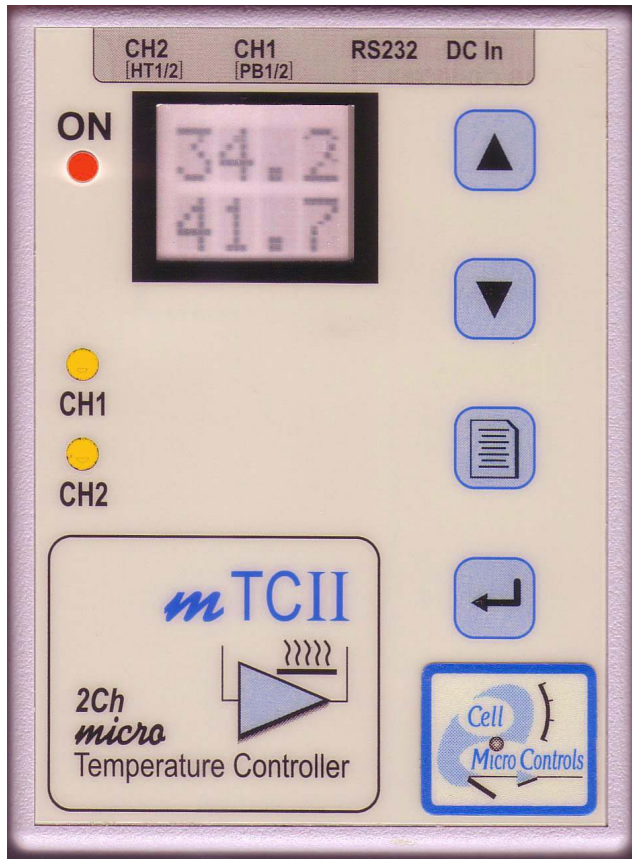




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Equipment for cellular & electrophysiology research

mTCII *micro*-Temperature Controller & Heaters



- **Miniature low power** controller for heating small tissue baths, microscope stages, small animal heaters
- **2 independent channels** with feedback
- **Compatible** with many low voltage **heater elements** for different applications
- **RS232** port for control and temperature logging
- **2 heating modes, PWM** (for more power) or **analog** (for low noise).
- Maintains **setpoint** and **parameters** in **EEPROM**
- **Firmware reprogrammable** - for upgrades, customization

DESCRIPTION

The **mTCII micro-Temperature Controller** is a multi-purpose microcomputer based temperature controller powerful enough to heat small tissue baths, microscope stages, small animal heaters or containers used in a laboratory. It is simple to set up a mini-incubator to hold cells, or alternatively, heat tubes on a shaker. The **mTCII** uses a state-of-the-art microcontroller to provide a flexible instrument rather than a modular PID design where there is no control over the user interface and instrument function. Updated or customized firmware can be downloaded via the RS232 port so we can add new features and improve on existing firmware. For example our firmware checks the heater resistance in case there is a short or broken lead. We also detect the temperature of the heatsink used for the

power amp and turn on an internal fan if required. Using the RS232 port we are able to accept commands to change the setpoint and receive reports of the probe temperatures for data logging/analysis. Parameters for control, set-points are stored in non-volatile EEPROM.

The **mTCII** has two ways of driving heaters, either with a **PWM** (pulse width modulated) output where the on/off time is varied in the 10's of microsecond (typ. 20KHz) time scale or with an **analog** output. The **PWM** output allows it to generate **high output powers** (approx 15W) while the analog output can be used for modest powers (<8W peak, 2W continuous) where electrical interference is of concern. In the **PWM** mode it can control currents up to 1.5Amps provided by a battery or 15V block type power supply.

The controller also supports "mixed" control where two thermistors are used for control.

Application notes

■ Heating small tissue baths, animal heaters

The **mTCII** can drive foil type heaters with a resistance of 5-15Ω. For example the **HC-1** heater can be attached to a thin aluminium plate. The the temperature of a 30mm culture dish on top of the plate can be regulated with the **mTCII** powered by the 15V block supply provided. It can be used as an inexpensive temperature controlled stage for microscopy by drilling a hole in the center of the plate (the **mTCII** is not intended for low noise electrophysiology measurements-use our **TC2BIP**). With a silicon coated heater and our **TH-10Kmr** Tygon sleeved rectal probe it can be used to control a small animal heater.

Controls & Display

Up/down: Increments or decrements set-point, also used for menu selection.

Menu: Displays parameters. Can set control parameters for each channel, set LCD display mode, set RS232 mode.

Display: Upper line shows set point or thermistor temperature Lower line shows set-point or thermistor temperature. Can also be used to show heater power.

LEDs: ON-indicates that unit is receiving DCIn
 CH1-indicates output to heater and error (flashing)
 CH2-indicates output to heater and error (flashing)

Input/Output:

CH1 [HT1/2] - channel 1 heater thermistor or both CH1 and CH2 heaters.
 CH2 [PB1/2] - channel 1 heater thermistor or both CH1 and CH2 thermistor probes.

Specifications

Temp Ref Range: 5°C to 45°C. Accuracy: ± 0.2°C

Heater Output: 0 to 12V at up to 1.5Amps.

