Warner Instruments
Thermal Stage Heater/Cooler Insert
for Prior NanoScanZ Stage System
Model TB-3/CS

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The **TB-3/CS Thermal Stage Insert** has been designed for use with Prior's *NanoScanZ* piezo stage system. The **TB-3/CS** uses reliable and precise Peltier technology to control the temperature in disposable, rectangular chambered slides and cover glasses available from Nunc, Beckton Dickinson, and other sources.

Stage insert temperatures can be stably maintained from 0 to 50 °C. An integral water jacket uses recirculation water from Warner's **TCM-1 Thermal Cooling Module** to remove excess heat from the Peltier electronics within the **TB-3/CS**.

The efficiency of specimen heating and cooling has dependence on the type of slide and on the presence of condensation. Thermal transfer efficiency also depends on a good mechanical attachment of the slide to its support, for this reason we provide two sets of slide clamps to both position the slide and to bring it into close apposition with the stage insert. The base of the **TB-3/CS** has a thermal barrier designed to reduce the occurrence of condensation when the unit is cooled to below the dew point.

The **TB-3/CS Thermal Stage Insert** is designed to fit directly into the *NanoScanZ* stage and uses the same mounting and positioning provisions as for other sample holders that fit the *NanoScanZ*.

THIS EQUIPMENT IS NOT DESIGNED NOR INTENDED
FOR USE ON HUMAN SUBJECTS

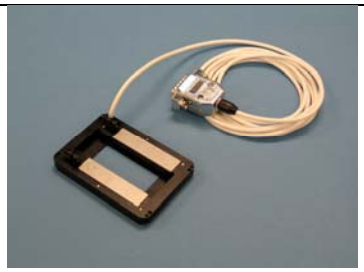
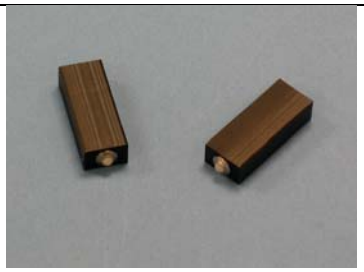
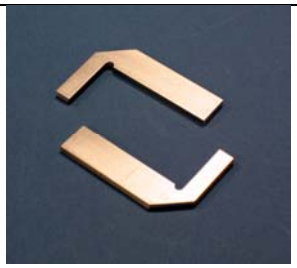
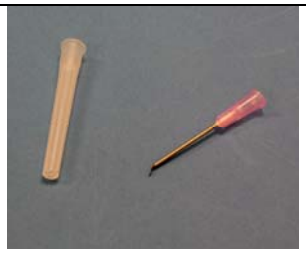
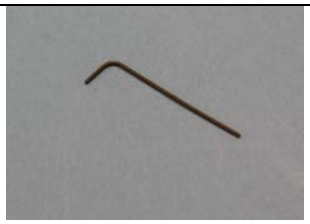
GENERAL

Peltier control of heating and cooling is a proven and direct method for providing temperature regulation to devices comprised of metal components. The quiet performance of the Peltier device, coupled with the high thermal conductivity of the metal components, makes for a robust and efficient system.

The **TB-3/CS Thermal Stage Insert** has been specifically designed for use with Prior's *NanoScanZ* piezo stage system and it can accommodate any slide having a 1 x 3 in (25 x 76 mm) footprint. Slightly smaller footprint slides, most commonly the 1 x 2 inch (25 x 50 mm) slides, are also supported; test fit before use.

The **TB-3/CS** is designed to be used with Warner's **CL-100** Bipolar Temperature Controller and **TCM-1** Thermal Cooling Module. The **CL-100** provides feedback-driven regulation of heating/cooling power and the **TCM-1** quietly and effectively dissipates the heat generated by the operation of the integral **TB-3/CS** Peltier device.

