

Technological Studies
Case Study Report
Higher

8697

Spring 2001

HIGHER STILL

Technological Studies

Case Study Report
Higher

Support Materials



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TEACHER'S GUIDE

The purpose of these materials is to help support both teachers and candidates through the unit of the Case Study Report. The materials contain advice for teacher's including extracts from the Arrangements Documents, Second edition published May 1999 and the relevant NAB (D19112/NAB001), both produced by SQA. The student materials provide a focus on how to organise, research and produce the final report. Finally, an exemplar report is included which should provide useful for both teachers and students in terms of content, layout and standard.

Purpose of the Case Study Report

The importance of this unit should not be underestimated by teachers or students as it is intended to provide a logical conclusion to the course and offer the opportunity for students to review, consolidate and possibly extend the knowledge and understanding gained in other units. It provides candidates with the opportunity to investigate the development of an existing solution to a problem and to record their findings in the form of a report.

Report writing is a skill required by every engineer. It is an important 'tool' used to formally record the development of a solution to a problem. This is recognised by both further education and employers who see report writing as a *key skill* that is to be encouraged. The production of a report is, in itself, a problem solving activity in terms of planning, investigating, researching and in producing the written report.

Outcomes

The outcomes for the Case Study Report are as follows:

1. Analyse the development of an existing solution to a given problem.
2. Produce a report.

The length of the report should be approximately 2000 words in length. The depth of treatment should be similar to that described in the other units of the Higher Technological Studies course. While the time allocated to the unit is at the discretion of the centre, the notional design length is 20 hours.

Timing

It is recommended that candidates complete at least one other unit of the course before starting the case study. This will provide candidates with some knowledge of the course and an insight into the depth of treatment required. It is important however, that some form of induction take place in order to introduce candidates to the other units as some may prefer to base their reports within that context.

While some centres may prefer to deliver the unit as a 'block' of teaching time, it is recommended that the time allocated to the unit be spread out over the course. This will provide candidates with the time required to fully investigate their topic and organise their work. It may then be appropriate to have a small block of time to concentrate on the writing of the report itself.

Content

The content of the case study will of course, depend upon the chosen topic however candidates should address the following:

Introduction

-background to case study

Analysis and Description

-including a systems analysis of the problem, represented graphically, showing how different aspects of technology are integrated in the solution

Social, Environmental and Economic Effects

-emphasis will vary according to topic

Conclusion

-a critical evaluation of the effectiveness of the solution in meeting the needs of the identified problem.

A typical case study could involve candidates in interpreting a given specification to analyse a problem in systems terms. The sub-systems could be electronic, programmable, control, or structural. Candidates are expected to research the ideas developed for solutions to each sub-system. Methods of testing, calculations and results achieved can be included in the report. Candidates should give due emphasis to the social, environmental and economic effects. An evaluation of the effectiveness of the solution in meeting the specification should be produced.

Case Study Topics

There has been much discussion about the type of topics that lend themselves to the Case Study Report. There have been suggestions at times that a list of suitable topics should be produced and that all candidates will base their reports around these topics. There are a number of problems with this, the first of which is related to resources. A prescriptive list would place an unfair burden on centres who already have resources suited to other case study topics. Also, where a list is available and all candidates are producing reports around the same topics, the system becomes open to abuse as these reports may well circulate.

The following general advice is given to teachers. It is vital that this information is passed to candidates.

- a) It is important to note that the enquiry should consist of a study of a problem in Technological Studies.
- b) The topic chosen should relate to other units within the course.

- c) A topic is suitable in terms of difficulty if it can provide an analysis and technical content similar to that in other units.
- d) The topic chosen should be that of interest to the candidate.
- e) Consider the limitations with regard to the availability of information.

Resources

Possible sources of information for the Case Study report are: CD-ROM, Internet access, audio/visual material, library access, company literature and direct industrial contact. While there is no longer a need for a project to be linked directly to industry, as was the case with the Industrial Study, there are obvious benefits to a study that does. Where centres already have good industrial links, they are encouraged to keep this up.

Assessment

The case study is assessed on a pass/fail basis in line with the outcomes and performance criteria outlined within the Arrangements Document and NAB. No marks or grades should be allocated to the report. The case study does not contribute to estimates or appeals and is not assessed in the external examination. It is the responsibility of the centre to ensure that the report produced is the candidate's own and therefore should be monitored on a regular basis.

Moderation

As with all Higher Still units, the Case Study Report is subject to moderation. If selected, the centre will be required to provide evidence of the candidates work and the assessment made by the centre. This assessment is on a pass/fail basis and may be recorded on a checklist like the one provided within the NAB. Some centres have adapted this to suit their own needs -this is perfectly acceptable.

Remember that the moderation process is to ensure that the required standard is being applied consistently and fairly to all candidates. Centres should look upon the moderation process as a positive one as feedback is given to the centre in the form of a moderator's report. This will first of all indicate if the sample of work has been accepted but should also provide feedback relating directly to the standard of work submitted by that centre.

To assist centres with this process, such a report has been included within these support materials. In addition, the moderator has produced comments that relate directly to the exemplar report included in this set of materials. This is to assist centres in their overall assessment of the unit and highlights the key aspects of this particular example.

