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# QWEL

## Qualified Water Efficient Landscaper

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### Class Ten:

## Valve, Controller & Field Wire Troubleshooting



## Valve, Controller & Field Wire Troubleshooting

# What's your problem?



Valve Won't Open?

Valve Won't Close?



## Class Ten

# Overview

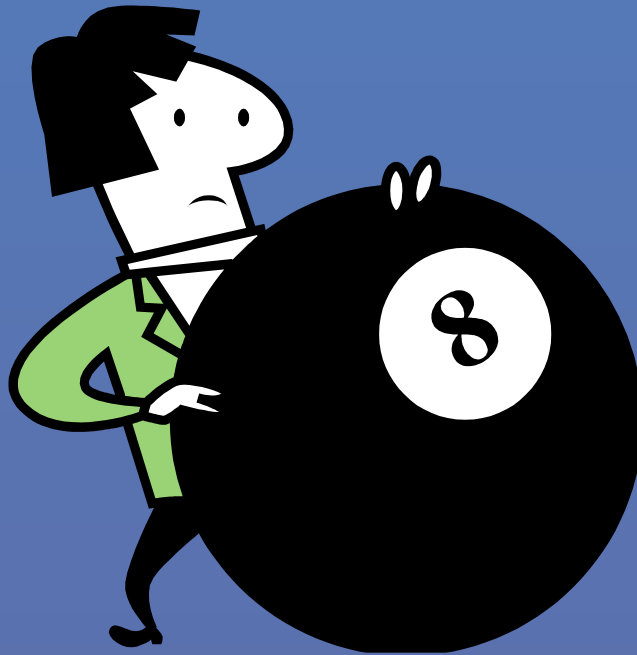
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- Learn how an irrigation valve works
- Learn how to identify irrigation valve and controller problems
- Learn how to troubleshoot irrigation valves and controllers
- Learn how to use a Volt/Ohm meter



