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***Product Application Guide***

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***Valves and Actuators***

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## **Introduction**

The purpose of this guide is to explain and illustrate the features and methods of operation of the various valves and actuators produced by The Toro Company. The different types of valve operation have been designed to meet specific watering demands in automatic irrigation systems using one of the various possible water supplies.

With a clear understanding of the types of valve and actuator operation made available by Toro, irrigation professionals will be able to specify, install and maintain these products and provide their customers with efficient, reliable service.

All methods of valve and actuator operation are clearly depicted by cut-away illustrations showing internal parts and water-flow direction with the valve or actuator in open and closed positions. These are accompanied by a brief explanation of the method of operation. Troubleshooting tips which provide appropriate solutions in the event of a malfunction are also included.

The first section explains the basic design and configuration of control valves, indicates the available sizes of each type, and illustrates how they are activated by electric and hydraulic control methods. In addition, this section discusses the principals of pressure regulation and illustrates the operation of Toro's pressure regulated valves.

The second section explains the purpose of valve actuators and describes the methods of actuator adaptations in electric, normally closed hydraulic and manual system conversions.

The third section deals with the design and operation of the types of selector valves used in many of Toro's residential and commercial hydraulic controllers. Included are the pin-type valve block selector valve, the pin-type rotary selector valve, and the normally open rotary selector valve.

# Types of Control Valves

Toro manufactures two basic types of control valves: the Diaphragm valve and the Piston valve. The diagram below shows the variations available and the type of irrigation water recommended for each valve system.

## Diaphragm Valves

### Plastic

3/4" & 1" Globe

1", 1-1/2" & 2"

Globe/Angle

Electric

Hydraulic

Normally  
Open

Pin-Type  
(except 2")

Clean  
Water

Dirty  
Water

Clean  
Water

## Diaphragm Valves

### Brass

1", 1-1/2" & 2" Globe

2-1/2" & 3" Angle

Electric

Hydraulic

Normally  
Open

Dirty  
Water

Dirty  
Water

## Piston Valve

1" & 1-1/2" Piston

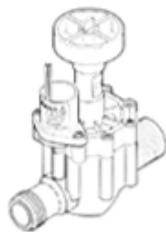
Hydraulic

Pin-Type

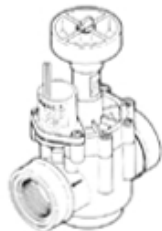
Normally  
Open

Clean  
Water

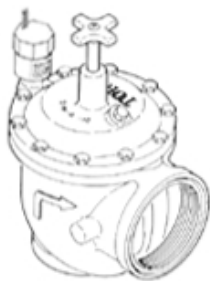
Dirty  
Water



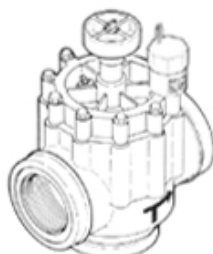
Series 254  
1" Male Thread x 1" Insert



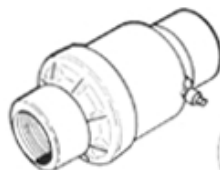
Series 252  
Globe/Angle



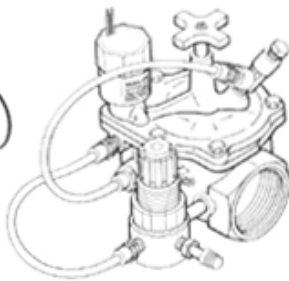
Series 216 Brass



Series 252 Plastic



Series 200 In-Line



Series 216  
Pressure Regulated

The diaphragm valve is produced in two configurations: Globe and Angle. The major difference between the two is the location of the supply water entry port. Supply water enters the Globe valve on the side and exits on the opposite side, 180° from entry. On the Angle valve, supply water enters from the bottom and exits on the side, 90° from entry. By nature of design, the Angle valve is less restrictive to water flow than the Globe valve, thereby offering less friction loss in the system. The Series 252 Globe/Angle valves are designed with two water entry ports which permits them to be adapted to either Globe or Angle applications. The unused entry port is plugged with a supplied pipe plug.

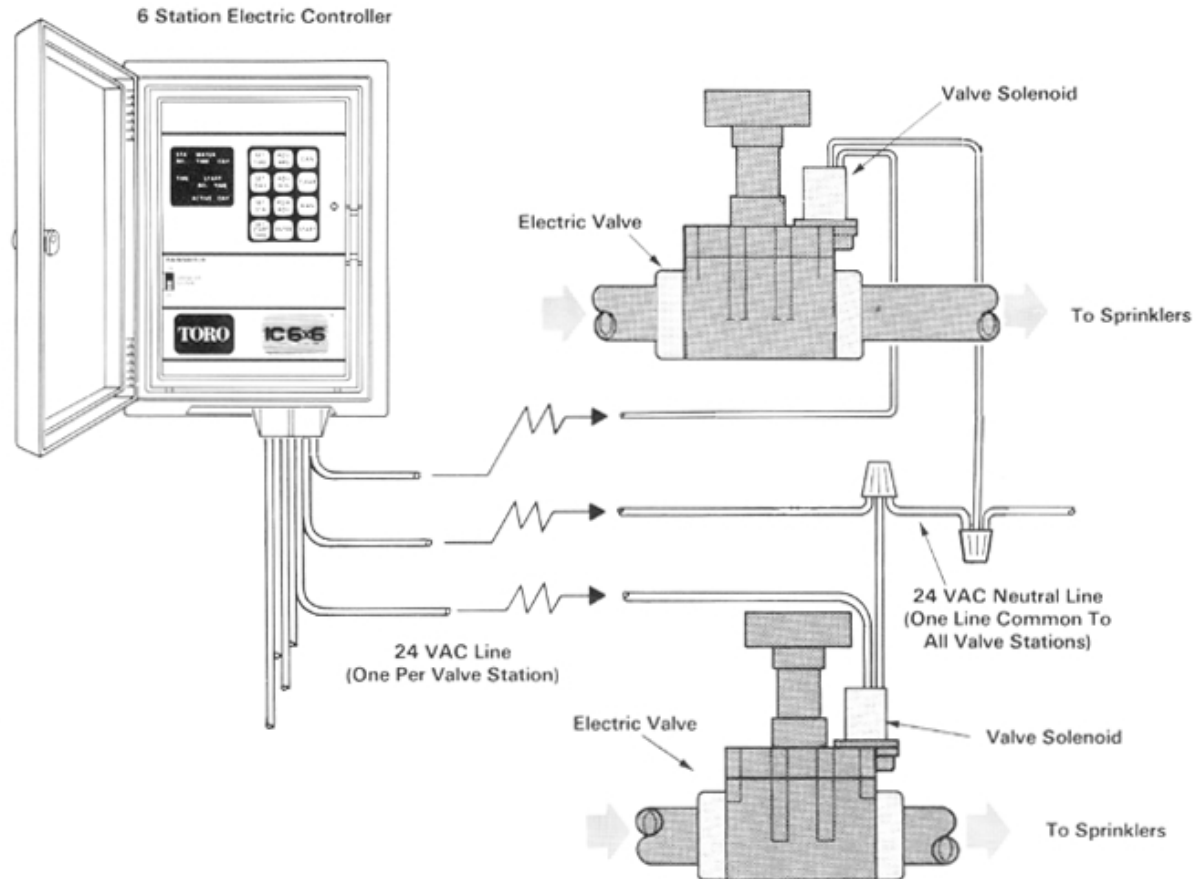
The Diaphragm valve is available in brass or plastic construction and is equipped with flow control (except Series 260 and 264) and manual bleed. In addition, the Series 216 (brass) and Series 252 (plastic) valves are available in pressure regulating models. The Series 254 and 264 plastic valves are designed with male thread inlets and optional male thread or barbed insert outlets for installation convenience.

The Series 200 valve is an in-line configuration. Water enters the side of the valve, flows around a piston assembly and exits the opposite side 180° from entry. The Series 200 is a sealed unit with no internal serviceable parts and is available in Pin-Type and Normally Open Hydraulic versions only.

## Note

*Valve-in-head applications have been excluded from this manual due to the complexity of the material. For complete explanation of valve-in-head features, see Product Application Guide 362-0079.*

# The Electric Control System



The controller sends 24 VAC to the control valve, energizing an actuation solenoid. The valve opens, allowing irrigation water to flow to the sprinklers. The valve will remain open until the controller discontinues its 24 VAC output.

## Controller Note

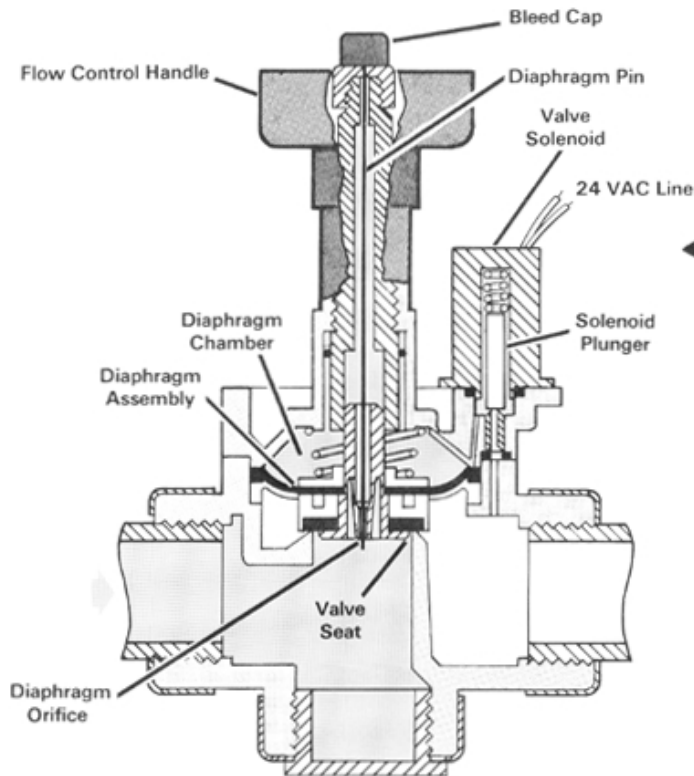
*Toro produces three types of controllers for electric systems: the electromechanical, the electronic solid state, and the "hybrid" which utilizes both technologies. Regardless of the timing method used, they all send 24 VAC to the control valves at scheduled intervals and are capable of operating any of the Toro valves and actuators.*

## Wire Size Note

*Valve wire size is very important in an electric control system and must be correct to insure proper valve operation. If undersize wire is used on long runs between the controller and the valve, actuator or valve-in-head sprinkler, a voltage drop will occur causing erratic operation. To avoid this problem, refer to wire sizing charts found in the Toro Technical Data Manual (Form No. 490-1737). Proper wire connections are also very important in an electric system. All connections must be made securely and waterproofed to prevent short circuiting.*

# Plastic Diaphragm Valve (Electric)

The electric models of Toro's plastic 250/260 Series valves are solenoid actuated and held in the normally closed position by internal water pressure. The electric valves in this Series are designed for clean water systems.

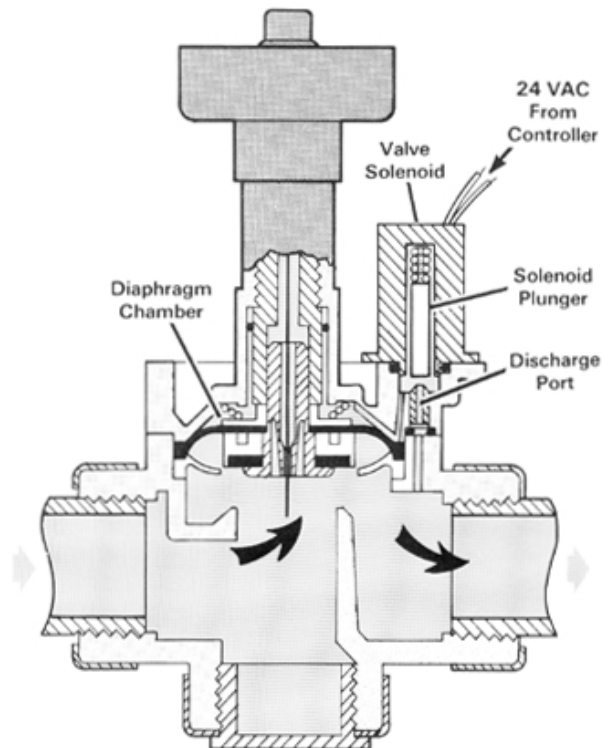


## ◀ Closed Position

Irrigation water, metered through the diaphragm orifice, fills the diaphragm chamber causing internal pressure to build. The pressure exerted within the chamber holds the diaphragm assembly firmly against the valve seat preventing water flow through the valve. The diaphragm pin helps prevent debris from clogging the orifice as the diaphragm moves to open and closed positions.

## Open Position ▶

The valve solenoid, when activated by 24 VAC from the controller, draws the solenoid plunger away from the discharge port, relieving water pressure from the diaphragm chamber. The irrigation water pushes the diaphragm assembly away from the valve seat allowing water to flow through the valve. The valve will remain open until the controller discontinues the 24 VAC.



