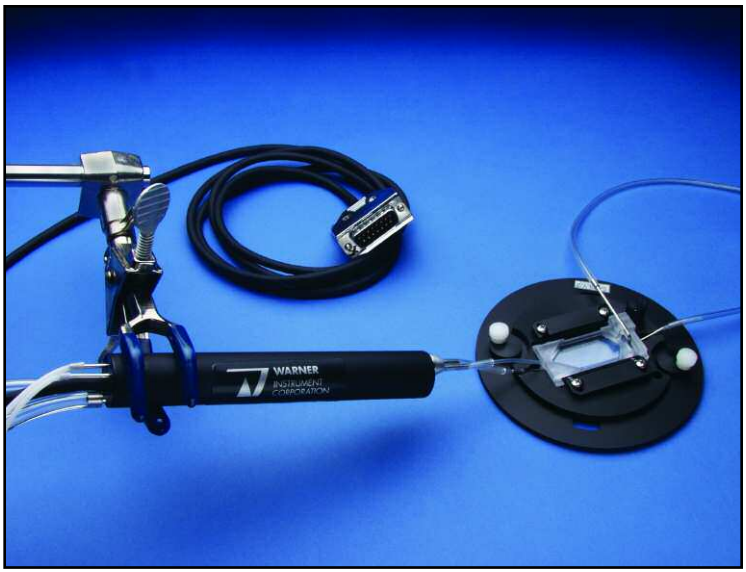
Dual In-Line Heater/Cooler

Catalog No. 64-0353

Model SC-20



WARNER INSTRUMENTS

A Harvard Apparatus Company

Publication 5706-001-REV-A

WEEE/RoHS Compliance Statement

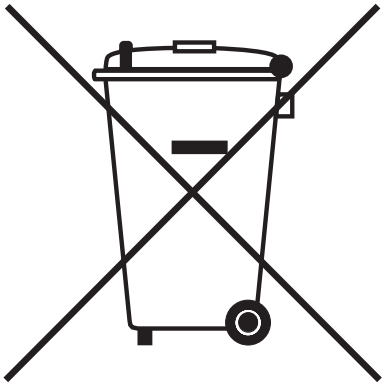
EU Directives WEEE and RoHS

To Our Valued Customers:

We are committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for our products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive – Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of our products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. We will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.



- **Do Not Dispose Product with Municipal Waste**
- **Special Collection/Disposal Required**

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Introduction

The SC-20 Dual In-Line Solution Heater/Cooler from Warner Instruments is a versatile and simple to use thermal control device. In addition, in-line solution heating has proven to be one of the most effective methods of maintaining the temperature of perfusion solutions. The SC-20 uses reliable and precise Peltier technology to regulate one or two solutions above or below ambient levels.

Solution temperatures can be maintained at 0 °C at flow rates of 2 ml/min, 5°C at 5 ml/min, or as high as 50°C at 5 ml/min. An integral water jacket using running water from a tap or large reservoir is used to remove excess heat from the Peltier electronics within the SC-20. Cooling flow rates as low as 4 liters per hour are sufficient to maintain thermal efficiency of the device.

The SC-20 can be used to control either one or two discrete perfusate solutions, or with a solution/gas combination. When coupled with a PHC Series Imaging Chamber Heater/Cooler Jacket, the SC-20 provides an effective means for temperature control in a Series 20 Imaging and Recording Chamber, even in the absence of solution flow.

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

CAUTION: Not for clinical use on human patients.