## Valve, Controller & Field Wire Troubleshooting

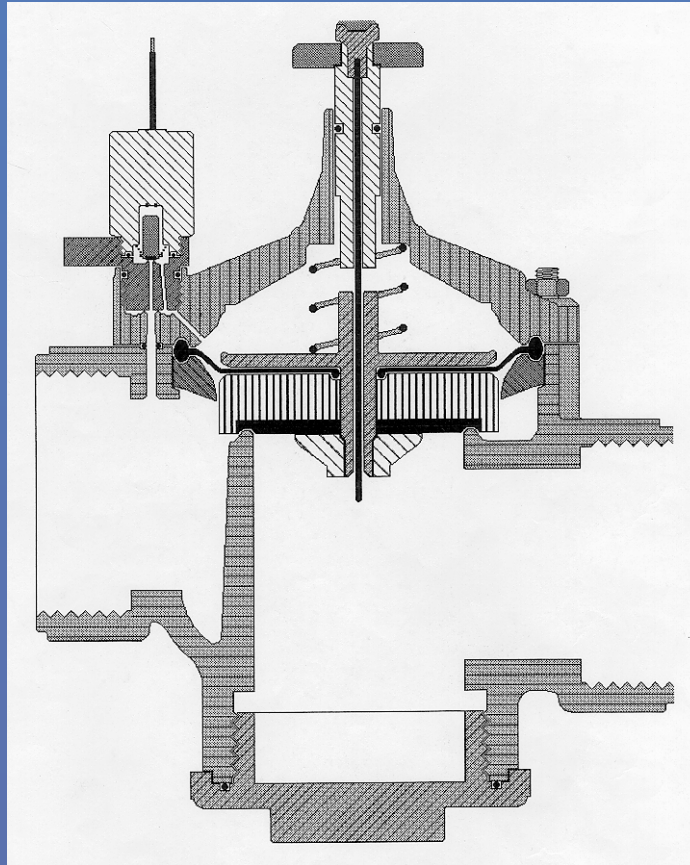
# Valve mechanics



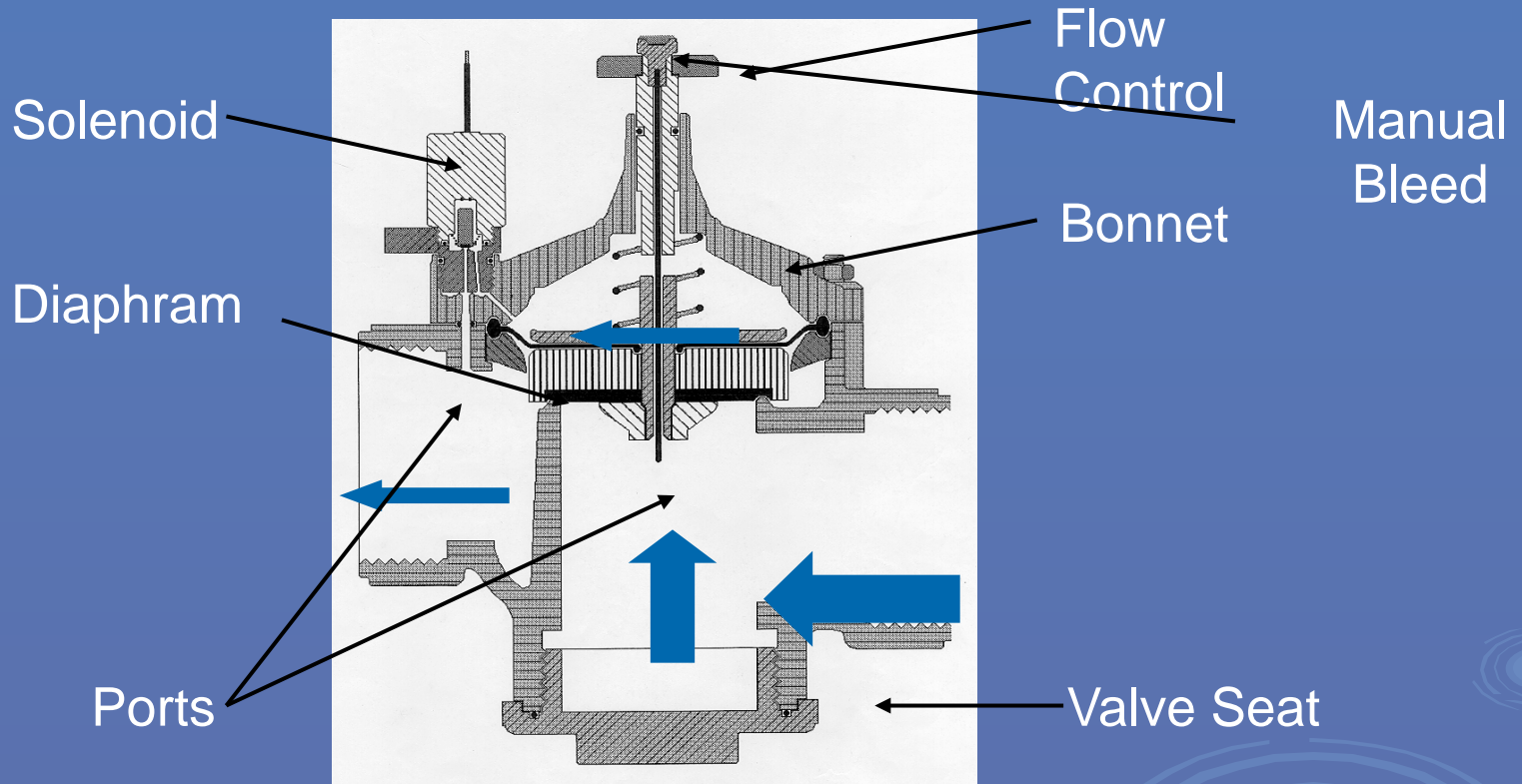
Before you can fix  
it.....

.....You must  
know how it  
works

## Valve anatomy



## Valve anatomy





# Process of elimination

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Only three possibilities for valve malfunction

1. **Hydraulic** - something has impaired the flow of water
2. **Mechanical** - something is physically stopping the valve from functioning properly
3. **Electrical** - something is wrong with the valve solenoid, the field wiring, or the irrigation controller



# Have a plan... Work your plan

## Identify Problem – stuck open/won't open

### 1. Start with the obvious

- ✓ Is the water On?
- ✓ Is the power On?
- ✓ Is the correct program in controller?

