Servicing a Frozen Internal Heater in a Ninja/E600

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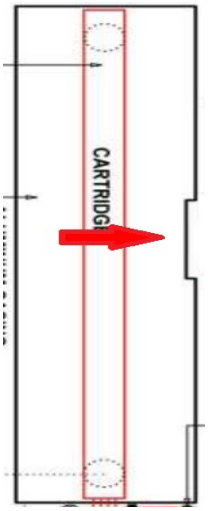
Below is a review on how to test them quickly and where to look first when they are not working.

How does a heatermate get damaged?

The most obvious answer to this question is that it has been frozen. When a heatermate gets frozen, this causes the water to expand, and most times crack the housing/casing. In the image on a heater schematic below, you will see a notch in the casing.



This notch is milled out of the casing to hold the thermostat flush to the housing/casing. When the heatermate freezes, most times, this will be the location of the damage.

Freezing is not the only cause of issues with the internal heatermate. Water leaks internally from hoses or cracked brass can spray water onto the heatermate causing a short. The heatermate is covered in a foam casing for insulation to prevent the heat from the heatermate from escaping which allows for better transfer of heat to the water. This foam tends to trap and hold water if it gets wet. Once the water travels into the foam to the thermostat area, it can cause a short, and short out the thermostat. Once the thermostat has been shorted there is no repair other than to replace it.

What are other areas of concern when diagnosing a heatermate issue?

The thermo cutout that is located on the end of the heatermate contains a fuse that can possibly be reset if it gets wet and pops. Sometimes this can be reset by simply pressing its button at the center. The thermo cutoff acts as a safety guard for the thermostat in case of a thermostat malfunction. Once the water reaches the maximum 200F temperature of the thermostat, it will turn off the heatermate and wait for the water temperature to fall back below maximum before starting again to heat the water. If this feature malfunctions, the thermo cutoff has a temperature shutoff of 302F degrees that will pop the circuit breaker in the center the thermo cutout to prevent the heatermate from continuously building

heat and pressure. A popped fuse may indicate that the thermostat is not functioning correctly and may need to be further investigated outside of a short due to water. A replacement of the thermostat MAY need to be considered if the center fuse has been popped especially if you have connectivity through the thermostat to the thermo cutoff.

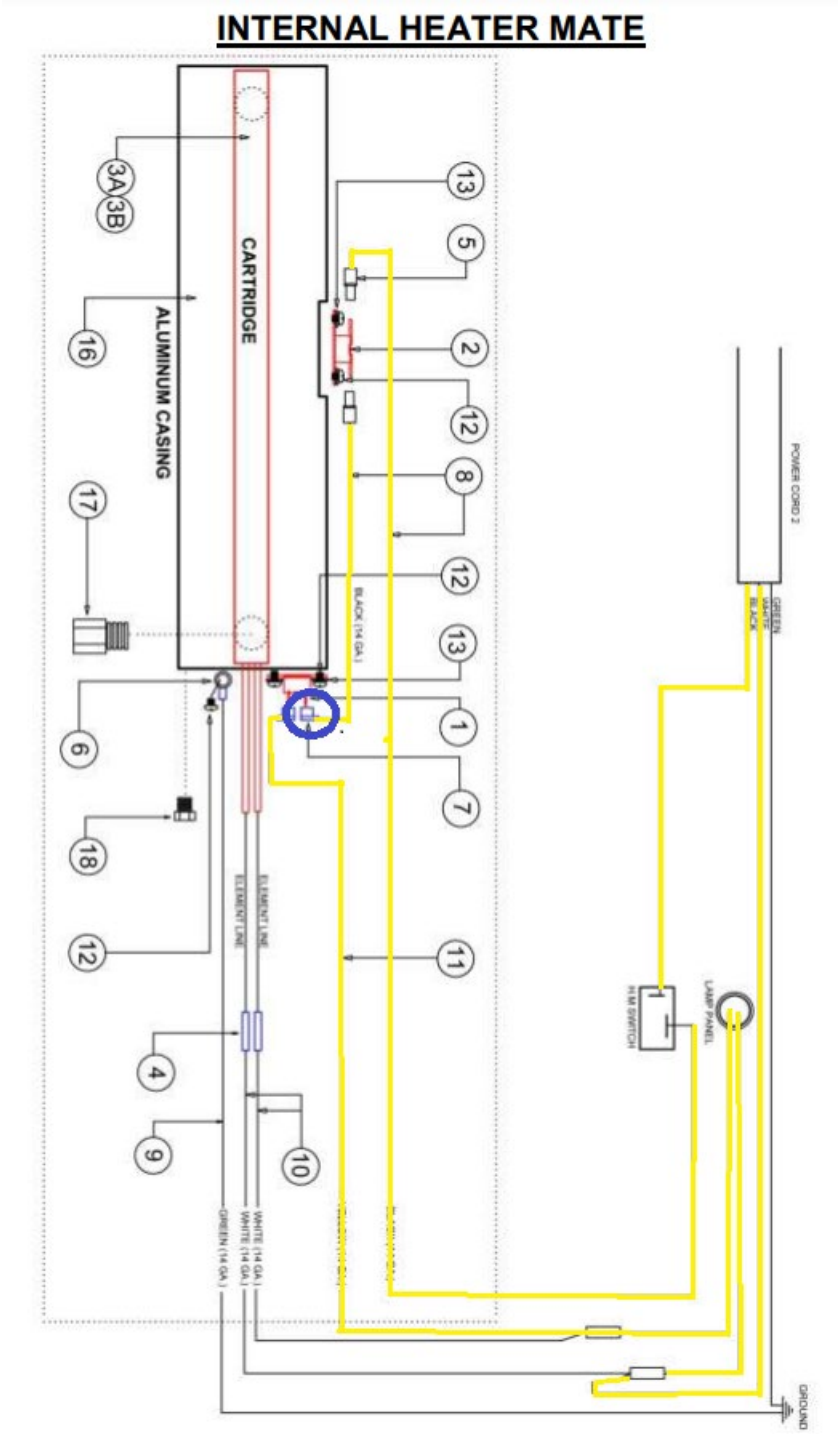
The least likely issue with a heatermate not working would be the element and heater light. These two components have very few issues and probably result in less than 1% of heatermate issues. Testing is required on both to rule out these components, but you will probably find that most of the time that they are usually problem free and not related to any issues.

