

Pupil information sheet

Systems and Controls

A system is a group of components that are connected so they work together to perform a task.

All control systems need information. Information goes **into** a system. The information is **processed** and new information is sent back **out**.

All control systems have three parts:



Computer Control

Most rides at Thorpe Park are controlled by a Programmable Logic Controller (PLC). This is a programmed computer that accepts **inputs** (information) from sensors, levers and switches.

The PLC **processes** the information and determines what the outputs should be. Outputs include the control of motors, brakes and valves on the rides.

X:\No Way Out

As the ride travels backwards in the pitch black, sensors on the track tell the PLC exactly where the train is. The PLC processes this information.

The output depends on the location of the train. It might be a special effect to make the ride more exciting e.g. at one point the train stops and slips forward, pretending to be out of control.



Feedback

Many control systems need to 'know' how accurate their control is. A sensor is used to feed this information back into the system.

An important safety feature on many rides at Thorpe Park is the **block system**. This is used to stop trains/cars/boats colliding. The track is split into sections (blocks) and monitored with sensors. The sensors feedback information so that the controller can be sure that two trains/cars/boats cannot be in the same block at the same time.



Track sensor

Pupil activity sheet

Feedback at Thorpe Park

Colossus

As the train climbs the lift hill, sensors feedback information to tell the PLC exactly where Colossus is on the track. The sensor at the top of the hill triggers a timer. The train has a set time to travel round the twists, turns and loops and reach the brake sensors. If it does not make it in time the PLC shuts the ride down and stops the next train from leaving the station.

Logger's Leap

At the top of the 15m drop, the boats pass a plastic wand. This wand operates a switch that tells the PLC the train has reached the top. There is another wand at the bottom of the hill and a magic eye sensor on the way down. The boat must pass all three sensors in a set time. If it does not, the PLC stops the conveyor belt so that other boats cannot enter that block.



Activity - Design a ride with special effects

X:\No Way Out is a rollercoaster that travels backwards in the dark. To make the ride even more exciting, riders experience many special effects.

What to do

Design your own rollercoaster ride in the dark. Include four special effects.

- a) You will need to plan, design and explain your ride using a storyboard. Start by dividing an A3 sheet of paper into six sections as shown below:

START	1	2
3	4	Finish

- b) Think about the theme for your ride. Sketch how the ride begins and finishes.
- c) Decide what your four special effects are going to be. Include a colour sketch or diagram of these in the squares marked 1-4.
- d) Each picture on a storyboard needs to have a brief description to explain what is happening. Describe each of your effects.
- e) You should also explain what triggers the effect and how the effect works.

Things to think about

What will your effects look like?

- How will it be visible in the dark?
- Will the effect creep up on a car?
- Do you want your ride to be scary – what scares people?

What will your effects do?

- Will it be moving or stationary?
- Will it make a noise, light up or make strange movements.

How will your effects be controlled?

- You will use a computer to control the effects.
- What inputs and outputs will there will be to the computer system. What type of sensors will be used? How will the sensors be triggered? How will the outputs be controlled?

Extension activity

Write a set of control instructions for the computer. These instructions must tell the computer how to control at least one of your effects.

