

# Log Flume - 1

## ACTIVITIES

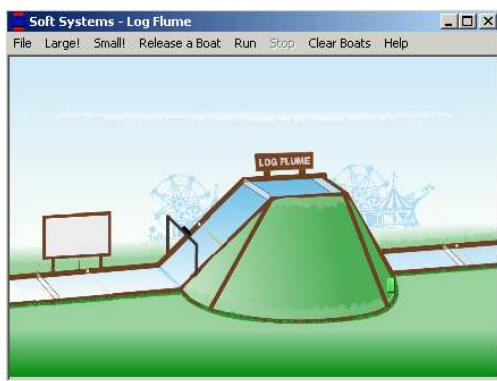
These sheets present a series of activities for **building your own programs** to control the Log Flume Soft System. Together, they build into a complete control system for the log flume ride.

### Skills - You need to know how to:

- Switch outputs (including motors) on and off in a timed sequence;
- Monitor digital input devices and produce an output in response;
- Use procedures as building blocks to build a larger program.

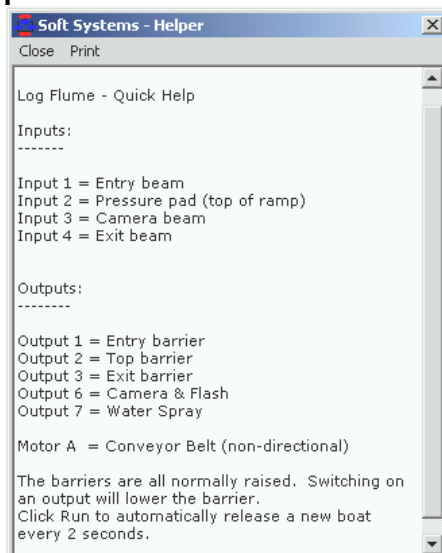
*These skills are taught in the teaching materials for the: Pelican Crossing, Car Park, Burglar Alarm, and Greenhouse.*

From the **System>Soft Systems** menu, select **Log Flume**



From the Soft System window menu, select **Help>Quick Help**

Look through this carefully to see what input and output devices there are in this system.



## Activity One

ENTER

SPLASH

EXIT

The log flume ride can be divided into three sections: Enter, Splash, Exit. In this Activity, you are given a Specification for each section. **Build and test a procedure for each section.** Then build the main program to run all 3 procedures one after the other.

## "Enter" Specification

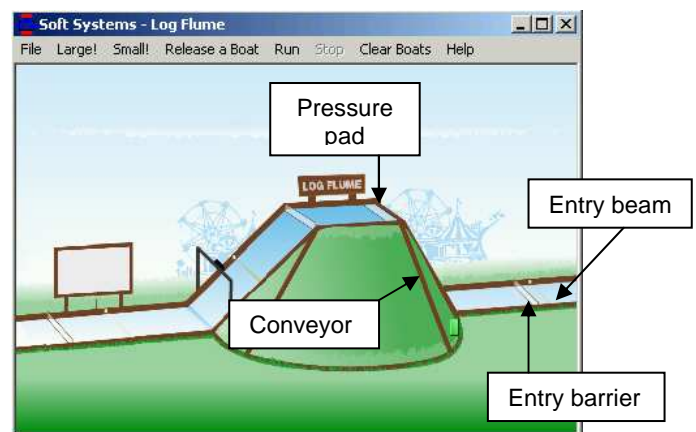
The system checks the Entry beam. If the beam is broken (input off) by a boat arriving at the start of the ride, the Entry barrier is lowered to let the boat through.

After a two second wait to allow the boat to pass, the gate is raised.

The conveyor is switched on to carry the boat to the top of the ramp. When the boat is at the top, it presses the pressure pad. The conveyor is then switched off.

## Help

The picture below shows the key parts of the "Enter" section. Check the input and output numbers in the Quick Help.

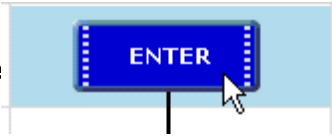


*Help is continued on the next sheet.*

## Log Flume - 2

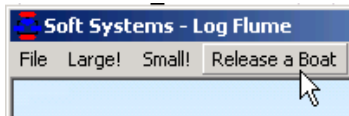
### Help (continued)

When you have built the procedure, test run it by clicking on the Procedure command to highlight it:



Then click the green RUN button.

