ADVOCATE HEALTH		
Title: EQ Sensor Check-Alarm Activation Procedure (NCBH)		**Document Number: 54367**
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Content Applies to Patient Care: (Select all that apply) **☒ Adults** **☒ Pediatrics (Under 18)**	**Content Applies to: (Select One)** **☒ Clinical** **☐ Administrative**	**Effective Date: Not Set**
Scope: ☐ Enterprise ☐ MW Region ☐ SE Region **☐ WI ☐ IL ☐ Greater Charlotte Market ☐ Navicent Market ☐ Wake Market ☐ Floyd Market** **☒ Entity Only (Entity Name): NCBH ☒ Department Only (Department Name): Blood Bank**		

I. PURPOSE

To purpose of this procedure is to describe the process for testing high and low temperature alarms for blood storage equipment. All blood storage equipment, including refrigerators, freezers, and platelet rotators shall be tested for both high and low alarm activation periodically following the QC schedule for the facility. Electronic (if available on the equipment) and/or manual methods are acceptable for alarm testing; however, manual alarm checks must be performed at least quarterly and after major repairs.
The laboratory must demonstrate that all components of the alarm system (including manual chart recordings) work as expected and that there is a process to ensure a timely response to alarms, including remote alarms.
Alarms shall activate before the temperature is outside of the acceptable range to allow for adequate time to correct the problem or move inventory before products are affected.

II. SCOPE

This procedure applies to NCBH Blood Bank Staff and Management.

III. DEFINITIONS/ABBREVIATIONS

A. Procedure: A process or method for accomplishing a specific task or objective.
B. WFBH Lab System: Wake Forest Baptist Lab System is a health system that includes Wake Forest Baptist Medical Center and all affiliated organizations including Wake Forest University Health Sciences (WFUHS), North Carolina Baptist Hospital (NCBH), Lexington Medical Center (LMC), Davie Medical Center (DMC), Wilkes Medical Center (WMC), High Point Medical Center (HPMC), Lab at Westchester and Lab at Clemmons.

IV. POLICY

Alarm Activation Points		Acceptable Operating Limits		
Low	**High**	**Storage Unit Type**	**LOW**	**HIGH**
1.4˚C	5.8˚C	**Blood Storage Refrigerators** (Refrigerators 6, 7, 11, 12, PED, Adult ED, L&D, Sera 3, Biofridges)	1˚C	6˚C
1.4°C	5.8°C	**Cooler Inserts Refrigerator** (Sera 3)	1°C	6°C
2.4˚C	5.8˚C	**Reagent/Blood Storage Refrigerators** (Sera 5, Refrigerator 10, 12)	2˚C	6˚C
20.0˚C	24.0˚C	**Platelet Incubators** (1, 2)	20˚C	24˚C
-50˚C	-19.5˚C	**Plasma/Cryo Storage Freezers** (Freezers 5, 11, 13)	NA	-18˚C
-50˚C	-18˚C	**Cooler Inserts/Misc Freezers** (Freezer 12, 14)	NA	-18˚C
-101˚C	-68˚C	**Red Cell Freezers** (Freezer 10, 22, 23)	NA	-65˚C
2.4°C	7.8°C	**Student Reference Refrigerator** (Sera 2)	2°C	8°C

V. PROCEDURE

Electronic Temperature Alarm Method (if available)

Chemical Risk Assessment: moderate
Biological Risk Assessment: low
Protective Equipment: lab coat, gloves
Supplies: Container or bowl, weigh boat, thermometer, towel, Alarm Activation – Sensor Check Worksheet, Charts
Reagents: Table salt, water, ice
Equipment: Refrigerators, Freezers, Platelet Incubators

A. The electronic alarm testing function artificially heats and cools by a tiny, built-in thermoelectric heating and cooling unit which stimulates both warm and cold conditions. While this alarm testing is very accurate and reliable, the temperature of the refrigerated space does not change during this test and thus it is **not a valid method for QC of alarm functions** and should only be used to check alarm set points or after minor repairs.

