

S3 Technological Studies: Homework 1: Modular Electronics.

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Grade:	

Name: _____ Class: _____ Date: _____

1. We use systems diagrams to describe and illustrate technological systems.

Draw a **universal systems diagram** to show the function of...

(a) a kettle.

(b) a torch.

3
2
1
0

2. A **universal systems diagram** shows a technological device in its simplest form. If we want to show more detail we can use a **sub-systems diagram**.

For one of the examples above, draw a suitable **sub-systems diagram**, remember to include all relevant sub-systems and a systems boundary.

3
2
1
0

5
4
3
2
1
0

3. In electronics we are concerned with both **analogue** and **digital** signals or devices.

(a) Describe the difference between an analogue and a digital signal.

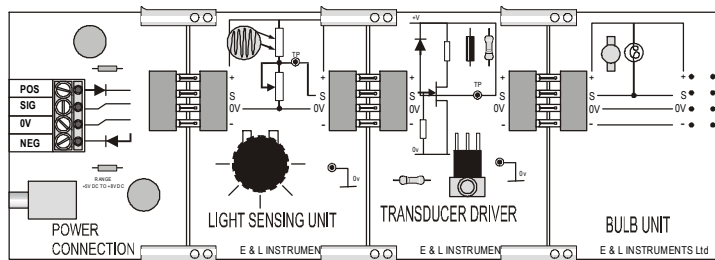
(b) E & L boards have a variety of input and output transducers, under the appropriate column in the table list two examples of each type.

Digital Input	Analogue Input	Digital Output	Analogue Output

4
3
2
1
0

8
7
6
5
4
3
2
1
0

4. A pupil designs and builds a system using E & L boards. The block diagram of the system is shown below.



(a) Describe what happens to the system if the pupil **covers** and then **uncovers** the LDR.

(b) What is the purpose of the **potentiometer** on the light sensing board?

4
3
2
1
0

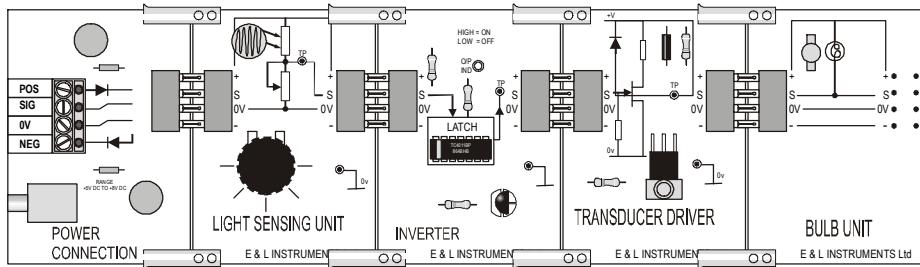
2
1
0

S3 Technological Studies: Homework 2: Modular Electronics.

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Name: _____ Class: _____ Date: _____

1. A system is required to switch on a streetlamp when it gets dark, a prototype is constructed using E & L boards and is shown in the diagram below.



- (a) Describe how the streetlamp system will function.

- (b) Explain what the purpose of the inverter in the system.

2. An inverter is also known as a **NOT gate**.

- (a) Draw the correct logic symbol for a NOT gate.



Logic Symbol

A	B
0	
1	

Truth table

3
2
1
0

2
1
0

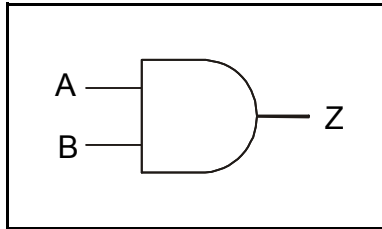
1
0

2
1
0

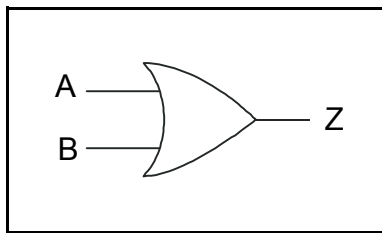
3. When we have a problem to be solved in electronics we often use logic systems to solve them.

(a) Label each gate in the space provided below the logic symbol.

(b) Complete the truth table for each gate.



A	B	Z
0	0	
0	1	
1	0	
1	1	



A	B	Z
0	0	
0	1	
1	0	
1	1	

4. An industrial freezer has a fan to circulate the cold air inside.

The fan should operate when the temperature rises above $-18\text{ }^{\circ}\text{C}$.

