



Irrigation Design Information



Electric Zone Control Valves

The automatic zone control valve is the heart of your sprinkler system. Proper installation and performance of the valve is vital to the irrigation system. Reliable performance of the valve means that it must always open fully to allow optimum performance of the sprinkler heads. The valve must always shut off tightly to prevent leakage, and the valve must always operate without slamming open or closed to prevent pipe, fitting or sprinkler damage from surges.



Figure 1: Typical 1" Zone Control Valve

Surges occur when the valve closes, improper design and installation can create intense surges that can literally blow the piping out of the ground. Normally caused by having a flow velocity in excess of 5 feet per second through the pipe. Even though a 1" valve can safely flow 20 - 30 G.P.M. a 1" SDR 21 PVC pipe can only safely flow 15 - 16 G.P.M.. Another factor in surge intensity is the length of pipe run, the longer the run the more intense the surge. The third factor is the closing time of the valve, the faster it closes the more intense the surge. The more water flowing through the valve the faster it closes.

Size	2	5	10	15	20	30	40
1"	3.82	3.00	2.20	1.90	3.10	5.10	11.40

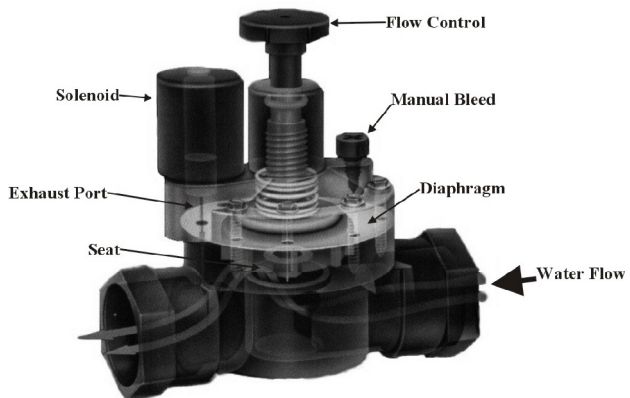
(Pressure loss in psi) (Flow Rate in G.P.M.)

Typical Valve Pressure Loss Chart

Principle of Operation

Automatic: The water from the mainline enters under the valve seat and flows up through a small port into the chamber above the diaphragm. Since the surface area on top of the diaphragm is larger than the valve seat area, the hydraulic force on the top of the diaphragm is greater than the force under it, so the valve closes.

When the solenoid is energized, it opens the exhaust port under the solenoid creating an escape path for the water to clear the upper chamber flowing into the downstream side of the valve, thus lowering the pressure on the top of the diaphragm. As this pressure is dissipated, the higher pressure under the seat of the valve forces the valve seat and the diaphragm assembly to open. This pressurizes the downstream side of the valve. While the valve is in the open position there is a constant flow of water through the metering device to the top of the diaphragm and out the exhaust port, because of this there has to be a minimum flow rate through the valve (see manufacturers specification for minimum/maximum flows). If there is a low flow rate the valve might not stay open so you will have to crank down on the flow control until the valve stays open. Do not use the flow control to drop the pressure in the system, use a pressure regulating valve for that purpose.



Manual: When the manual bleed screw is opened, the pressure in the upper chamber is vented to atmosphere and the pressure under the valve seat forces the valve to open.