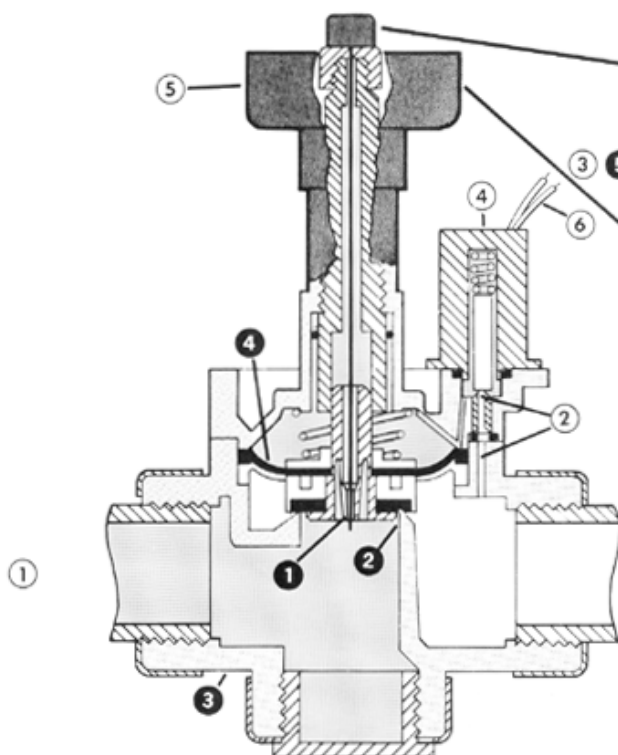
## Troubleshooting

### Valve Will Not Close ●

1. Blocked orifice - remove debris by cleaning.
2. Debris between diaphragm assembly and seat - clean out.
3. Leak in valve body - repair or replace.
4. Damaged diaphragm assembly - replace.
5. Controller malfunction - see Controller Service Manual.

### Valve Will Not Open ○

1. No water pressure - isolate and correct situation.
2. Plugged communication tube - clean out.
3. Controller malfunction - see Controller Service Manual.
4. Faulty solenoid - replace.
5. Flow control closed - open flow control.
6. Faulty or severed control wiring - repair wiring using an approved wire splicing method.



### Manual Bleed

A manual bleed port is provided on all diaphragm valves. It allows the valve to be fully opened by relieving water pressure from the diaphragm chamber.

### Flow Control

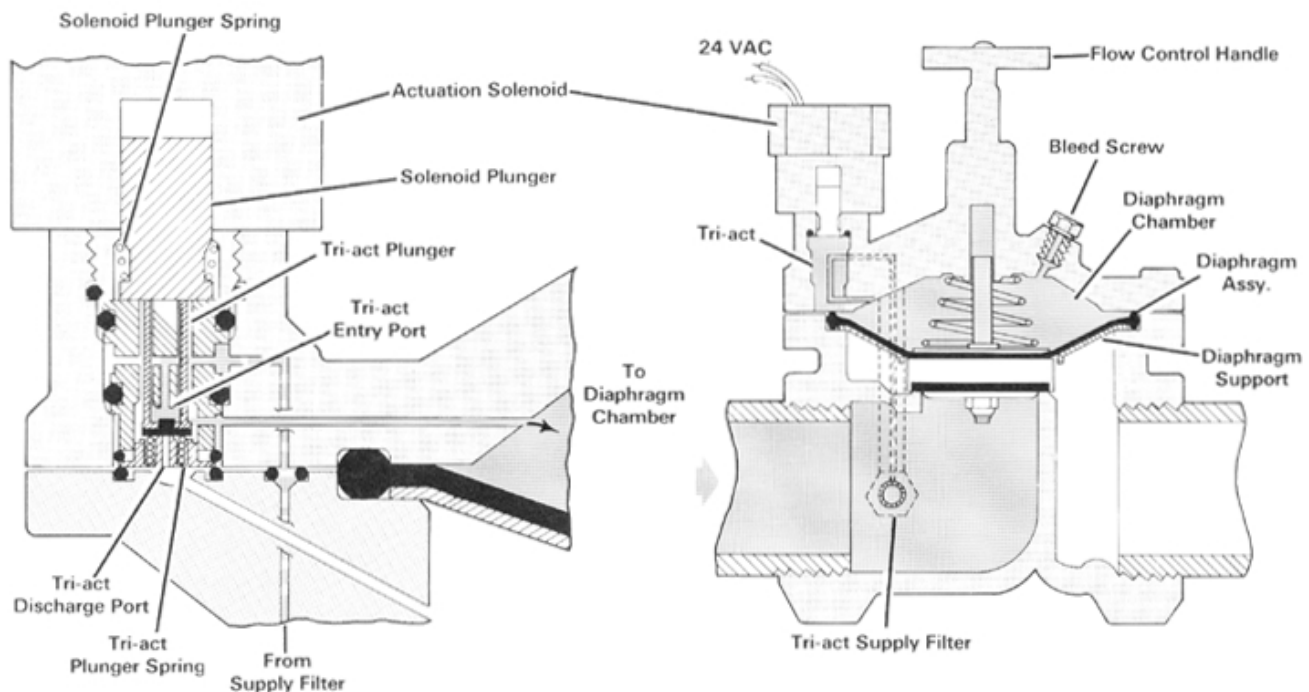
The flow control mechanism, standard on all diaphragm valves (except Series 260) is provided to limit water flow through the valve. **It is not a pressure regulating device.** Clockwise rotation of the handle limits travel of the diaphragm assembly away from the valve seat which restricts water flow. Full clockwise adjustment will hold the valve in the closed position.

### Note

*The diaphragm orifice, used for metering supply water to the diaphragm chamber, is engineered to control a specific volume of water flow. Therefore, to prevent erratic valve operation, the orifice **MUST NOT** be enlarged or damaged in any way.*

## Brass Diaphragm Valve (Electric)

The Series 216 Brass Diaphragm Valve (Electric) is solenoid actuated and held closed by internal water pressure. A small internal valve called a tri-act channels internally filtered supply water to and from the diaphragm chamber. The 216 valve is designed for the most severe dirty water conditions.



### Closed Position

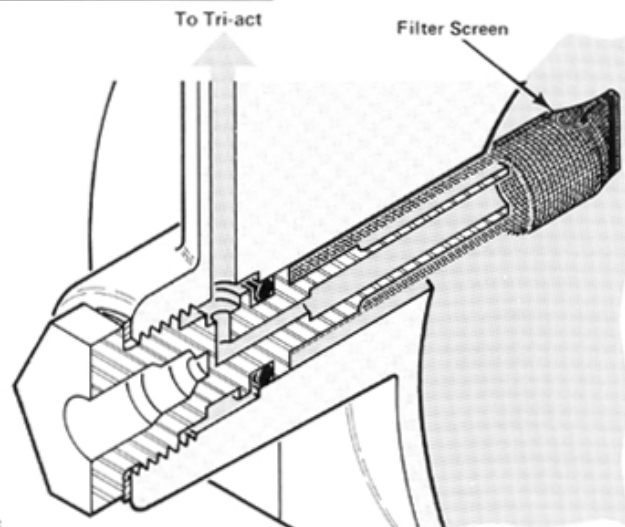
The spring loaded solenoid plunger exerts pressure against the tri-act plunger which closes the discharge port and opens the entry port. Supply water, drawn through the tri-act, fills and pressurizes the diaphragm chamber. Water pressure within the chamber holds the diaphragm assembly firmly against the valve seat restricting water flow through the valve.

#### Note

*For clarity, some water flow in tri-act has not been shown. Dotted water flow indicates hidden passage way.*

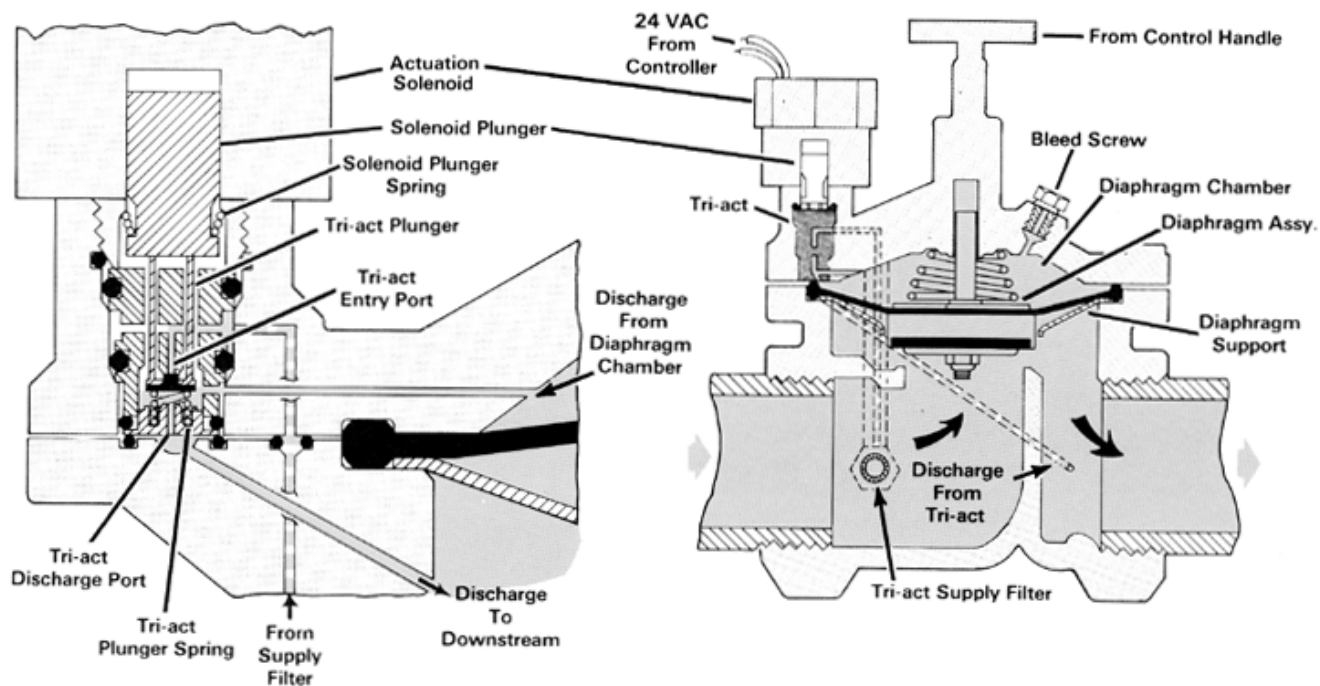
### Tri-act Supply Filter

Water, metered through the tri-act for valve actuation, is drawn through a filter screen located in the inlet side of the valve where the screen is continuously flushed during normal supply water flow. Since the only water drawn through the filter screen is the small amount needed to fill the diaphragm chamber, the possibility of clogged ports is greatly reduced, which makes this valve an excellent choice for severe dirty water applications.



## Open Position

The actuation solenoid, when activated by 24 VAC from the controller, draws the solenoid plunger up, allowing the spring loaded tri-act plunger to move up, closing the entry port and opening the discharge port. Water pressure is then relieved from the diaphragm chamber. The irrigation water pushes the diaphragm assembly away from the valve seat allowing water to flow through the valve. The valve will remain open until the controller discontinues the 24 VAC to the actuation solenoid.



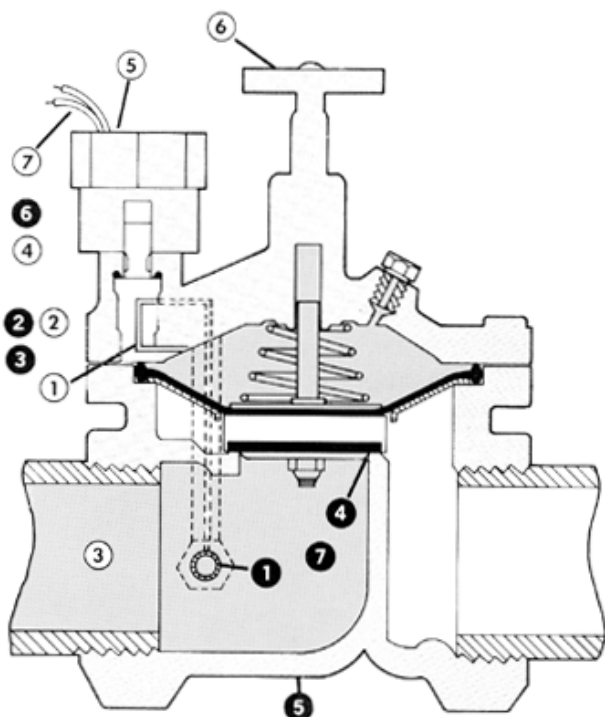
## Troubleshooting

### Valve Will Not Close ●

1. Filter screen blocked - clean out.
2. Blocked tri-act - remove and clean out.
3. Damaged tri-act - remove and replace.
4. Debris between diaphragm assembly and seat - clean out.
5. Leak in valve body - repair or replace.
6. Controller malfunction - see Controller Service Manual.
7. Damaged valve seat - repair or replace valve body.

### Valve Will Not Open ○

1. Tri-act discharge port blocked - clean out.
2. Damaged tri-act - remove and replace.
3. No water pressure - isolate and correct situation.
4. Controller malfunction - see Controller Service Manual.
5. Faulty solenoid - replace.
6. Flow control closed - open flow control.
7. Faulty or severed control wiring - repair wiring using an approved wire splicing method.

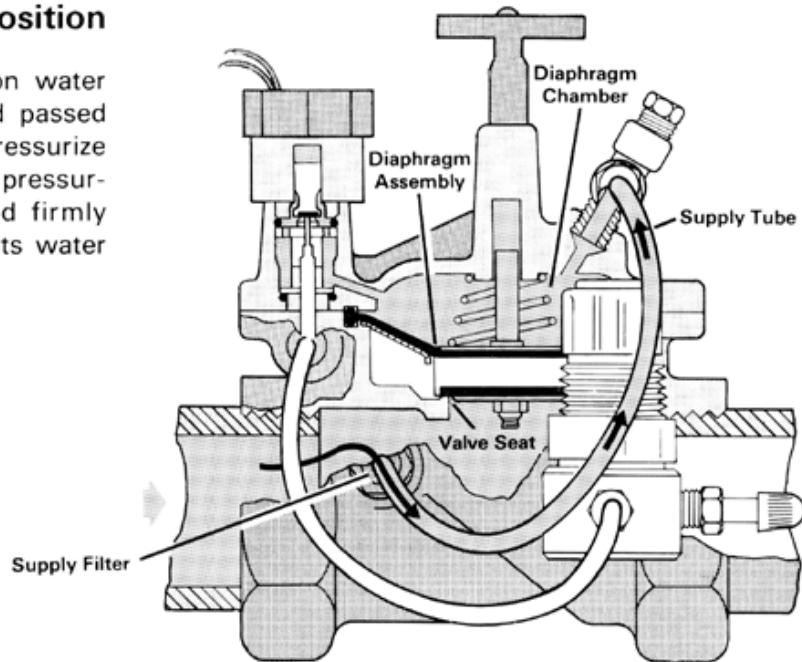


# Pressure Regulating Valves

Toro's pressure regulating valves are solenoid actuated and held in the closed position by internal water pressure supplied from a filtered source within the valve. When open, the downstream pressure is controlled by an adjustable pressure regulator mounted on the valve body. The pressure regulating valve is suitable for the most severe dirty water conditions.

