

# SPA / HOT TUB Heating Issues

## WARNING! Water Temperature Safety

### Failure to heed the following may result in permanent injury or death.

Prolonged immersion in water warmer than normal body temperature may cause a condition known as HYPERTHERMIA. The symptoms of hyperthermia include: unawareness of impending hazard, failure to perceive heat, failure to recognize the need to exit the spa, and unconsciousness. The use of alcohol, drugs, or medication can greatly increase the risk of fatal hyperthermia. In addition, persons having an adverse medical history, or pregnant women, should consult a physician before using a hot tub or spa. Children and the extreme elderly should be supervised by a responsible adult.

Here are few RULES posted by Home Owners & Condominium Associations across the country which should be followed by everyone who owns or uses a Spa or Hot Tub:

- 1. Do not use, or allow the hot tub to be used, alone.**
- 2. Persons suffering from heart disease, high blood pressure, diabetes, or other health problems should not enter the spa without prior medical consultation and permission from your doctor**
- 3. Do not permit children under the age of eighteen (18) to use the hot tub unless they are closely supervised at all times.**
- 4. Unsupervised use by children is strictly prohibited. In no case should children under the age of eight (8) be permitted in the hot tub. Never leave children unattended in the vicinity of the hot tub.**
- 5. Pregnant women and individuals under medical care (for such problems as heart disease, diabetes, high blood pressure, skin sensitivities, cardiac or circulatory problems) should consult their physician prior to using the hot tub.**
- 6. Never use the hot tub when taking anticoagulants, antihistamines, vasoconstrictors, vasodilators, stimulants, narcotics or tranquilizers. In all cases, if you are not thoroughly familiar with the medication(s) that you are taking, please consult with your physician prior to using the hot tub.**
- 7. Soaking for too long at high water temperatures can elevate body temperature and the temperature of internal organs beyond safe limits. Observe reasonable time limits to avoid nausea, dizziness and fainting. Should you experience any of these symptoms, carefully exit the hot tub immediately.**
- 8. Alcoholic beverages should not be consumed before or during hot tub use. The temperature of the water may intensify the effects of alcohol and cause drowsiness, dizziness and/or unconsciousness.**
- 9. Always use caution when entering and exiting the hot tub. Wet surfaces can be slippery.**

The following guidance is found on the Consumer Product Safety Commission website:

- 1. Before entering the hot tub, users should check the water temperature with an accurate thermometer; hot tub thermostats may err in regulating water temperatures by as much as four degrees.**
- 2. Hot tub water temperatures should never exceed 104 degrees Fahrenheit. A temperature of 100 degrees is considered safe for a healthy adult. Special caution is suggested for young children.**
- 3. Excessive drinking during hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.**
- 4. Pregnant women beware! Soaking in water above 102 degrees Fahrenheit can cause fetal damage during the first three months of pregnancy (resulting in the birth of a brain damaged or deformed child). Pregnant women should stick to the 100-degree maximum rule.**
- 5. Persons with medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician's advice before using hot tubs.**
- 6. Persons taking medications which induce drowsiness, such as tranquilizers, anti-histamines or anti-coagulants, should not use hot tub**

## Thermostat Set Point Depression

**WARNING - To avoid Thermostat Set point Depression, which could lead to an unsafe spa temperature, INSULATE THE PIPING IF AT ALL POSSIBLE TO AND FROM THE SPA AND OPERATE THE PUMP AT HIGH SPEED WHEN HEATING YOUR SPA.**

**Following all local electrical codes restricting placement in proximity to the pool or spa as well as the use of ground fault circuit breakers, bonding and other wiring requirements, locate your Heat Siphon as close as SAFELY possible to the Spa.**

In addition to all of the installation requirements found in the Heat Siphon Owners Manual for pools and pool/spa combo's, the following important issues must be addressed when installing and operating a Spa or Hot Tub.

Most Spas which are heated separately or as "stand alone" spas using a Heat Siphon or other Spa Heaters especially fossil fuel types tend to be located out of sight of the spa to prevent bathers from tampering with the thermostat as well as to keep the public away from hot surfaces and fumes.

In many cases the heater is 15 to 25 feet away and more from the Spa, and most have the pipes buried at least a foot or more under ground.

In these cases, the hot water leaving the spa to be reheated, must travel inside pipes surrounded by sand, clay or even wet soil which will be 20 to 30°F or more below the spa water. By the time the water reaches the heaters inlet it can be 5 to 10 °F colder than the spa. If this heat loss is excessive it may even prevent the heater from reaching its set point altogether.

Virtually all pool and spa heaters' thermostat sensors are located at the inlet port of the heater. It is under control of the manufacturer and is the safest secure place to measure the water temperature to determine if the water is still below the set point of the heater's thermostat. If it is the heater continues to run.

The heaters outlet temperature or degree rise above the inlet temperature, depends on the heater's BTUH output and the flow rate of the water going through it. The outlet water may be 5 to 10°F or more above the inlet temperature and well above the heat loss it will undergo as it returns to the spa.

