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REFRIGERATOR QC & PM – HELMER i-SERIES

☒ St. Joseph Medical Center Tacoma, WA	☐ St. Clare Hospital Lakewood, WA	☐ St. Elizabeth Hospital Enumclaw, WA
☒ St. Francis Hospital Federal Way, WA	☒ St. Anthony Hospital Gig Harbor, WA	☐ Highline Medical Center Burien, WA ☐ PSC

PURPOSE

To define the necessary steps for performing preventive maintenance and quality control on the Helmer i-Series refrigerators located at SJMC, SFH, and SAH. The Helmer refrigerators used at SAH and SFH are used to store blood components and are set to 1-6°C. At SJMC, one Helmer refrigerator is used to store blood components and is set to 1-6C. The other, a solid door refrigerator, is used to store reagents and RhIG and is set to 2-8°C.

RELATED DOCUMENTS

M-F-TS-1070   Refrigerator QC & PM Log – Helmer i-Series

PREVENTIVE MAINTENANCE TASKS

Use the Refrigerator QC & PM Log listed above to record all preventive maintenance actions and results.

Task	Frequency		
	Quarterly	**Annually**	**As needed**
• Test the various alarms	X		
• Check the temperature calibration on the monitor and change it if necessary	X		
• Check the backup battery for the chart recorder and change it if necessary	X		
• Clean the condenser grill	X		
• Examine the probe bottles and clean or replace them if necessary		X	
• Check for active battery alarms. If an alarm is present, replace the backup batteries for the monitoring system. If the batteries have been in use for one year, replace them			X
• Check the level of the solution in the probe bottles. Refill or replace solution if necessary			X
• Check the light bulbs and replace them if necessary			X
• Clean the exterior of the refrigerator			X
• Clean the interior of the refrigerator			X
• Clean the door gaskets			X
• Recalibrate the chart recorder			X

STEPS – QUARTERLY PREVENTIVE MAINTENANCE

Test the miscellaneous alarms

Testing these alarms requires that you turn off power to the freezer or open the freezer door, which may affect the chamber temperature. Before testing the alarms, take reasonable precautions to protect items in the freezer from extended exposure to adverse temperatures.

1. Door Open Alarm
   - Identify the current setting for the door open timer.
   - Change the setting to zero minutes.
   - Open the refrigerator door.
   - The door open alarm should activate immediately, causing the following to happen:
     - the audible alarm sounds
     - the Door Open message appears on the HOME screen
     - an event is added to the event log indicating that the door open alarm condition started
   - Close the refrigerator door.
   - The door open alarm should clear, causing the following to happen:
     - The audible alarm clears
     - The Door Open message clears from the HOME screen.
     - An event is added to the event log indicating that the door open alarm condition reset.
   - Change the setting back to the original value.

2. Power failure alarm
   - Identify the current setting for the power failure timer.
   - Change the setting to zero minutes.
   - Disconnect the refrigerator from power.
   - The power failure alarm should activate immediately, causing the following to happen:
     - The audible alarm sounds
     - The AC Power Failure message appears on the HOME screen
     - An event is added to the event log indicating that the power failure alarm condition started.
   - Connect the refrigerator to power.
   - The power failure alarm should clear, causing the following to happen:
     - The audible alarm clears
     - The AC Power Failure message clears from the HOME screen
     - An event is added to the event log indicating that the power failure alarm condition reset.
   - Change the setting back to the original value.

3. No Battery Alarm
   - From the battery holder for the monitoring system, remove a battery.
   - The No Battery alarm should activate, causing the following to happen:
     - The audible alarm sounds
     - The No Battery message appears on the HOME screen
     - An event is added to the event log indicating that the No Battery alarm was started.
   - Insert the battery into the battery holder.
   - The No Battery alarm should clear causing the following to happen:
     - The audible alarm clears
     - The No Battery message clears from the HOME screen
     - An event is added to the event log indicating that the No Battery alarm was reset.

Temperature alarm checks (Manual Method – used once a year)

1. Perform this test immediately AFTER the quarterly calibration of the display monitor has been completed

2. Choose a time when the refrigerator has not been entered recently and has a stable temperature.

3. Identify the current settings for the low alarm setpoint and high alarm setpoint.

4. Remove the upper chamber temperature probe from the probe bottle.

5. Tape the temperature probe to the thermometer, and immerse them in the glass of chilled water so that their ends are toward the bottom of the glass.
6. Activate the Low Temperature alarm by doing the following:
   - While constantly stirring the thermometer and probe in the chilled water and watching the temperature on the monitor, slowly add ice so that the temperature decrease 0.5C per minute. This is about 1 teaspoon (5 Ml) of ice every 15-25 seconds
   - Be sure to keep the end of the thermometer and probe in the lower liquid and not in the upper ice.
   - When the temperature reaches the low alarm setpoint, an alarm sounds, the temperature reading flashes, and an event is added to the log.
   - Note the temperature on the independent thermometer and record it

7. Activate the High Temperature alarm by doing the following:
   - While constantly stirring the thermometer and probe in the chilled water and watching the temperature on the monitor, slowly add warm water so that the temperature increases 0.5C per minute.
   - When the temperature reaches the high alarm setpoint, an alarm sounds, the temperature reading flashes, and an event is added to the log
   - Note the temperature on the independent thermometer and record it.