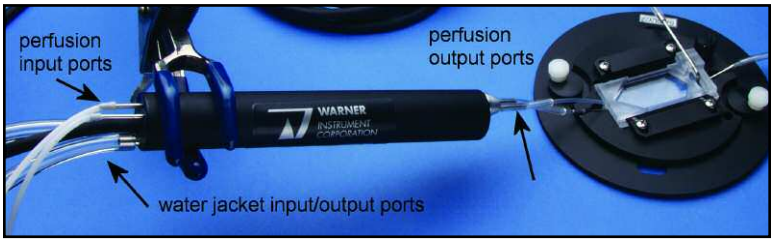
General

In-line solution heating is the simplest and most effective method of warming or cooling perfusion solutions prior to use. The minimal dead space manifold at the heater/cooler output allows it to be used in applications where from 1 to 2 perfusion lines are connected to a chamber or other device.

The SC-20 Dual In-Line Solution Heater/Cooler is designed for use with the Warner CL-100 Bipolar Temperature Controller. The compact design of the SC-20 makes it possible to install the device immediately adjacent to the input port of a perfusion chamber insuring minimal heat loss. The SC-20 will easily accommodate flow rates up to 5 ml/min.

Each heater/cooler is supplied with a TA-29 thermistor cable assembly (which allows for monitoring of the actual bath temperature), and 3 meters each of PE-160 and ¼" OD Tygon® tubing.

A general configuration for the SC-20 is shown below. Note that the illustration here makes use of a PHC Series Imaging Chamber Heater/Cooler Jacket to provide additional thermal control for the imaging and recording chamber.



The SC-20 has two input ports, and two corresponding output ports, for fluid flow to the sample chamber. These lines are attached to the INPUT and OUTPUT PERFUSION PORTS and are identified above.

The two WATER JACKET INPUT/OUTPUT PORTS are the larger diameter ports on the input side of the SC-20 and are also identified. The WATER JACKET PORTS are provided for connecting to the INTEGRAL WATER JACKET within the SC-20.

NOTE: The use of the INTEGRAL SC-20 WATER JACKET is mandatory regardless if the unit is being used for heating or cooling.

If you look closely at the routing of the two perfusion flow lines exiting the SC-20 (the two lines enter into the Series 20 Chamber and Platform on the right hand side of the picture), you will see that the upper perfusion line enters into the chamber's input port. This line carries your experimental perfusion solution and would come from your solution reservoir.

The lower perfusion line in the picture enters into the PHC Series Imaging Chamber Heater/Cooler Jacket. This line carries heated/chilled water, comes from a circulating reservoir, and is used to aid to maintain the temperature of the chamber/platform.

Tubing Connections

Solution Flow Lines

PE-160 tubing (or any other tubing with a ⅛" (1.5 mm) ID) is used to connect to both of the available input and output solution ports on the SC-20. Connections are made by press fitting the tubing onto the 18 gauge stainless steel hypodermic tubes. Cap plugs are supplied to block unused inputs.

NOTE: Use a short length of PE tubing between the heater output and perfusion chamber.

Tubing Connections (Cont'd)

Water Jacket Flow Line

Water is circulated through the SC-20 WATER JACKET via the two large ports located on the input side of the heater/cooler. Run Tygon" flow lines in a loop from your water source (a sink or water bath) to both ports the SC-20. Connections are made to the SC-20 by press fitting the tubing onto the large-bore stainless steel tubes. Use of the INTEGRAL WATER JACKET to remove excess heat from the internal Peltier device is critical to the function of the SC-20 and its use is mandatory.

PHC Series Imaging Chamber Heater/Cooler Jacket

The use of a separate water jacket attached to a Series 20 chamber to aid in maintaining the temperature of the chamber represents an improvement in function for systems using an upright microscope. Series 20 WATER JACKET water is passed through the SC-20 via one of the solution flow paths and is channeled to the Series 20 water jacket lying under the chamber. Since both the perfusion solution and PHC Series WATER JACKET lines are routed through the same heater/cooler, their temperature will be maintained to the same value.

