

**ARTICLE**

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## Hints for Using Multiple TECs

If the size of your temperature controlled load is large, you may choose to use more than one thermoelectric (TE) to stabilize your system. There are several tricks to using more than one thermoelectric effectively.

We recommend that you run the thermoelectrics electrically in series. If you operate them in series, they will each see the same control current. Even with the same current, the cooling capacity of each TE may differ, and one side of the load can become cooler than the other. If only one feedback sensor signal is used, the system usually stabilizes. Position of the sensor is critical. For the most accurate temperature, place the sensor right at the critical element whose temperature needs to be stabilized. For a more stable, average temperature, put the sensor closer to the TE and centralized in the load. Experiment with sensor location to optimize the control system. To run in series, add the voltages of the thermoelectrics to see what total voltage the controller must support.

If you run the thermoelectrics in parallel, they'll each take a portion of the control current based on their effective impedance. The impedance of a TE is dynamic (it changes with current) so what typically happens is that one takes more current than the other and forces one section cooler than the other, further changing its impedance. By the time the change reaches the common sensor, the setpoint has been overshoot. The current then is reduced or reversed so the net effect is that the temperature at the sensor oscillates.

We also do not recommend putting multiple sensors in series around the area to be cooled. Instead of feeding an average temperature back to the control loop, the sensors "report" changes to their individual locations and the net effect is to cause the load temperature to oscillate.

For ultimate control and stability, use one controller and sensor per thermoelectric.

For more information, contact **Warsash Scientific** on +61 2 9319 0122 or [sales@warsash.com.au](mailto:sales@warsash.com.au).

