Use Case S4: Detailed Description
Use Case Name: Calculate Heat Index
Scenario: N/A
Brief Description: With the system running, the system will calculate the Heat Index given the humidity and temperature data.
Actors: System
Related Use Cases: Use Case S1: *The System shall Monitor the Temperature Data*
Use Case S2: *The System shall Monitor the Humidity Data*
Stakeholders: National and local weather bureaus, user
Preconditions: The system is running, the measurement rate is set, the network is up and running, the temperature and humidity data have been measured.
Postconditions: The Heat Index is calculated

Flow of Events

System	One Wire Sensors
1. Use the latest temperature data	
2. Use the latest humidity data	
3. Apply the appropriate heat index calculation based on the data presented	

Exception Conditions:

1. If the temperature sensor returns an error (-999.9), then the system shall return a default heat index (-999.9)
2. If the humidity sensor returns an error (-99.9), the system shall return a default heat index (-999.9)
3. If the ambient temperature (dry bulb temperature) is less than or equal to 70 degrees F, then the system shall return a default heat index (-999.9). This is due to the fact the heat index cannot be accurately calculated with a temperature under or equal to 70 degrees F.

If the networks stop working, then either or both the humidity and temperature sensors will drop out and the system shall return a default heat index (-999.9).

The formula used for heat index calculation is:
Here is the 16 element equation used to convert dry bulb temperature (T) and relative humidity (RH) into the Heat Index. This equation works at dry bulb temperatures of 70°F and higher. It is configured as I use it in Excel: The symbol "^" means "raised to the power of".

=16.923+((1.85212*10^-1)*T)+(5.37941*RH)-((1.00254*10^-1)*T*RH)
+((9.41695*10^-3)*T^2)+((7.28898*10^-3)*RH^2)+((3.45372*10^-4)*T^2*RH)
-((8.14971*10^-4)*T*RH^2)+((1.02102*10^-5)*T^2*RH^2)-((3.8646*10^-5)*T^3)
+((2.91583*10^-5)*RH^3)+((1.42721*10^-6)*T^3*RH)
+((1.97483*10^-7)*T*RH^3)-((2.18429*10^-8)*T^3*RH^2)
+((8.43296*10^-10)*T^2*RH^3)-((4.81975*10^-11)*T^3*RH^3)

From the website: http://www.zunis.org/16element_heat_index_equation.htm