When the procedure is running, click "Release a Boat" on the Soft Systems menu.



Check that the boat is detected; then moves to the top of the conveyor and stops – as described in the "Enter" Specification.

### Now build a procedure for the "Splash" section of the ride.

#### "Splash" Specification

The system checks the pressure pad.

If the pad is pressed (input on) by a boat at the top of the ramp, the Top barrier is lowered.

After a two second wait to allow the boat to pass, the gate is raised.

Test run your "Splash" procedure.

The sequence should be triggered by the boat that was left at the top of the ramp after you tested your "Enter" procedure.



The boat should stop at the bottom of the flume.

### Now build a procedure for the "Exit" section of the ride.

#### "Exit" Specification

The system checks the Exit beam.

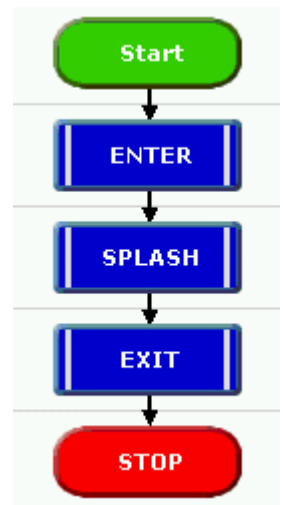
If the beam is broken (input off) by a boat at the bottom of the ramp, the Exit barrier is lowered.

After a two second wait to allow the boat to pass, the gate is raised.

Test run your "Exit" procedure.

Then build the main program to run all 3 procedures one after the other.

This program will do the sequence just once.



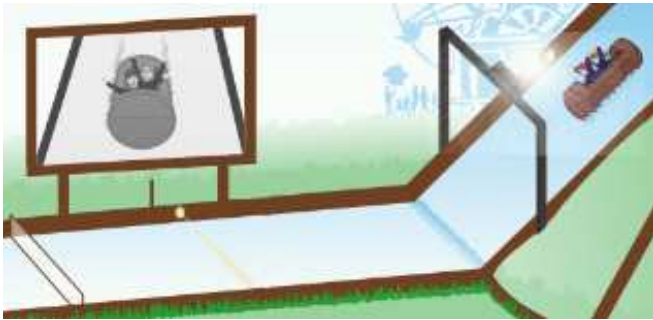
Run the program and click "Release a Boat". Check that the boat moves smoothly through all 3 sections of the ride.



## Log Flume - 3

### Activity Two – Camera and Spray

There is a light beam half way down the flume, and a camera on the gantry above it, so that a souvenir photograph of the boat can be taken automatically as it comes down the flume.



There is a water spray below the screen where the photograph is displayed, so that people in the boat can be soaked again as they look at their photograph.



1. Edit your “Splash” procedure so that a photograph is taken every time a boat comes down the flume.

2. Edit your “Exit” procedure so that the spray is switched on while the people in the boat are waiting for the Exit barrier to open.

### Help

Check the input and output numbers of the beam, camera, and spray in the Quick Help.

Just one Outputs command set to switch on the camera is enough to take the picture.

Take care when you add an Outputs command for the spray. Make sure that the command that lowers the barrier does not instantly switch off the spray.

### Activity Three – Faster Throughput

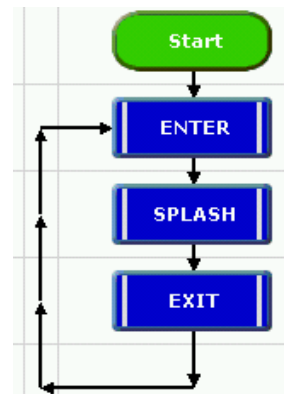
The system you have built so far is not very efficient. There are two problems:

1. The program has to be restarted for every boat.
2. Only one boat can pass through the whole ride at a time so long queues will build at busy times.

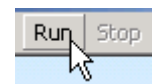
*Do the following Investigations to see how the problems can be solved:*

### Investigation One – A Repeat Loop

Add a repeat loop to the main program like this:



Run the program. Then click Run on the Soft Systems menu.