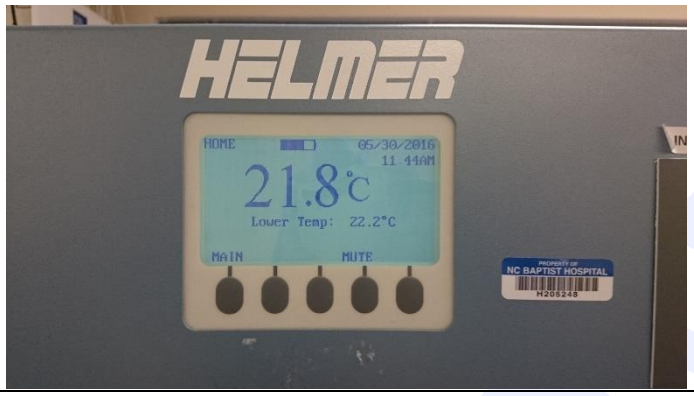
B. Refrigerator 6 and 7, Sera 3, Freezers 5, 11, 12, 13, and 14

STEPS	INSTRUCTIONS
1.0	**Assure that key hole is in the most horizontal position** 1.1 If key hole is not in the "Alarm On" horizontal position, obtain key from Blood Bank key box. Place key in key hole and turn clockwise to the "Alarm On" horizontal position
2.0	**Press the ▲ and the ● simultaneously for 1-2 seconds** 2.1 The unit will begin the electronic alarm test by first warming the internal probe. 2.2 Carefully watch the temperature display 2.2 Document the HIGH temperature displayed when the alarm sounds on the Alarm Activation – Sensor Check Worksheet. DO NOT mute the alarm – it will mute itself. a. ***NOTE:*** There is NO low alarm test for Freezers 5, 11, 12, 13, or 14. 2.3 The unit will automatically begin the low alarm set point. 2.4 Carefully watch the temperature display. 2.5 Document the LOW temperature displayed when the alarm sounds on the Alarm Activation – Electronic Sensor Check Worksheet. DO NOT mute the alarm– it will mute itself.
3.0	**Compare documented temperatures to Acceptable Limits** 3.1 Determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Electronic Sensor Check Worksheet. 3.2 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management.

C. Freezer 10

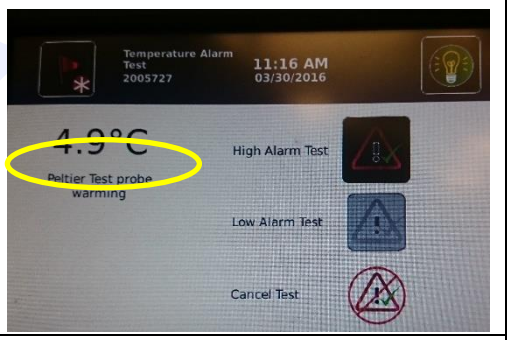
STEPS	INSTRUCTIONS
1.0	**Press the MODE button 1 time** 1.1 Once the MODE button has been pressed, the instrument requires you to enter the access code. Look for the display under the MODE button – it will read ACC CODE?000 1.2 Use the UP / DOWN arrows to the right to enter the access code – **911**.  a. Press the DOWN arrow until the #9 is displayed in the first position, press → b. Press the UP arrow until the #1 is displayed in the second position, press → c. Press the UP arrow until the #1 is displayed in the third position, press ENTER
2.0	**Press the MODE button x2 until orange light to left of the work Configuration is illuminated.** 2.1 Press ENTER. The digital display will have the text HI ALRM TEST. 2.2 Press ENTER. The digital display will have the text RUNNING HA T 2.3 There is no "LOW" alarm activation for Freezer 10
3.0	**Watch temperature of freezer on the display carefully. Record temperature when audible alarm sounds on the Alarm Activation – Electronic Sensor Check Worksheet.** 3.1 Press SILENCE to silence the audible alarm 3.2 Compare documented temperature to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet. 3.3 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management
4.0	**Press the MODE button to exit out of the alarm test function.**