8. If the readings do not match the high and low alarm setpoints in the monitor, the monitor may require recalibration.

9. Remove the thermometer and probe from the water and remove the tape from them.

10. Place the probe in the bottle, immersing it at least 2 inches in the solution

Temperature Alarm Checks (Automatic Method – used 3 times a year)

1. For the Low Alarm Test, perform the following:
   - Identify the current setting for the low alarm setpoint.
   - From the MAIN screen, use the buttons to navigate to and select the System Alarm Test & Status option. The SYSTEM ALARM TEST & STATUS screen appears.
   - Press the UP or DOWN button until the Start Low Alarm Auto Test option is highlighted.
   - Press the ENTER button. You are returned to the HOME screen. Under the reading for the upper temperature probe, a LOW ALARM TEST IN PROGRESS message appears. When the test is complete, the LOW ALARM TEST IN PROGRESS message clears.
   - View the event log to determine the temperature at the time the low temperature alarm event started.
   - Compare this value to the alarm setpoint and record it on the manual log.
   - If the values do not match, the monitor may require recalibration

2. For the High Temperature Alarm Test do the following
   - Identify the current setting for the low alarm setpoint.
   - From the MAIN screen, use the buttons to navigate to and select the System Alarm Test & Status option. The SYSTEM ALARM TEST & STATUS screen appears
   - Press the UP or DOWN button until the Start High Alarm Auto Test option is highlighted.
   - Press the ENTER button. You are returned to the HOME screen. Under the reading for the upper temperature probe, a HIGH ALARM TEST IN PROGRESS message appears. When the test is complete, the HIGH ALARM TEST IN PROGRESS message clears.
   - View the event log to determine the temperature at the time the high temperature alarm event started.
   - Compare this value to the alarm setpoint and record it on the manual log.
   - If the values do not match, the monitor may require recalibration.

Check the temperature calibration on the monitor

To ensure that the high temperature alarm activates properly, the chamber temperature that is read by the temperature probe must be accurate. This must be immediately performed _prior_ to the quarterly alarm check.

1. Measure the temperature of the probe bottle contents.
   - Remove all probes and the cap from the bottle.
   - Tape the independent thermometer to the temperature probe, and replace them in the bottle so that their ends are immersed at least 2 inches (5 cm) in the solution.
   - Allow the chamber temperature to stabilize for approximately 10 minutes.
   - Obtain the readings from the independent thermometer and the digital display.
   - If they do not match, the offset value must be calculated.

2. Determine how to adjust the _offset value_ (this is the measured difference between the digital display and the thermometer reading).
   - Compare the reading of the thermometer (± any temperature adjustments specific to the calibration of the thermometer) to that displayed on the monitor.
   - Determine how much to increase or decrease the monitor offset value to make the monitor reading match the thermometer reading.
   - See the following table for examples. This process is non-intuitive when dealing with temperatures below zero.

Thermometer °C	Monitor °C	Problem	Offset Value	Push
4.0	3.0	Monitor reading set too low	+1.0	Up button
4.5	5.0	Monitor reading set too high	- 0.5	Down button

3. Enter and save the offset value.
   - Press and hold both the up arrow and down arrow buttons for three seconds. The MONITOR lamp flashes to indicate that you are in program mode.
   - Press and release the SEL button until only the MONITOR lamp flashes. The monitor offset parameter is selected.
   - While pressing and holding the SET button, do one of the following:
     - ► Press and release the down arrow button to decrease the offset value.
     - ► Press and release the up arrow button to increase the offset value.
   - When your changes are complete, release the SET button.
   - Press and hold both the up arrow and down arrow buttons for three seconds. The MONITOR lamp stops flashing to indicate that you have exited program mode. The new setting is saved.

4. Replace the probes in the probe bottle.
   - Remove the thermometer and probe from the bottle and remove the tape from them.
   - Screw the cap on the bottle, ensuring that it fits tightly to minimize evaporation.
   - Place the probes in the bottle, immersing them at least 2 inches (5 cm) in the solution

Check the backup battery for the chart recorder

1. The chart recorder has a visual alarm to notify you if the remaining charge on the installed battery is too low: the LED color changes from green to red (constant pattern if AC power is also being supplied). This alarm remains active until a battery with sufficient charge is installed.

2. Should the chart recorder be operating on battery power only, the LED flashes red (fast).
3. To replace the backup battery:
   - On the chart recorder, disconnect the leads to the old battery and remove the old battery from the holder.
   - Press the new 9V battery into the holder and connect the leads to the new battery. The LED color changes from constant red to constant green.