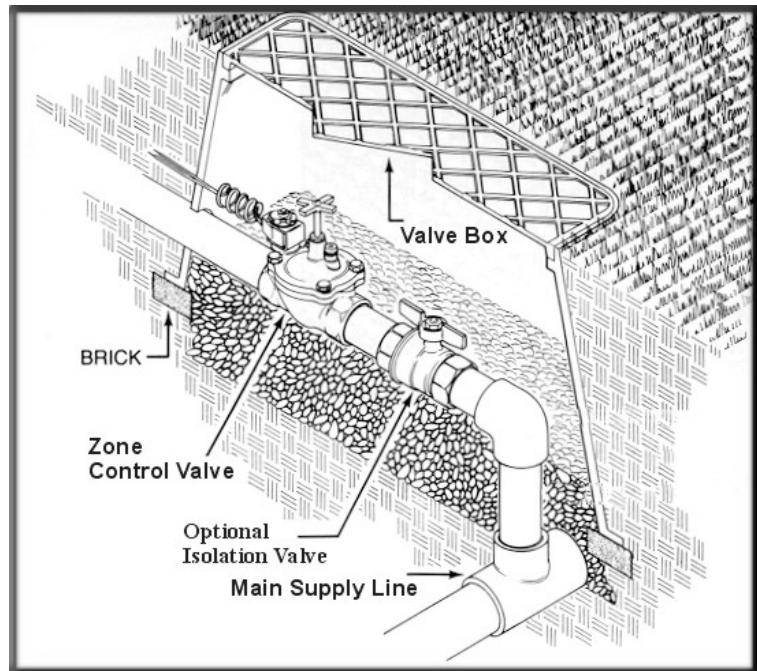
Installation

Install all valves on the main supply line according to the water flow arrow on the valve, caution must be taken to keep dirt, debris, rocks, etc... from entering the pipe or the valve body. Foreign material can keep the valve from operation properly and can cause a malfunction.

Even though most modern valves can be buried directly in the ground it is recommended that the valves be installed within a valve box. The box should be of sufficient size to enable repairing or adjusting as needed. There should be a drainage sump underneath the box to promote sufficient drainage. Some bricks can be used to stabilize the box and keep it from sinking due to foot or other traffic, if the box is pushed down it may damage the pipe that runs through it.

An optional isolation valve can be installed on the upstream side of the zone control valve to shut down that zone for repairs without disabling the entire system.

Wiring: Use only UL approved UF low voltage direct burial feeder wire to connect the solenoid wires to the controller. The connections must be made with a watertight sealant such as 3m's DBY or DBR connectors. Before making the connection coil the UF DB wire around a 1" by 12" pvc pipe this should give you sufficient length to lift the valve bonnet out of the ground if repairs are required.



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Troubleshooting

Problem	Possible Cause	Solution
Valve will not open	<ol style="list-style-type: none"> 1. Flow control fully closed 2. Solenoid coil burned out 3. Solenoid plunger bent/bound 4. Blocked internal bleed ports in body or bonnet 5. No power to valve 	<ol style="list-style-type: none"> 1. Open flow control 2. Replace 3. Replace 4. Clean ports 5. Check controller output and wiring.

Valve will not open fully	<ol style="list-style-type: none"> 1. Flow control partially closed 2. Restriction in internal solenoid and diaphragm ports. 3. Not enough flow through valve 	<ol style="list-style-type: none"> 1. Open flow control 2. Clean ports 3. Throttle valve with flow control or replace valve with smaller size
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Problem	Possible Cause	Solution
Valve will not close	<ol style="list-style-type: none"> 1. Obstruction in valve 2. Metering port through diaphragm plugged 3. Ruptured diaphragm 4. Improperly reassembled in field. 5. Solenoid plunger spring missing, damaged or bound. 6. Solenoid plunger seat disc damaged. 7. Plunger rubber seat damaged. 8. Valve too large; not enough flow & pressure loss to operate properly. 	<ol style="list-style-type: none"> 1. Check for foreign object under seat 2. Clean ports in diaphragm assembly. 3. Replace 4. Reassemble 5. Clean or replace 6. Replace 7. Replace 8. Throttle valve with flow control or replace valve with smaller size.

Valve will not close fully	<ol style="list-style-type: none"> 1. Cut or damaged seat washer 2. Damaged seat on valve body. 3. Solenoid plunger seat corroded or damaged. 	<ol style="list-style-type: none"> 1. Replace 2. Replace body 3. Replace
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The above is a general guideline of possible problems and solutions, but because of the individual nature of each system you may have to do a little extra troubleshooting.



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