The toggle switch can also be an issue when it has been damaged due to bumps, rough use, age, etc.

How do I test to see if I have to remove the heatermate to check the thermostat for damage?

Removing a heatermate from a unit is a time-consuming task. Testing the thermostat before removing the entire heatermate would be the first thing to look at. Like everything in portables and AC power machine, components need a complete circuit to work (a hot line, a neutral line and a ground connection). The heatermate is no different. The thermostat and thermo cutout work on the same circuit making it easy to test the thermostat without removing the heatermate from the unit. (see picture below, follow the yellow lines for the complete circuit)

Testing the toggle switch and heater light for connectivity is the first step to make sure that the circuit is complete. Make sure that there is power from the power cord making its way to the switch as well. Check the ground for the heatermate to make sure that all is solid and secured. If all is good up to this point, to determine if the thermostat is functioning or not, you are going to want to check for connectivity on the right post of the **thermo cutout** (See picture below. Refer to blue circle). If you have no connectivity at this point, you know that either the thermostat is damaged or a wire has come disconnected. Either way, the heatermate will need to be removed from the unit and checked.



IF you have connectivity at this point, check the left side of the post on the thermo cutout for connectivity. If there is none, reset the thermo cutout and start the unit and heater. Watch the heater light for the heatermate on the outside of the unit. This should take around 80 seconds for the light to turn off (For the water to heat up to maximum from cold). If it takes longer than 80 seconds for the light to turn off, a malfunctioning thermostat maybe the cause of a popped thermo cutout and both thermostat and thermo cutout should be replaced.
It's good to note that thermostats and thermo cutouts rarely ever break without a cause.

If the thermostat and thermo cutout are both working correctly, the heating element may be the cause of the issue. Testing for connectivity through the element at the blue butt connectors (#4 on the picture above) will tell you if there is a break in the element.

How do I know if the thermostat has been damaged due to freezing or other causes?

If it is indeed the thermostat that is damaged, the heatermate will need to be removed.
Once the heatermate is out, remove the foam around the casing near the thermostat. Be careful doing this with a knife as not to damage any of the wiring around in the area. The thermostat is attached to the housing/casing with (2) small screws. Remove the attached wires to the thermostat and then remove the (2) screws to release the thermostat from the heatermate.

Sometimes damage due to freezing is very visible to both the thermostat and casing/housing. Water around the area of the thermostat in the foam is a good indication of a leak from somewhere. To know if it is from the thermostat notch in the casing, run your finger along the flat surface of the notch and feel for any bulge or bumps and look for any variation in texture and color on the surface. This surface should be smooth and flat. Any slight variance in the surface of this spot indicated that the unit has been frozen and has formed cracks or micro fractures allowing water to leak thought under pressure shorting out the thermostat. Replacing the thermostat at this point will not fix the unit. As soon as pressure and water build up internally again, it will leak and short out a new thermostat. A new heatermate is required to fix the issue.

Note: It is possible to replace the casing /housing of the heatermate. However, the time, effort and cost make it an unreasonable solution. Replacing the complete heatermate is a more cost-effective way of repairing a damaged heatermate that has been cracked and frozen.

But the surface of the heatermate is OK, what now?

If you do not find any issues in this area, but the thermostat has been shorted out, look elsewhere for the water source that caused the short (broken brass connection to the heatermate, leaking freshwater tank, leaking hoses around the heatermate, split/cracked brass fittings). Keep in mind that if you replace the thermostat at this point and the foam surrounding it is still wet, you WILL short out a new thermostat. Be sure that when you put a new one back on that the surface, and foam is dry to the touch.

Garden hose pressure coming from the freshwater tank thought the system may help in finding where these leaks are coming from and help narrow down parts that need to be fix and addressed.

Everything is fine with the heatermate but I still have no water flow

Internal and external heatermates require a machine with a minimum of 100 PSI pump to operate correctly. At the off chance you encounter a unit that is having issues with water flow when the heatermate heats up, looking at the pump for the issue would be a good step. Rare as this occasion would be, it’s never a bad idea to check into and rule out the pump before taking a heatermate out of a unit.