

SOLAR TIMING FOR POT WATERING

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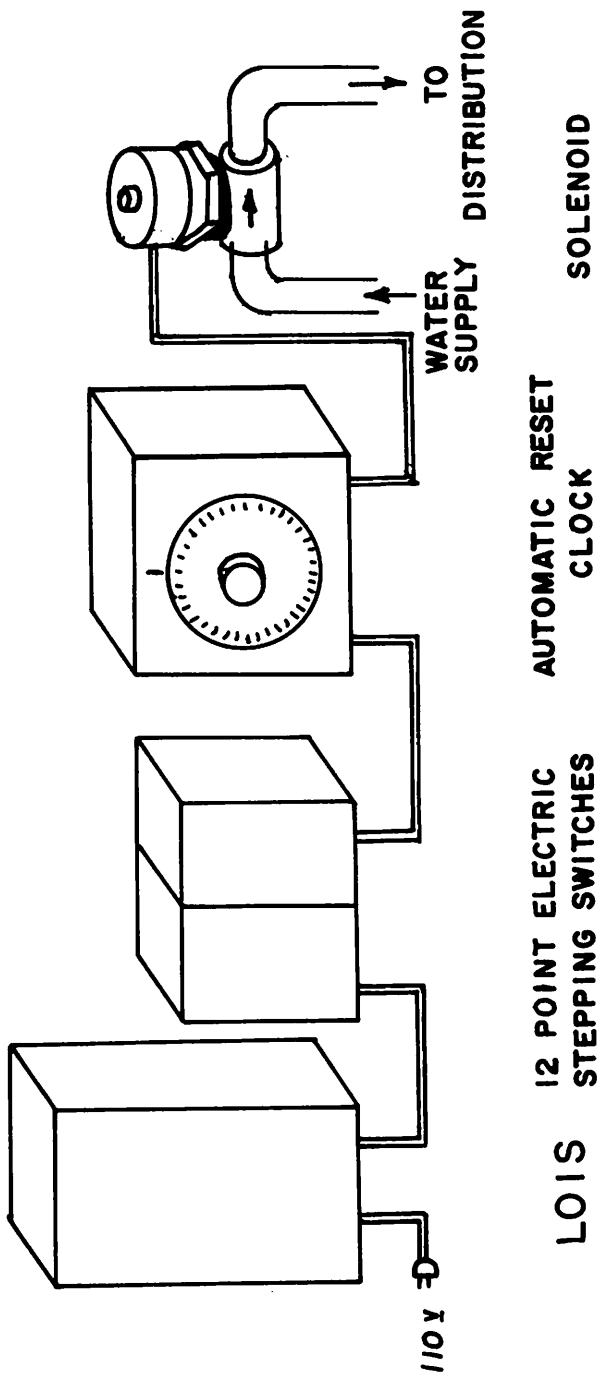
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Plants transpire water primarily in proportion to the light they receive. In the greenhouse, humidity and air movement play a relatively minor role. Therefore the same signal from a light operated interval switch (LOIS--see Connecticut Greenhouse Newsletters No. 65 and 66) which provides the finest control for mist propagation systems, can be used to program the watering frequency for pot plants.

The signal from LOIS is much too frequent and short (ca 4-6 minutes apart for 6 seconds when light is intense) to be used for pot watering. This signal may be easily adjusted in two ways, by frequency or by signal time accumulation.

To use the LOIS signal frequency, a stepping switch counter is connected to the LOIS unit. Assume that light is very bright. LOIS is calling for mist every 6 minutes, or 10 times an hour. Your pot mum crop can use an application of water about every 5 hours of bright light. The counter is then programmed to water about every 50 counts. It activates a simple timer that in turn activates your automatic watering system for the time required to apply the desired amount of water.

Many types of counters are available that will perform this function. In Figure 1, two inexpensive rotary step counters are connected in series. These are 12 position, 24 volt steppers that may be purchased for less than \$10 each (115 v steppers may



cost \$25 each). Looking at the terminal connections, one may think of a clock's face. The first stepper rotates to a new contact each time it receives a signal from LOIS (through a 24 volt transformer). When it reaches 1 o'clock, the signal is passed to the second stepper. This means that the second stepper moves one position every 12th signal from LOIS.

Now, connect the contacts at 1, 5 and 9 o'clock together so that this signal will be $4 \times 12 = 48$ signals from LOIS. Next, connect the contacts at 2 and 8 o'clock. This signal will be $6 \times 12 = 72$ counts. A final connection to 3 o'clock provides a 144 count signal. (A connection to 2:00 on stepper 1 also provides a 12 count signal.) Choices from this wiring will be 48, 72 and 144 counts from LOIS. A selector switch may then be placed before the automatic reset to provide simple selection. Or these choices may be wired to a multiple outlet box so that several automatic reset clocks can direct water at selected intervals to independent areas.

Another way of accumulating the LOIS signal is to activate a program timer (similar to the one described in Connecticut Greenhouse Newsletter No. 66) directly. To accomplish this, use a 30 minute program timer with multiple cams. The first cam controls the programmer motor. The indent on cam #1 should require an activation time equivalent to 50 of the 6-second signals from LOIS, or 300 seconds. This 5-minute accumulative signal from LOIS will initiate the programmer to complete its cycle. While it is doing this, the other cams on the programmer will activate solenoid valves in your watering systems to provide the watering time appropriate for your crop.

The stepping switch counter provides multiple choices for watering frequency. On the other hand, the program timer provides choices of duration with one frequency. To double the signal duration, a latching on/off stepper (less than \$10) may be wired into the program timer circuit so that every other signal is interrupted and water is applied only half as often. If set as above, signals of 50 and 100 calls could be chosen to activate the watering system. If another programmer is similarly set for 70, a sequence of 50-70-100-140 is obtained.

With the stepping switch system, changes in frequency setting on the LOIS will change the frequency of watering. With the program timer system, LOIS changes of either frequency or duration will change water application frequency. This is not considered to be a serious consideration since, once LOIS is set for optimum mist control in the propagation area, adjustments are seldom necessary.

It should be noted that, even with this advanced stage of development of the art of watering, the human element is ever present and someone must make the decision to shift a crop from one frequency to another.

These programmers are designed for use with "spaghetti tube" watering systems with a tube in each pot. Many growers are installing capillary watering systems where a mat is laid on the bench and the water enters the pot from the bottom by capillarity. If a bench is already fitted with tube watering, the tubes may be used to water the pad. In our trials, the solenoid controlling the water system was activated directly by the LOIS signal. This provided uniform watering with a minimum of drop. Water usage was estimated to be less than half of that applied with a hose to control pots.