

# Ranger<sup>®</sup>\*

Blood/Fluid Warming System

## Initial Equipment Check

- Make sure the Ranger unit's power cord is plugged into the unit.
- When checking for grounding, clamp to the screw threads on the unit's IV pole clamp or the equipotential stud on the rear of unit. Clamp should be tightened securely.
- Sometime during shipping, this unit may have been exposed to extreme temperatures. The unit may need a period of 20 minutes or more to return to normal operating temperature. Store the Ranger unit at room temperature, allowing it to equilibrate, before using or testing the unit.

# Ranger

## Blood/Fluid Warming System

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# Technical Service and Order Placement

## Technical service

TEL: 1-952-947-1200

1-800-733-7775

## Order placement

TEL: 1-952-947-1200

1-800-733-7775

FAX: 1-952-947-1400

1-800-775-0002

## In-warranty repair and exchange

Replacement parts to correct a problem are delivered at no charge. To return a device to Arizant Healthcare Inc. for service, first obtain a Return Authorization (RA) number from a customer service representative. Please use the (RA) number on all correspondence when returning a device for service. A shipping carton will be delivered to you at no charge, if needed. We will service and ship your device within five (5) working days of our receipt. Call your local supplier or sales representative to inquire about loaner devices while your device is being serviced.

## When you call for technical support

Remember, we will need to know the serial number of your unit when you call us. The serial number label is located on the bottom of the warming unit.

## Introduction

The Ranger blood/fluid warming system includes a warming unit that uses dry heat transfer method, and disposable fluid warming and irrigation sets. The Ranger warming unit is designed to warm blood, blood products, and liquids and deliver these at flow rates from KVO to 500 mL/min. At these flow rates, the device maintains fluid output temperatures ranging from 33°C to 41°C. It takes less than 2 minutes to warm up to the 41°C set point temperature.

Disposable sets include IV blood/fluid sets for standard flow and high flow applications, and an irrigation set with patient line for flow rates up to 30L/hr. Disposable sets are sterile (fluid pathway unless otherwise indicated), latex-free, single-use only (unless otherwise indicated, ie: 24601, 24602).

The Ranger warming unit is designed to be mounted to an IV pole. A handle located on the top of the unit makes transport easy. When mounted to the IV pole, the unit fits easily above a Bair Hugger\* warming unit.

### Indications for use

The Ranger blood/fluid warming system is intended to warm blood, blood products and liquids.



### Warnings and precautions

#### ANGER

Explosion hazard. Do not use in the presence of flammable anesthetics.

#### WARNING

- Electrical shock hazard. Do not open the warming unit case.
- Do not substitute other devices for the Ranger warming unit or Ranger disposable sets. Thermal or electrical injury or device damage may occur.
- Never infuse fluids if air bubbles are present in the fluid line, as air embolism may result.
- Do not continue use of the unit if the over-temperature alarm continues to sound and the temperature does not return to the set point temperature. Immediately stop fluid flow and discard the disposable set. Have the warming unit tested by a biomedical technician or call Arizant Healthcare\* Customer Service.

#### CAUTION

- Do not immerse the blood/fluid warming unit. Wipe with a clean, slightly damp cloth.
- To prevent tipping, clamp the Ranger warming unit to an IV pole with a minimum 14" (35.6 cm) radius wheelbase and at a height no higher than 44" (112 cm). Failure to do so may result in damage to the product or catheter site trauma.

### Before servicing equipment

All repair, calibration, and servicing of this equipment must be performed by Arizant Healthcare Inc. or an authorized service technician. Arizant Healthcare Inc. assumes no responsibility for the reliability, performance, or safety of the equipment if:

- Modifications or repairs are performed by unauthorized personnel.
- The equipment is used in a manner other than that described in the operator's manual.
- The equipment is installed in an environment that does not meet the appropriate electrical and grounding requirements.

# Servicing Instructions

## Cleaning the Ranger warming unit

Clean the Ranger unit on an as-needed basis.

### CAUTION

- Do not immerse the warming unit in cleaning or sterilizing solutions. The unit is not liquid-proof.
- Do not clean the warming unit with solvents. Damage to the case, label, and internal components may result.

