Input, process, output

LEARNING INTENTION

We are learning to describe electronic products as systems with an input, a process and an output.

SUCCESS CRITERIA – I CAN

- ☐ draw a universal system diagram
- ☐ draw a system diagram with external inputs and outputs
- ☐ identify the input, process and output of a product
- ☐ explain what a system boundary is

What is a system?

A **system** is a set of parts that work together to change an **input** into an **output**.

Engineers use the **systems approach**: they describe what a product does without worrying yet about how it works inside.

The universal system diagram



Every system can be drawn like this

Input: what goes into the system. **Process**: what the system does. **Output**: what comes out.

SHORT CIRCUIT

× WHAT EXAMINERS SAW

Universal system diagram: some pupils wrote “user input” or “output energy” in the boxes. These specific terms gained no marks.

✓ THE FIX

The universal system diagram uses exactly three words: INPUT → PROCESS → OUTPUT.

Course report 2025 Q6(a).

System diagrams



System diagram for an electric kettle

A **system diagram** names the system in a box. Arrows show the **external** inputs and outputs.

The box edge is the **system boundary**. Anything crossing it is an external input or output.

Input, process, output

DATASHEET · SYSTEM DIAGRAM

01 Box = the whole system, labelled with its name.

02 Arrow in = external input (energy, information, material).

03 Arrow out = external output.

04 Do not show internal parts such as motors, heaters or switches.

WORKED EXAMPLE System diagram for a hand dryer

1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
a hand dryer	system diagram	external input → system → external output	in: electrical energy in: hands detected out: heat, kinetic energy (air), sound	**diagram below**

The inputs and outputs cross the system boundary. The fan and heater inside are not shown.



Hand dryer system diagram

SHORT CIRCUIT

× WHAT EXAMINERS SAW

System diagrams showed components (motor, switch, LED) instead of what crosses the boundary. A motor inside the product is internal, not an output.

√ THE FIX

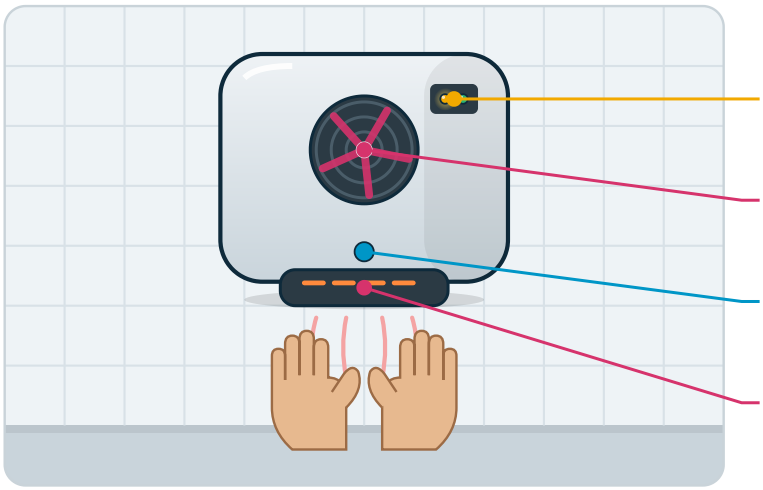
Show only external inputs and outputs: energy, information or materials that cross the boundary (e.g. electrical energy in; kinetic energy and sound out).

Course reports 2024 (Task 3a(i)) and 2026 (Q7a): external inputs/outputs, not components.

Input, process, output

Systems all around you

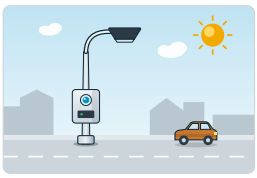
Hand dryer as a system



Every product can be split into input, process and output

FOLLOWING THE SIGNAL THROUGH A STREET LAMP

1



Daylight: the lamp is off

2

Light

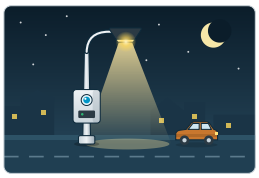
The light level falls

3

control circuit decides

The process compares the light level

4



Output: the lamp switches on

WORKED EXAMPLE **System diagram for a street lamp**

1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
street lamp switches on when it gets dark	input, process, output, energy	input = what it senses output = what it does	input: light level process: control circuit output: light	**light level → control → light**

The input is the condition the system senses, not the component.

Input, process, output

WORKED EXAMPLE **Input and output energy of a kettle**

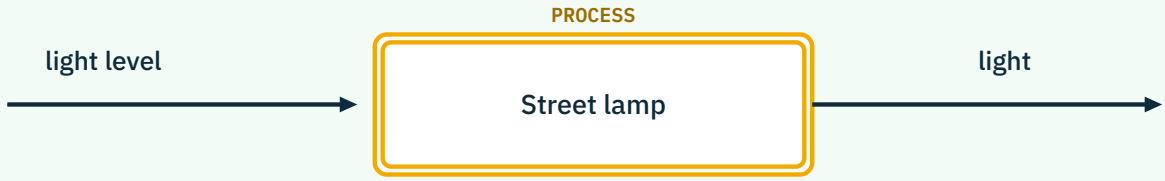
1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
kettle plugged into the mains	main input and output energy	input energy = what it is powered by output energy = what it is designed to give	input: electrical energy output: heat (thermal) energy	**electrical → heat** Sound is a waste output, not the main output.

Name the MAIN useful output only.

WRONG Components (LDR, bulb) are not inputs and outputs of the system diagram.



RIGHT Name the quantities: light level in, light out.



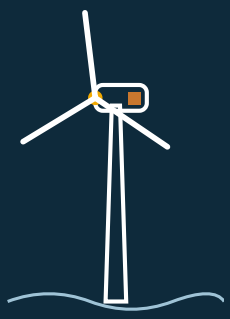
Right and wrong system diagrams

Input, process, output

REAL ENGINEERING · MORAY FIRTH OFFSHORE WIND FARM

Engineers at Firthwind Energy (fictional) describe each turbine as a system.

External input: kinetic energy of the wind. External output: electrical energy to the grid. Sound and heat are also output, as losses.



PROBE · QUICK CHECKS

1. Name the three boxes of the universal system diagram. _____
2. What does the edge of a system diagram box show? _____
3. Is the motor in a hair dryer an external output? _____

EXAM READY · 9 MARKS

1 **Complete** the universal system diagram. **[2]**



2 An electric fan is a system. **State** its external input and its main external output. **[2]**

3 A pupil drew a system diagram for a toaster with 'heating element' as the output. **Explain** why this is wrong. **[2]**

Input, process, output

4 **Complete** a system diagram for a doorbell. **[3]**

