

Operation of a Closed-Loop Control System

Most people may not think about control systems in their day to day activities. Control systems are used millions of times a day. Control systems are found in cars, home electronics, power plants, and cities worldwide. The most common type of control system is a closed loop system. The closed loop system consists of five essential processes. The processes are carried out in each basic part of a control system and they are: input transducer, summing junction, controller, plant or process, and the output transducer.

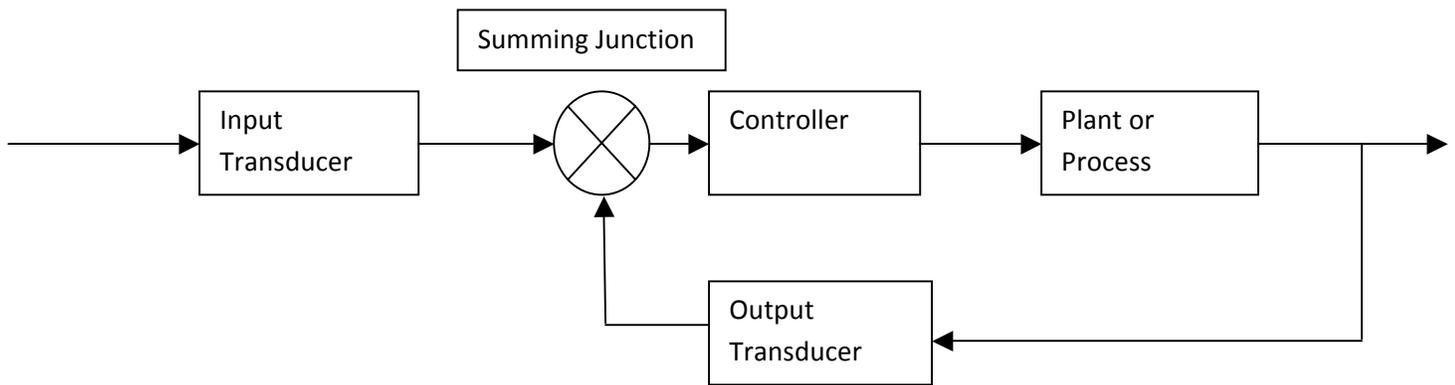


Figure 1: Diagram of a Closed-loop Control System
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Input Transducer

The input transducer is the start to the control system. It takes the input signal from whatever system is being controlled and transforms it into the correct signal type for the controller. This step is not necessary in all control systems. A control system could be built to function on the same signal type as the plant or process. The transformation is generally accomplished by a potentiometer or thermistor.

Summing Junction

The next step in the process is the summing junction. The summing junction does exactly what one would think, it adds two signals together. The junction adds the input signal from the input transducer to the output of the output transducer. The signals are added mathematically. After they are added together they go to the controller.

Controller

The controller is the part of the process that manages or controls the entire system or process. The controller is nothing more than a mathematical expression that is derived by an

engineer to keep a signal within a given set of parameters. This is accomplished by using upper level mathematics such as differential equations and calculus. The controller processes the signal, or simply corrects the signal to achieve the desired effect.

Plant or Process

After the signal is corrected by the controller, the signal goes to the process or plant. This is simply the device being controlled. It could be an air conditioner, the cruise control in a car, or a government satellite. The plant or process will send its output to two different places. One place is the device's output the other is the output transducer.

Output Transducer

The output transducer operates the same as the input transducer. It converts the signal to one that is usable by the control system. Once accomplished it sends the signal to the summing junction where the process starts over.