### TO CLEAN THE EXTERIOR OF THE WARMING UNIT:

1. Disconnect the Ranger warming unit from the power source.
2. Wipe the outside of the unit with warm, soapy water, nonabrasive cleaning solutions, dilute bleach, or cold sterilants. Do not use abrasive materials.
3. Wipe with a dry, soft cloth.

### TO CLEAN THE HEATING PLATES:

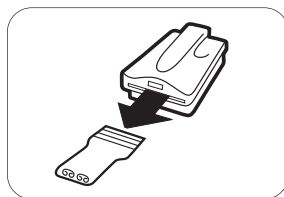
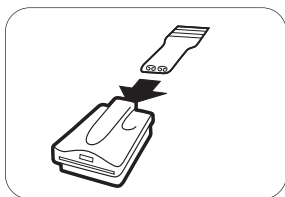
The Ranger cleaning tool is intended to clean both heating plates of the warming unit. It is not necessary to disassemble the warming unit to use the tool.

### CAUTION

- Do not insert metallic instruments in the warming unit, as damage to the heating plates may occur.
- Do not use abrasive material or solutions to clean the heater plates.
- Do not allow spills to dry inside the unit, as this may make it more difficult to clean the unit.
- The cleaning tool provides only superficial cleaning—it does not disinfect or sterilize the interior of the unit.

### METHOD

1. Unplug the warming unit.
2. Unfold the cleaning tool. Wet the foam pads with a nonabrasive solution, such as Alconox\* brand detergent.



3. Insert the tool from the back of the unit and pull the tool all the way out from the front.
4. Rinse the tool with water and repeat 3 times. Discard the tool according to institutional protocol.
5. Wipe off the unit to remove excess fluid.

### TO CLEAN RESISTANT, DRIED-ON FLUIDS:

1. Spray a nonabrasive solution inside the slot of the warming unit and let sit for 15-20 minutes.
2. Clean the unit by using the cleaning tool.

**NOTE:** You may use a nonmetal instrument, such as a cotton swab, to clean the upper channels. If you are unable to adequately clean the unit, call Arizant Healthcare Customer Service.

\*Alconox is a registered trademark of Alconox, Inc.

## Testing the operating temperature

Testing of the operating temperature should be done at least every 6 months or according to institutional protocol.

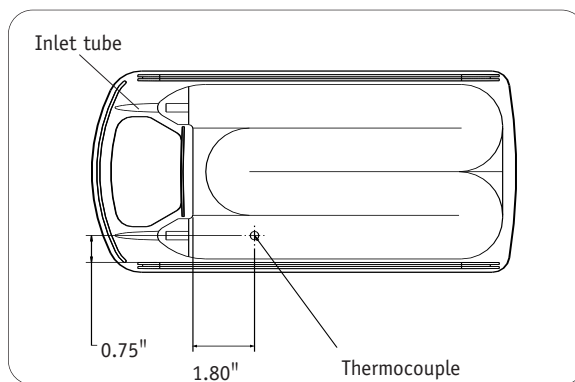
### CAUTION

Temperature adjustments cannot be made to the Ranger warming unit. If the tested temperature is out of specification, please call Arizant Healthcare Customer Service.

### TOOLS AND EQUIPMENT

- Thermocouple: 0.005" leads or smaller
- Calibrated thermocouple temperature monitor
- Aluminum tape
- IV bag containing room temperature saline

### METHOD



1. Tape a thermocouple to the exterior of one side of the Ranger warming cassette. See figure above for correct position of the thermocouple.
2. Slide the warming cassette into the slot of the Ranger warming unit.
3. Using room temperature fluids, prime the cassette just until fluid flows through the patient end. Clamp the white clamp to stop the flow.

NOTE: To achieve correct results, fluids must be administered into the **inlet** tube, NOT into the outlet tube.

4. Turn the Ranger unit ON and allow it to warm up for 5 minutes. The Ranger unit display should read  $41^{\circ}\pm 1^{\circ}\text{C}$ . Note the temperature on the thermocouple temperature monitor. If the temperature reading is not  $41^{\circ}\pm 1^{\circ}\text{C}$  call Arizant Healthcare Customer Service.

NOTE: Most hand-held temperature meters have a  $\pm 1^{\circ}\text{C}$  tolerance.

## Testing the alarms

Testing of the alarms should be done at least every 6 months or according to institutional protocol.