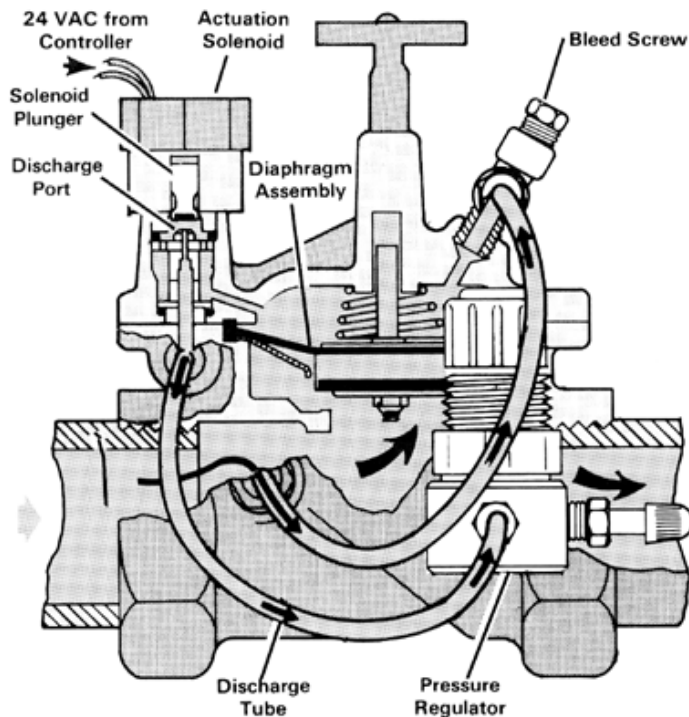
## Closed Position

Supply water taken from irrigation water entering the valve is filtered and passed through a supply tube to fill and pressurize the upper diaphragm chamber. The pressurized diaphragm assembly is held firmly against the valve seat and prevents water flow through the valve.



## Open Position

The valve solenoid, when activated by 24 VAC from the controller, draws the solenoid plunger away from the discharge port, allowing supply water in the diaphragm chamber to pass through a tube to the pressure regulator and exit downstream. Diaphragm travel distance, which determines the amount of water flowing through the valve, is controlled by the discharge rate through the pressure regulator. This distance is held constant regardless of fluctuations in inlet pressure to provide a regulated rate of flow.



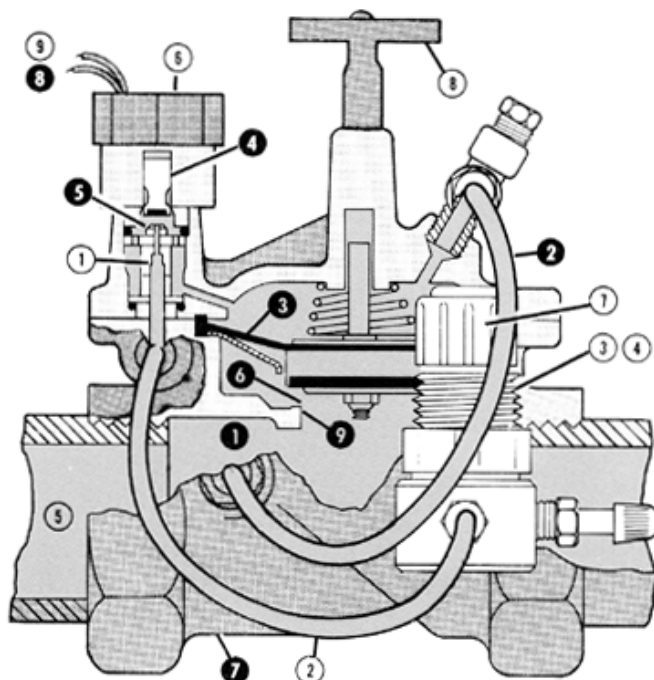
## Troubleshooting

### Valve Will Not Close ●

1. Filter screen blocked - clean out.
2. Supply line blocked - clean out
3. Ruptured diaphragm assembly - remove and replace.
4. Debris in solenoid plunger - clean out.
5. Damaged actuator seat - remove and replace.
6. Debris between diaphragm assembly and seat - clean out.
7. Leak in valve body - repair or replace.
8. Controller malfunction - see Controller Service Manual.
9. Damaged valve seat - repair or replace valve body.

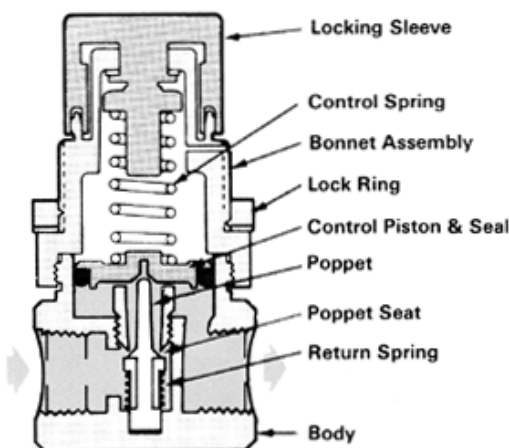
### Valve Will Not Open ○

1. Blocked actuator - clean out.
2. Blocked discharge tube - clean out.
3. Debris in regulator - clean out.
4. Broken regulator piston spring - remove and replace.
5. No water pressure - isolate and correct.
6. Faulty solenoid - remove and replace.
7. Regulator pressure setting too low - readjust setting.
8. Flow control closed - open flow control.
9. Faulty or severed control wiring - repair wiring using approved wire splicing method.



## The Pressure Regulator

The pressure regulator maintains a constant water pressure within the upper diaphragm chamber and controls water flow through the valve. It regulates the amount of water being released from the diaphragm chamber by adjusting to fluctuations caused by pressure surges, varying friction loss due to obstructions, etc.

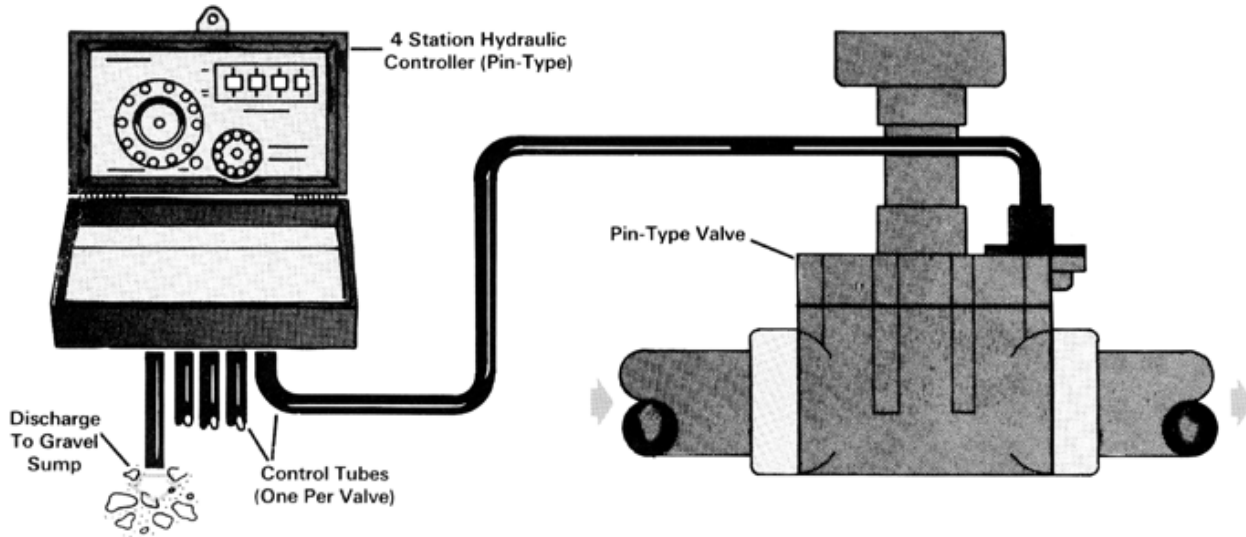


When the locking sleeve is turned counterclockwise, the control spring exerts pressure on the control piston which, in turn, displaces the poppet assembly from its seat. Discharge water flowing downstream through the poppet assembly, exerts opposing pressure against the piston. As the control piston is displaced by water pressure, the poppet return spring forces the poppet closed, restricting the flow of discharge water.

As discharge water pressure decreases on the control piston, opposing spring pressure on the piston once again displaces the poppet assembly from its seat. This on-going cycle of opposing spring and water pressure within the regulator maintains the set rate of discharge from upper diaphragm chamber.

# The Pin-Type Hydraulic Control System

The illustration below shows the basic Pin-Type system. Supply water fills the actuation mechanism within the valve and holds it in the closed position. A control tube, filled with water, links the valve to the controller where a selector valve is opened automatically by the controller timing mechanism, allowing water in the control tube to discharge, releasing pressure from the valve and allowing it to open.



## *Pin-Type Control Tube Note*

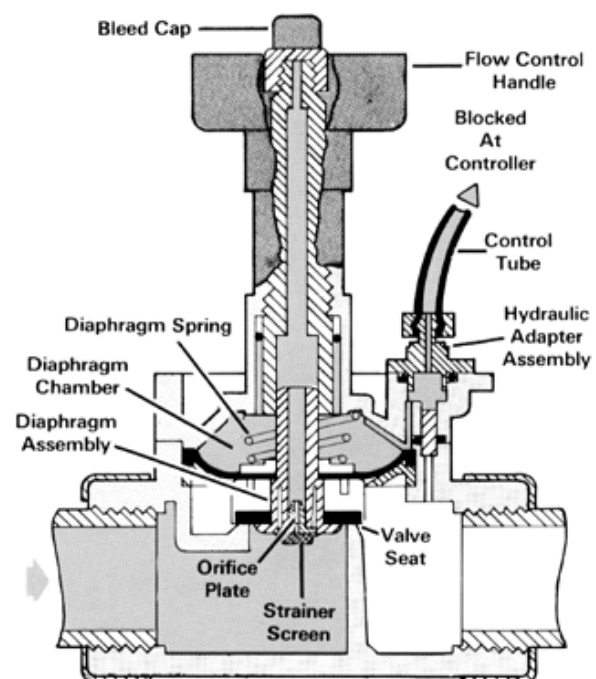
*To assure proper operation of Pin-Type valves, discharge water must flow with minimum restriction through the control tubing, therefore, the control tubing length between the valve and controller should not exceed 200 feet. Control tubing runs that exceed 200 feet will result in added flow restriction and may cause improper valve operation.*

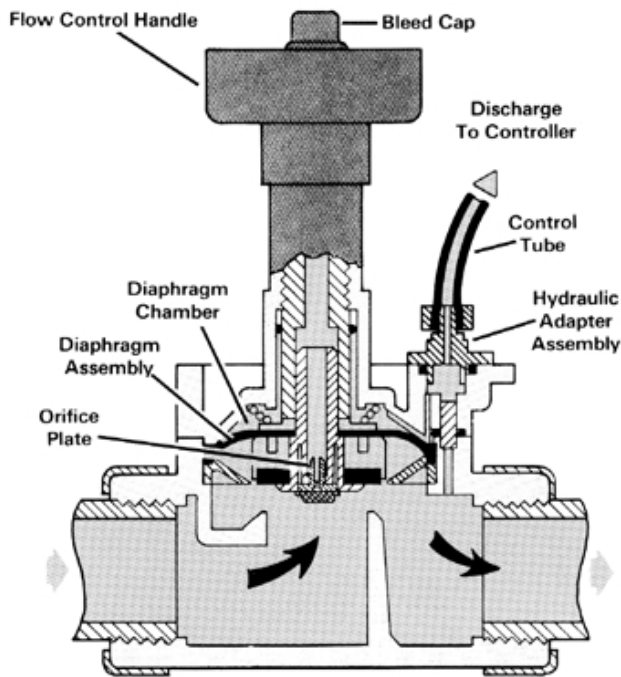
## Hydraulic Diaphragm Valve (Pin-Type)

The Series 250/260 Diaphragm Valves (Pin-Type) are hydraulically actuated and are held closed by internal water pressure. **These 250/260 Pin-Type valves are designed for clean water systems only.**

### Closed Position

Supply water, metered through the orifice plate, fills the diaphragm chamber and control tube. The controller selector valve blocks the discharge from the control tube allowing pressure to build in the control tube and diaphragm chamber. The pressure exerted within the chamber holds the diaphragm assembly firmly against the valve seat, restricting water flow through the valve.





## ◀ Open Position

The selector valve in the controller allows water to discharge through the control tube, relieving water pressure from the diaphragm chamber. The irrigation water pushes the diaphragm assembly away from the valve seat allowing water to flow through the valve. The valve will remain open until the selector valve blocks the discharge water metered through the control tube.