So even though the heater inlet temperature is below the actual spa temperature, the water temperature returning to the spa can still be above the spa bulk water temperature.

Thus, all heaters will "overheat the water" by the same number of °F the water has lost (say X degrees) getting to them, because they will keep heating until they reach the heater's set point.

As shown in the table, an 80,000 BTUH size heater with 15 GPM going thru it, will have a throughput degree rise of 10.7°F (outlet minus inlet temperature).

PUMP FLOW RATE GPM	DEGREE RISE Inlet to Outlet			
	Z200HP 50,000 BTUH	Z375HP 80,000 BTUH	Z575HP 110,000 BTUH	Z700HP 140,000 BTUH
5	20.0	32.0	44.0	56.0
10	10.0	16.0	22.0	28.0
15	6.7	10.7	14.7	18.7
20	5.0	8.0	11.0	14.0
25	4.0	6.4	8.8	11.2
30	3.3	5.3	7.3	9.3
35	2.9	4.6	6.3	8.0
40	2.5	4.0	5.5	7.0
45	2.2	3.6	4.9	6.2
50	2.0	3.2	4.4	5.6
55	1.8	2.9	4.0	5.1
60	1.7	2.7	3.7	4.7
65	1.5	2.5	3.4	4.3
70	1.4	2.3	3.1	4.0
75	1.3	2.1	2.9	3.7
80	1.2	2.0	2.7	3.5

If, for example, this heater's thermostat is set to 104°F and the water in the spa is 104°F and it loses 4°F in the piping to the heater, it will be 100°F at the heater inlet and the heater will continue heating the water. The outlet temperature will be 100°F plus 10.7° rise = 110.7°F and if it loses 4°F returning to the spa it will be 106.7°F when it returns, mixing and raising the spa temperature even further.

The heater will continue to heat the water until the inlet temperature is 104°F and the return water just before it shuts off will be 104°F plus 10.7°F rise minus 4 degree return loss = 110.7°F and the spa will reach 108°F or 4 degrees above the thermostat set point when it shuts off.

So you can see where the statement made by the Consumer Product Safety Commission that "HOT TUB THERMOSTATS MAY ERR IN REGULATING WATER TEMPERATURES BY AS MUCH AS FOUR DEGREES" - is a case of Thermostat Set Point Depression caused by excessive heat loss from long piping runs plus excessive heater degree rise caused by low flow.

If the flow rate is tripled to 45 GPM then the degree rise is cut by 66% to 3.6°F (see table) and the heat loss will be cut to 1.3°F in the piping because every gallon will spend 1/3 of the

time exposed to the cold ground. The net result is

- Inlet temp = spa temp -1.3°F
- Return temp = Inlet temp + 3.6°F rise -1.3°F loss =inlet temp+2.3°F
- At a 104°F set point the spa temp will be 105.3°F

## Spa Temperature Sensor Calibration

As of Player software revision 1.253 (heating only models) and 1.309 (Heat/Cool models) Heat Siphon's DIGITAL Zseries Player Controller provides a way to calibrate the spa temperature sensor by increasing the inlet temperature reading to match the actual spa temperature. The temperature may be increased from 1 to 5°F in 1°F steps. This will not eliminate the differential due to ground loss which only insulating the supply and return lines can mitigate. High flow rates reduce ground loss and mix the spa return water better raising the bulk average spa water temperature which in turn raises the heater inlet temp.

Call us or ask your installing dealer to perform this calibration HOWEVER MAKE SURE YOU ALWAYS RUN THE PUMP ON THE SAME RPM/FLOW RATE WHEN HEATING AS YOU USED DURING CALIBRATION. ALWAYS RUN ON HIGHEST PUMP SPEED WHEN HEATING.

## Set-points Above 102°F

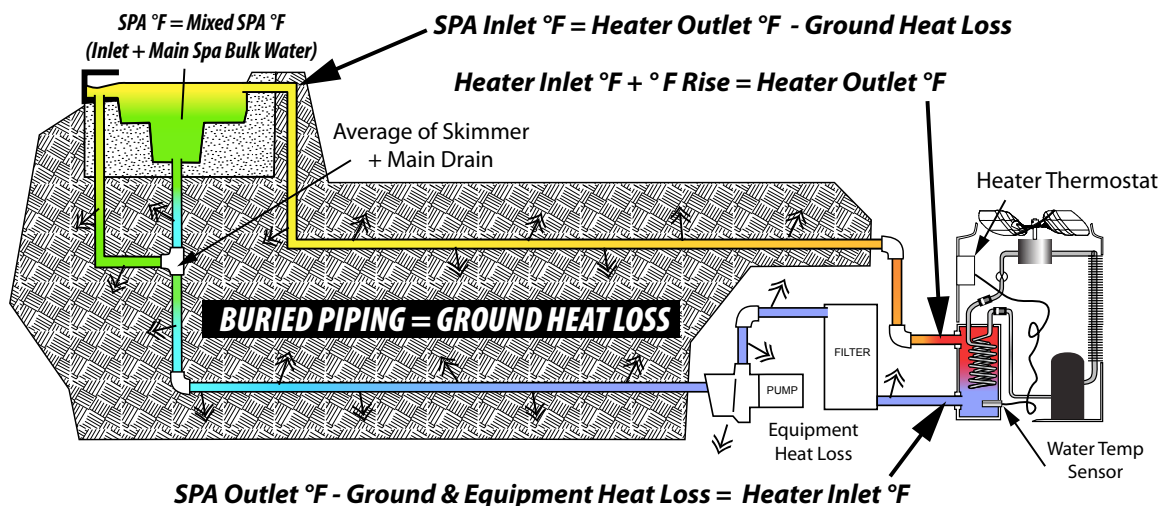
The Consumer Product Safety Commission (CPSC) states that a Spa temperature of 100°F is considered safe for a healthy adult. Pregnant women should avoid soaking in water above 102°F as it can cause fetal damage and should stick to the 100°F maximum rule. Spa owners should take special precautions with children and the elderly.