### TESTING THE OVER-TEMPERATURE ALARM (43° AND 46°C ALARM POINTS)

#### TOOLS AND EQUIPMENT

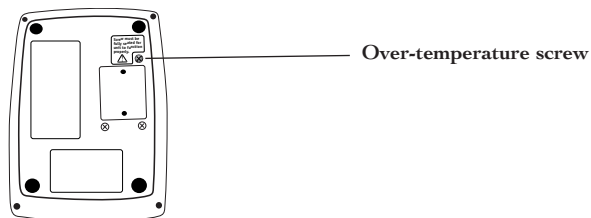
- Phillips screwdriver
- IV solution at room temperature
- 1 Ranger standard flow warming cassette instrumented with a thermocouple (see page 5 for instructions)
- Calibrated thermocouple temperature monitor

**Read before testing:** The over-temperature alarm test causes the Ranger unit to go into an over-temperature test mode by manually overriding the primary control system and engaging the heaters. The Ranger system is very responsive to heater input; therefore, the test procedures are technique sensitive. Read instructions thoroughly before beginning these tests.

The first alarm point at 43°C alerts you to the rise in temperature (see step 5). At the 46°C secondary alarm set point, the unit cuts power to the heaters (see steps 6-8). Please note that due to tolerance stack-ups between the various systems and the heater's rapid response, you may see secondary alarm set point readings from 45-49°C.

#### TEST SET-UP

1. Turn on the Ranger warming unit and allow it to stabilize at normal operating temperature (40-41°C) for 30 minutes.
2. Insert the instrumented warming cassette into the Ranger unit.
3. Prime the warming cassette with room temperature IV solution. When primed, clamp the outlet tube to stop flow.
4. Connect the thermocouple to the calibrated thermocouple temperature monitor to verify that the warming unit's temperature has stabilized at normal operating temperature.
5. Slowly loosen the over-temperature screw on the bottom of the Ranger unit (see illustration below). When the heater reaches 43°C, an audible alarm sounds, the alarm light illuminates, and the display alternately flashes "HI" and the plate temperature.



**Important note:** Steps 6 through 8 are highly dependent upon each other; be sure to read all steps before proceeding with the alarm test. Newer Ranger units or units fitted with a new alarm board will test differently than older units. Steps 6a and 6b will help you determine the unit type you are working on. It is important to note that neither the alarm function nor the efficacy of the Ranger system has changed, only the mechanism for testing.

6. Remove the over-temperature screw on the bottom of the Ranger unit.
  - 6a). If the temperature display **climbs slowly to the alarm point (44-46°C) and stabilizes**, replace the screw, turn off the Ranger unit, and unplug the unit to silence the alarm. The unit is ready to return to service after it cools to normal operating temperature (approximately 20-30 minutes). Note: At the alarm point, the audible alarm sounds, the alarm light illuminates, and the alphanumeric display alternately reads "HI" and the plate temperature.
  - 6b). If the temperature display **climbs rapidly to 49°C or higher**, replace the screw, turn off the Ranger unit, and unplug the unit to silence the alarm. Allow the unit to cool to normal operating temperature (approximately 20-30 minutes), then continue testing by following steps 7 and 8.
7. **Slowly loosen** the over-temperature screw on the bottom of the Ranger unit. Listen for a slight click as the microswitch opens. **Stop turning the over-temperature screw as soon as you hear the click.** The unit is now in over-temperature test mode.
8. Watch the alphanumeric display. When the unit reaches 44°C, quickly tighten the over-temperature screw. Listen for the power relay to click between 45-49°C (you can feel the click when holding the lower left corner of the unit as you face the front display). This signals that power to the heaters has been shut off. The over-temperature alarm will sound, the alarm light will illuminate, and the alphanumeric display will alternately read "HI" and the plate temperature. Watch the thermocouple temperature monitor to determine when the unit temperature has stabilized (about 1 minute). The temperature reading on the monitor should peak between 45-49°C.
  - If you detected the power relay click, proceed to step 9.
  - If you did not detect the power relay click, follow these instructions: When the temperature stabilizes (reaches a peak and begins to fall), slowly loosen the over-temperature screw. Wait 1-2 seconds before quickly tightening the over-temperature screw. Repeat until the relay click is confirmed.