Clean the condenser grill

1. The condenser grill is the finned surface at the rear of the unit. It must be kept clean for proper operation. Not cleaning the grill regularly significantly reduces life expectancy. If exposed to excessive lint of dust, condenser grill may need to be cleaned more frequently that stated on the PM schedule

2. Disconnect power to the refrigerator to eliminate the potential of electric shock and injury from surrounding components

3. Protect items in refrigerator from extended exposure to adverse temperatures

4. Clean by using a soft brush and a vacuum cleaner.

5. Reconnect power.

ANNUAL PREVENTIVE MAINTENANCE

Examine the probe bottles

1. Check to see if bottle and solution is clean

2. If cleaning is required:
   - Remove probes from the bottle
   - Pull the bottle upward, out of the bracket
   - Clean bottle with 10% bleach solution (1 part bleach to 9 parts water)
   - Fill bottle with approximately 4 oz. (120 mL) of product simulation solution (10:1 ratio of water to glycerin)
   - Refit cap tightly and push bottle downward into the bracket
   - Place probes in bottle, immersing at least 2 inches in the solution

Biomed safety checks

1. Clinical Engineering performs this annual task involving electrical and mechanical checks, etc.

AS NEEDED PREVENTIVE MAINTENANCE

Check for active battery alarms

1. If alarms are present, replace the backup batteries for the monitoring system

2. If the batteries have been in use for one year, replace them

3. To replace the batteries:
   - Disconnect power to the refrigerator

- The battery holder is located on the top of the refrigerator behind the monitoring system.
- Remove the 6 non-rechargeable 1.5V D-cell alkaline (or equivalent) batteries and replace them with fresh ones.
- Reconnect the power to the refrigerator

Check the level of solution in the probe bottles and refill if necessary

Use 10:1 ratio of water to glycerin and add as needed.

Check the light bulbs

1. Replacing the bulbs requires the power to be disconnected. Protect items in the refrigerator from extended exposure to adverse temperatures.

2. Disconnect the power
   - Remove drawers, shelves, baskets, and slides on the right side of the chamber to provide easier access to the bulb
   - Press the short side of diffuser and unsnap it to remove from the light base
   - Turn the defective light bulb and remove from the sockets
   - Insert new light bulb into the sockets and turn to lock into place
   - Snap diffuser into the light base
   - Connect power to refrigerator and test the new bulb
   - Replace the slides drawers, shelves, and baskets

Clean the exterior of the refrigerator

1. Clean glass surfaces with a soft cotton cloth and glass cleaner.

2. Clean other exterior surfaces with a soft cotton cloth and non-abrasive liquid cleaner

Clean the interior of the refrigerator

1. Clean painted surfaces with mild detergent

Clean the door gaskets

1. Clean door gaskets with a soft cloth and mild soap and water solution
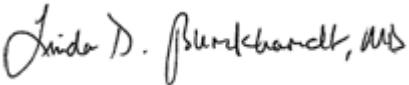
Calibrate the Chart Recorder

1. After the chamber temperature has stabilized, measure the temperature where the probe for the chart recorder is located. If the probe is inserted into liquid, measure the temperature of the liquid.
2. Change the position of the stylus arm if necessary.
   - The arrow buttons on the chart recorder indicate which direction the stylus will move.
   - Press and hold the appropriate arrow button until the stylus has moved to the desired location, then release the button to save the setting.
   - While the stylus is moving to the new location, the LED is off.
   - After the button is released, the LED lights green (constant pattern) to indicate a return to normal operating mode.

REFERENCES

AABB Technical Manual, AABB, Bethesda, Maryland, current edition

Standards for Blood Banks and Transfusion Services, AABB, Bethesda, Maryland, current edition

Helmer Refrigerator Operation Manual i.Series™ and Horizon Series™, 360078-1/G, Noblesville, IN

Helmer Refrigerator Operation Manual i.Series™ and Horizon Series™, 360078-1/K, Noblesville, IN

Helmer Refrigerator Service Manual i.Series™ and Horizon Series™, 360077-1/H, Noblesville, IN

Helmer Refrigerator Service Manual i.Series™ and Horizon Series™, 360077-1/L, Noblesville, IN

DOCUMENT APPROVAL	Purpose of Document / Reason for Change:		
To create a document that provides necessary maintenance and quality control requirements for Helmer i-series refrigerators along with instructions for performing them.			
☐ *No significant change to process in above revision. Per CAP, this revision does not require further Medical Director approval.*			
Committee Approval Date	☒ Date: 10/22/2015		
	☐ N/A – revision of department-specific document which is used at only one facility		
SAH Medical Director Approval *(Electronic Signature)*	1-13-2016	**SJMC Medical Director Approval** *(Electronic Signature*	*Katie Wilkinson, MD* 10/16/15
SFH Medical Director Approval *(Electronic Signature*	*Linda D. Burkhardt, MD* 1/13/16		