### 2. Be Consistent



# Valve stuck open

### Possible culprits

- Incorrect controller setting
- Worn or damaged diaphragm
- Debris in valve
- Loose solenoid / bleed screw
- Damaged valve seat
- Insufficient force on the top of the diaphragm



# Valve **stuck** open

Insufficient force on the top of the diaphragm

- Valve not “tuned”
  - Adjust flow control down (this is common when low-flow/pressure conditions are present)
- Plunger missing
- Constant voltage from solenoid
- Leak at bonnet
- Backwards valve



# Valve **stuck open**

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**Weeping valve** - water is slowly but constantly escaping from lowest sprinkler head(s)

## Culprit

1. Damaged solenoid seat
2. Damaged valve seat
3. Debris in valve



# Valve **won't** open

## Possible culprits

- Flow control is down
- Bad solenoid
  - Test with volt/Ohm meter
- Plugged ports
- Solenoid not receiving voltage
  1. Broken field wire
  2. Bad connection
  3. Controller problem



## Valve, Controller & Field Wire Troubleshooting

# Remember your plan . . . **Work** your plan

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Start at the controller and work towards the valve, or start at the valve and work back to the controller:

- I prefer to start at the controller
- Be consistent



# Troubleshooting at the controller

## √ Check the obvious

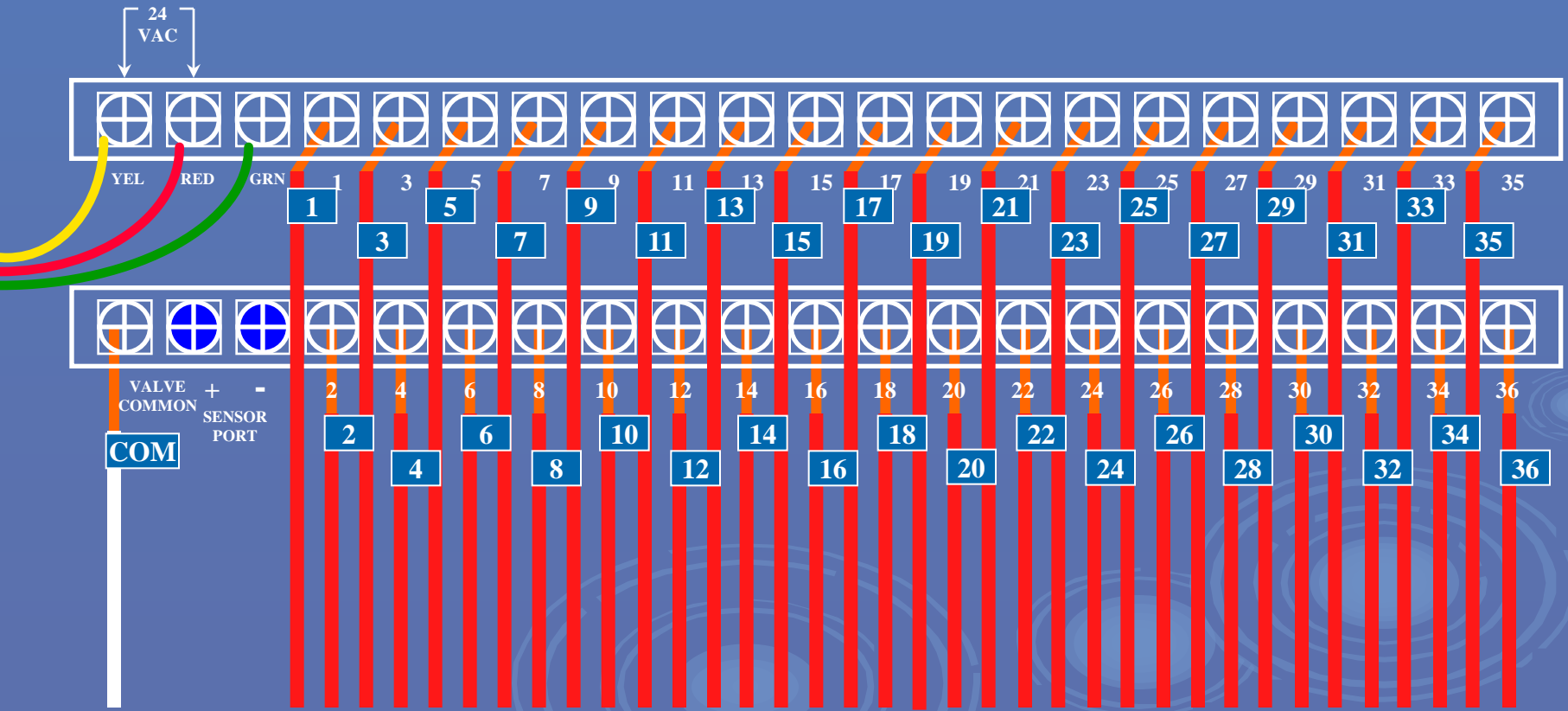
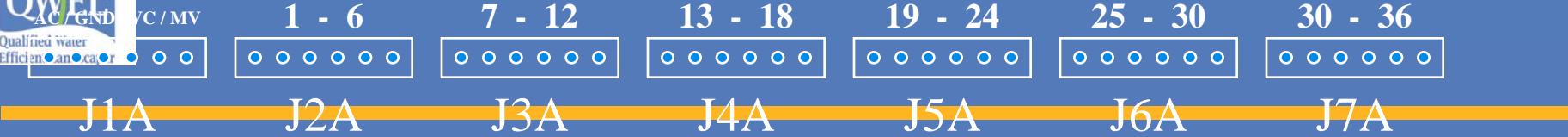
1. Is it plugged in?
2. Check program - Start time / run time / days on
3. Check fuses
4. Sensors?

