Basics of Two-Wire Irrigation Technology
The Basics

A-Z
Objectives

- Introduce students to the Basics of Two Wire
- Present the benefits of Two Wire over Conventional Wiring
- Explain the steps in selecting which brand of Two Wire to use.
- Discuss ways of wire path installations.
- Explain & illustrate proper wire connection
Hold it... 2-wire?
Not something new.
Decades in the making.

- Introduced in the U.S over 30 years.
- Started out using DC Current.
- Not very reliable.
- Very expensive.
- Not user friendly.

This caused the concept to fade from the U.S. market for many years.
Technology Changed.

- Redeveloped using AC Current.
- Systems became more reliable.
- Controllers and components became user friendly.
- Cost of product became less expensive.

“Is it the system of the future?”
What is 2-Wire?

- Control system that eliminates the need for a separate wire conductor for every valve
- Replaces individual conductors with a single 2-wire path
- Five primary components
  - Controller
  - Decoder Module (Some Built-In.)
  - 2-Wire path - Carries power and control signal from the controller to the valve.
  - Decoder
  - Surge Protection - Earth Ground
Benefits of 2-Wire

- Less Wire!!
  - Save money—Generally you will use about 20% of the wire for a conventional system
  - Save labor—no more “ringing out” and bundling large tangles of wire
  - Can operate 1 to more than 200 valves and pump or master valve on only two 14 gauge wires!
Conventional Wiring Example
Conventional Wiring Example
Benefits of 2-Wire

- **Flexibility and Expandability**
  - Easy to add zones - splice anywhere on 2-wire path, program & install decoder, wire to valve
  - Less restrictive on controller location
    - Controller can be located or even moved to anywhere along the path
    - Potentially allows an earlier start on jobs and eliminates the need for temporary controllers
Benefits of 2-Wire

- Decreased Costs
  - Fewer controllers
  - Less wire
  - Fewer power sources
  - Fewer hours for electrical contractor/ utilities
  - Manage more water meters with fewer controllers
Faster – Easier installation
Less Product cost – More competitive
Bottom line – More Money in your pocket!
Manufactures

*Rain Bird  *Weathermatic
*Acclima    *Underhill    *Toro
*Rain Pro(HIT)   *Tucor    *Hunter
*Rain Master   *Baseline Systems
*Signature Control Systems

So which one should I use?
Check with local Distributors

- Factors that are important.
  - Product training.
  - Knowledgeable staff.
  - More than one line.
  - Product on hand.
First step - Controller Selection

- Site plan – Type of project.
  Golf course, Condo, Commercial Lot, Park, Athletic Complex.....etc.
- Length of runs? Longest possible run.
- Programs, Start times, Water Budgets...
Second Step – Decoder Selection

These are the most commonly used.

- **Single Station (Address) Decoder**
  Operates 1 valve - (2 simultaneously)

- **Two Station (Address) Decoder**
  Operates 1 to 2 valves - (2 pair of valves.)

- **Four Station Decoder**
  Operates 1 to 4 valves
Decoders – Basic Function

- Decoders are constantly powered and always “listening” for their unique address.

- The decoder reads or “decodes” the signal from the controller and turns on the valve when the address is right.

- Decoders are the “middleman”
  - Connected to the two-wire path
  - Connected to each valve solenoid
Decoder Types - Example

1 Address

2 Address

4 Address
Third Step - Surge Protection

- Surge or Lightning Arrestors

Suppress line surges by redirecting them to earth ground

- Protect system components – decoders, decoder module, controller
- Locations
  - Within 25’ of the controller
  - Every 500’ along the 2-wire path
  - End of the 2-wire path
- Wiring – Red and Black to 2-wire path, Green to earth ground

- Earth Grounding

- Required for Surge Arrestor functionality
- Use 8’ - 5/8” copper clad ground rod and Clamp.
Wiring Surge / Lightning Arrestors

GROUNDING DETAIL
Forth Step – Wire Selection

Check with the Manufacturer.

- **Type or Make of wire.**
  
  2-conductor, jacketed, UL/UF approved for direct burial, sunlight resistant.

- **Gauge of wire depending on length.**
  
  14 or 12 Gauge most popular. (Could be smaller or larger.)

- **Warranty issues.**
2-Wire System Overview

SYSTEM REQUIREMENTS

- **SLWIRE 14-2 or 12-2**
- **2' Expansion Coil at All Splices**
- **SLGDT Surge Arrestor Every 600'**
- **Typical Decoder SLDEC2**
- **Terminate and Ground Two Wire Path**

**GROUND ROD**
- 3/8" Dia. x 8'-0" UL Listed Copper Clad Ground Rod
- Top to be 6" Below Grade and Located as Close to Controller as Possible
Planning the wire path

- The wire path will follow the mainline
- Each controller uses its own 2-wire path
- Options for wire path layout are flexible
- Looping wire provides the same benefits of looping pipe
  - A redundant path
  - Able to have longer runs
Wire Layouts
Wire Layouts

Star

Decoder

Decoder

Decoder

Decoder

SLM48DM

C

Decoder

Decoder

Decoder

Decoder
Wire Layouts
Sizing Wire – Manufactures Example

Straight line configuration, i.e. wire distance to furthest decoder, no loop:

<table>
<thead>
<tr>
<th>Wire Size (Gauge)</th>
<th>#14</th>
<th>#12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire Length (ft)</td>
<td>4,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Wire Length (m)</td>
<td>1,200</td>
<td>1,800</td>
</tr>
</tbody>
</table>

Loop Configuration, i.e. wire distance to the furthest decoder in the loop:

<table>
<thead>
<tr>
<th>Wire Size (Gauge)</th>
<th>#14</th>
<th>#12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire Length (ft)</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Wire Length (m)</td>
<td>3,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Maximum total wire path length is 10,000 ft. (3,000 m).

03 WIRE SIZING
Wire Connections

- Must be UF \ UL
- Waterproof
- Electrical tape and/or bubble gum and a wire nut is not an approved method
- 90% of electrical problems are a result of poor wire connection!
Proper Tools & Waterproof Connectors
Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7
Step 1
Step 2
Step 3
Not like this!
Tying the Knot
Tying the Knot
Expansion Coils
Expansion Coils
Expansion Coils
Troubleshooting

- Manufacturers Instruction Book
- Built in Diagnostics – Fault or Error Codes
- Product Specific Training
  Tuesday – Basics of Troubleshooting Electrical Faults in 2-Wire Irrigation Systems
  Bruce Nelson – Armada Technologies
Thank you for attending!