

# Irrigation Tech I:

## Controllers

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This session is an introduction to irrigation controllers. We will discuss the basic features shared by most irrigation controllers and what information is needed to program them to use your water most efficiently.

## Suggestions

- Download the owner's manuals for controllers that are on your sites for easy reference in the field. Most are available in multiple languages.
- Most manufacturers have training classes and/or videos for their products, and some have certificate programs as well.
  - You can assign classes to your employees for products that are used on the sites that they manage.

## Controller Incoming Power Wiring

- Incoming power is 120 volts.
- The irrigation controller should be on its own circuit.
  - If you use a circuit that is shared with other outlets or appliances any issues with them can cause a power failure to the controller and ALL irrigation will stop. This is especially likely to happen if there are GFCI outlets on the same circuit.
- If the controller is installed indoors a plug (pigtail) may be used.
- ALL connections MUST be made in a junction box.
  - Some controllers have a built-in junction box for ease of installation.
- ALL line voltage MUST be encased in conduit if installed outdoors.

# Valve Wiring

- There is a transformer in the controller that steps the voltage down from 120 to 24 volts.
- Commercial work usually calls for 14-gauge solid wire.
- Residential work usually uses multi-strand 18-gauge wire.
- Station wiring is considered “direct burial” low-voltage and can be put in the ground without conduit.
- 24-volt AC solenoids have no polarity, and both wires will be the same color.
  - If you have a solenoid with two different color wires it is a “DC Latching” solenoid that is used with battery-powered controllers. It will not work on most standard controllers.
- One side goes to the station tap and the other side goes to the “common” tap. Standard practice is the white wire is used for the common, and multiple common wires can be bundled together in one wire connector.

# Programs

- Group together similar zones into a PROGRAM
  - Multiple turf zones or plant zones, for example.
- Usually marked A,B,C, etc. on the controller
- A program requires three things to be **valid**:
  - At least one start time
    - Can have multiple start times
  - At least one station (valve)
    - Can (and usually does) have multiple stations
  - A run time

# Stations/Zones

- A section of an irrigation system served by a single control valve.
- Zones are comprised of similar sprinkler types and plant material types with similar water requirements and soil types.

- Drip zones
- Turf zones
- Citrus zones
- Cactus zones
- Vegetable gardens
- Roses
- Plants in pots
- Etc...

- Grouping your zones properly makes programming your controller easier and ensures the most efficient use of water.

# Sample Program Setup Chart

## Programming Chart

Program Info	Program A	Program B	Program C	Program D
Program Name	M T W T F S S	M T W T F S S	M T W T F S S	M T W T F S S
Select Days To Water (Mon-Sun) For Custom	□ Day Cycle	□ Day Cycle	□ Day Cycle	□ Day Cycle
OR	□ Even	□ Even	□ Even	□ Even
Select Day Latching	□ Odd	□ Odd	□ Odd	□ Odd
Allowed For Non-custom	□ Odd 31	□ Odd 31	□ Odd 31	□ Odd 31
1	am / pm	am / pm	am / pm	am / pm
2	am / pm	am / pm	am / pm	am / pm
3	am / pm	am / pm	am / pm	am / pm
4	am / pm	am / pm	am / pm	am / pm
5	am / pm	am / pm	am / pm	am / pm
6	am / pm	am / pm	am / pm	am / pm
7	am / pm	am / pm	am / pm	am / pm
8	am / pm	am / pm	am / pm	am / pm
Seasonal Adjust	%	%	%	%
Monthly Seasonal Adjust	<input type="checkbox"/> ON	<input type="checkbox"/> ON	<input type="checkbox"/> ON	<input type="checkbox"/> ON
Station Delay				
Program Water Window Start Time	am / pm	am / pm	am / pm	am / pm
Program Water Window End Time	am / pm	am / pm	am / pm	am / pm

### Overview

#### Programs

The process of telling the controller exactly when and for how long you want to water.

#### Each program contains:

##### Watering Days

The days of the week that irrigation is allowed. Also, the cyclical watering cycle can be used to water at a regular interval, such as every third day.

##### Watering Start Times

The time(s) of day that irrigation begins. All other stations in the program then follow in sequence.

##### Station Run Times

The length of time (in hours and minutes) that each individual station is programmed to run.

Monthly Seasonal Adjust %
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

Default Values for Monthly Seasonal Adjust = 100%

# Sample Station Setting Chart

Station #	Description	No. of Zones	Requires RT Sensor	Chp Sensor	Station Cycle Time	Station Soak Time	Program A Station Run Time	Program B Station Run Time	Program C Station Run Time	Program D Station Run Time
1			<input type="checkbox"/>	<input type="checkbox"/>						
2			<input type="checkbox"/>	<input type="checkbox"/>						
3			<input type="checkbox"/>	<input type="checkbox"/>						
4			<input type="checkbox"/>	<input type="checkbox"/>						
5			<input type="checkbox"/>	<input type="checkbox"/>						
6			<input type="checkbox"/>	<input type="checkbox"/>						
7			<input type="checkbox"/>	<input type="checkbox"/>						
8			<input type="checkbox"/>	<input type="checkbox"/>						
9			<input type="checkbox"/>	<input type="checkbox"/>						
10			<input type="checkbox"/>	<input type="checkbox"/>						
11			<input type="checkbox"/>	<input type="checkbox"/>						
12			<input type="checkbox"/>	<input type="checkbox"/>						
13			<input type="checkbox"/>	<input type="checkbox"/>						
14			<input type="checkbox"/>	<input type="checkbox"/>						
15			<input type="checkbox"/>	<input type="checkbox"/>						
16			<input type="checkbox"/>	<input type="checkbox"/>						
17			<input type="checkbox"/>	<input type="checkbox"/>						
18			<input type="checkbox"/>	<input type="checkbox"/>						
19			<input type="checkbox"/>	<input type="checkbox"/>						
20			<input type="checkbox"/>	<input type="checkbox"/>						
21			<input type="checkbox"/>	<input type="checkbox"/>						
22			<input type="checkbox"/>	<input type="checkbox"/>						
23			<input type="checkbox"/>	<input type="checkbox"/>						
24			<input type="checkbox"/>	<input type="checkbox"/>						