Each **TB-3/CS Thermal Stage Insert** is supplied with:

 The thermal stage insert	 Two black slide clamps	 Two aluminum slide clamps
 One lift-out tool	 One 0.028 inch Allen wrench	 Four #2 x 10 mm mounting screws
	 Two 3-meter lengths of ¼ in OD Tygon® tubing	

SETUP

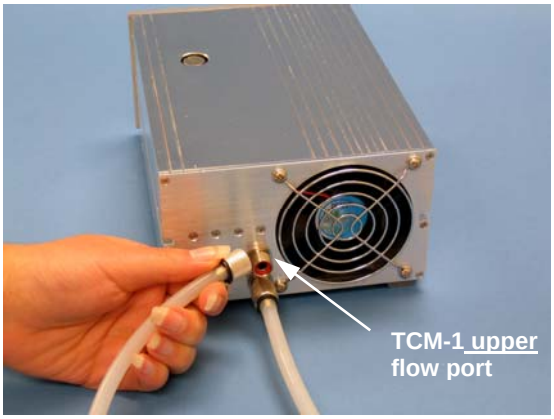
A fully assembled **TB-3/CS**, including the **CL-100** and **TCM-1**, is shown to the right. Instructions for the use of the **CL-100** and **TCM-1** are left their respective user's manuals.

General procedure

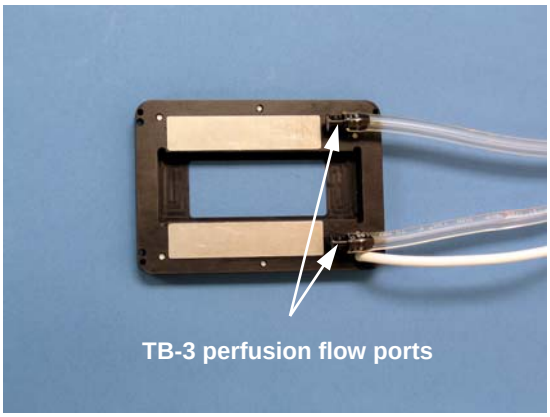
The general assembly procedure is to attach the **TCM-1** to the **TB-3/CS**, away from the microscope, and to check for secure, leak-free connections. This is followed by positioning the **TB-3/CS** into the *NanoScanZ* stage. Then leveling and securing the insert. A connection is then made between the **TB-3/CS** and **CL-100**. Finally, your sample slide in inserted into the stage insert and your experiment begun.

Connecting the Thermal Cooling Module

Note: This step should be performed away from the microscope.



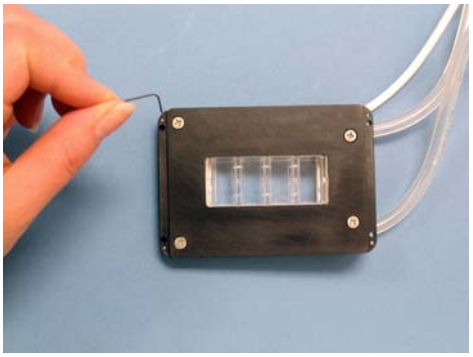
1. First review the assembly instructions for the **TCM-1 Thermal Cooling Module**. We will use a modified procedure.
2. The goal is to connect flow lines from a fill reservoir to the **TB-3/CS**, to the **TCM-1,** and, finally back to the fill reservoir. Once the system is filled the lines entering and exiting the fill reservoir are joined.
3. Begin by connecting the WATER JACKET CONNECTING TUBES (supplied with the **TCM-1**) to the upper and lower fluid flow ports on the rear of the **TCM-1** as shown to the right.



4. Now cut the two 3-meter Tygon® tubes (supplied with the **TB-3/CS**) to length. Attach these tubes to the **TB-3/CS** perfusion flow ports as shown to the right.
5. Join the open end of one the aforementioned tubes to the upper WATER JACKET CONNECTING TUBE which you attached to the **TCM-1** flow port in step 3.
6. Now take a short length of Tygon® tubing and connect to the other WATER JACKET CONNECTING TUBE (attached to the lower fluid flow port on the rear of the **TCM-1**).

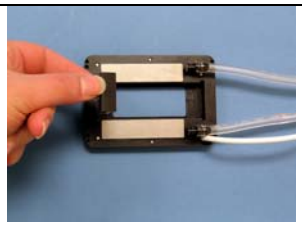
7. Next, remove the screw on the top of the **TCM-1** to reveal the fill port for the internal fluid reservoir. Add the supplied algaecide (part of the **TCM-1**) to the fill reservoir. Refill the bottle with water and add to the reservoir. This will act to prime the **TCM-1** pump.
8. Fill a 500 ml beaker with water and submerge the open ends of the two Tygon® tubes from steps 5 and 6 into the beaker.
9. Power the **TCM-1**. Solution should begin moving from the beaker, through the **TB-3/CS,** through the **TCM-1,** and finally back into the beaker. Add more fluid to the beaker as needed. The flow path is full once bubbles stop coming out of the outflow tube.
10. Turn off the power to the **TCM-1** and remove the short length of Tygon® tubing attached to the WATER JACKET CONNECTING TUBE connected to the lower **TCM-1** fluid flow port.
11. Join the full length Tygon® tube attached to the **TB-3/CS** to the open WATER JACKET CONNECTING TUBE to complete the flow path.
12. Power the **TCM-1** and check for leaks.