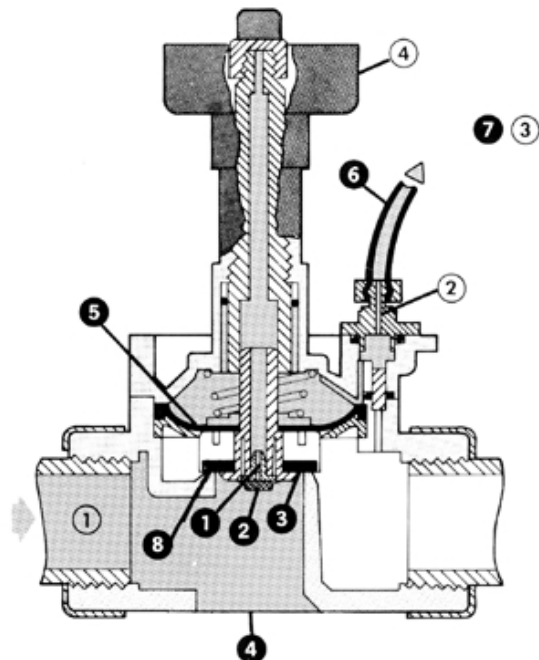
## Troubleshooting

### Valve Will Not Close ●

1. Blocked orifice plate - remove debris by cleaning.
2. Strainer screen blocked - flush out.
3. Debris between diaphragm assembly and valve seat - flush out.
4. Leak in valve body - repair or replace.
5. Damaged diaphragm assembly - repair or replace.
6. Control tube leak - isolate and repair or replace.
7. Controller selector malfunction - see Controller Service Manual.
8. Damaged valve seat - replace valve body.

### Valve Will Not Open ○

1. No water pressure - isolate and correct situation.
2. Hydraulic adapter assembly plugged - clean out.
3. Controller selector malfunction - see Controller Service Manual.
4. Flow control closed - open flow control.

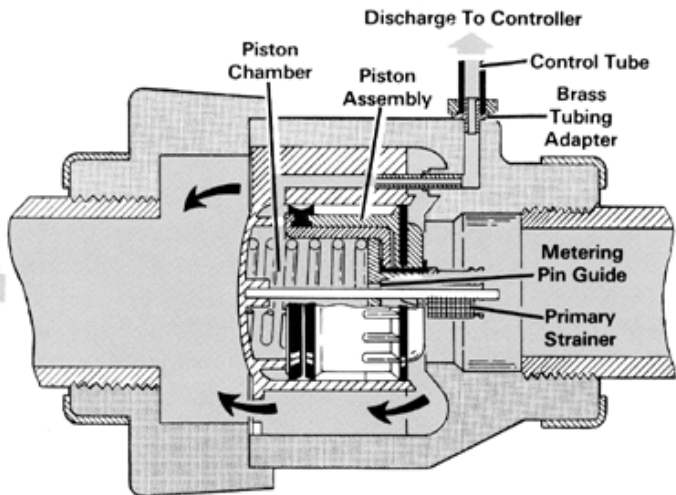
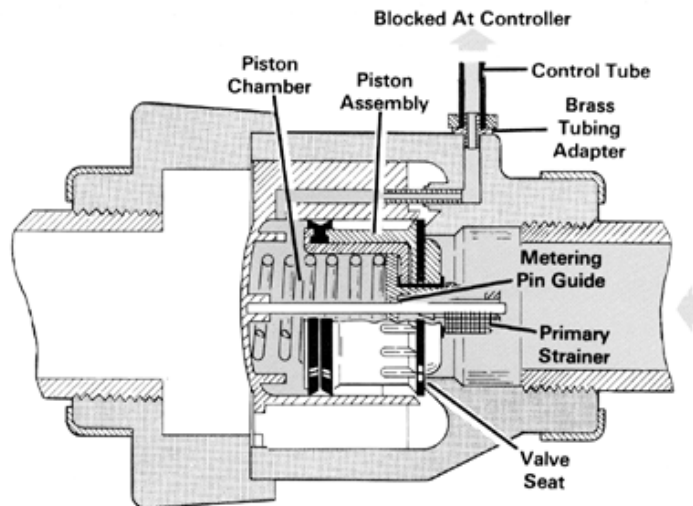


## Series 200 In-Line Valve (Pin Type)

The Series 200 Pin-Type valve is hydraulically actuated and held in the closed position by internal water pressure. It is designed for clean water applications.

### Closed Position

Supply water is metered into the piston chamber through the primary strainer and metering pin guide. Water is channeled from the piston chamber through the control tubing which connects to the controller selector valve. The selector valve blocks the discharge water in the control tube and allows pressure to build within the piston chamber, holding the piston assembly firmly against the valve seat, restricting water flow through the valves.



### Open Position

The controller timing mechanism opens the selector valve allowing water pressure to discharge through the control tube from the piston chamber. Supply water pushes the piston assembly away from the valve seat allowing water to flow through the valve. The valve will remain open until the selector valve is closed.

## Troubleshooting

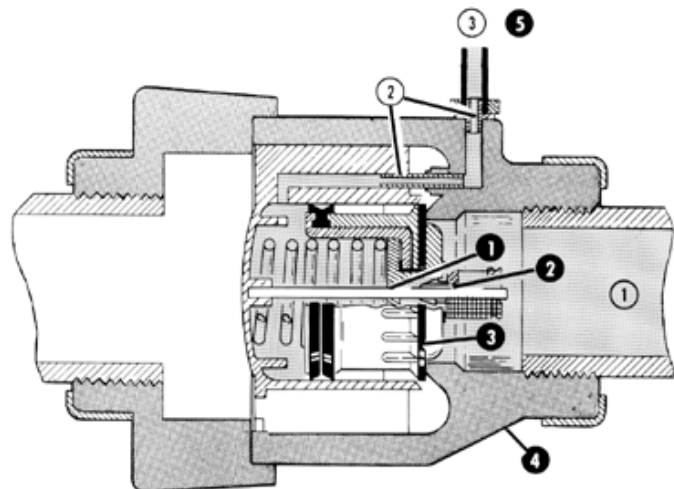
### Valve Will Not Close ●

1. Blocked metering pin guide - replace valve.
2. Primary strainer blocked - flush out.
3. Debris between piston assembly and seat - flush out.
4. Leak in valve body - replace valve.
5. Faulty selector valve - see Controller Service Manual.

### Valve Will Not Open ○

1. No water pressure - correct situation.
2. Plugged communication tube or control tube fitting - clean out.
3. Faulty selector valve - see Controller Service Manual.

**Note**  
The Series 200 Valve is a sealed unit and has no serviceable parts.

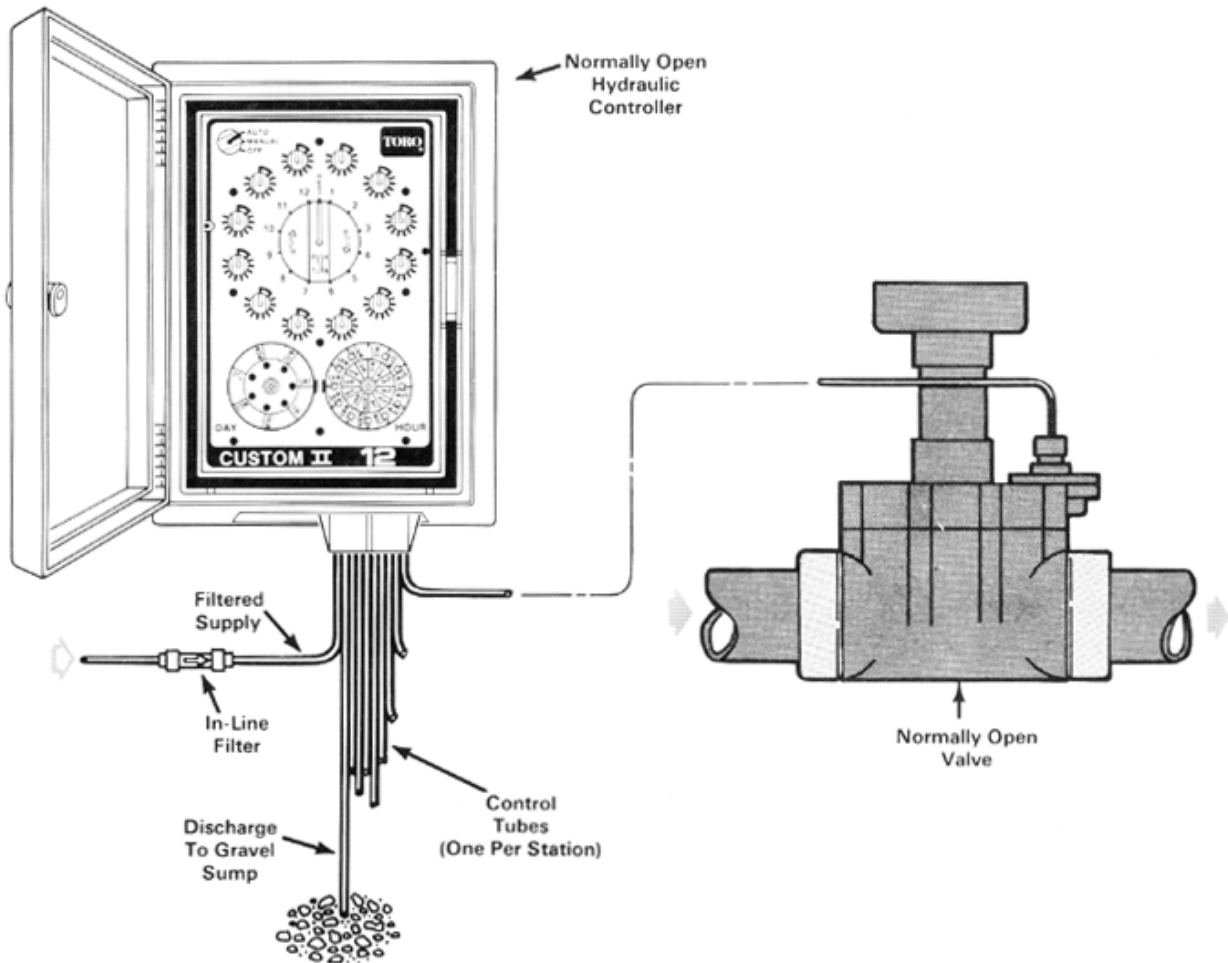


## Normally Open Hydraulic Control System

The illustration below shows the basic components of a Normally Open control system. The controller supplies and discharges filtered water to and from the valve diaphragm/piston chamber for operation. **The Normally Open Valve diaphragm/piston chamber is isolated from the irrigation water and receives only filtered water from the controller, which enables this valve to be used in dirty water systems.**

### Note

*For proper valve operation; the filtered water supplied to the controller must be obtained from the highest pressure point in the system, usually at the source or pump station.*

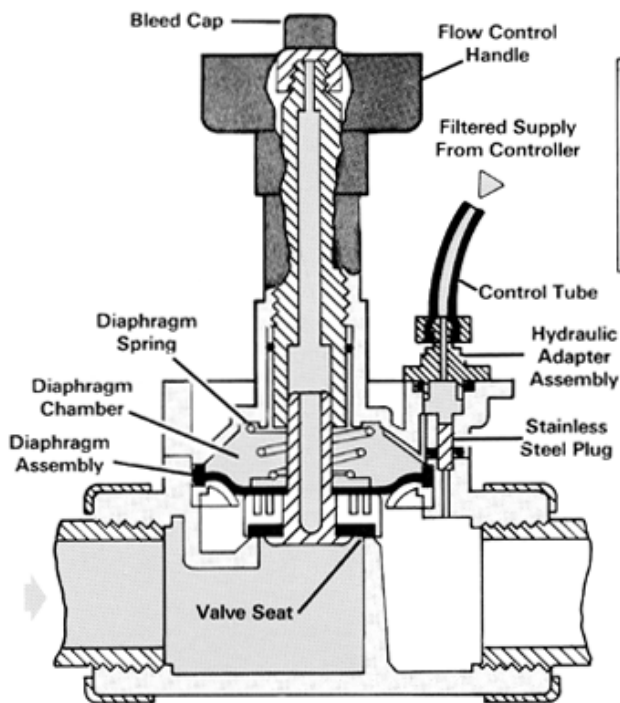


### Normally Open Control Tube Note

*In Normally Open valve systems, control tube length between the valve and controller is not as critical as in Pin-Type systems. Only the amount of water required to open and close the valve is moved through the tube. The recommended maximum tubing length is 1,000 feet. Tubing lengths over 1,000 feet may cause erratic valve operation.*

# Normally Open Hydraulic Diaphragm Valve

The Series 250/260 Hydraulic Diaphragm Valve (Normally Open) is hydraulically actuated and held closed by a filtered external water source. It is designed for use in dirty water systems.



## Note

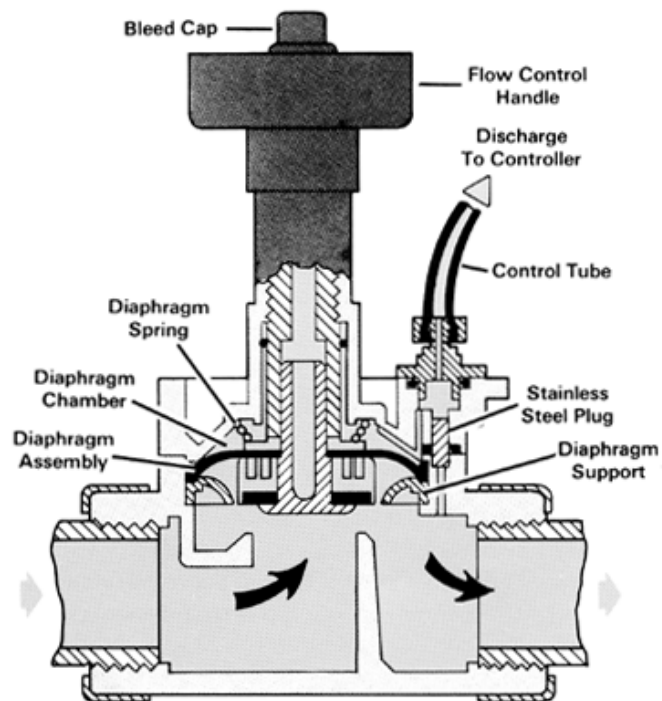
*Filtered water pressure from the controller must be equal to or greater than the supply water pressure to the valve.*

## ◀ Closed Position

Filtered water from the controller fills and pressurizes the diaphragm assembly firmly against the valve seat, restricting water flow through the valve.