Component Placement

1. Plug the SC-20 into the rear of the CL-100 Bipolar Temperature Controller using the attached cable.
2. Attach solution flow lines from the solution reservoir(s) to the input ports of the SC-20.
3. Attach the SC-20 INTEGRAL WATER JACKET flow lines to the SC-20 WATER JACKET PORTS.
4. Using a support stand, place the SC-20 in a convenient location, usually adjacent to the sample chamber.
5. Run solution flow lines from the output ports of the SC-20 to the input ports of the perfusion chamber.
6. The supplied TA-29 Thermistor Assembly is used to monitor the temperature at a point of interest. Plug the TA-29 into the MONITOR TEMP IN BNC on the CL-100 and place the thermistor at the point of interest.

Using With A Chamber

1. Turn power to the CL-100 on.
2. Set the CL-100 MODE SELECTOR SWITCH into auto, the INTERNAL/EXTERNAL SELECTOR SWITCH to internal (see CL-100 user's manual), and adjusts the SET TEMPERATURE of the system.
3. Start the solution flow to the SC-20 INTEGRAL WATER JACKET.
4. Start solution flow through the SC-20 to the chamber and PHC Series Imaging Chamber Heater/Cooler Jacket, if used.
5. Place the TA-29 thermistor into the bath to measure its temperature.
6. Adjust the SET TEMP to the desired operating temperature. Allow the system to thermally stabilize. Monitor the temperature at the point of interest using the TA-29 thermistor.
7. Make any temperature adjustments on the CL-100 to compensate for heat loss from the SC-20 to the bath.
8. Additional adjustment of the heater set point may be required if any of the following change substantially during an experiment:
   - Solution flow rate
   - Temperature of solution entering the heater
   - Ambient (room) temperature
   - Air currents around chamber

   Efforts to minimize these factors will be rewarded.

Outgassing

A common problem with rapid heating of solutions is outgassing. The bubbles formed can often cause blockages or disruptions to the flow in the chamber bath. An effective solution to this problem is to pre-warm the perfusate at the reservoir. Warner Instruments carries a full line of Solution Reservoir Heaters designed to work in concert with our In-Line Solution Heaters.

Appendix

Maintenance

Salt solutions can be corrosive to metal components and can shorten the life of the heater/cooler if left in the unit during storage. The SC-20 should be flushed with distilled water and blown dry after each use to eliminate the effects of salt and moisture.

NOTE: Proper maintenance is critical to the life and functionality of the device!

Specifications

Minimum Temperature	0°C (2 ml/min maximum flow)
Maximum Temperature	50°C
Maximum Flow Rate at 5°C	5 ml/min
Accuracy	±0.1°C
Perfusion Lines	Type 316 Stainless Steel 0.032" ID x 0.062" OD
Internal Dead Volume	330 µl
Water Jacket Ports	Type 316 Stainless Steel 0.12" ID x 0.147" OD
Controller	Model CL-100 Bipolar Controller
Physical Dimensions	21 x 165 mm (dia x length)
Cable Length	1.9 m
Connector Type	15 pin Male "D"
Weight	109 g
Warranty	1 year

Warranty

The model SC-20 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 extend to damage resulting from misuse, neglect or abuse, normal wear and tear, or accident.

This warranty extends only to the original customer purchaser.

IN NO EVENT SHALL HARVARD APPARATUS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE.** Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

If a defect arises within the one-year warranty period, promptly contact your local distributor or ***Harvard Apparatus, Inc. 84 October Hill Road Holliston, Massachusetts 01746-1388*** using our toll free number 1-800-272-2775 (valid only in the U.S., outside U.S. call 508-893-8999). Goods will not be accepted for return unless an RMA (returned materials authorization) number has been issued by our customer service department. The customer is responsible for shipping charges. Please allow a reasonable period of time for completion of repairs, replacement and return. If the unit is replaced, the replacement unit is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific rights, and you may also have other rights which vary from state to state.

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

Service Notes

Please refer all questions regarding service to our Engineering Department.

A) Should service be required, please contact the factory. The problem may often be corrected by our shipping a replacement part. Factory service, if required will be expedited to minimize the customer 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 3 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.