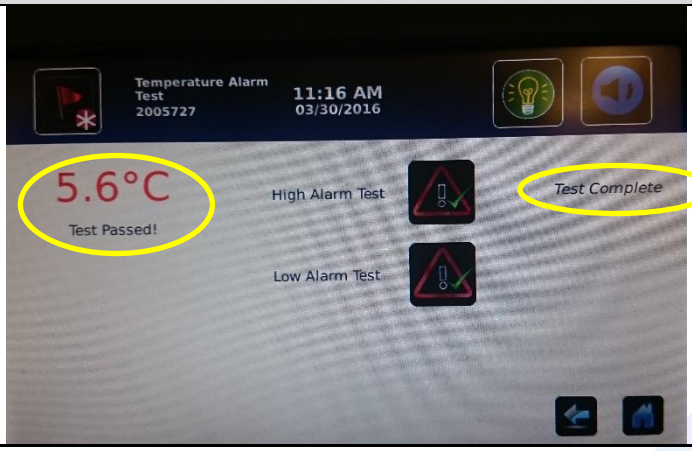
D. Platelet Rotator 2

STEPS	INSTRUCTIONS
1.0	**Locate the digital control panel in the blue area of the front of the rotator** 1.1 Below the digital read-out there are 5 oval buttons. 1.2 Press the button above which you see the word MAIN (far left) 
2.0	**Press the button above which you see the word DOWN one time** 2.1 The words "System Alarm Test & Status" should be highlighted in blue. 2.2 Press the button above which you see the word SELECT 2.3 The words "Start High Alarm Auto Test" should now be highlighted in blue. 2.4 Press the button above which you see the word ENTER to start the High Alarm Test 2.5 The words "High Alarm Test in Progress" will appear on the screen and the temperature shown on the display will begin to increase.
3.0	**Document the temperature at which the unit alarms on the Alarm Activation – Sensor Check Worksheet** 3.1 Press Mute to silence alarm. 3.2 Press the button above which you see the word MAIN to return to the MAIN screen.
4.0	**Repeat steps 2.0, 2.1, 2.2 then** 4.1 Press the button above which you see the word DOWN to high light the words "Start Low Alarm Test" in blue. 4.2 Press the button above which you see the word ENTER to start the Low Alarm Test. 4.3 The words "Low Alarm Test in Progress" will appear on the screen and the temperature shown on the display will begin to decrease.
5.0	**Document the temperature at which the unit alarms on the Alarm Activation – Sensor Check Worksheet** 5.1 Compare documented High and Low temperatures to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document

STEPS	INSTRUCTIONS
	on Alarm Activation – Sensor Check Worksheet. 5.2 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management

E. ED, Peds ED, and L&D Refrigerators

STEPS	INSTRUCTIONS
1.0	**Press the Alarm Test icon on the digital screen** 
2.0	**Select Alarm Test function to be performed** 2.1 High Alarm Test a. Press adjacent icon 2.2 Low Alarm Test a. Press adjacent icon 
3.0	**Carefully watch the temperature display** 3.1 A comment will appear below the temperature that the Peltier Test Probe is warming (cooling) 
4.0	**Document the Temperature at which the Alarm sounds on the Alarm Activation – Sensor Check Worksheet** 4.1 Once the probe reaches the temperature of the alarm set point, the alarm will sound and the display temperature will turn red. 4.2 A message will appear that the test passed and that the test is complete.

