have rooted. This additional switch allows the cuttings to be watered manually if for some reason a controller malfunctions. The complete setup has one advantage over most commercial clocks in that the person who wires it can replace most parts in place with little or no downtime.

This system offers much needed flexibility in the propagation house. The two biggest advantages this system has over commercial controllers are reasonable cost and simplicity of repair.

YOUR IRRIGATION WATER SAMPLE

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The purpose of water sampling is to collect a portion of the water source small enough in volume to be transported conveniently and handled easily in the laboratory while still representing the water source being sampled. A representative sample is the most important single element in the water analysis since the result of any test can be no better than the sample on which it is performed. A representative sample means that the concentrations of all components are the same in the sample as in the water source. The task of obtaining a representative sample often becomes more difficult as the size of the water source increases. A good grab sample can be representative if it is collected from a well-mixed water tank but will not be representative if it is collected from a pond. The sampling program should take into account the variations of time, area, depth, and the rate of the water flow. Quality can change overnight even with city water if a decision is made by city officials to soften the water.

It is impossible to give detailed sampling procedures under all conditions. In general, a representative sample can be attained by making a composite of individual samples collected at different locations or over a period of time. For example, if pond water is to be tested the samples should be taken from different depths and combined to form one composite. For well water a composite is obtained by taking samples over a period of 5 min. to 1 hr. or longer. Sometimes it is necessary to obtain more information about the variability of a water source by analyzing the individual samples separately. If flow rate increases, more settled material will be agitated back into the water. Flooding can decrease solute concentration.

Sampling Procedure. Prior to sampling make sure that your hands, sample bottle, and any other items that might come into contact with the water sample are clean. Use new bottles, preferably made of plastic, that have never been used for food or beverage. Sterilization is not necessary unless a bacteria test is requested. Rinse sample bottle a few times with the water being collected. If the sample is collected from a distribution system, flush the line to avoid the contamination.

A water sample collected at a certain time and place can only represent the composition of the water source at that particular time and place. Keep a record of time, place, flow rate, weather conditions and any other data you think might possibly affect the sample. Identify the sample bottles. To make a composite sample, collect at least five subsamples at a minimum of 100 ml. (about ½ cup) each and combine in a larger bottle. A final volume of 500 ml (about ½ qt.) is sufficient for most irrigation suitability tests. For herbicide or pesticide residue tests, one liter (about 1 qt.) is a minimum amount needed. Fill the sample bottle and secure the cap.

Sample Preservation (Table 1). In general, the shorter the time that elapses from the collection of water until its analysis, the more reliable the analytical results will be. A complete stabilization of the sample from the moment of collection to the time of analysis is impossible. When a water sample is taken out of its original environment where it is stable, the components of the water may change chemically or biologically. The most common example is white calcium carbonate precipitating out of the well water into the water line or collecting on the surface of a bathtub. Iron in reduced state (Fe^{++}) is soluble. When it is oxidized by the air to Fe^{+++}, it becomes insoluble and precipitates.

Storage at low temperatures is perhaps the best way to preserve most samples. Using acid to adjust the pH to less than 2.0 is another common preservation technique for metal tests. A second sample would be needed for pH and other tests. For most greenhouse usage the changes of the sample during the time of shipment (2 to 3 days) are normally non-critical and should not alter the conclusion as to whether or not it is suitable for irrigation.

Remember that it is also important to sample soil and plant tissue. Take enough small samples from several containers to give two good handfuls. Plant tissue gives an immediate indication of what the plant can utilize from the soil and water. The newest mature tissue should be used.

Table 1. Below are general guidelines for sample preservation for some common tests.

Tests	Preservation	Max. Storage Time
Acidity/alkalinity	Refrigeration	14 days
Boron	None	28 days
Chlorine residue	Analyze immediately	2 hours
Conductivity	Refrigeration	28 days
Metals	Filter, add nitric acid to below pH of 2.0	6 months
Nitrogen, ammonium nitrate, and total	Add sulfuric acid to below pH of 2.0, refrigeration	28 days
Pesticides, herbicides	Refrigeration	7 days
pH	Analyze immediately	2 hours*
Phosphorus	Add sulfuric acide to below pH of 2.0	3 days
Sulfate	Refrigeration	30 days

* pH may or may not change if storage time is longer. For irrigation purposes, the change during the shipment will not alter the medium or soil pH since it is weak-buffered.

A WOOD-BURNING FURNACE FOR HEATING PROPAGATION HOUSES

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The escalating cost of fossil fuels in the winter of 1981 led our nursery to seek a more economical and reliable method of heating our propagating and liner-growing houses. After much research and evaluation it was decided that a wood-burning furnace was the answer to our needs. It was important that we answer the following questions:

1. Could the wood-burning furnace provide the heat needed?

2. What unit was needed and what would it cost?

3. Was hardwood available?

4. How much time would be required to operate and maintain the unit?

5. How much could we save by using wood instead of fossil fuel?

During the winter of 1981 our nursery spent about $10,000 heating approximately 13,000 ft.^{2} of space. The space heated included three houses used for propagation and four houses used for growing-on the rooted cuttings. Three of our units