
Just Another Bottom Heat System[®]

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In 2001 we replaced our boiler (used for bottom heat) with a 100-gal A.O. Smith Cyclone commercial gas water heater. We needed to heat greenhouse space that equaled approximately 6000 ft². Since this is a small application we were able to reduce our propane costs by 80%. The money savings paid for the water heater in the first year. The water heater managed to keep up with demand rather well except when the temperature dipped, we were getting some variation due to the time it took the water heater to heat the water in the tank. The 2nd year we wanted additional backup for severe demand and to add an additional 3000 ft² of bottom heat. We bought a washing booster heater from Precision Temp. Inc. which is used in the restaurant business for dish washing. It maintains water temperatures on demand under normal conditions. This has become our primary heat source. Between the two heaters we have 400,000 BTU input. The water heater is now used as a 100-gal reservoir in case of severe demand.

A Simple, Versatile Mist Clock Setup[®]

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In the past we used mechanical clocks to regulate mist for 17 zones, consisting of individual benches or small greenhouses. The setup was limited in its versatility and required us to mist several zones at the same time. This inevitably resulted in low pressure midway through the mist time, leading to both dry and overly wet areas. In addition the mechanical clocks were prone to failure or hang up, leading to unpleasant surprises.

We decided to develop a new system, with the following objectives in mind:

- Simple to adjust and easy to see current setting for each zone
- Up to 18 zones of operation
- Mist zones need to operate separately to allow for peak water pressure
- Dependable; relatively failure proof
- Long-lasting

We settled on using three Paragon model 4004 solid state 24-h time clocks; each of these controls one Phytotronics Gemini 6 controller. These are housed in a sturdy steel cabinet equipped with a small cooling fan.

The 24-h clocks can be set to start operation in 3-min increments (e.g., 8:00, 8:03, 8:06); this stages the Gemini controllers so that they are functioning separately.

The Gemini controllers have a built in delay for each zone; with the staggered start-up times there is little chance of zones misting concurrently, even if all are set to mist at the same frequency. The Gemini controllers are very easy to regulate, with dial settings allowing mist cycles of 2 to 60 min with on times adjustable from 2 to 20 sec. They include a sun-sensor feature, which we bypassed in favor of the 24-h clocks.

Cost for this system (when built about 10 years ago) was approximately \$1400.