STEPS	INSTRUCTIONS
	
5.0	**Repeat steps 2.0 – 4.0 for the alarm test not yet performed**
6.0	**Compare documented High and Low temperatures to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet**. 6.1 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management

Manual Alarm Activation Method

Chemical Risk Assessment: moderate
Biological Risk Assessment: low
Protective Equipment: lab coat, gloves
Supplies: Container or bowl, weigh boat, thermometer, towel, Alarm Activation – Sensor Check Worksheet, Charts
Reagents: Table salt, water, ice
Equipment: Refrigerators, Freezers, Platelet Incubators

A. A manual test of the alarms is done by placing the temperature probe in chilled or warm water and recording the temperature at which the high and low alarms activate. Manual checks shall be performed at least quarterly or if needed for troubleshooting or after major repairs.

B. Refrigerators (6, 7, 10, 11, 12, Sera 2, 3, 5, ED, Peds ED, L&D)

<table>
<tr><th>STEPS</th><th>INSTRUCTIONS</th></tr>
<tr><td>1.0</td><td>Prepare appropriate ice/water bath in bowl/container. (Perform all Low Activations, then proceed to High Activations)
<table>
<tr><th>Low Activation</th><th>High Activation</th></tr>
<tr><td>1.1 Place ice in bowl/container
a. Ice may be obtained from the bags saved in the refrigerators</td><td>1.1 Fill bowl/container ½ full with water.</td></tr>
<tr><td>1.2 Measure out approximately 50-55g of table salt into a weigh boat. add to ice in bowl/ container
a. Weigh boats are located in the drawer in CP labeled Weigh Boats / Helmer Supplies.
b. Table salt is located in the under counter cabinet labeled Cobe Sets.
c. Place empty weigh boat on the top loading balance in CP
d. Tare balance to 0
e. Pour salt to 50-55g</td><td>1.2 Add a small amount of ice to the water.</td></tr>
<tr><td>1.3 Add water to bowl/container until ice moves freely in bowl. Do not overfill.</td><td>1.3 Place thermometer in water bath. Temperature of bath should be ≤5.8°C.</td></tr>
<tr><td>1.4 Place thermometer in water slush bath. Temperature of bath should be ≤1.5°C.</td><td></td></tr>
</table></td></tr>
<tr><td>2.0</td><td>Insert Appropriate Chart into Chart Recorder BEFORE continuing with alarm check.
2.1 Ensure chart is functioning before continuing.
2.2 Alarms must be “visible” on the chart.
Refer to EQ Operation of Chart Recorders Procedure (NCBH)</td></tr>
</table>

STEPS	INSTRUCTIONS
3.0	**Locate the sensor bottle containing the REES probe and refrigerator thermocouple in the refrigerator to be tested.** 3.1 Remove the entire sensor bottle containing the REES probe and refrigerator thermocouple from its' holder in the refrigerator to be tested. 3.2 Place entire bottle into bowl/container with ice / water bath taking care NOT to spill contents of bottle or allow salt, water to enter bottle. Water should cover at least 50% of the bottle 3.3 Close refrigerator door to avoid changing temperature of compartment. Wait for refrigerator internal alarm to sound
3.0	**When alarm sounds, document temperature displayed on equipment digital readout on the Alarm Activation – Sensor Check Worksheet** 3.1 Compare documented temperature to Acceptable Alarm Points, determine if results are Satisfactory (S) or unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet. 3.2 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management. 3.3 Remove bottle from water bath and return to original location.
4.0	**Allow the unit to return to normal temperature range.**
5.0	**Print the REES graph report showing the temperature deviations and include with Alarm Activation –Sensor Check Worksheet.**
6.0	**Leave Chart running for a full 7 days to ensure proper functioning during downtime events.**

C. Freezers 5, 11, 12, 13, and 14

<table>
<tr><th>STEPS</th><th>INSTRUCTIONS</th></tr>
<tr><td>1.0</td><td>Prepare appropriate antifreeze/glycerol bath in bowl/container. Perform High Activations, no low activations are necessary.