## Open Position ▶

The selector valve in the controller opens and allows water to discharge through the control tube, relieving water pressure from the diaphragm chamber. Supply water pushes the diaphragm assembly away from the valve seat allowing water to flow through the valve.



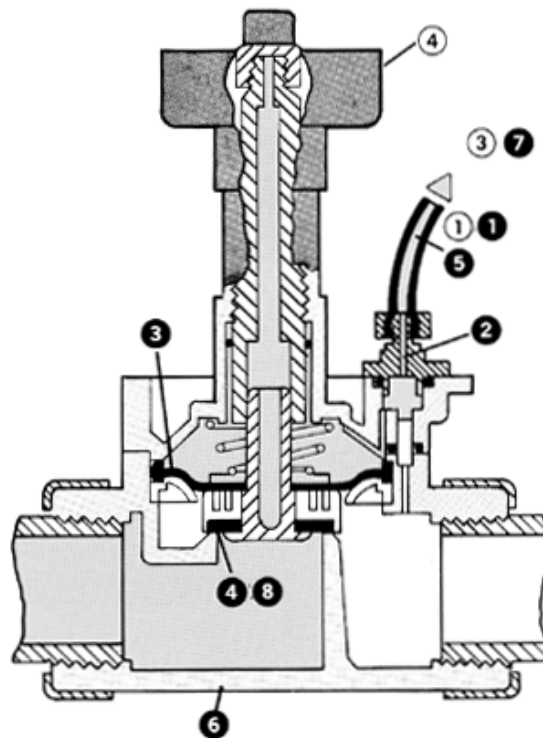
## Troubleshooting

### Valve Will Not Close ●

1. Leak in control tube - isolate and repair or replace.
2. Blocked hydraulic adapter assembly - clean out.
3. Damaged diaphragm assembly - replace.
4. Debris between diaphragm assembly and seat - clean out.
5. Low pressure in control tube - isolate and repair.
6. Leak in valve body - repair or replace.
7. Controller selector malfunction - see Controller Service Manual.
8. Damaged valve seat - replace valve body.

### Valve Will Not Open ○

1. Blocked control tube - isolate and repair.
2. No supply water pressure - isolate and correct situation.
3. Controller selector malfunction, see Controller Service Manual.
4. Flow control closed - open flow control.



### Note

*The Series 216 Hydraulic (Normally Open) Valve has not been illustrated in open and closed positions as it operates in the same manner as the Series 250/260 (Normally Open) Valve. However, it is important to note that with their brass and stainless steel construction the Series 216 valves make an ideal choice for the most severe dirty water systems.*

## Series 200 In-Line Valve (Normally Open)

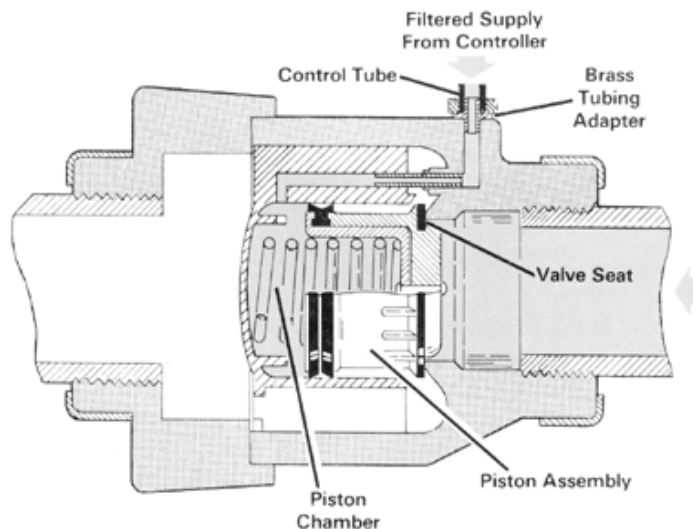
The Series 200 In-Line Valve is hydraulically actuated and held closed by a filtered external water source. It is designed for use in dirty water systems.

### Note

*Filtered water pressure from the controller must be equal to or greater than the supply water pressure to the valve.*

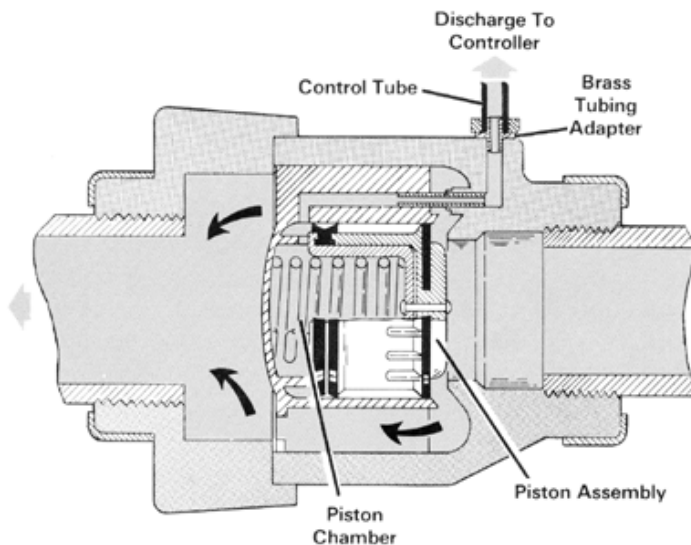
### Closed Position

Filtered water from the controller fills and pressurizes the piston chamber, holding the piston assembly firmly against the valve seat, restricting water flow through the valve.



### Open Position

The selector valve in the controller opens and allows water to discharge from the control tube, relieving water pressure from the piston chamber. Supply water pushes the piston assembly away from the valve seat allowing water to flow through the valve.



### Note

*The Series 200 valve is a sealed unit and has no serviceable internal parts.*

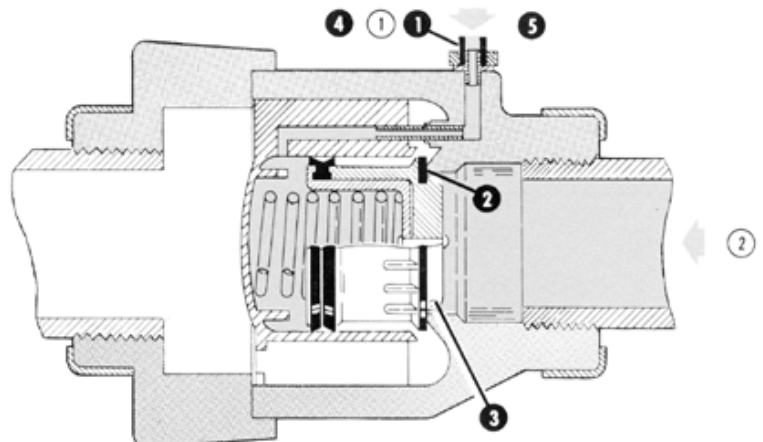
## Troubleshooting

### Valve Will Not Close ●

1. Leak in control tube - repair or replace.
2. Foreign objects keeping piston from seating - flush out.
3. Damaged piston seal or assembly - replace valve.
4. Low pressure in control tube - repair.
5. Faulty pilot valve - see Controller Service Manual.

### Valve Will Not Open ○

1. Blocked control tube - clean out.
2. No water pressure - correct situation.



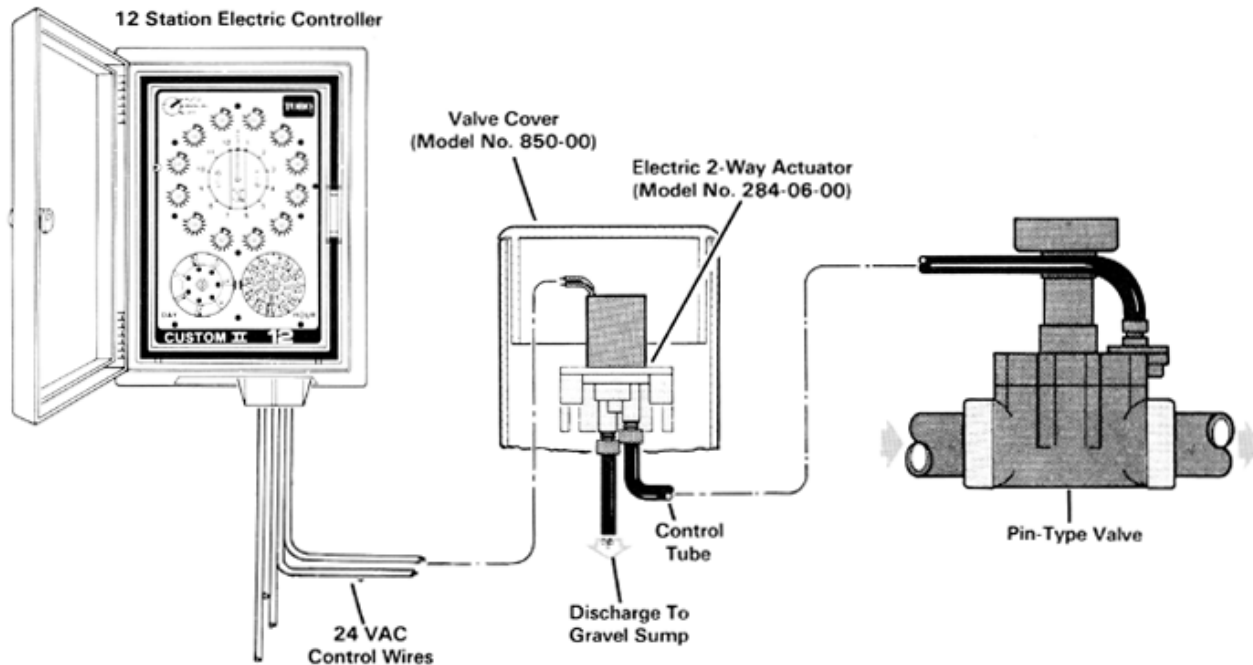
# Actuators

Toro actuators were developed to provide a means of converting one valve activation method to another (i.e., Hydraulic to Electric) and to allow manual control of valve operation.

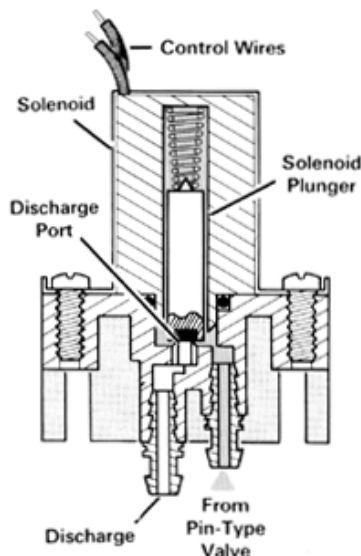
The valve actuators are manufactured in Electric, Hydraulic (Normally Closed) and Manual activation models. Electric 2-Way actuators are produced exclusively for Pin-Type valves. 3-Way actuators are designed for use with either Normally Open or Pin-Type valves.

On the following pages you will find illustrated examples of actuator adaptations for both 2-Way and 3-Way versions using various activation methods.

## Electric 2-Way Actuator



The illustration above shows a typical installation of a 2-Way actuator used to convert a Pin-Type Hydraulic system to an Electric control system. **This type of installation is recommended for clean water systems only.**

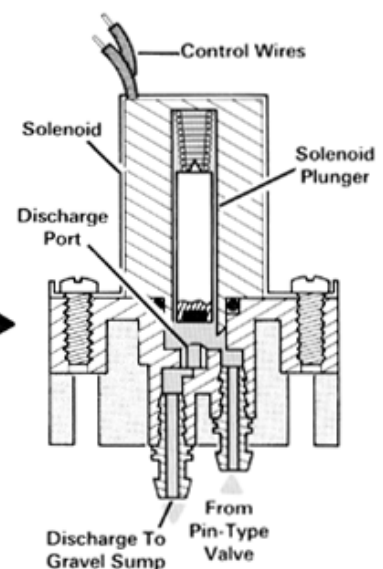


### ◀ Closed Position

The spring loaded solenoid plunger covers the discharge port which allows pressure to build within the control tube and valve diaphragm chamber causing the valve to close.