## √ Verify power – Use volt/Ohm meter

## √ Check terminals



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# Valve, Controller & Field Wire Troubleshooting

## Using a Volt/Ohm meter

### Testing power at the terminal



AC AC C 1 2 3 4 5 6



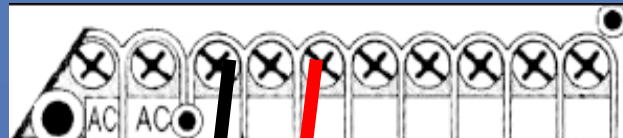
Should Read between  
**24 and 28 Volts**

## Valve, Controller & Field Wire Troubleshooting

# Using a Volt/Ohm meter

## Testing station power at the terminal

AC AC C 1 2 3 4 5 6



Turn on Stations and  
test each terminal

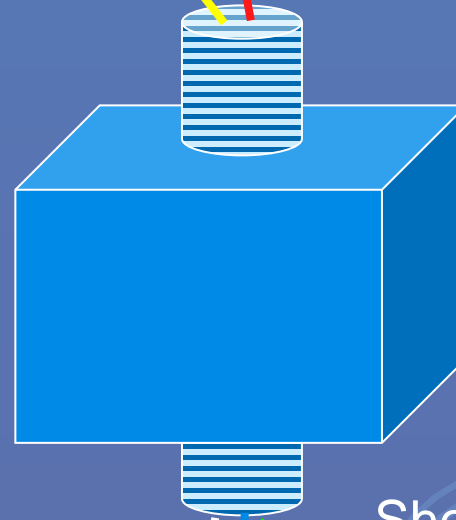
Should Read between  
**24 and 28 Volts**

## Using a Volt/Ohm Meter

### Testing power at the transformer



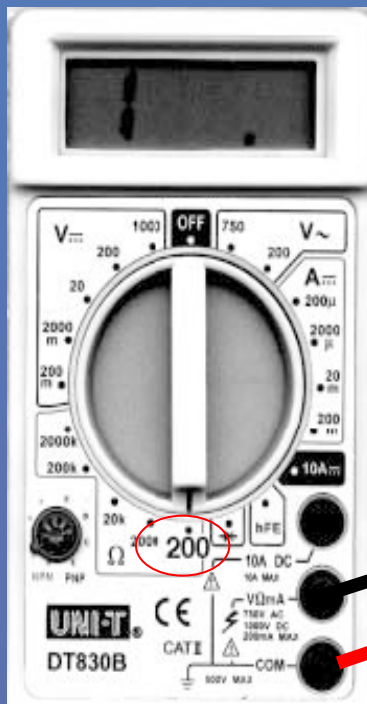
Should read between  
**24 and 28 volts**