It should **not** operate when the freezer door is open for the store man to take stock out.

(a) Draw a **block diagram** of a possible solution to this problem.

(b) Using appropriate terminology, explain how the system you have designed works.

3
2
1
0

3
2
1
0

6
5
4
3
2
1
0

2
1
0

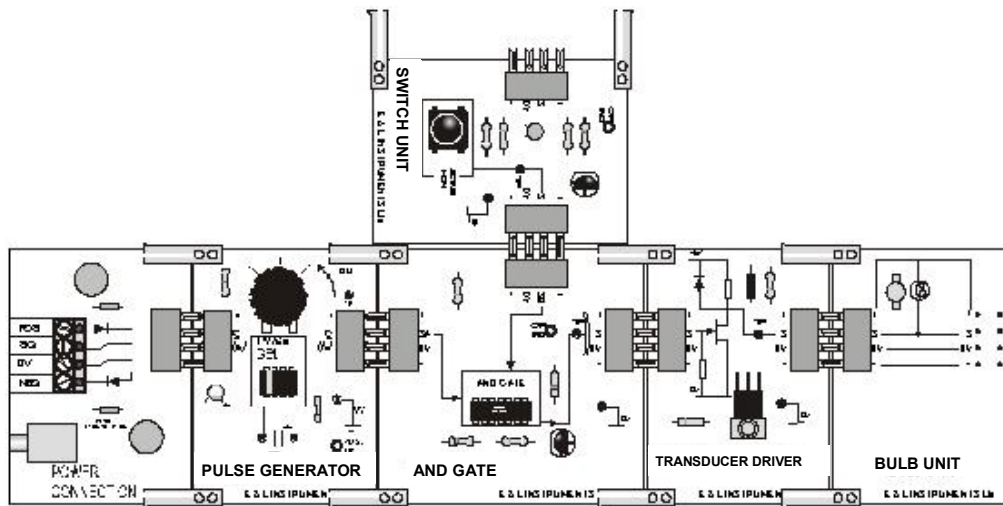
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Name: _____ Class: _____ Date: _____

1. A school pupil designs a simple silent alarm system using E & L boards.

Her prototype design is shown in the diagram below.



- (a) Draw a **sub-systems diagram** of the pupils alarm system.

- (b) Describe the function of the **pulse generator**.

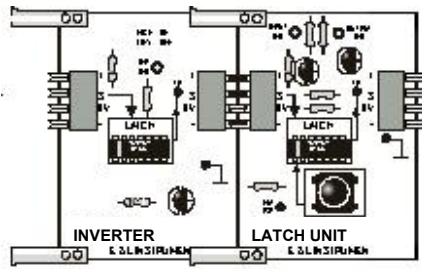
- (c) Using appropriate technical language, describe how the pupils silent alarm system will operate.

5
4
3
2
1
0

1
0

3
2
1
0

2. The pupil decides to modify her system using following two boards.



The Latch unit is a “**negative edge triggered device**”.

(a) Explain the term “**negative edge trigger**”.

1
0

(b) Describe why an **inverter** must be used before the latch unit in an E & L system.

2
1
0

The pupil would like the alarm to stay on once it has been triggered by the push switch.

(c) Draw a **block diagram** of the new system, showing where the inverter and latch units should be placed.

4
3
2
1
0

(d) Describe how the system will now operate and explain how it can be reset once the alarm has been triggered.

3
2
1
0

S3 Technological Studies: Homework 4: Modular Electronics.

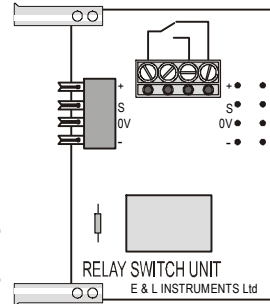
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Often we do not wish to use one of the E & L boards to provide an output.

We can replace the output units with a **relay unit**.