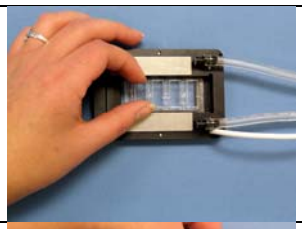
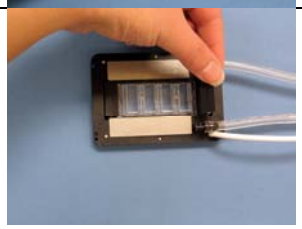
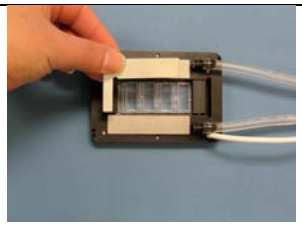
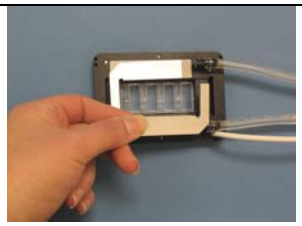
Mounting onto the *NanoScanZ* stage



1. Place the **TB-3/CS** into the cutout on the *NanoScanZ* stage. The fit should be an exact match.
2. Refer to the leveling procedure in your NanoScanZ user's manual and if needed, adjust the leveling set-screws of the **TB-3/CS** using the supplied Allen wrench.
3. Once proper leveling has been achieved, you may secure the **TB-3/CS** to the stage using the four #2 x 10 mm mounting screws.
4. Make a connection between the **TB-3/CS** and **CL-100** at this time.

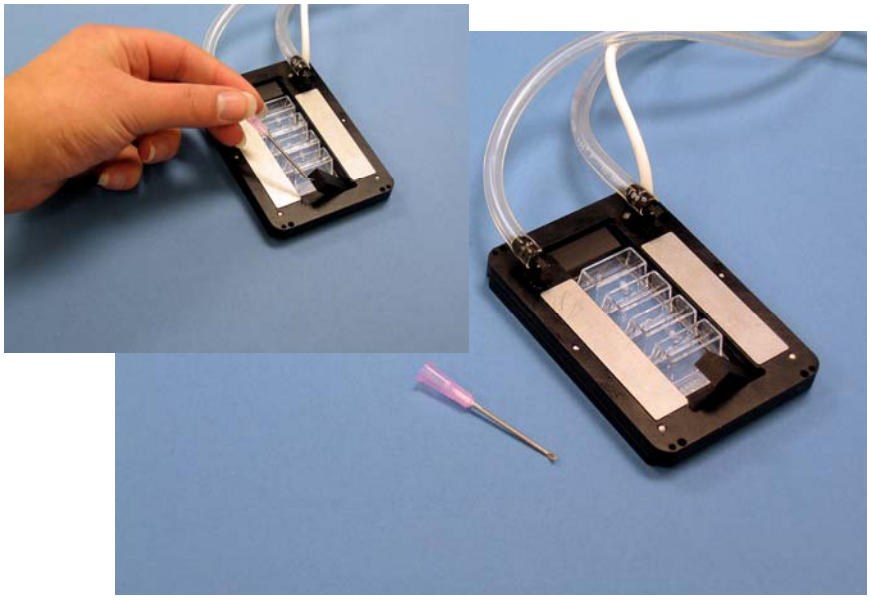
Loading the slide

	If your slide has dimensions of **less than** 1 x 3 inch	If your slide has dimensions of 1 x 3 inch
	Begin by placing one of the black slide clamps on one end of the stage insert opening.	Do not place the black clamp until after the slide has been inserted.