Should read between  
**105 and 129 volts**

## Using a Volt/Ohm Meter

### Testing continuity




**Continuity** is the path of the wire through the solenoid back to the controller

- If the connection is open, the resistance (ohms) is high or infinite
- If it is very low, there may be a short in the line or solenoid



## Valve, Controller & Field Wire Troubleshooting

# Solenoid diagnostic chart

- 0 - 6 ohm = Shorted solenoid - Replace
- 6 - 15 ohm = Slow burn - Draws excessive amps
- 15 - 50 ohm = Good solenoid
- 50 + ohm = Broken internal wire - Replace
-  = Break in wire or bad connection

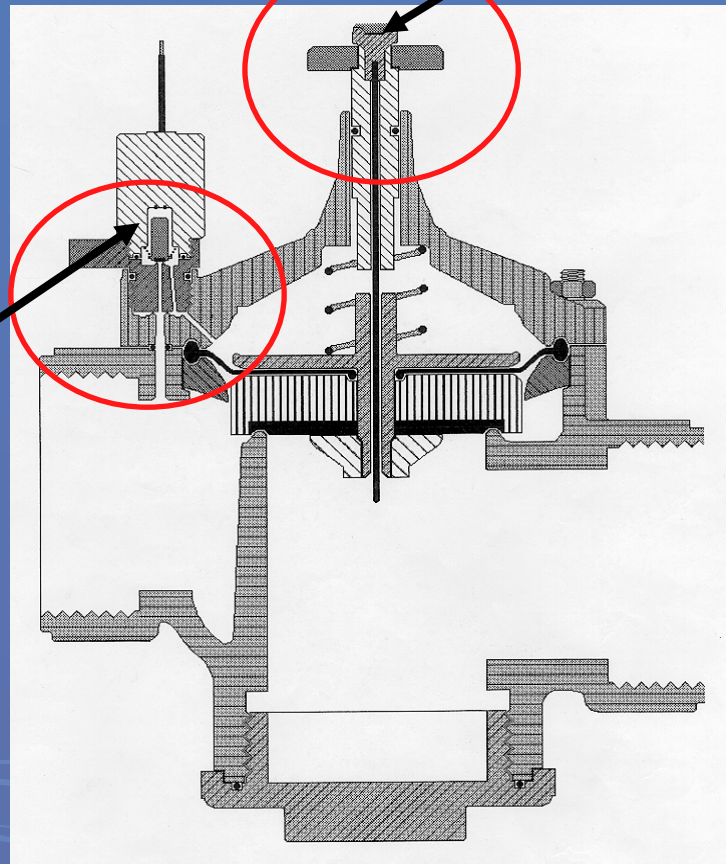
# Valve, Controller & Field Wire Troubleshooting

## Process of elimination

Quickly determine if an issue is electrical or hydraulic using **internal** and **external bleed screws**

Internal

External





Using Internal bleed screw

# Valve opens!

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- Solenoid failure
- Solenoid plunger clearance
- Wiring issue
- Controller issue (including programming)

Go to controller troubleshooting section. . .



# Using Internal bleed screw Valve won't open

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- Close internal bleed screw
- Open external bleed screw . . . .



# Valve won't open

## Using **external** manual bleed

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- No water to valve (no water from bleed port)
- Flow control turned down (water from bleed port)
- Diaphragm condition (too stiff to move)