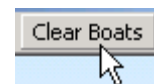


A boat will be released automatically every 2 seconds. Watch what happens.

To stop the boats, click Stop on the Soft Systems menu.



Click Clear Boats.



Then stop the program.

Does this development solve either of the two problems?

***Now do Investigation Two on the next sheet***

# Log Flume - 4

## Investigation Two – Using Interrupts

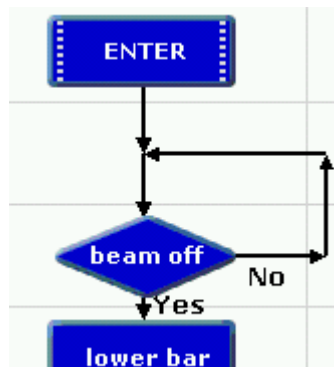
The 3 procedures are done in sequence. This means that even though a boat arrives at the Entry barrier every 2 seconds, it has to wait until the loop goes back to the ENTER procedure before the Entry beam is checked.

To overcome this problem, the program needs to be checking all three inputs all the time so that it can respond instantly to a boat arriving.

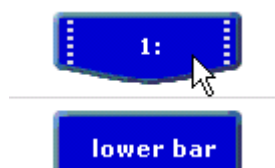
The **Interrupt** command enables you to do this. Begin by reading about this command in Help>Logicator Commands. Then follow the Instructions to use Interrupts in your program.

### Instructions

Each of the procedures in your program will begin like this:  
- a Procedure command followed by a Decision command that checks the input.



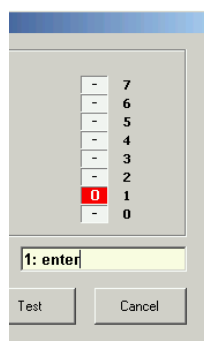
1. Delete these two commands in your ENTER procedure, and replace them by an **Interrupt** command:



Double click on the Interrupt command. Set input 1 to check if the Entry beam is broken (0)

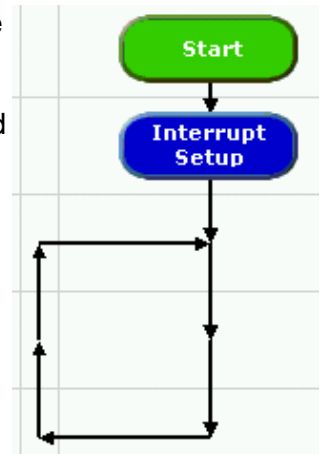
Type a label

Click OK.



2. Edit your SPLASH and EXIT procedures in the same way. Set the “splash” Interrupt command to check if the pressure pad is on (1). Set the “exit” Interrupt command to check if the exit beam is broken (0).

3. Edit the main part of the program so that it contains just an **Interrupt Setup** command and a repeat loop like this:

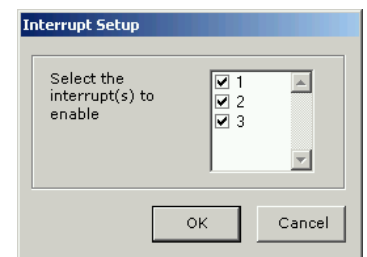


*The Interrupt Setup command tells the program to check the Interrupts.*

Double click on the Interrupt Setup command.

Check all 3 boxes so all 3 Interrupts will be checked.

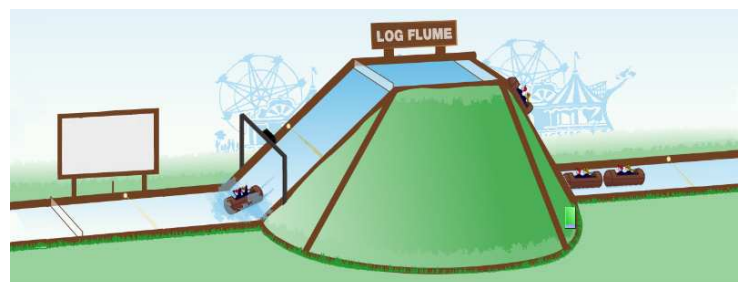
Click OK.



