

# CONTINUOUS CONTROL

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The best way to describe a control system is to use a block diagram.

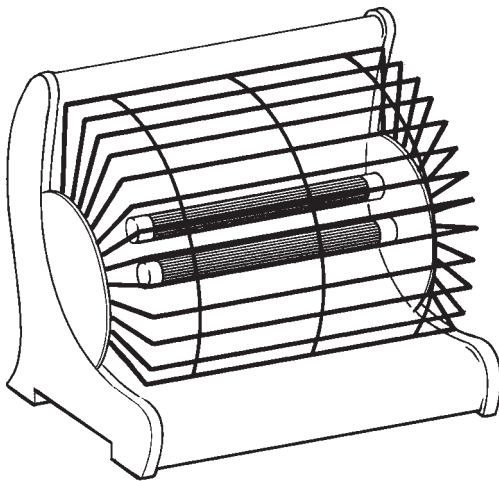
All control systems have, at least, three parts to them;

An **INPUT** that takes information into the control system,

A **PROCESS** that uses the input information to create the output information,

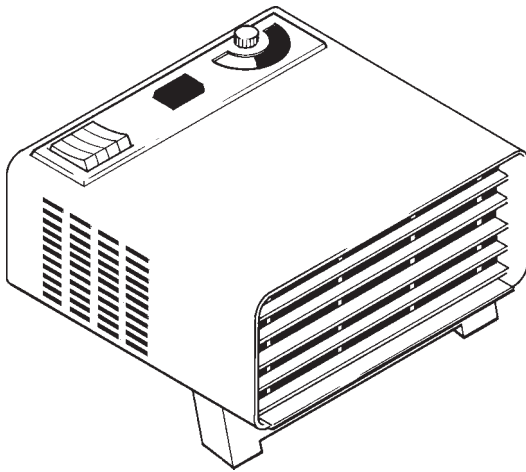
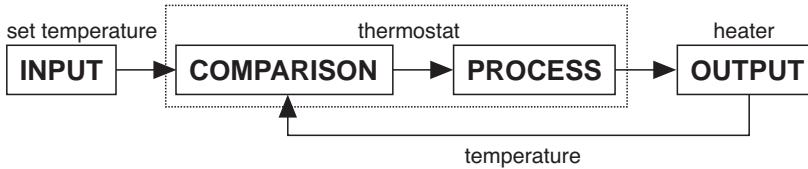
An **OUTPUT** that passes information out of the control system.

These three parts are shown as a complete, but very simple, control system in the block diagram for an electric fire;



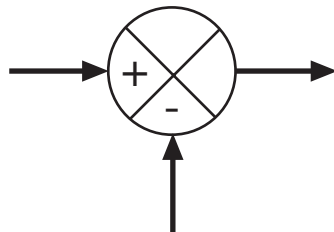
This shows an **Open Loop** control system. In this system the information from the output is not sent back to the input; however hot the room gets, the heater keeps producing heat - until someone switches it off.

If the heater had a thermostat in, it would switch off by itself when the room reached a set temperature (the 'input' to the system). In this case information from the output of the system (heat) has been fed back to the input, as shown in the block diagram below.



The control system is now a **Closed Loop** system. Information from the output goes back to the input in a **Feedback** loop.

The **comparison block** of the system is normally represented by the special symbol:



This shows the place of the heater thermostat in the control system. It compares the set temperature with the actual temperature. A difference between these two temperatures is an **error**. When the control system detects an error it tries to make it smaller by changing the output.

This system now has all the basic elements of any control system:

- A **demand** - this is the set temperature shown above.
- A **sensor** to measure the output - a temperature sensor. This is part of the thermostat
- A **controller** - the thermostat
- An **actuator** - the heater

**Remember:**

- A **sensor** is a device that converts a *physical* signal (such as heat, light, sound or movement) into an *electrical* signal.
- An **actuator** is a device that converts an *electrical* signal into a *physical* signal (such as heat, light, sound or movement).
- Actuators and sensors are both **transducers** - devices that change one kind of signal into a different kind of signal.