# Don't give up!

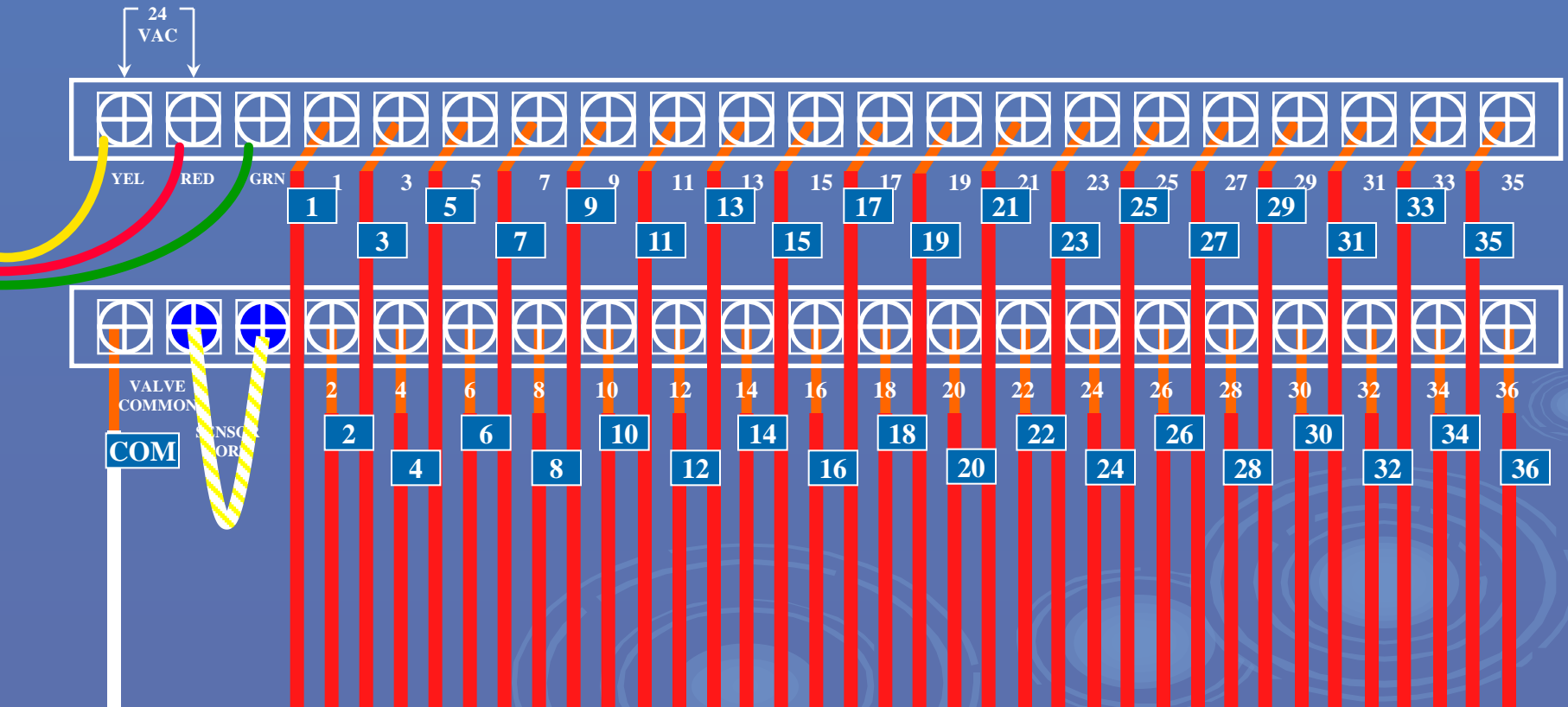
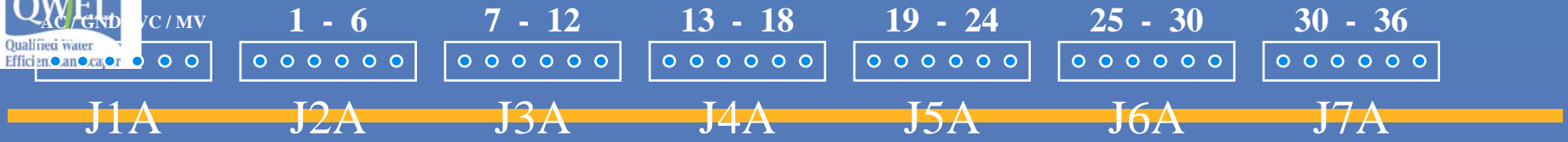
If you've worked your plan and still can't figure it out

1. Check all connections at terminals and in field
2. Look for bugs, frogs, snails and lizards
3. Check sensors jumpers
4. Look for bent cables/wires





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## Class Ten

# Summary

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- Learn how an irrigation valve works
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# Question & Answer

