1. Pressure is 75 PSI, solenoid minimum operating voltage 21 volts, controller output is 26 volts, 2 valves operating per station, 18 AWG wire. What is the maximum allowable distance from controller to valve?

2. Pressure is 50 PSI, solenoid minimum operating voltage 19 volts, controller output is 24 volts, 1 valve operating per station, 14 AWG wire. What is the maximum allowable distance from controller to valve?

3. 1 mile from controller to valve. Pressure is 50 PSI, solenoid minimum operating voltage 19 volts, controller output is 24 volts, 1 valve operating per station. What size wire?

4. 455' from controller to valve. Pressure is 75 PSI. The allowable voltage loss is 3 volts. Two valves are operating per station. What size wire?

Electrical Tables

Example Solenoid Operating Voltage and Inrush Current

Water Pressure (psi)	**Minimum Solenoid Operating Voltage** (volts)	**Inrush Current** (Ohms)		
		1 Valve	**2 Valves**	**3 Valves**
50	17.9	0.240	0.480	0.720
75	19.9	0.265	0.530	0.795
100	21.5	0.289	0.578	0.867
125	22.7	0.310	0.620	0.930
150	24.3	0.328	0.656	0.084

Wire Resistance

Wire Gauge (AWG)	**Wire Type** (UF)	**Insulation Thickness** (inch)	**Resistance** (ohms/1000 ft)	
			77° F (25° C)	**149° F (65° C)**
00	Stranded	5/64	0.079	0.092
0	Stranded	5/64	0.100	0.116
2	Stranded	5/64	0.159	0.184
4	Stranded	5/64	0.253	0.292
6	Stranded	5/64	0.403	0.465
8	Solid	5/64	0.641	0.739
10	Solid	4/64	1.020	1.180
12	Solid	4/64	1.620	1.870
14	Solid	4/64	2.580	2.970
16	Solid	4/64	4.090	4.730
18	Solid	4/64	6.510	7.510

Answers:

1. AVL (allowable voltage loss) = 26v at the controller – 21v needed by the solenoid = 5v
   I (Amps) = 2 valves operating at the same time at 75 psi draw 0.530 (from table)
   R (resistance) of 18ga wire = 6.51 ohms/1000 ft from table)
   Then:
   L = (5v x1000) ÷ (0.530 x 6.51 x 2) = 5,000 ÷ 6.90 = 724.65 or 725 feet
2. AVL (allowable voltage loss) = 24v at the controller – 19v needed by the solenoid = 5v
   I (Amps) = 1 valve operating at 50 psi draws 0.240 (from table)
   R (resistance) of 14ga wire = 2.58 ohms/1000 ft (from table)
   Then:
   L = (5v x1000) ÷ (0.240 x 2.58 x 2) = 5,000 ÷ 1.2384 = 4,037.47 or 4,037 feet
3. AVL (allowable voltage loss) = 24v at the controller – 19v needed by the solenoid = 5v
   I (Amps) = 1 valve operating at 50 psi draws 0.240 (from table)
   1 mile = 5,280 feet
   Then:
   L = (1000 x 5) ÷ (2 x 5,280 x 0.240) = 5,000 ÷ 2,534.4 = 1.97 ohms
   Look at wire chart to find wire size that does not exceed 1.97 ohms = 12 ga wire
4. AVL (allowable voltage loss) = 3v (given)
   I (Amps) = 2 valves operating at 75 psi draws 0.530 (from table)
   Then:
   L = (1000 x 3) ÷ (2 x 455 x 0.530) = 3,000 ÷ 482.3 = 6.22 ohms
   Look at wire chart to find wire size that does not exceed 6.22 ohm s= 16 ga wire