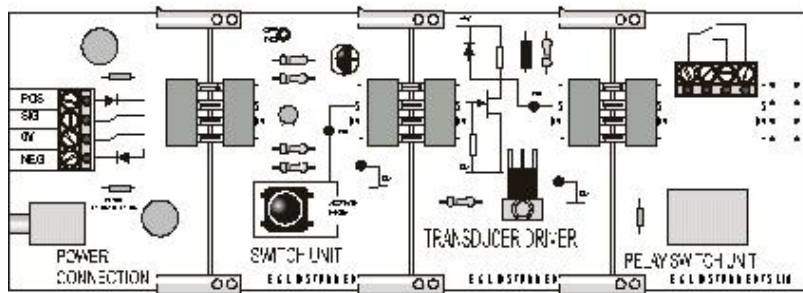
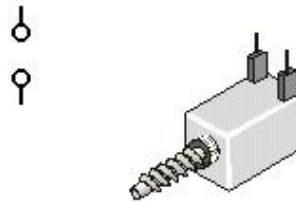
1. (a) Describe the function of the relay unit.



2
1
0

- (b) On the diagram below, complete the wiring of the relay to the motor so that when the switch is pressed, the motor will switch on.

12 V power supply



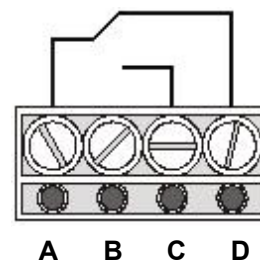
3
2
1
0

- (c) The output terminals of the relay unit can be connected to be either **Normally Open (NO)** or **Normally Closed (NC)**.

State which pairs of terminals must be used to give...

Normally open: _____

Normally closed: _____



2
1
0

2. A relay is useful if we wish to have a “**remote**” output device, however if we wish to have a “**remote**” input we must use an **I/O unit**.

(a) Explain how the I/O unit allows us to connect remote input and output devices to an E & L system.

2
1
0

(b) We can also use the I/O unit to connect remote output devices.

Describe one advantage and one disadvantage of using an I/O unit to control output devices rather than a relay unit.

Advantage: _____

1
0

Disadvantage: _____

1
0

(c) Normally when using E & L boards we can only use one output device.

By using a I/O board we can connect more than one output device to a system making it more versatile.

Draw a block diagram showing how two bulb units could be connected to light at the same time when a remote switch has been pressed.

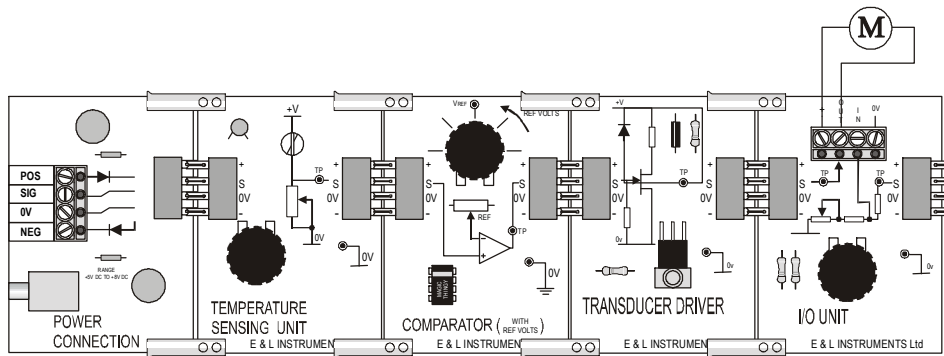
8
7
6
5
4
3
2
1
0

S3 Technological Studies: Homework 5: Modular Electronics.

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Name: _____ Class: _____ Date: _____

1. The system shown below uses a **comparator** to control the operation of a motorised fan.



- (a) Using appropriate technical language, describe the purpose and function of the **comparator** in the above system

2
1
0

- (b) Describe the operation of the complete system shown above.

2
1
0

- (c) It is found that the motor driving the fan is not powerful enough.

Describe how the system could be modified to allow a more powerful motor to be driven by the above system.

2
1
0

2. A company who makes motorised garage doors wishes to expand the function of control system. It has been decided that an automatic car detection and door opening system is to be designed.

The detection and opening system should operate in the following manner:

- The door should operate when an approaching car flashes its headlamps.
- The system must not be accidentally triggered by passing vehicles.
- The system must be capable of operating at both day and night time.

(a) Draw an appropriate systems diagram to show the function of the automatic garage door system described above.

(b) Develop a block diagram of a possible solution using modular E & L boards.

(c) Explain, using appropriate technical language, the operation of the system that you have designed.

4
3
2
1
0

6
5
4
3
2
1
0

3
2
1
0