4. Run the program, and then click Run on the Soft Systems menu to start the boats.

Watch for a while to see what happens. Then stop the boats and the program. This program allows more than one boat into each section at a time.

**This is a major safety problem. The ride will not be allowed to operate like this.**



# Log Flume - 5

## Safe Faster Throughput

The program must check to see if there is already a boat in the first section, before the Entry barrier is lowered.

This can be done by checking if the pressure pad is on. If it is not on, then it is safe to lower the Entry barrier.

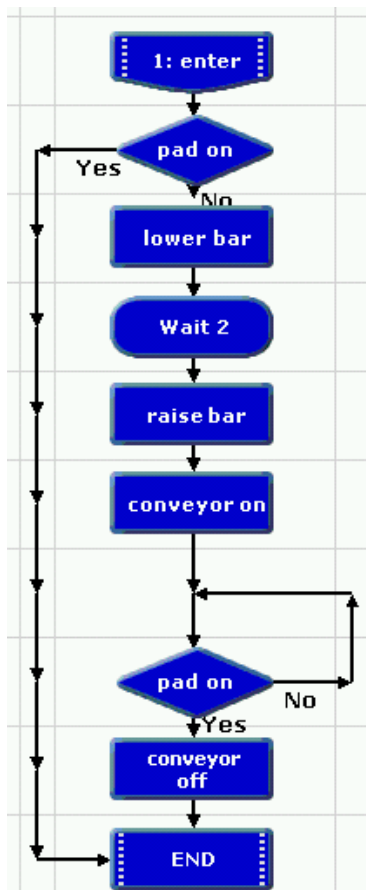


1. Edit the "Interrupt 1: enter" procedure as shown below:

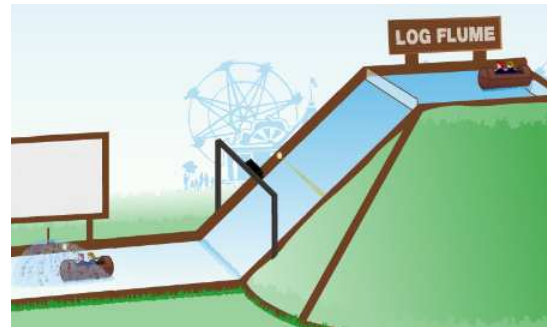
As soon as the Entry beam is broken, the pressure pad is checked.

If the pad is not on, the barrier is lowered.

If the pad is on, flow goes straight down to the END, and the barrier is not lowered.



2. Decide for yourself how to edit the "Interrupt 2:splash" procedure so that the Top barrier can't be lowered if there is a boat in the final section.



The "Interrupt 3:exit" procedure will not need to be changed.

3. Run the program to check that only one boat at a time ever enters a section.

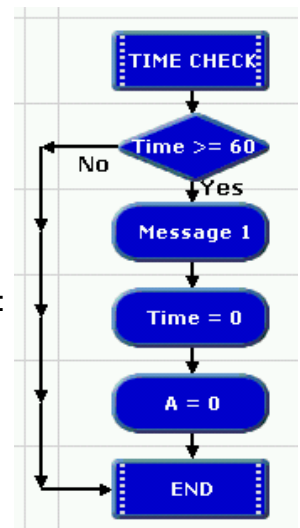
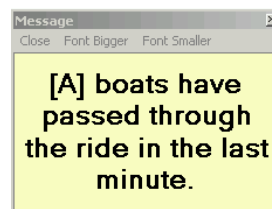
## Extension – Monitoring Throughput

Follow these instructions to display a count of how many boats per minute pass through the ride.

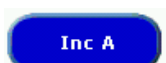
1. Build this procedure: It uses Compare, Message, and Expression commands.

Help>Logicator Commands gives information about them.

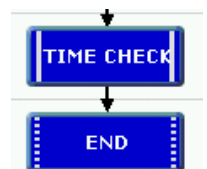
2. Type this into the Message:



3. Add an Inc A command just before the End of the "Interrupt 3:exit" procedure.



4. Add a Do Procedure command to the end of each procedure. Set it to do the TIME CHECK.



5. Run the program to check that the count is updated every minute.