**Note:** If the temperature displayed on the thermocouple monitor exceeds 49°C during the test, tighten the over-temperature test screw on the bottom of the Ranger unit, unplug the unit, and run cold fluid through the warming cassette. This returns the unit to normal operating temperature. When the temperature stabilizes below 41°C, repeat the test starting at step 7. If the second test still exceeds 49°C, call Arizant Healthcare Technical Support at 800-733-7775.
9. Securely tighten the over-temperature screw, turn off the Ranger unit, and unplug the unit to silence the alarm. The unit is ready to return to service after it cools to normal operating temperature (approximately 20-30 minutes).

#### TESTING THE UNDER-TEMPERATURE ALARM

You may perform this test procedure directly following the testing for the over-temperature alarm. Only the visual alarm can be verified; the audible alarm will continue to sound throughout the rest of the procedure.

#### TOOLS AND EQUIPMENT

- Thermocouple: 0.005" leads or smaller
- Calibrated thermocouple temperature monitor
- IV bag containing saline at <33°C



#### METHOD

1. Verify that the 46°C alarm is functioning properly. The over-temperature test turns off the heaters. **DO NOT UNPLUG THE UNIT AT THIS POINT.** Do not reseal the over-temperature test screw.
2. Flush the fluid warming cassette with cold water until the display temperature falls to or below 33°C. This drop in temperature will trigger the under-temperature alarm. The alphanumeric display will alternately read "LO" and the measured temperature. You may notice a slight stutter in the alarm as the temperature crosses the 43°C alarm point and again as it crosses the 33°C alarm point.
3. To silence the alarm, unplug the unit for 5 minutes. Securely tighten the over-temperature test screw before returning the unit to service.

### Replacing the power fuse

The power fuses are located in the power entry module.

#### TOOLS AND EQUIPMENT

- Small slotted screwdriver

#### METHOD

1. Disconnect the warming unit from the power source.
2. Remove the power cord.
3. Locate the fuse carrier in the power entry module.
4. Use the small screwdriver to remove the fuse carrier from the power entry module.
5. Remove the blown fuse from the fuse carrier and replace with a new new fuse (as marked).
6. Place the fuse carrier back into the power entry module.
7. Reattach the power cord.
8. Reconnect the warming unit to the power source.
9. Turn the unit on to verify normal operation.
10. Record the maintenance action taken.

## Troubleshooting

Condition	Cause	Solution
Nothing illuminates on the warming unit display panel.	<ul style="list-style-type: none"> <li>•Unit is not turned on, plugged in, or power cord is not plugged into an appropriate outlet.</li> <li>•Unit failure.</li> </ul>	<ul style="list-style-type: none"> <li>•Turn unit on. Make sure the power cord is plugged into the power entry module of the warming unit. Make sure the warming unit is plugged into a properly grounded outlet.</li> <li>•Call Arizant Healthcare Customer Service.</li> </ul>

Condition	Cause	Solution
Alarm indicator light illuminates and alarm sounds, alphanumeric display alternately flashes a temperature of 43°C or higher and the word "HI."	<p>Temporary over-temperature condition because:</p> <ul style="list-style-type: none"> <li>•An extreme change in flow rates occurred (e.g., from 500 mL/min to stop flow).</li> <li>•Unit was turned on and reached set point temperature before warming cassette was inserted.</li> <li>•Fluids were prewarmed to above 42°C before being run through the warming unit.</li> </ul>	<ul style="list-style-type: none"> <li>•Open flow to reduce temperature. Alarms will stop when the display reads 41°C. The unit is ready to use.</li> <li>•Alarms will stop when the display reads 41°C. The unit is ready to use.</li> <li>•Turn off unit. Discontinue infusion of fluids. Do not warm fluids before infusing them through the Ranger unit.</li> </ul>

Condition	Cause	Solution
Alarm sounds, alphanumeric display and alarm light go dark.	<p>Primary controller failure.</p> <p>Unit will no longer operate.</p>	<p>Power to heating plates will shut off if temperature rises to 46°C. Turn unit off and unplug it. Discontinue use of unit. Discard disposable set. Alarm will continue to sound if you do not unplug unit. Call Arizant Healthcare Customer Service.</p>

### Condition

- Unit alarms soon after plugging it in (unit does not have to be turned on for this condition to occur).
- Heater temperature rises to 46°C and unit shuts down soon after plugging it in (unit does not have to be turned on for this condition to occur).

### Cause

Test screw on bottom of unit is loose or missing.

