# Irrigation Wiring

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## Basic Wiring

- Wiring must make a loop
- System must be grounded
- Be consistent – *it saves time, heartache and money*
- Exposed wires and water is bad! Really bad!!!

## Basic electricity

$$\text{current} = \frac{\text{voltage}}{\text{resistance}}$$

$$\text{Amps (I)} = \frac{\text{voltage (E)}}{\text{ohms (R)}}$$

## Basic electricity

Voltage = current x resistance

E (volts) = IR

## Basic electricity

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\text{resistance (R)} = \frac{\text{voltage (E)}}{\text{Amps (I)}}$$

## Basic electricity

Power = voltage x current

Volt amperes (VA) = EI

## Irrigation Controllers

- Programmable
- Flexable
- Muti-zone
- Manual modes
- 24-volt

## Wiring

- Wires are generally color coded to distinguish station and control wires
  - White = common for valves
  - Red = station (control) for valve

## Electrical Wiring

- Wire gage (AWG – American Wire Gage) no. is inversely related to size, i.e., 10 gage wire is large and has less resistance than 18 gage wire
- When wire is buried, it must be coated (UF – underground feeder)

## Electrical Wiring

- Transformers: - used to "step down" voltage, typically step down 115V to ~24V.
- Wire size must be large enough so that the remaining voltage is sufficient to operate the electric diaphragm valve
- For most electric diaphragm valves, the minimum operating voltage is 21V (unless otherwise specified)
- "In rush" current – what is required by the valve when it is activated
- "Holding" current – what is required to "hold" the valve in a particular position after being activated

## Electrical Wiring - sizing

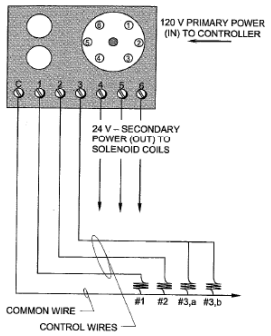
- Size 14 AWG wire is a recommended minimum size for relatively large irrigation installations (2.68 ohms/1000 ft).
- Size18 AWG wire is used on many home installations
- Using size 14 wire, an inrush current of 0.4 amps, and 3-V allowable loss, the allowable distance between the valve and controller is:

V = I R, 3V = 0.4A * (2.68 ohms/1000 ft) * D (ft)

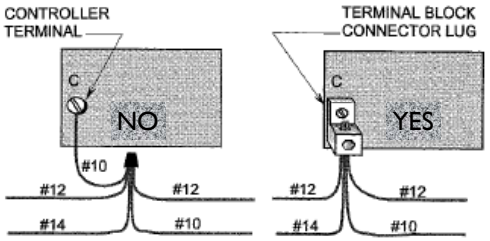
D = 3 * 1000 *(1/(0.4 * 2.68)) = 2,798 ft

**Wires (out and back), so distance between the controller and valve = 2,798/2 = ~ 1,400 ft**

## More than one valve can share a common wire



## Connections: Common



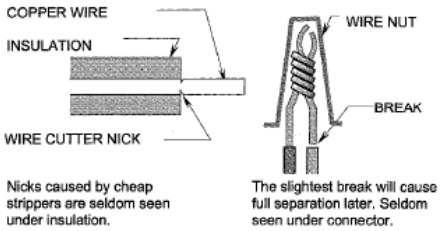

## Static Water Pressure

- Static water pressure at the control valve can affect the size of the wire size needed to operate the valve

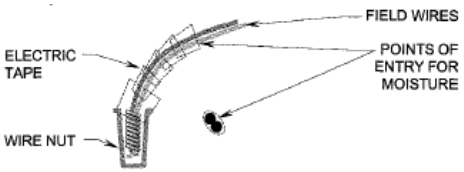
## Irrigation Wiring

- Factors that affect voltage drop in a control wire.
  - Small wires
  - High amperage (load) with a long small wire
  - Long distances of small wires

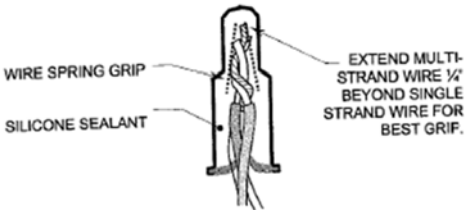
## Invisible flaws in connections




## Connections: lousy splice

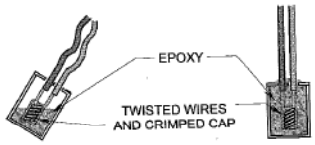



## Connections: Silicone Caps




- Strip 5/8" of single and 7/8" of multi-strand wire
- Insert wires into connector simultaneously, twist until refusal
- Tug hard on each wire. Now is the time to find out if the connection is loose

## Connections: Epoxy filled PVC cups




WRONG

- Not sitting upright
- Wires are crooked
- Some epoxy is lost
- Not "bottomed out"

RIGHT

- Cup is upright
- Wires are straight
- Cup is full of epoxy
- Splice is "bottomed out"

## Connections: Epoxy filled PVC bags

WRONG

- Not sitting upright
- Tape is loosened
- Some epoxy is lost
- Not "bottomed out"

RIGHT

- Envelope is upright
- "Twist-Em" seals and holds
- Envelope is full of epoxy
- Splice is "bottomed out"


## Connections: Heat shrink

PVC – tendency to melt and not shrink

Irradiated poly-olefin (IPO) - melts evenly and performs well in wet areas



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