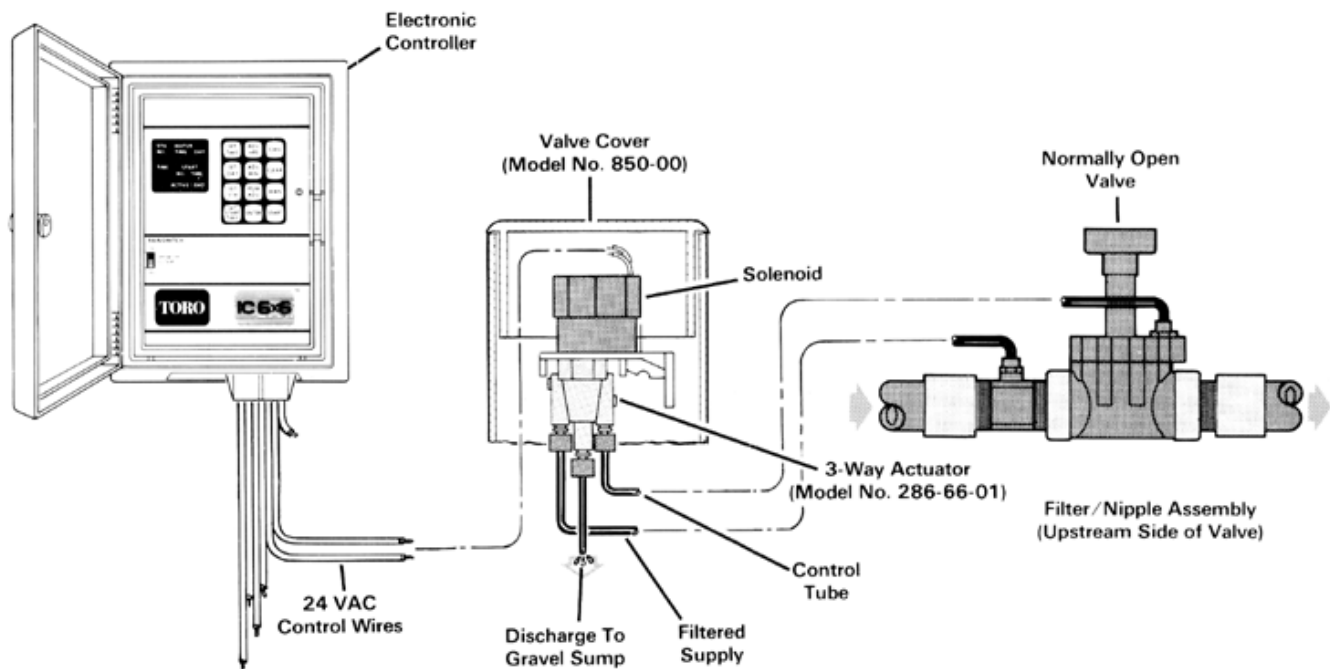
### Open Position ▶

The actuator solenoid, when activated by 24 VAC from the controller, draws the solenoid plunger away from the discharge port, relieving water from the control tube and valve diaphragm chamber allowing the valve to open.



## Electric 3-Way Actuator

The illustration below shows how a Normally Open Hydraulic system with the use of an Electric 3-Way Actuator, can be adapted to a Toro Solid State Electronic controller. The filtered water source for the actuator is tapped from a special Filter/Nipple assembly located on the **upstream** side of the valve.



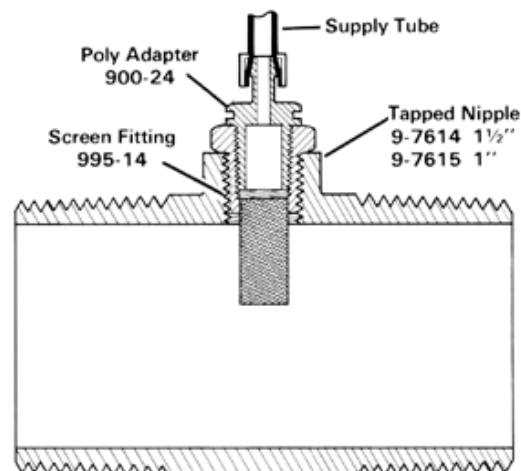
### Note

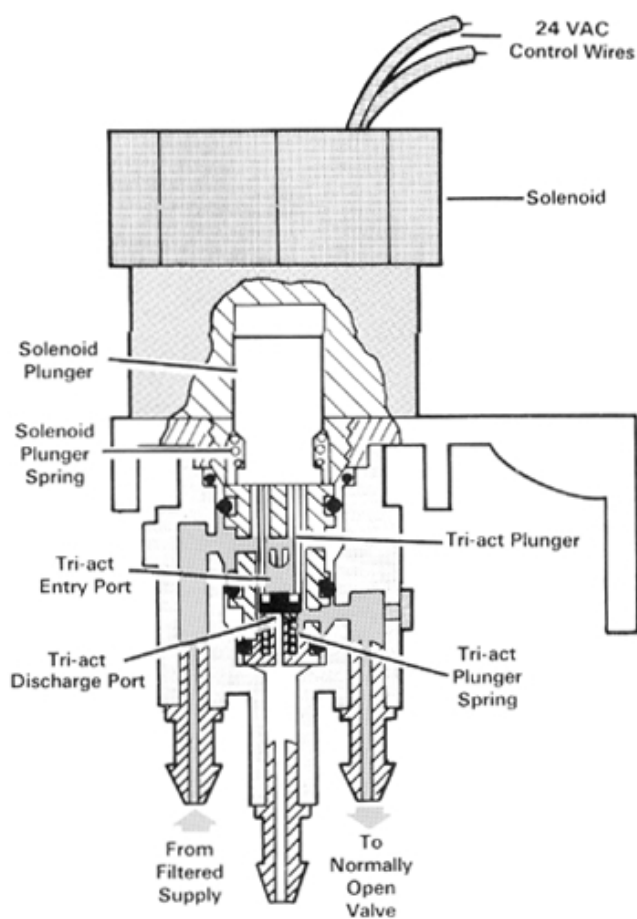
*The Electric 3-Way actuator must be supplied from a filtered water source which is equal to or greater in pressure than the supply water pressure in any valve it controls.*

## Filter/Nipple Assembly

The filter/nipple assembly is a combination of three parts, all available separately from Toro. When combined as shown, it creates an effective way to obtain filtered water for valve actuation from a dirty water system. The only water required to be filtered is the small amount needed to close the valve. When the valve is open the filter screen is continuously flushed by the flow of supply water.

**The tapped nipple is available in 1" and 1½" models only.**





### ◀ Closed Position

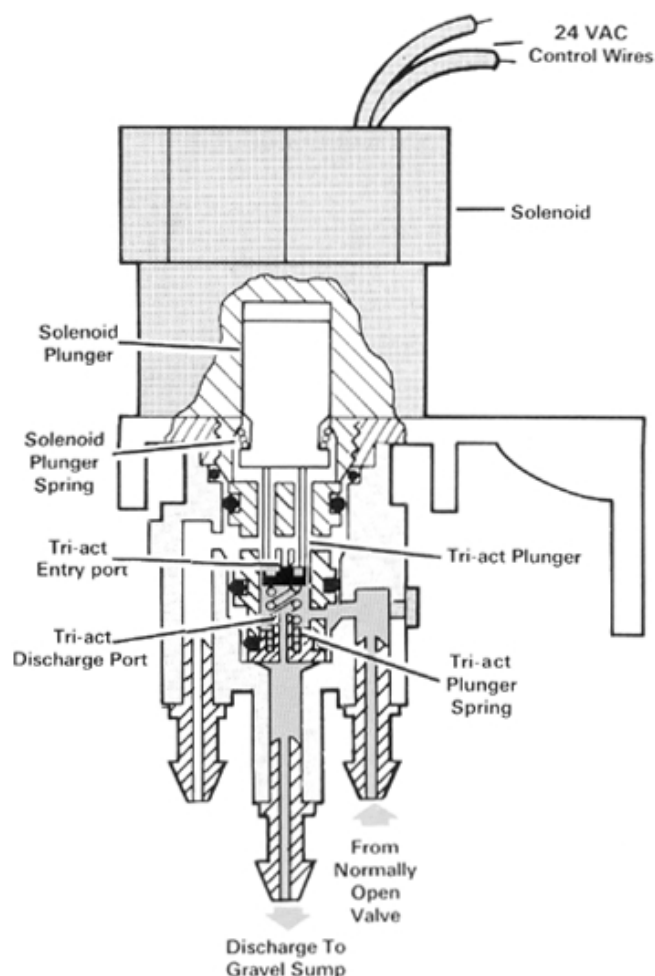
The spring loaded solenoid plunger applies pressure to the tri-act plunger holding it firmly against the discharge port and opening the entry port. Filtered supply water is allowed to flow through the tri-act and control tube filling the diaphragm chamber of the valve causing it to close,

### Note

*For clarity, some water flow in tri-act has not been shown.*

### Open Position▶

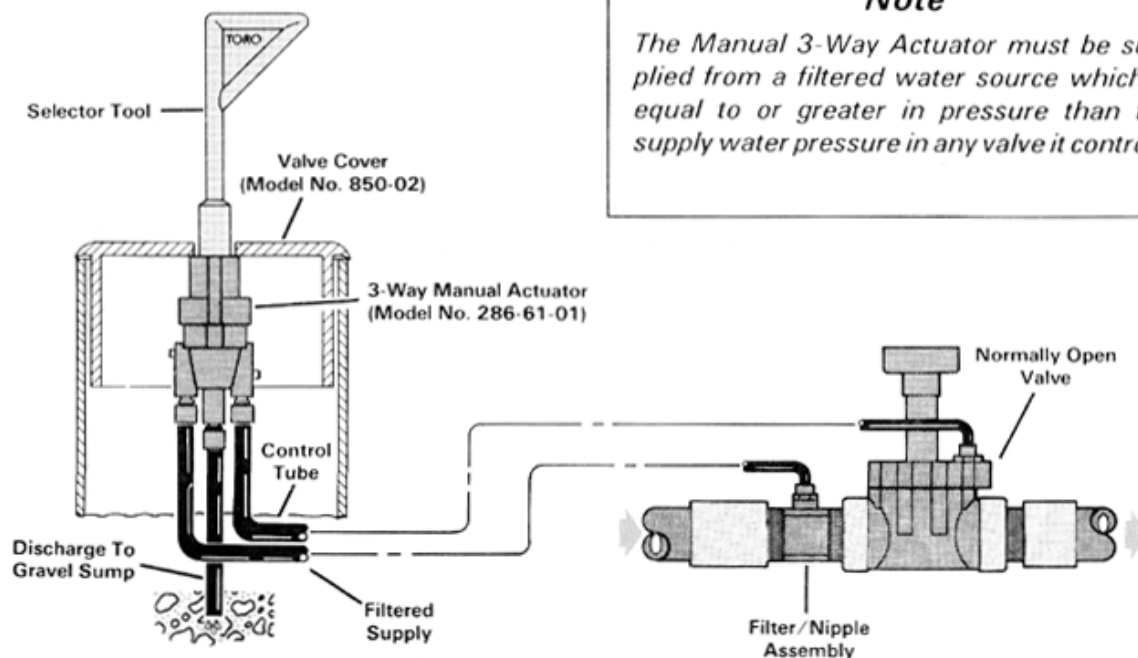
The valve solenoid, when activated by 24 VAC from the controller, draws the solenoid plunger up allowing the spring loaded tri-act plunger to move up, closing the entry port. Water pressure is then relieved through the control tube from the valve diaphragm chamber opening the valve.



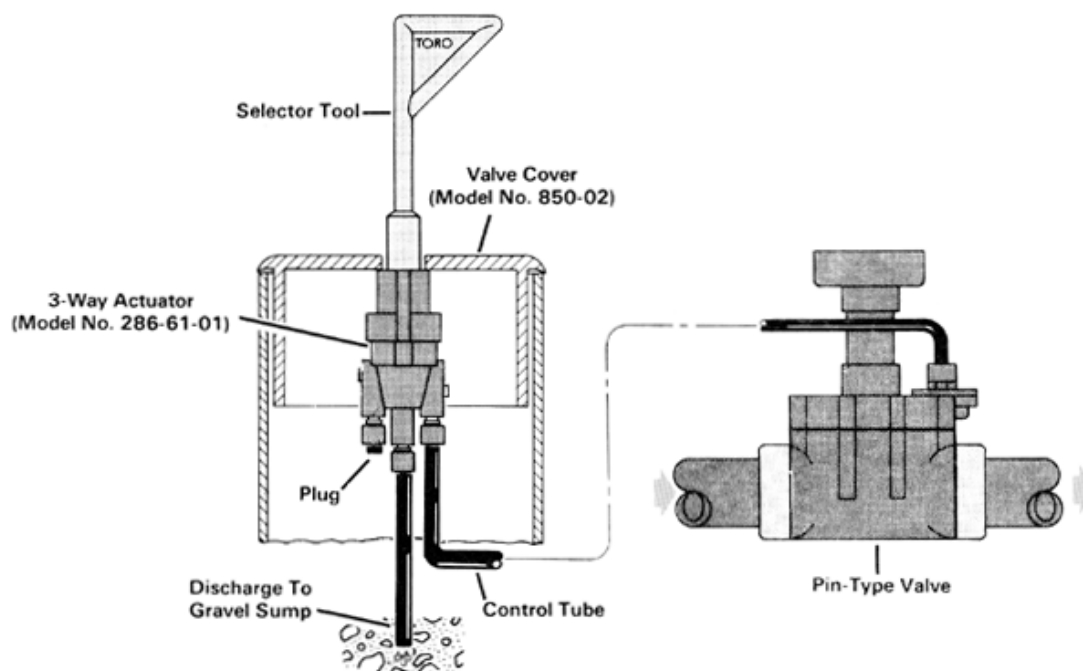
## Manual 3-Way Actuator

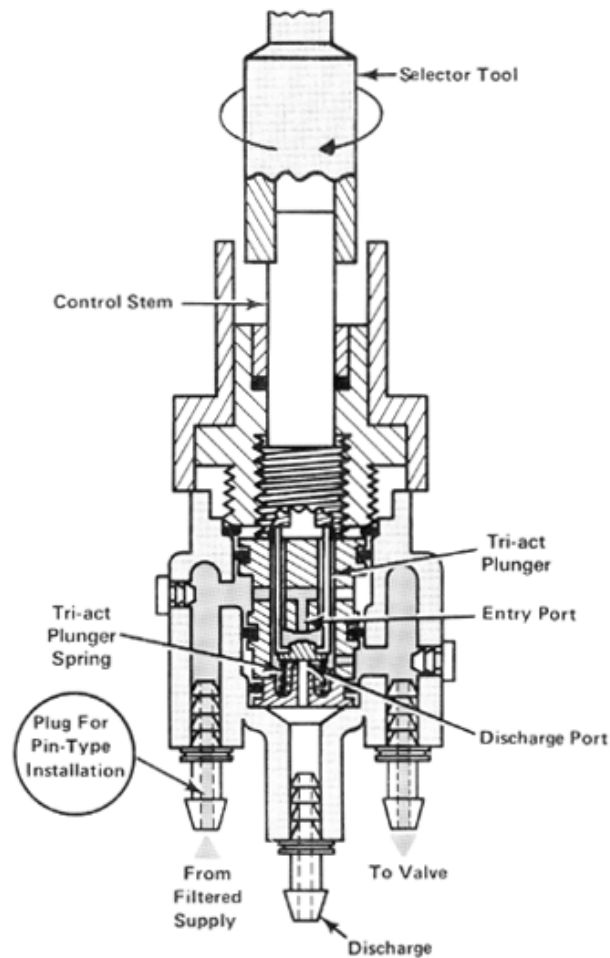
If manual operation of an automatic control valve is desired, the 3-Way Manual Actuator can be adapted to replace the automatic controller and convert the valve to complete manual operation.