### Solution

Make sure test screw is completely tightened. If it is missing, turn unit off and unplug it. Call Arizant Healthcare Customer Service.

### Condition

Alarm sounds but unit has been turned off.

### Cause

Independent backup safety system has been activated.

### Solution

Unplug unit. Call Arizant Healthcare Customer Service.

### Condition

Cannot remove warming cassette from unit.

### Cause

- Warming cassette is too full, fluids are still being infused, or clamp is open proximal to the warming cassette.

### Solution

- Make sure fluid is drained from warming cassette before sliding out the cassette, that fluids are no longer infusing, and that clamp is closed proximal to the warming cassette.

- Warming unit is below patient level, creating excessive back pressure.

- Raise unit above patient level.

### Condition

Alarm indicator light illuminates and alarm sounds, alphanumeric display alternately flashes a temperature of 33°C or lower and the word "LO."

### Cause

Under-temperature condition, or defective heater/relay.

### Solution

Alarm should stop when temperature rises above 33°C. If alarm continues, unplug unit and discontinue use. Call Arizant Healthcare Customer Service.

### Condition

Alphanumeric display reads "Er 4" or "Open."

### Cause

Open wire on temperature sensor.

### Solution

Do not use unit. Call Arizant Healthcare Customer Service.

### Condition

Alphanumeric display reads "Er 5" or "Open."

### Cause

Electrical interference.

### Solution

Remove the unit. Refer to biomedical technician or call Arizant Healthcare Customer Service.

# Specifications

## Physical characteristics

### WARMING UNIT

4.5 in. (11 cm) high x 7.5 in. (19 cm) wide x 10 in. (25 cm) long;  
wt.: 7 lb. 7 oz. (3.4 kg)

### CLASSIFICATION

Classified under IEC 601-1 Guidelines (and other national versions of the Guidelines) as Class I, Type B, Ordinary Equipment. Not suitable for use in the presence of flammable anesthetic mixtures with air or with oxygen or nitrous oxide. Classified by Underwriters Laboratories Inc. with respect to electric shock, fire, and mechanical hazards only, in accordance with UL 60601-1 and in accordance with Canadian/CSA C22.2 No. 601.1

## Electrical characteristics

### INPUT VOLTAGE

100-120 or 220-240 VAC

### OPERATING FREQUENCY

100-120 VAC, 50/60 Hz  
220-240 VAC, 50/60 Hz

### MAXIMUM HEATING POWER

900 W

### FUSE RATING

100-120 V unit: 250V, T10A  
220-240 V unit: 250V T6.3A

## Temperature characteristics

### SET POINT TEMPERATURE

41°C

### OVER-TEMPERATURE ALARM

43°C

### UNDER-TEMPERATURE ALARM

33°C

### OVER-TEMPERATURE CUTOFF

46°C

### LEAKAGE CURRENT

Meets leakage current requirements in accordance with UL 60601-1 and IEC 601-1.

## Environmental conditions

### OPERATING TEMPERATURE RANGE

15° to 40°C (59° to 104°F)

### STORAGE TEMPERATURE RANGE

-20° to 45°C (-4° to 113°F)

### OPERATING HUMIDITY

10 to 85% RH, noncondensing

### ATMOSPHERIC PRESSURE RANGE

50 kPa to 106 kPa

## Returning Warming Units for Service

Call Arizant Healthcare Customer Service to get a Return Authorization (RA) number and a service carton. Arizant Healthcare Customer Service: 1-800-733-7775.

## Definition of Symbols



ON



OFF



Fuse



Attention-read accompanying documents



Nonexplosion-Proof



Type B Applied Part



Voltage, Alternating Current (AC)



**Ranger**  
Blood/Fluid Warming System



Arizant Healthcare Inc.  
10393 West 70th Street, Eden Prairie, MN 55344 USA  
TEL 952-947-1200 • 800-733-7775  
FAX 952-947-1400 • 800-775-0002  
[www.arizanthealthcare.com](http://www.arizanthealthcare.com)

Authorized Representative in the European Community (as defined in Article 14 of the Medical Device Directive: 93/42/EEC): Actamed Limited, Calder Island Way, Wakefield, WF2 7AW, United Kingdom  
Tel (44) 1924 200550 • Fax (44) 1924 200518

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200750C 12/04  
U.S. patent 6,464,666. Other patents pending.