<b>Digital I/O Cable</b>	
1	Ground
2	+5 VDC
3	Position A output
4	Position B output
5	Position A input
6	Position B input
7	Position A relay contact
8	Position A relay contact
9	Position B relay contact
10	Position B relay contact
<b>Serial Port (RS232) Cable</b>	
1	Ground
2	RS232 transmit (output)
3	RS232 receive (input)

Pin #	Signal Description
<b>Input Power Cable</b>	
1	+20-30 VDC power in
2	+20-30 VDC power in
3	+20-30 VDC power grid
4	+20-30 VDC power grid
<b>Motor Driver Output Cable</b>	
1	Phase B
2	Phase B
3	Ground
4	Phase A
5	Phase A

Typical Switching Times	
90 degrees	150 ms
60 degrees	105 ms
36 degrees	80 ms



**Valco Instruments Co. Inc.**  
 P. O. Box 55603  
 Houston, TX 77255  
 Sales toll-free (800) FOR VICI  
 Technical help (713) 688-9345  
 Fax (713) 688-8106



**Valco Europe**  
 Untertannberg 7  
 CH-6214 Schenkon  
 Switzerland  
 Telephone (041) 925-6200  
 Fax (041) 925-6201