<table><tr><th>High Activation</th></tr><tr><td>1.1 Fill bowl/container with antifreeze, place in freezer and allow to cool till -18°C</td></tr><tr><td>1.2 To adjust temperature add a small amount of ice or water to till the temperature is approximately -18°C.</td></tr></table></td></tr>
<tr><td>2.0</td><td>Insert Appropriate Chart into Chart Recorder BEFORE continuing with alarm check.
2.1 Ensure chart is functioning before continuing.
2.2 Alarms must be “visible” on the chart.
Refer to EQ Operation of Chart Recorders Procedure (NCBH)</td></tr>
<tr><td>3.0</td><td>Locate the sensor bottle containing the REES probe and freezer probe in the freezer to be tested.

3.1 Remove the entire sensor bottle containing the REES probe and freezer thermocouple from its’ holder in the freezer to be tested.
3.2 Place entire bottle into bowl/container antifreeze/glycerol solution taking care NOT to spill contents of bottle or allow salt, water to enter bottle. Water should cover at least 50% of the bottle
3.3 Close freezer door to avoid changing temperature of compartment. Wait for internal alarm to sound</td></tr>
<tr><td>4.0</td><td>When alarm sounds, document temperature displayed on equipment digital readout on the Alarm Activation – Sensor Check Worksheet

4.1 Compare documented temperature to Acceptable Alarm Points, determine if results are Satisfactory (S) or unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet.
4.2 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management.
4.3 Remove bottle from water bath and return to original location.</td></tr>
<tr><td>4.0</td><td>Allow the unit to return to normal temperature range.</td></tr>
<tr><td>5.0</td><td>Print the REES graph report showing the temperature deviations and include with Alarm Activation –Sensor Check Worksheet.</td></tr>
<tr><td>6.0</td><td>Leave Chart running for a full 7 days to ensure proper functioning during downtime events.</td></tr>
</table>

D. Freezers 10, 22 and 23

STEPS	INSTRUCTIONS
1.0	**Insert Chart and ensure chart is running BEOFRE proceeding with alarm activations.** 1.1 Alarms must be "visible" on the chart records. *Refer to EQ Operation of Chart Recorders Procedure (NCBH)*
2.0	**Open door of freezer.** 2.1 Open door to bottom row (22 and 23). Each door must be opened separately on Freezer 10. 2.2 There is no "LOW" alarm activation for Freezers 10, 22 and 23.
3.0	**Watch temperature of freezer. Record temperature when audible alarm on freezer sounds on the Alarm Activation – Sensor Check Worksheet.** 3.1 Some freezer doors have audible alarms. Make sure you are acknowledging the alarm for temperature and not for the open door when silencing an alarm on the unit itself 3.2 The REES alarm system, DOOR AJAR alarm for the freezer being tested may be silenced temporarily while door is open. 3.3 Compare documented temperature to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet. 3.4 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management
4.0	**Print the REES graph report showing the temperature deviations and include with Alarm Activation –Sensor Check Worksheet.**
5.0	**Leave Chart running for a full 7 days to ensure proper functioning during downtime events.** 5.1 After a week, take chart out and turn into management with Alarm Activation – Sensor Check Worksheet and graphs.

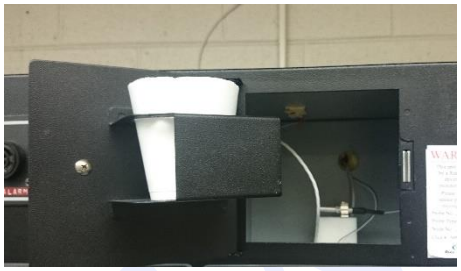
E. Platelet Rotator #1 Alarm Activation

<table>
<tr><th>STEPS</th><th>INSTRUCTIONS</th></tr>
<tr><td>1.0</td><td>Prepare a small container/cup of water.

1.1 Locate cup in the small door in the upper black panel of the front of Platelet Rotator #1

DOOR

 
OPEN DOOR / CUP</td></tr>
<tr><td>2.0</td><td>Prepare the cup with water for LOW or HIGH alarm activation as indicated below. Perform the LOW activation 1st.