The illustration below shows the Manual actuator used with a Normally Open valve. Filtered water for actuation is drawn from a Filter/Nipple assembly installed in the valve supply entry port. (See Filter/Nipple Assembly page .)



The illustration below shows a manual actuator adapted to a Pin-Type valve. Since the valve is actuated with internal supply water, the actuator supply port is not used and must be plugged.





### ◀ Closed Position

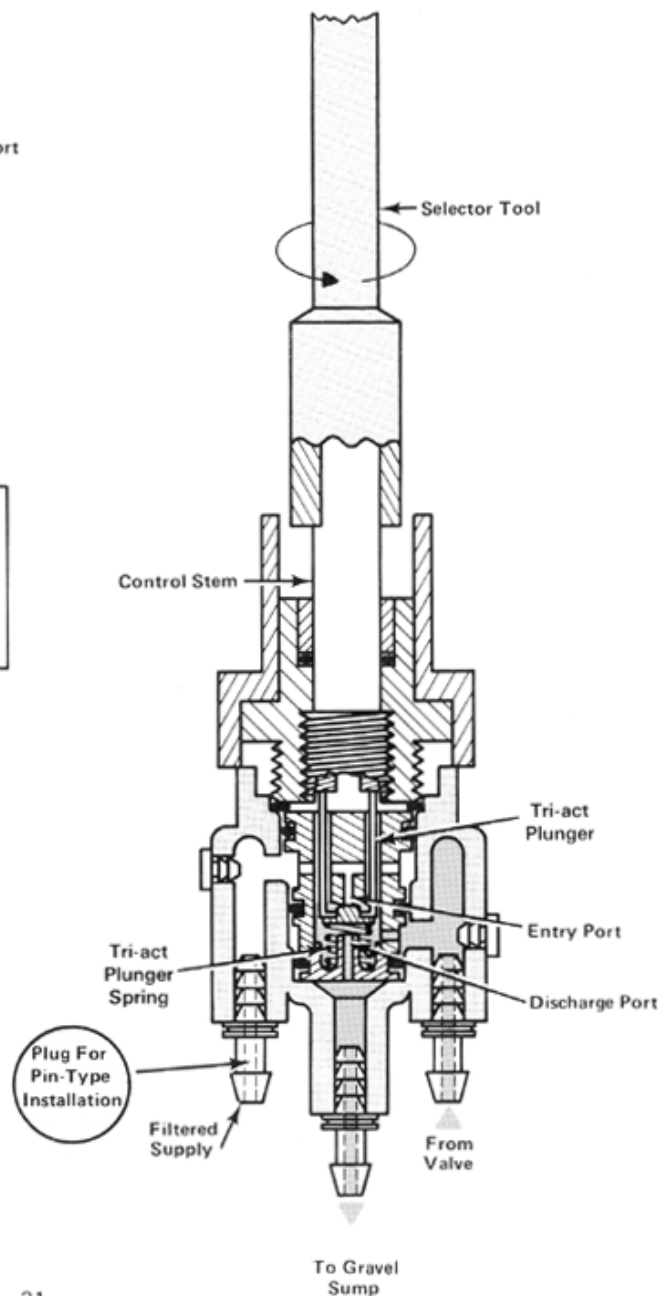
The control stem, when rotated fully clockwise, moves the tri-act plunger down, closing the discharge port and opening the entry port. The closed discharge port causes pressure to build within the Pin-Type valve diaphragm/piston chamber closing the valve. The open entry port allows filtered supply water to fill and pressurize the normally open valve diaphragm/piston chamber closing the valve.

### Note

*For clarity, some water flow in tri-act has not been shown.*

### Open Position ▶

The control stem, when rotated fully counter-clockwise, allows the spring loaded tri-act plunger to move up, closing the entry port and opening the discharge port. Water pressure is then relieved through the control tube from the valve diaphragm/piston chamber, opening the valve.

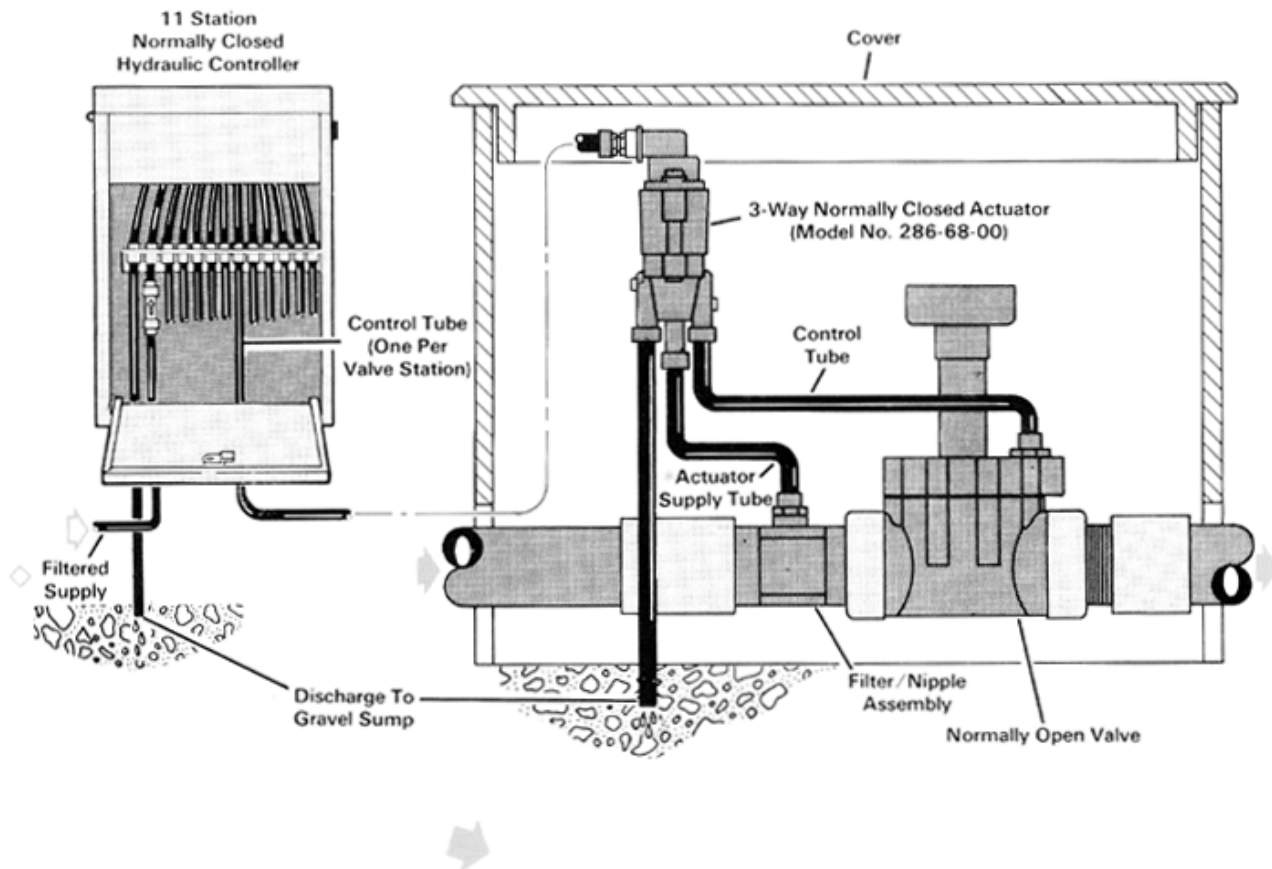


## Normally Closed Hydraulic 3-Way Actuator

The illustration below shows how a Normally Closed (NC) 3-Way actuator will adapt a Normally Open (NO) valve to a (NC) controller. **This valve/actuator combination may be used in dirty water systems.** Filtered water required by the actuator can be tapped from a Filter/Nipple assembly installed in the **upstream** side of the (NO) valve.

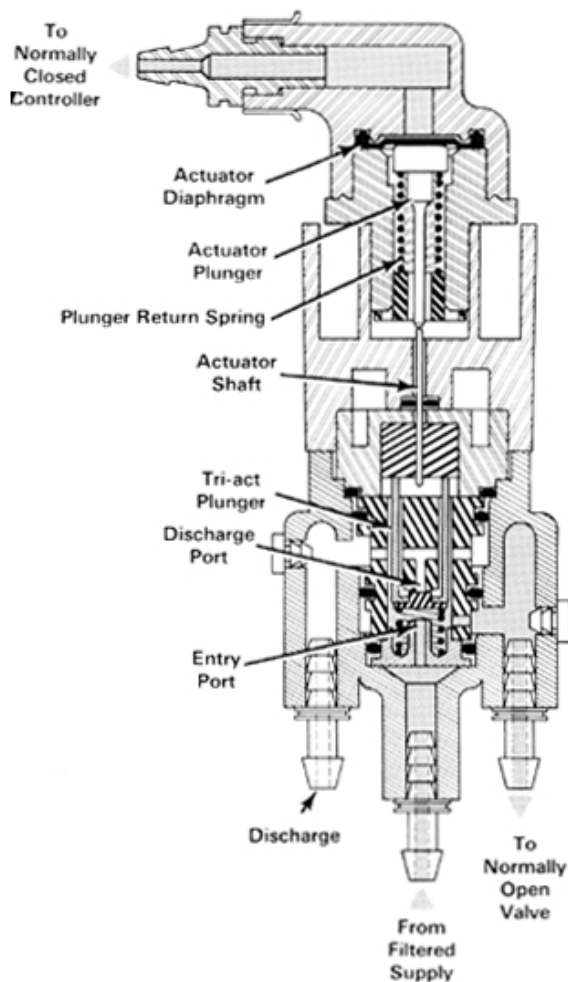
### ◇ Note

*For proper valve operation; the filtered water supplied to the controller must be obtained from the highest pressure point in the system, usually at the source or pump station.*



### \* Note

*The Hydraulic (NC) 3-Way actuator must be supplied from a filtered water source which is equal to or greater in pressure than the supply water pressure in any valve it controls.*



## ◀ Closed Position

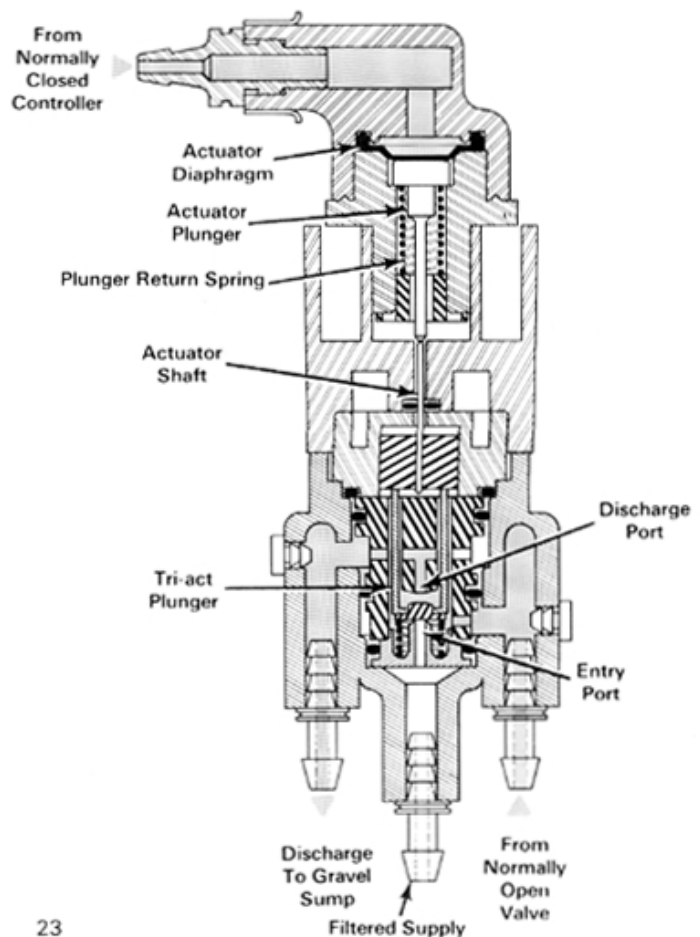
In the off position, water pressure in the control tube from the controller to the actuator is discharged. The actuator diaphragm is depressurized allowing the actuator plunger to be moved up by its return spring. The spring loaded tri-act plunger moves up, closing the discharge port and opening the entry port. Filtered water, channeled through the tri-act, fills the control tube and the valve diaphragm chamber causing the valve to close.

### *Note:*

For clarity, some water flow in the tri-act has not been shown.

## Open Position ▶

Filtered supply water is channeled through the controller selector valve to the 3-Way (NC) actuator. A small diaphragm within the actuator is pressurized, which moves the actuator plunger down against its return spring. Plunger movement is transmitted through the actuator shaft which in turn moves the tri-act plunger down, opening the discharge port and closing the entry port. Water pressure from the (NO) valve diaphragm chamber is discharged from the control tube through the actuator, allowing the valve to open.