# Controller Schedule

Program	Plant Type	Irrigation Type	Stations	Days to Irrigate	Start Times	Run Time	Cycle and Soak?	Exclusion Day?
A	Turf	Rotors	1,2	Odd	1:00 AM	40 min	20min/1 Hour	Tuesday
B	Turf	Pop-ups	3,4	Even	1:00 AM	15 min	8 min/1 Hour	Tuesday
C	Native Plants	Drip Emitters	5	Weds	5:00 AM	2 hours	no	no
D	Citrus	Bubblers	6	every 3 days	4:00 AM	10 min	no	no

- “Cycle and Soak” is used to prevent runoff on areas that can only absorb a limited amount of water (slopes, clay soils, etc.).
- Drip emitters give off small amounts of water (gallons per hour) so we program them to run for a longer run times.
- Bubblers give off large amounts of water (gallons per minute) so we program them for shorter run times.
- Your “exclusion day” is any day during the week that you do not want to water, usually your mow day.

# Weather (or Other) Sensors

Most controllers can use sensors to adjust or suspend irrigation based on conditions.

Weather sensors can be simple rain sensors to shut off irrigation during storms, or they can be advanced units that will calculate ET values and adjust your irrigation schedules accordingly. The most common would be rain/freeze, wind, or soil moisture sensors.

Usually the controller can be programmed to obey or ignore the weather station by program. This is useful if you had areas that you want to be irrigated regardless of other conditions (potted plants under an overhang, for example).

# Manual Watering

Manual watering can usually be done by station or by program.

- Manual station would allow you to irrigate a station for whatever run time you select.
- Manual program would run whatever program you choose for the times programmed into the controller for that program.

Some controllers also have a “test cycle” that will run each station for a set period of time. This would allow you to do a “wet check” of your system to look for issues.

## Advanced Features

- Some of these features may not be available on all controllers but can be very helpful in managing your irrigation.

## Rain Delay

You can use a “Rain Delay” to easily suspend irrigation for a set number of days, after which normal irrigation will resume.

This is a very convenient way to ensure there is no irrigation for a special event without having to come back to the site to turn the irrigation back on.

## Cycle and Soak

“Cycle and Soak” allows you to set the maximum run time of a station before a “soak”, or break period, to continue the remaining irrigation time.

For example, if your turf requires 30 minutes of irrigation per day, but after ten minutes the water is puddling or running off, you can set a ten-minute cycle and a sixty-minute soak. This would let the controller run for ten minutes, then pause for sixty minutes before running for another ten minutes. It would continue this until the entire run time was completed.

This is very useful on slopes or hard soil.

This feature is usually programmed per station as each station can have different characteristics (slope, etc).

This feature can also be used during overseeding to easily set your controller to irrigate for short periods of time multiple times per day.

- If you set your station for a fifty-minute run time with a five minute cycle and one hour soak it would run every hour for five minutes ten times per day.

## Seasonal Adjustment

Some controllers allow you to set a “Seasonal Adjustment” by month. The water requirement of your plant material varies throughout the year. The chart below shows the varying evapotranspiration rates in Phoenix by month.

An easy way to use this feature is to program your controller for the water that is required for the hottest month of the year and then use the percentage adjustment for each month of the year.

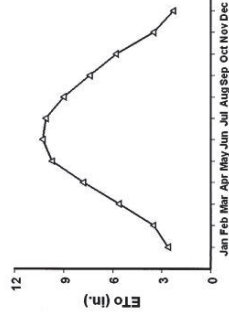


Figure 3. Mean monthly reference evapotranspiration (ET<sub>0</sub>), Phoenix, Greenway reporting station, 1988-1997. Data provided by The Arizona Meteorological Network (AZMET) (<http://Ag.Arizona.Edu/AZMET/>).

# Seasonal Adjustment

Using the above chart as a guide, we will set the percentage adjustment by month to be:

January:	30%	July:	100%
February:	35%	August:	100%
March:	50%	September:	90%
April:	75%	October:	75%
May:	90%	November:	50%
June	100%	December:	30%

Using these settings will reduce your customer's water use by approximately 30% over the entire year.

Remember that this will reduce the overall run time but will not add or remove days or start times.

# Storing Standard Programming

- **Store Programs**-Allows you to store a "Contractor Default" program that you can recall later. If a customer changed your program you can reset it to the original programming. This is a VERY useful feature that many people do not use.
- **Delayed Recall Program**-Perfect for a new installation or overseeding!
  - Create and store your "Contractor Default" program.
  - Select Basic Setup > Backup Programs > Delayed Recall
  - Select the number of days (up to 90) before the "Contractor Default" program is restored.
  - Reprogram the controller with your grow-in or overseeding schedule. After the number of days you entered the controller will automatically return to your "Contractor Default" programming.