<table>
<tr><th>Low Activation</th><th>High Activation</th></tr>
<tr><td>2.1 Fill small cup with cold water. Place thermometer in water.</td><td>2.1 Fill small cup with water. Place thermometer in water.</td></tr>
<tr><td>2.2 Adjust water temperature by adding small amounts of ice or warm water to cup until temperature on thermometer reads between 15-20°C.</td><td>2.2 Adjust water temperature by adding small amounts of ice or warm water to cup until temperature on thermometer reads between 24-27°C.</td></tr>
</table>
</td></tr>
<tr><td>3.0</td><td>Insert and start Chart BEFORE proceeding with Alarm Activation

3.1Alarms must be “visible” on the chart records.
Refer to EQ Operation of Chart Recorders Procedure (NCBH)</td></tr>
<tr><td>3.0</td><td>Locate the internal probe to be used for the alarm activation

3.1 With the door in the upper black panel on the front of the rotator still open, locate small metal probe attached to a white cord which is attached to the inside of the rotator.
3.2 Gently remove the probe and pull up through the opening in the upper black panel.</td></tr>
<tr><td>4.0</td><td>Place the probe in the cup of water.

4.1 DO NOT drop the probe completely in the water</td></tr>
<tr><td>5.0</td><td>CAREFULLY watch for temperature changes. Changes will happen very quickly.

5.1 Watch for the #2 indicator lamp to illuminate.
5.2 Make note of the temperature immediately after the #2 indicator illuminates. This is the Low activation temperature.</td></tr>
</table>

STEPS	INSTRUCTIONS
	5.3 Document noted LOW and HIGH activation temperatures on the Alarm Activation – Sensor Check Worksheet 5.4 Remove probe from water 5.5 Repeat steps 2.0-5.4 for the HIGH Activation 5.6 Compare documented temperature to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet. 5.7 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management
6.0	**Print the REES graph report showing the temperature deviations and include with Alarm Activation –Sensor Check Worksheet.**
7.0	**Leave Chart running for a full 7 days to ensure proper functioning during downtime events.** 7.1 After a week, take chart out and turn into management with Alarm Activation – Sensor Check Worksheet and graphs.

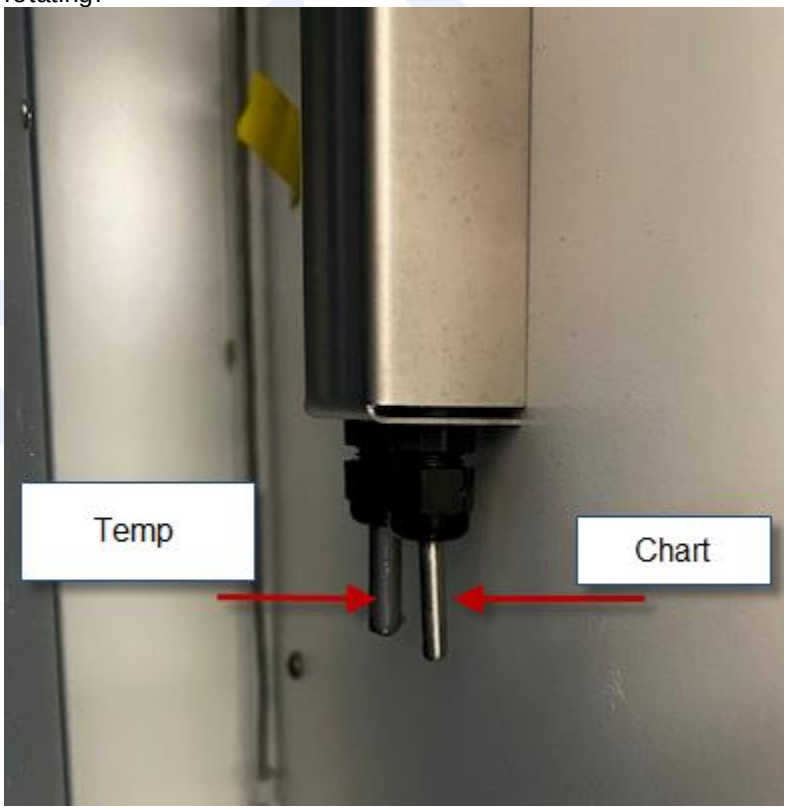
F. Platelet Rotator #2

<table>
<tr><th>STEPS</th><th>INSTRUCTIONS</th></tr>
<tr><td>1.0</td><td>Prepare two separate containers of water. One should be 15-20°C and the other 24-27°C.