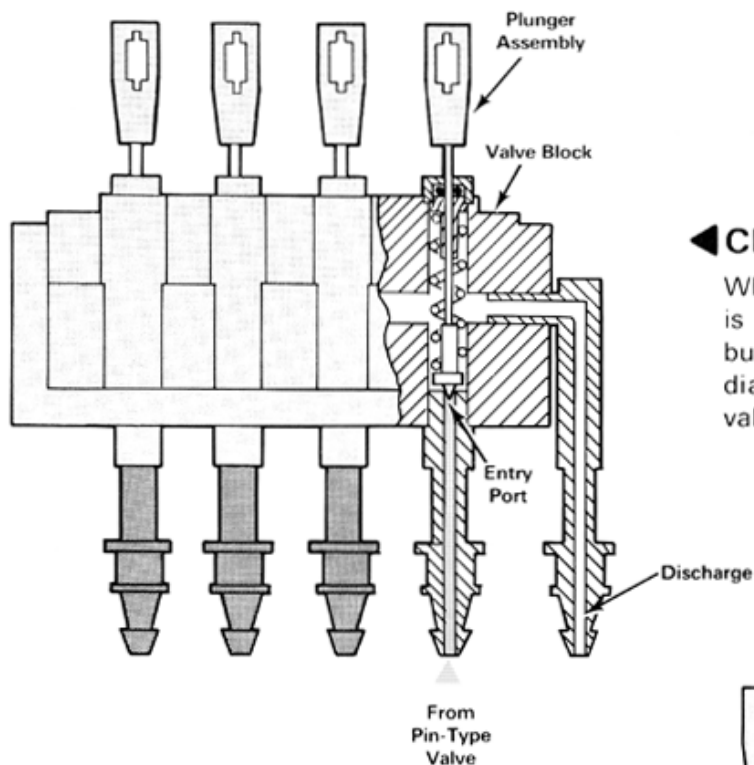


## Controller Selector Valves

The Selector Valve is operated by a motor driven timing mechanism within the controller, and is connected to each control valve station by a control tube. The function of the Selector Valve is to channel filtered supply water to and/or from the control valve for valve activation.

### Pin-Type Valve Block Selector Valve Operation

The Freetime 4 and 8 Hydraulic controllers incorporate a Pin-Type Selector Valve which consists of a valve block and plunger assembly. The plungers are raised and lowered for valve activation. **The Pin-Type Selector Valve is designed for use in clean water systems only.**

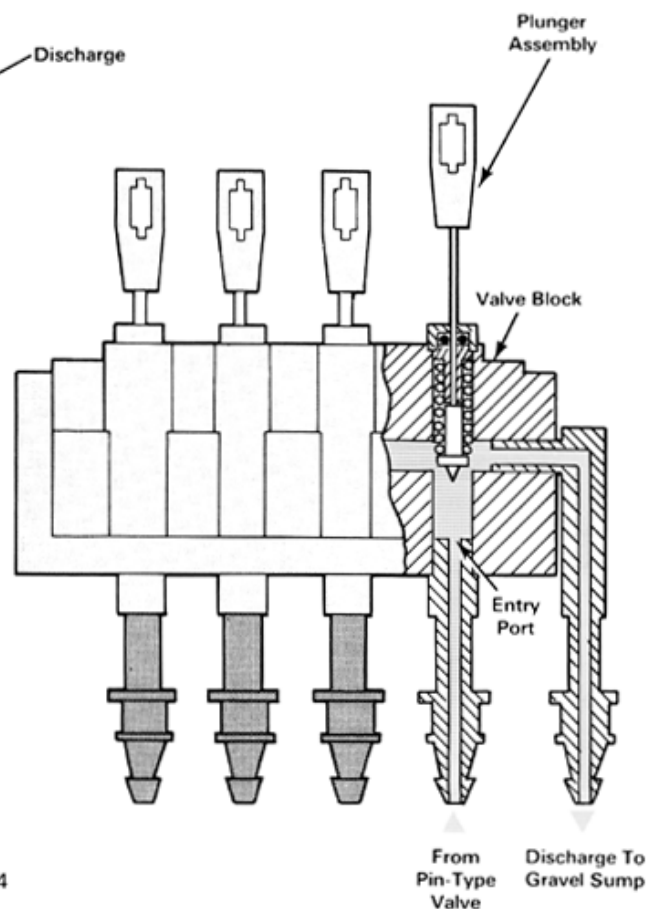


#### ◀ Closed Position

When the plunger is lowered, the entry port is closed. Metered water from the valve builds pressure in the control tube and valve diaphragm/piston chamber, closing the valve.

#### Open Position▶

The plunger assembly is raised, opening the entry port in the valve block, allowing metered water from the control tube and valve diaphragm/piston chamber to discharge, which allows the valve to open. A small amount of metered water will continue to discharge while the valve is in the open position.

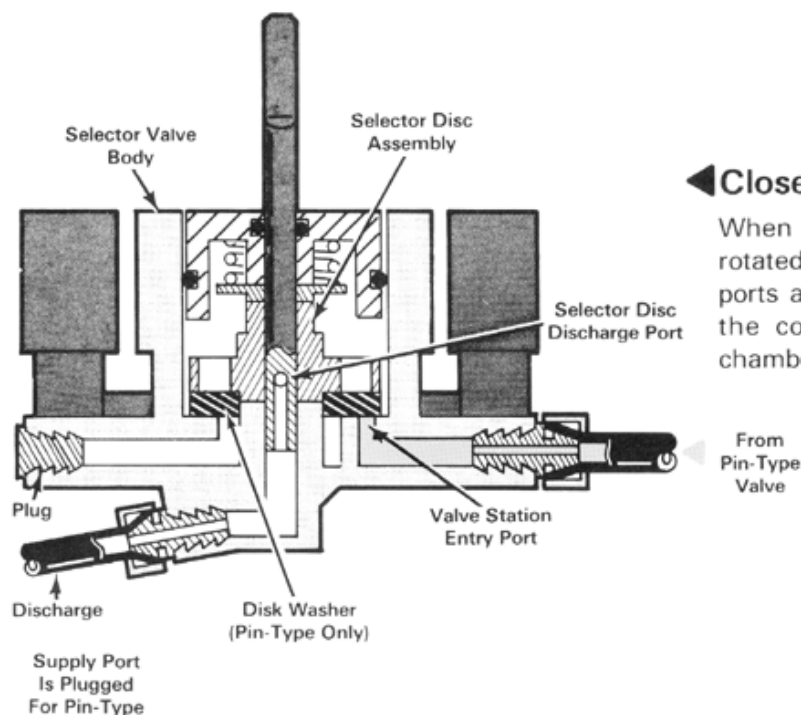


## Rotary Selector Valve

The Rotary Selector Valve is used in all Toro hydraulic version controllers except the Freetime 4 and 8. It consists of a cylindrical valve body with a control tube connection port for each valve station. A selector disk and shaft is rotated within the body for valve activation. The Rotary Selector Valve is available in Pin-Type and Normally Open versions.

### Pin-Type Rotary Selector Valve Operation

The Pin-Type Rotary Selector Valve is designed for use in clean water systems only.

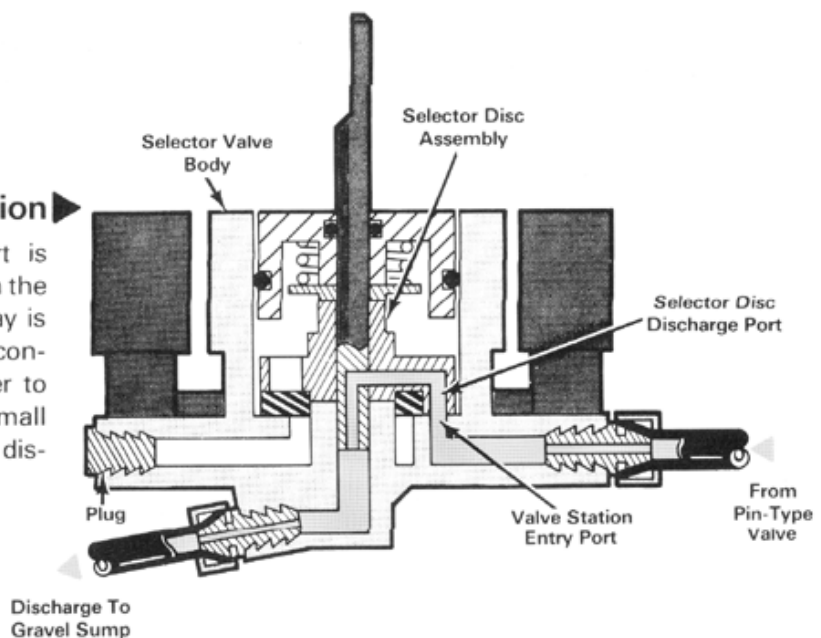


#### ◀ Closed Position

When the selector disc discharge port is rotated to the "off" position, the valve station ports are blocked causing water pressure in the control tubes and diaphragm/piston chambers to hold the valves closed.

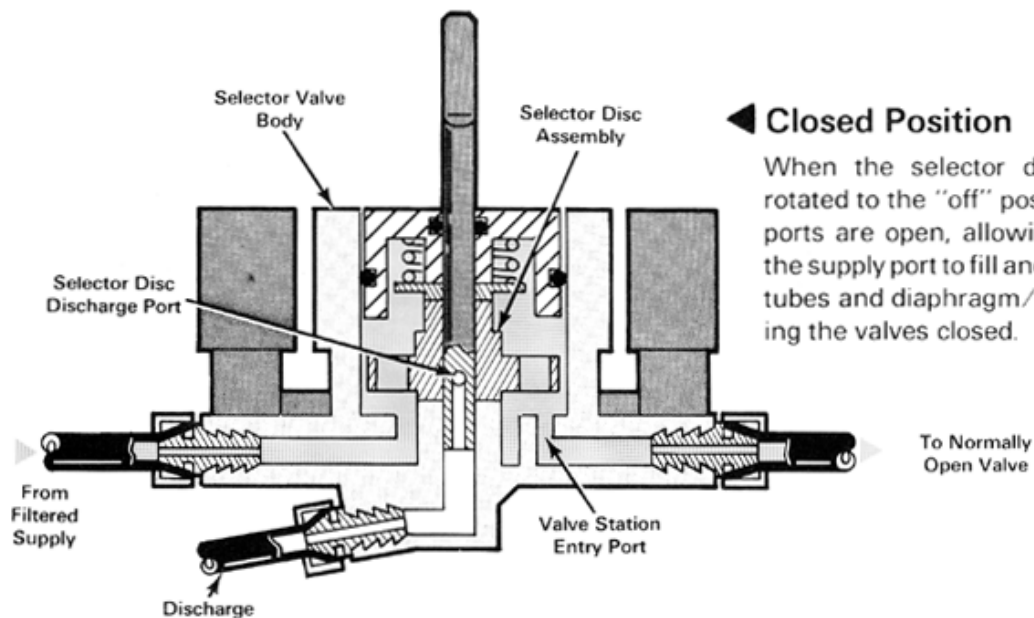
#### Open Position ▶

When the selector disc discharge port is rotated to align with a valve station port in the selector valve body, an open channel way is created permitting water pressure in the control tube and diaphragm/piston chamber to discharge, allowing the valve to open. A small amount of metered water will continue to discharge while the valve is open.



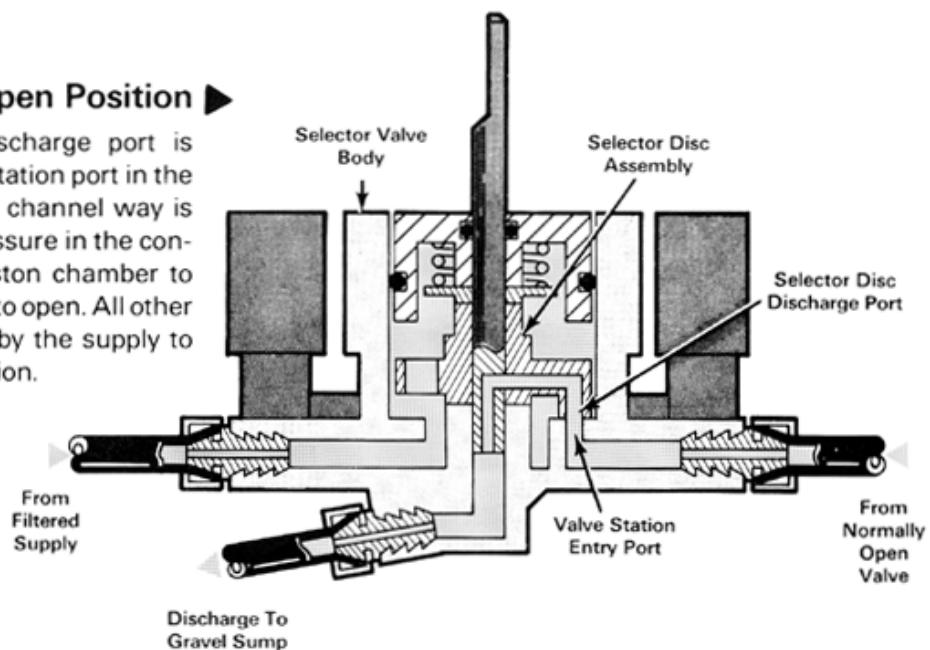
# Normally Open Rotary Selector Valve Operation

The Normally Open Rotary Selector Valve requires a filtered water supply which is obtained from the highest pressure point in the system, usually at the source or pump station.



## Open Position ▶

When the selector disc discharge port is rotated to align with a valve station port in the selector valve body, an open channel way is created permitting water pressure in the control tube and diaphragm/piston chamber to discharge, allowing the valve to open. All other stations remain pressurized by the supply to hold them in the closed position.



## Notes

## Notes



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