# BASIC ELECTRICAL TROUBLESHOOTING OF IRRIGATION SYSTEMS

Electrical problems with irrigation systems can usually be lumped into two categories: controller malfunction and zone wiring- with today's reliable solid state controllers most malfunctions in the controller will usually occur within the first week of operation.

Some solid state controllers can be very helpful in troubleshooting an irrigation system. These controllers actually have overload sensing protection that retires then skips stations rather than blowing fuses, they will also report failures when the program is complete. Also several new controllers have incorporated provisions for maintenance radios that can aid in isolating field wiring problems.

To troubleshoot the systerm a few tools will be needed: A screwdriver and a volt-ohm meter that can read 0-120 VAC and 0-1 mega ohms resistance.

As with any electrical problem, it is usually best to start at the controller. Lets assume that there is a total system failure.

*Check the owners manual of the controller before making any tests. Some controllers are powered by an external 24v power supply but most have an internal 120v x 24v transformer. With a voltmeter, test theincoming voltage to see if it meets the manufacturers recommendations. If there is no power, check the fuses an/or breaker at the power source and replace as necessary and test again.

Once the incoming power has been determined to be correct proceed through the next steps.

*Check the controller by inspecting for any obvious problems (disconnected wires, blackened areas on the circuit board, etc.). A controller will usually be protected on its power supply side. Check its fuse or circuit breaker - replace or reset same if needed (be sure when replacing a fuse that a correct fuse is reinstalled, the use of a larger fuse could damage the controller permanently. Test controller once again. If the controller still malfunctions, return controller to an authorized service center for repaiar - replace clock.

*Once the controller appears to be operational, test each station at the controller's terminal strip for 24 volt output to the field. To do this, test for voltage between station 1 on the terminal strip and the valve common wire with the volt-ohm meter in the appropriate range. Do the same for the remaining stations. If there is no power at some or all stations the controller is in need of repair. Replace or repair controller. If 24 volts are present, the problems are in the control wires or the electric valves.

At this point the determination must be made whether or not the problem lies in the field wiring or the electric valves. Generally, a whole series of valves would not fail at the same time unless all the wires were cut or else the common wire is cut before the first valve.

The zone wiring should now be tested.

## TESTING ZONE WIRING

Many tests can be made to troubleshoot simple field wiring problems. Problems are grouped into two categories:

**Grounded and Shorted Wires:** Typical to older irrigation systems when splicing techniques were not as advanced, grounded wires are assoicated with voltage coming in contact with the ground wire or earth which ususally results in a blown fuse or tripped breaker. A shorted wire acts in a simnilar manner. Symptoms are, two or more valves running at once while only 1 station is activated or if the voltage reaches the ground wire, blowing a fuse or tripping a breaker.

Broken wires: Broken wires area complete break in a wire that renders a station inoperable. They also can trip a breaker or blow a fuse if they are grounded or shorted at the break.

Take the following steps to test the zone wiring:

*At the controller use a volt-ohm meter to test for shorts by putting the meter in the R X 1 position and record the readings for each inoperative valve by testing across the power wire and the common on the terminal strip. A low resistance reading of 0-5 ohms will be observed if there is a short. This indicates a short in the zone wiring or the solenoid. On tones indication a short, connect the volt-ohm meter to the solenoid leads. With the meter in the R X 1 range, a shorted solenoid will read 0-5 ohms, an open solenoid will read "infinity" and a good solenoid will read 1 3-20 ohms (24 VAC solenoids only). If the solenoid if faulty, replace it. If the solenoid test proves to be ok, the problem has been narrowed down to a wire problem.

*To check for grounded wires, check an

# SUPERINTENDENT OF THE YEAR

The 1992 Superintendent of the Year Award goes to Bob Costa. Bob is employed by the Lombardo group of Monterey, CA. Bob is very active in promoting the profession of the golf course superintendent as he teaches a turfgrass management class for the Horticulture Department at Monterey Community College. He also was instrumental in putting on the 1992 Superintendent Institute at Asilomar last fall.

Bob graduated from Cal Poly San Luis Obispo. In 1984 he went to work for the Lombardo Group and through a series of promotions he has proceeded to become the Vice President of Golf Course Mangement, currently overseeing the following golf courses: Laguna Seca, Parajo Valley and both courses at Rancho Canada.

Award presented by Randy Gai.

...vated zone in the field for power. At the valve, disconnect both the common and power wire from the solenoid. With the volt-ohm meter in the A.C. volt posiiton test from the power wire to an earth ground. if the test reads positive (21027 volts), the problem is in the common wire. If the test 1 reads negative, the problem may be in either the power wire or both wires.

There are many easy to use tracking and fault find devices available designed to locate wire faults. Many irrigation distributors sell these units or rent them for location of these problems. The preceding simple tests can be followed first and may solve the problem without the use of these special devices.

Article by Paul J. Roche, S.V. Moffett co., Inc. New York.