How a Keurig Coffee Maker Works

The Keurig B60 coffee maker is one of several machines, which will brew a cup of coffee using the single serve “K-Cup”. The basic operation of the machine is that it stores water on a side tank, pumps it into a water heater and then uses an air pump to force the hot water through the “K-Cup” and into your coffee cup. This all sounds simple but, of course, it isn’t.

Keurig Mechanical Schematic
1. Unit not plugged into AC power source:
   a. The Fwd and Aft Pneumatic Solenoid Valves are normally closed.

2. Unit plugged into AC power source:
   a. A 12 Vdc signal is applied to both the Fwd and Aft Pneumatic Solenoid Valves causing them to open. An audible “click” can be heard from the unit when it is plugged in.

3. Unit powered on by Power Switch:
   a. The blue LCD Control Center will come on and indicate, “NOT READY”.
   b. The 12 Vdc signal is removed from the Fwd Pneumatic Solenoid Valve causing it to close.
   c. A 12 Vdc signal will be applied to the Water Pump causing it to turn on.
   d. The water pressure will open the Spring-loaded Check Valve, and water will flow in through the bottom of the Water Heater.
   e. The air displaced from the Water Heater will flow out the hose in its top, through the open Aft Pneumatic Solenoid Valve, and will exhaust out the Overflow Tube into the Water Reservoir.
   f. The water level will rise to the height of the probe related to the lowest cup setting (i.e. blue wire probe for the small cup), and then the Water Pump will be turned off.
   g. The 12 Vdc signal is then reapplied to the Fwd Pneumatic Solenoid Valve causing it to open.
   h. The Water Heater will then heat the water. Once the water temperature reaches 192 degrees Fahrenheit, the LCD Control Center will indicate “READY TO BREW”. The Water Heater will maintain a steady water temperature. Small drips of water may be observed from the Overflow Tube back into the Water Reservoir as the water expands with the applied heat.

4. Brewing a cup of coffee:
   a. After placing a cup on the drip tray, raising the Handle, inserting a K-cup and then lowering the Handle, the switch inside of the handle mechanism tells the LCD Control Center that a K-cup has been placed inside.
   b. The LCD Control Center will indicate “READY TO BREW” and the BREW Button will flash.
   c. After using the buttons to select the desired cup size and hitting the BREW Button, the 12 Vdc signal will be removed from the Fwd Pneumatic Solenoid Valve causing it to close.
   d. A 12 Vdc signal will be applied to the Water Pump causing it to turn on.
   e. The water pressure will open the Spring-loaded Check Valve, and water will flow in through the bottom of the Water Heater.
   f. The level of the water will rise up to the height of the probe related to the selected cup size (not applicable to the small cup starting water height), and then the Water Pump will be turned off.
g. The air displaced from the Water Heater will flow out the hose in its top, through the open Aft Pneumatic Solenoid Valve, and will exhaust out the Overflow Tube into the Water Reservoir.

h. The Spring-loaded Check Valve should prevent water from flowing back in through the base of the Water Reservoir.

i. The 12 Vdc signal will be removed from both the Fwd and Aft Pneumatic Solenoid Valves causing them to close.

j. A 12 Vdc signal will be applied to the Air Pump causing it to turn on and force air in through the top of the Water Heater.

k. The LCD Control Center will indicate, “BREWING”.

l. Heated water should be forced out to the K-cup until the height of the water in the Water Heater drops below the height of the outlet hose.

m. After a few seconds of air bursting to purge all liquid from the K-cup, the air pressure sensor determines that the cup has been filled to the desired height and the Air Pump will be turned off.

5. Filling for the next cup of coffee:
   a. The 12 Vdc signal will be applied to the Aft Pneumatic Solenoid Valve causing it to open.
   b. A 12 Vdc signal will be applied to the Water Pump causing it to turn on.
   c. The water pressure will open the Spring-loaded Check Valve, and water will flow in through the bottom of the Water Heater.
   d. The air displaced from the Water Heater will flow out the hose in its top, through the open Aft Pneumatic Solenoid Valve, and will exhaust out the Overflow Tube into the Water Reservoir.
   e. The water level will rise to the height of the probe related to the lowest cup setting, and then the Water Pump will be turned off.
   f. The 12 Vdc signal is then reapplied to the Fwd Pneumatic Solenoid Valve causing it to open.
   g. The Water Heater will then heat the water. Once the water temperature reaches 192 degrees Fahrenheit, the LCD Control Center will indicate “READY TO BREW”.
   h. The Water Heater will maintain a steady water temperature.
   i. Small drips of water may be observed from the Overflow Tube back into the Water Reservoir as the water expands with the applied heat.

6. Unit powered off by rear-bottom Power Switch:
   a. The blue LCD Control Center will turn off.
   b. Separate 12 Vdc signals will still be applied to the Fwd and Aft Pneumatic Solenoid Valves causing them to stay open.

7. Unit un-plugged from AC power source:
   a. The 12 Vdc signal will be removed from the Fwd and Aft Pneumatic Solenoid Valves causing them to close.