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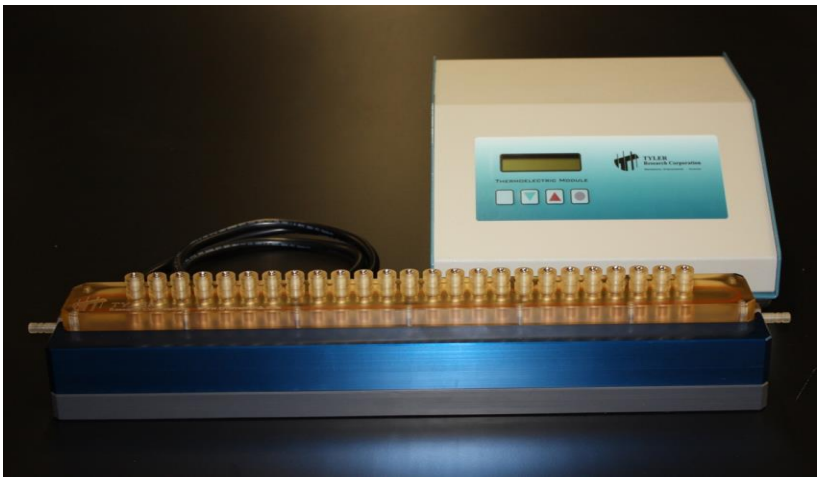
Tyler Research Corporation

Thermoelectric Modules

Tyler Research Thermoelectric Modules provide precise thermal control of biofilm devices. Standard systems are available for the LPMR-12 and LPMR-25 series manifolds in acrylic, polysulfone and stainless steel, for the MPMR-10 series manifolds in each of these formulations, and for the CHEM-500 chemostat culture system. Other devices may be accommodated through special order. The systems are designed to maintain stable temperatures from ambient to +70°C under standard laboratory conditions.



The modules consist of a resistive array embedded in an aluminum ingot machined to accept one or two specific biofilm devices. A low-voltage, high-current DC circuit under microprocessor control drives the array. Solid-state sensors embedded in the aluminum ingot provide feedback to the microprocessor, which functions as a proportional integrating controller. The temperature is programmed by means of a front panel keypad, indexing the desired set point in one-degree increments up or down. The setpoint is displayed on an LCD screen, along with the actual temperature and the power consumption of the driver circuit. An asterisk (*) appears in the upper right corner of the screen when the temperature is in stable equilibrium.

The cable from the manifold plugs into a circular 7-pin socket on the rear of the controller. Be careful to orient the pins correctly to avoid damage to the system. POWER is controlled by a rocker switch on the right rear panel. Front panel controls consist of a DECREMENT button (blue triangle), INCREMENT button (red triangle) and an ENTER button (purple circle) which is used only during calibration.

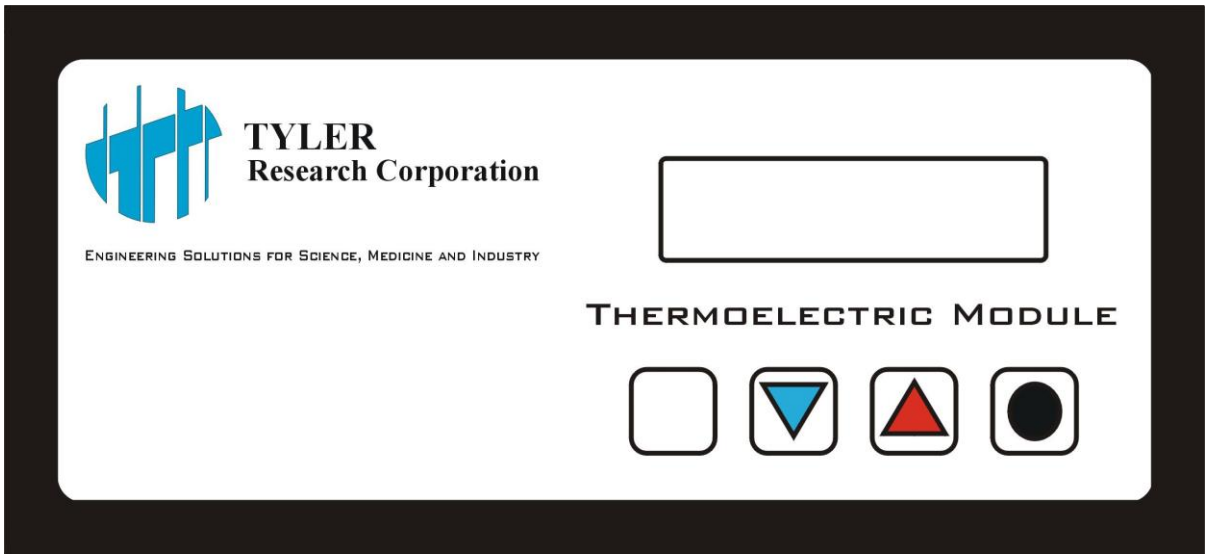
Due to the large mass of the ingot and biofilm device, it is recommended that the modules be activated prior to initiating an experimental run. This will permit the components to equilibrate at the desired temperature, and usually requires 30 to 60 minutes depending on the set point and the volume being maintained. To minimize convective heat loss, we also recommend that a laboratory blanket or other insulating layer (such as bubble wrap) be placed over the manifold whenever possible.

Thermoelectric modules are available in 110V or 220V versions.

Calibration Procedure

Tyler Research Thermoelectric modules are calibrated in our laboratories before shipment, and further calibration should not be required. However, an automatic calibration procedure is programmed into the microprocessor in the unlikely event re-calibration becomes necessary.

Place water in the well of the aluminum ingot, forming a temporary dam with electrical tape if necessary to permit containment. Place an accurate thermometer or thermocouple in the water to act as a reference, and cover the aluminum ingot with a laboratory blanket or insulating material.



Access the automatic calibration function by turning off the main power using the rocker switch on the right rear panel. Depress all three of the labeled buttons on the front panel simultaneously, and turn the main power on *while keeping these switches depressed.* After characters appear in the LCD display, release the front panel buttons. The device will then enter auto-calibrate mode.

In auto-calibrate mode, the device will display the current ambient temperature (arbitrarily chosen to be 20°C). Use the INCREMENT or DECREMENT buttons to indicate the actual ambient temperature, and press the ENTER key (designated by the purple circle on the right side of the keyboard). If, for example, the LCD display reads 20°C and the reference reads 18°C, depress the DECREMENT button (blue triangle) on the front panel of the module twice to bring it to a reading of 18°C. Depressing the ENTER key places this value in memory and automatically directs the module to drive the temperature to 60°C. Repeat the correction procedure at the high end of the curve. If, for example, the reference thermometer reads 63°C and the display reads 60°C after steady state has been reached, depress the INCREMENT button repeatedly to bring it to a reading of 63°C. Then press the ENTER button. This will save the high point in memory, recalculate the slope and establish a new calibration curve. The unit will then automatically enter standard mode, and a new set point can be programmed into the module.