Based on CPSC Guidelines it appears unnecessary or at least unwise to heat above 102°F, and even though the UL standard for spa heaters allows a maximum thermostat set point of 104°F, Heat Siphon has chosen to set the default maximum spa set point temperature of 102°F.

If you still feel it is necessary to have a higher set point than Heat Siphon's maximum default 102°F, then your dealer can increase it in 1°F steps to 104°F, HOWEVER, YOU MUST ASSUME TOTAL RESPONSIBILITY FOR OPERATING THE SPA AT THESE TEMPERATURES.

You must sign and return the attached hold harmless agreement also found on our website before we will authorize the dealer to perform this change.

## Spa/Hot Tub Thermostat Setpoint Depression



**SPA TEMPERATURE will ALWAYS be HIGHER than the HEATER SETPOINT because of Ground Heat Loss & Equipment Heat Loss**

# **Request to Modify My Heat Siphon's MAXIMUM ALLOWABLE SPA Set-point Temperature from the 102°F factory default to a maximum of 104°F**

Having read the preceding 2 page SPA WARNING DOCUMENT provided to me either with my unit packaging or separately and understand it, which includes the following warning I am requesting my dealer to obtain the code to modify the maximum setpoint of my Heat Siphon from 102°F to 104°F and I waive all rights to sue and hold harmless the manufacturer and or the dealer :

## **WARNING**

The Consumer Product Safety Commission (CPSC) states that a Spa temperature of 100°F is considered safe for a healthy adult. Pregnant women should avoid soaking in water above 102°F as it can cause fetal damage and should stick to the 100°F maximum rule. Spa owners should take special precautions with children and the elderly.

Based on CPSC Guidelines it appears unnecessary or at least unwise to heat above 102°F, and even though the UL standard for spa heaters allows a maximum thermostat set point of 104°F, Heat Siphon has chosen to set the default maximum spa set point temperature of 102°F.

If you still feel it is necessary to have a higher set point than Heat Siphon's maximum default 102°F, then your dealer can increase it in 1°F steps to 104°F, HOWEVER, YOU MUST ASSUME TOTAL RESPONSIBILITY FOR OPERATING THE SPA AT THESE TEMPERATURES.

### **Customer/ Owner of the Subject Heat Siphon:**

First NAME: \_\_\_\_\_ Middle NAME: \_\_\_\_\_ Last NAME: \_\_\_\_\_ DATE OF BIRTH: \_\_\_\_\_

ADDRESS: \_\_\_\_\_ PHONE: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP CODE: \_\_\_\_\_

**I, the customer and owner of the Heat Siphon, do hereby waive and release any and all claims whether in contract or of personal injury, bodily injury, property damage, damages, losses and/or death that may arise from my aforementioned use of my Heat Siphon with the maximum setpoint of 104°F, as I understand and recognize that there are certain risks, dangers and perils connected with such use as explained by the 2 page SPA WARNING DOCUMENT, which I hereby acknowledge to have read and which I fully understand, and which I nevertheless accept, assume and undertake after inquiry and investigation of extent, duration, and completeness wholly satisfactory and acceptable to me.**

**I further agree to use my best judgment in undertaking all activities, use and/or receipt and to faithfully adhere to all safety instructions and recommendations, whether oral or written from my Dealer and/or the Manufacturer.**

**I hereby certify that I am a competent adult assuming these risks of my own free will, being under no compulsion or duress.**

**This Waiver and Assumption of Risk is effective from this date forward and may not be revoked, altered, amended, rescinded or voided.**

Date \_\_\_\_\_ Customer's Signature \_\_\_\_\_

Dealer who will perform Modification: \_\_\_\_\_ Phone Number \_\_\_\_\_

Complete, sign, date and return to United States ThermoAmp Inc., 1223 Heat Siphon Lane, Latrobe, Pa 15650