1.1 Adjust water temperature by adding small amounts of ice or warm water to cup until temperature on thermometer reads between 15-20°C and 24-27°C.</td></tr>
<tr><td>2.0</td><td>Insert and start Chart BEFORE proceeding with Alarm Activation

3.1 Alarms must be “visible” on the chart records.
Refer to EQ Operation of Chart Recorders Procedure (NCBH)</td></tr>
<tr><td>3.0</td><td>Prepare two tubes with water for LOW or HIGH alarm activation as indicated below. Perform the LOW activation 1st.

<table>
<tr><th>Low Activation</th><th>High Activation</th></tr>
<tr><td>3.1 Fill two tubes with cold water from the 15-20°C Container. Place both probes in water (see 4.0)</td><td>3.1 Fill two tubes with water from the 24-27°C Container. Place both probes in water (see 4.0)</td></tr>
</table>
</td></tr>
<tr><td>4.0</td><td>Locate the internal probes to be used for the alarm activation and place both probes in water.

4.1 Open the platelet rotator doors and wait for rotator to stop before reaching for probes. If necessary gently move the shelves to the left hand side as it stops rotating.
 
</td></tr>
</table>

STEPS	INSTRUCTIONS
	4.2 Place both probes in the tubes. (one probe controls the temperature and the other controls the chart) 
6.0	**CAREFULLY watch for temperature changes. Changes could happen very quickly.** 6.2 Make note of the temperature immediately after the alarm sounds. 6.3 Document noted LOW and HIGH activation temperatures on the Alarm Activation – Sensor Check Worksheet 6.4 Remove probe from water 6.5 Repeat steps 2.0-5.4 for the HIGH Activation 6.6 Compare documented temperature to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet. 6.7 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management
7.0	**Leave Chart running for a full 7 days to ensure proper functioning during downtime events.** 7.1 After a week, take chart out and turn into management with Alarm Activation – Sensor Check Worksheet and graphs.

G. Biofridges Alarm Activation

STEPS	INSTRUCTIONS
1.0	**Check the low temperature alarm activation.** 1.1 Fill the unit with frozen panels. 1.2 Monitor unit. 1.3 Record temperature when unit alarms.
2.0	**Check the high temperature alarm activation.** 2.1 Place a container inside the BioFridge. 2.2 Fill the container with HOT water. 2.3 Record the temperature when the unit alarms.
3.0	**Compare documented High and Low temperatures to Acceptable Limits, determine if results are Satisfactory (S) or Unsatisfactory (U), document on Alarm Activation – Sensor Check Worksheet.** 3.1 Corrective action must be taken for any results that fall outside of acceptable limits. If unable to resolve, notify management.

Conformance to Accreditation:

All refrigerator and freezer probes are tested annually by Clinical Equipment against a standardized, calibrated thermometer.
REES system is tested annually against standardized, calibrated thermometer and has an additional separate fire and ice test done on all probes annually.

VI. CROSS REFERENCES

Alarm Activation – Sensor Check Worksheet Form (NCBH)

VII. RESOURCES AND REFERENCES

Technical Manual, revised periodically. Bethesda, MD: American Association of Blood banks 2005.
Helmer Service Manuals, Helmer Labs, Inc. Noblesville, IN.
Thermo Fisher Scientific, Inc. Service Manuals, Asheville, NC

VIII. ATTACHMENTS

Not Applicable