PWM (pulse width modulated) output (15W Max)

Analog output (8Wx2 peak, 2Wx2 contin-10ohms)

Suitable Heaters: 5 to 15Ω resistance.

Supply Voltage/DCIn: nom. 15V at up to 2.5Amps.

Included power supply: 15V, 4.0Amp block power supply.

Temperature sensor: Compatible with 10kΩ interchangeable thermistors.

Fan: internal fan under microprocessor control for analog mode

Control: RS232 port for temperature logging and control

Dimensions: 4.5 x 3.25 x 1.5 inches (LxWxH)

Accessories

Below are some of the accessories compatible with the **mTCII** 2Ch micro-Temperature controller. Most accessories used with the **TC2BIP** will also work with the **mTCII**. For example you can use the **HPRE2**, **HI-xx** heaters (with **TH-10Km** probe), **MPRE8** etc. Parameters for the various heaters are easily changed in the **mTCII**. Also you can use different heaters on each channel. The **mTCII** comes with adapter cables to convert from the 4pin Mini Din to 6mm thermistor jack and banana plugs. The heaters below require a **CAB-HX** Cable.

TH-10Km/TH-10Kmp Thermistor probes

Application: general purpose miniature thermistor probe



- TH-10Km thermistor 0.45mm diam. TH-10Kmp same but with two pin connector-requires **CAB-TH** cable.
- max oper. temp: 100°C; 1.2m lead; 6mm plug
- connects to **mTCII** via adapter cable

TH-10Kmr Thermistor probe

Application: mouse rectal probe



- TH-10Kmr Tygon sleeve 1.7mm diam
- max oper. temp: 100°C; 1.2m lead; 6mm plug
- connects to **mTCII** via adapter cable

HS-105p Heater - 25x12cm, silicon

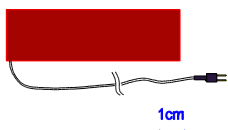
Application: small animal heater, culture dish heater

- size 25cm x 12cm.
- resistance nominally 8.5Ω
- constructed of a thin foil coated silicon. Total thickness 0.5mm.
- max. operating temperature 150°C



HLS-1p/HLS8x0.8p Heater - objective, silicon

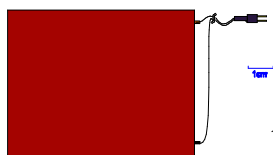
Application: objective heater and thermistor probe.



- heater size:
HLS-1p 20x70x≈0.35mm thick
HLS-8x0.8p 8x80x≈0.35mm thick
- max. operating temp. 150°C

HS-3x2.5p Heater - 7.5x6cm, silicon

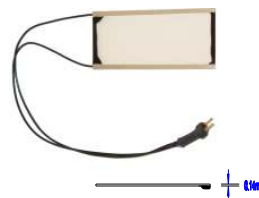
Application: small animal heater, culture dish heater



- size 7.5cm x 6cm.
- resistance nominally 11.5Ω
- constructed of a thin foil coated silicon. Total thickness 0.5mm.
- max. operating temperature 150°C

HI-24p/24Tp Heater-ITO transparent

Application: heating **BT-1-xx** Tissue chamber or similar small tissue chambers. Use with **inverted** or **conventional** microscope. **HI-2xT** are thinner for fluorescence or work with immersion lenses.



- **transparent** indium tin oxide coated heater
- sizes:
HI-24p: 40x22x≈0.25mm thick.
HI-24Tp: 40x22x≈0.14mm thick.
Heated area≈35x18mm
- resistance nominally 6-13Ω
- max. operating temp. 70°C

HI-22Dp/25Dp/55Dp/57Dp/711Dp Heater-ITO transp

Application: heating 30mm culture dishes, Nunc Lab-Tek chambers. Heater forms a platform for dishes/chambers.



- **transparent** indium tin oxide coated heater
- sizes: HI-25D/55D/57D 50x25/50/75x≈0.6mm thick.
- resistance nominally 9Ω
- max. operating temp. 70°C

HWPT-96 Well plate heater/ITO transp. microscope stage

Application: heating well plates, culture dishes, Nunc Lab-Tek chambers



- **transparent** ITO microscope stage heater
- size: 70x110mm x1.1mm
- resistance nominally 9Ω
- fits Olympus or Nikon round inserts
- max. operating temp. 70°C

HWPT-384[S] Well plate heater & HWPT-LID Heated lid

Application: heating well plates, culture dishes, Nunc Lab-Tek chambers



- **transparent** ITO microscope stage heater
- **transparent lid**
- size: 70x110mm x1.1mm
- resistance nominally 9Ω
- fits optical instruments/ auto stages
- max. operating temp. 70°C

BT-I55D ITO transparent microscope stage

Application: heating culture dishes, Nunc Lab-Tek chambers



- **transparent** ITO microscope stage heater
- size: 50x50mm x0.6mm.
- fits into any MSA-xxx stage adapter
- resistance nominally 9Ω
- max. operating temp. 70°C

HWP-96 Well plate heater

Application: heating 96/384 well plates. Low profile fast warmup heater with integrated thermistor sensor.



- **Low thermal mass, fast heatup**
- Fits within well plate base
- connects directly to **mTCII**
- Supports temp. control from well using second thermistor probe