	Insert the slide into the holder. Making sure the slide is up against the black slide clamp.	Insert the slide into the holder.
	Place the other black slide clamp into the space adjacent to the slide. The slide should now be securely positioned so that it cannot move laterally in the holder.	Place the two black slide clamps into the stage insert, on top of the outboard edges of the slide, to clamp it into place.
	Place the first top slide clamp into position as shown.	Place the first top slide clamp into position as shown.
	Place the second top slide clamp into position as shown.	Place the second top slide clamp into position as shown.

Removing the slide

The slide and black clamps can be easily removed by use of the included removal tool. Insert the flat end under the edge of the item to be removed and lift out.



OPERATION

1. Turn *on* the power to **TCM-1**.
2. Turn *on* the power to **CL-100**.
3. Set the **CL-100** MODE SELECTOR SWITCH into *auto*, the INTERNAL/EXTERNAL SELECTOR SWITCH to *internal* (see the **CL-100** user's manual), and the LOOP SPEED SELECTOR SWITCH to *medium*.
4. If desired, place a **TA-29** thermistor into the bath area to measure the temperature at a point of interest.
5. Adjust the SET TEMP on the **CL-100** to the desired operating temperature. Allow the system to thermally stabilize. Monitor the temperature at the point of interest using the **TA-29** thermistor.
6. Make any temperature adjustments on the **CL-100** to compensate for heat loss to the surrounding area.
7. Additional adjustment of the heater set point may be required if any of the following change substantially during an experiment:
   - Perfusion solution flow rate (if present)
   - Temperature of solution entering the heater (if flowing solutions)
   - Ambient (room) temperature
   - Air currents around chamber

   Efforts to minimize these factors will be rewarded.

APPENDIX

Maintenance

The **TB-3/CS** can be cleaned with soap and water should the outside surface become dirty.

Salt solutions and **TCM-1** perfusion solutions can be corrosive to metal components and can shorten the life of the heater/cooler if left in contact with the unit during storage. If storing the **TB-3/CS** for an extended length of time, the **TB-3/CS** - **TCM-1** flow path should be drained, flushed with distilled water, and blown dry.

Specifications

Minimum Temperature:	0°C
Maximum Temperature:	50°C
Accuracy:	±0.1°C
Water Jacket Ports:	Delrin® barbed connectors 0.12” ID x 0.147” OD
Controller:	CL-100 Bipolar Temperature Controller
Physical Dimensions:	3.6 x 2.5 x 0.4 inch (L x W x D)
	9.2 x 6.4 x 1.0 cm (L x W x D)
Cable Length:	2.5 m
Connector Type:	15 pin Male “D”
Weight:	150 g
Warranty:	1 year

Warranty and service

Warranty

The model **TB-3/CS** is covered by our Warranty to be free from defects in materials and workmanship for a period of one year from the date of shipment. If a failure occurs within this period, we will either repair or replace the faulty component(s). This warranty does not cover failure or damage caused by physical abuse, lack of maintenance, or electrical stress (inputs exceeding specified limits).

In the event that instrument repairs are necessary, shipping charges to the factory are the customer's responsibility. Return charges will be paid by Warner Instruments.

Normal business hours are 8:30 AM to 5:30 PM (EST), Monday through Thursday and 8:30 AM to 5:00 PM on Friday. Our offices are located at 1125 Dixwell Avenue, Hamden, CT 06514, and we can be reached by phone at (800) 599-4203 or (203) 776-0664. Our fax number is (203) 776-1278.

In addition, we can be reached by e-mail at **support@warneronline.com** or through the web at **http://www.warneronline.com**.

Service notes

Please refer all questions regarding service to our Customer Service department.

A) Should service be required, please contact the factory. A problem can sometimes be easily corrected by our shipping a replacement part. Factory service, if required will be expedited to minimize the customer's inconvenience.

B) Instruments are inspected immediately upon receipt and the customer is notified if the repair is not covered by the warranty. Repairs can often be completed in 1-2 days from our receipt of the instrument.

C) If factory service is required, please observe the following instructions:

1) Package the instrument with at least 2 inches of cushioning on all sides. Use the original shipping carton if it is available.
2) Insure the shipment for its full value.
3) Include with the shipment an explanation of the problem experienced.

IMPORTANT: CUSTOMERS OUTSIDE OF THE U.S.

Please be sure to contact us before return shipping any goods. We will provide instructions so that the shipment will not be delayed or subject to unnecessary expense in clearing U.S. Customs.