Exemplar Report

The exemplar report contained within these materials should supplement the exemplar already published in Autumn 1998 (code 4230). The purpose of the exemplar is to provide guidance on the approach, layout and standard of the report required to pass the unit. There is no reason why students should not have access to this exemplar although it might prohibit this topic being developed by your candidates.

It is important also to remember that after one year of presentations, a centre will have developed its own bank of useful exemplar reports.

IT Core Skill

While there is no requirement for candidates to word process or desktop publish their completed report, many centres request the reports in this form. Candidates may themselves, decide to present their findings in this format. The advantages are obvious in terms of the overall presentation of the document and also in terms of the ease of which changes can be made. As the availability of IT improves and the skills of our candidates develop, more and more case study reports will be produced electronically.

For those who choose this format, there is an additional benefit in the form of gaining the award of Information Technology at Higher. This is a core skill unit that students will be accredited with if they meet the required standard in terms of using IT. The exemplar report within these support materials satisfies the demands of this unit. A set of support materials will be produced to look specifically at this however, a summary of evidence has been provided below. The checklists referred to are contained within the NAB (Information Technology Higher) and should be held within your centre.

OUTCOME		EVIDENCE REQUIREMENTS
1	Use an IT system effectively.	<p>This outcome will usually be overtaken in the course of the candidate producing their report and achieving outcomes 2 and 3. Careful consideration should be given to PC (c) where students must identify and correct a hardware or software problem such as the printer being off-line or out of paper. In most cases this will naturally occur as the student completes their report. Where a student has not been seen to solve such a problem the teacher/lecturer would present a problem and ensure that the candidate solves it appropriately.</p> <p>The checklist relating to this outcome should be completed.</p>
2	Use software in an unfamiliar context to produce complex information.	<p>To achieve this outcome the Text Processing checklist must be completed along with two other outcome 2 checklists. Two complex processes for each software application should also be completed. It is good practice to spell-check any word-processed document to correct spelling or typing errors. In addition, students should carry out a word count to ensure that they meet the approximate 1500-2000 words relating to the Case Study. It is also recommended that a header and footer be inserted into their report showing page numbers, title of case study, candidate's name etc.</p>

		<p>It is a requirement of the Case Study that the candidate analyses their topic. The usual method for this is to produce systems diagrams. These should be produced in an appropriate software package and inserted into the main document. It is quite possible that the candidate may also wish to include clip-art, scanned or digitally produced images as well as tables, graphs and charts.</p> <p>Finally, the completed Case Study should be desktop published to produce a report that has all elements of text and graphics fully integrated into one document.</p> <p>The checklists (Text Processing, Graphics/Illustration and Desktop Publishing) relating to this outcome should be completed.</p>
3	Carry out searches to extract and present relevant information.	<p>The basis of the Case Study is that students research and gather information relating to their topic. Candidates must carry out at least two searches or select different data sets and extract and present data relevant to their study. It is important that students acknowledge the source of their searches such as the titles of CD-ROMs or web-site addresses. This would best be placed in the bibliography along with other sources. It is not acceptable to use similar search criteria for the two searches which result in similar outputs being obtained.</p> <p>The checklist relating to this outcome should be completed.</p>

It is important to note that in order for students to gain this additional unit they must be entered and the unit will also be subject to moderation.

**Case Study Report
Student's Guide**

Student Guide

As part of your coursework you must complete a Case Study Report. This will involve you researching a chosen topic and producing a report. Within your Case Study you will be able to demonstrate your knowledge and understanding of Technological Studies and the other units in the course. As part of your report you will need to provide background information to your topic, analyse how it works and describe the wider implications of this aspect of technology.

Your Case Study should be approximately **1500-2000 words** in length. Your teacher/lecturer will advise you on how your final report should be presented.

Selecting a topic

There are any number of different topics that you could choose. For example you could choose an everyday object, a control system or an industrial process. You must remember however, that your chosen topic should relate to the content of the course you are studying – namely Technological Studies. This means that the main part of your report should relate to Applied Electronics, Systems and Control or Structures and Materials.

The most successful topics are those that reflect your interests.

Careful consideration should be given to:

- The availability of suitable source material that you would require to complete all sections of the report. Remember that some companies will not reveal exact details of their products/processes.
- The constraints of time. You must work to the deadlines that your teacher/lecturer sets.
- The degree of difficulty of the topic. Your Case Study should reflect a similar difficulty to the other units in the course.

Make a list of possible topics for your Case Study.

Possible topics:
Chosen topic:

Discuss your chosen topic with your teacher/lecturer for advice on its suitability.

Researching your topic

It is important that you begin to research your Case Study as soon as possible. It may well take you several weeks to gather your information together. There are lots of different sources of information for you to use. Some of these include books, CD-ROMs, journals, periodicals and the internet. You may even wish to contact a company directly by letter or e-mail, in which case you will need an address and possibly a contact name. You should also remember that it may take them several weeks to reply, if they reply at all.

Produce a list of possible sources of information relating to your study.

Possible sources:

Sorting your information

Once you have gathered your information you need to select what is useful for your report. You may find that some of it is very complicated and difficult to understand. Your teacher/lecturer might be able to help you make sense of it but remember that he/she is not an expert on everything. You should also make use of your course notes as these contain useful explanations.

Take a note of information that you wish to use and make sure that you know the source as you need to acknowledge this in your bibliography.

Introduction

Your introduction should be brief and to the point. It should introduce the reader to your topic and provide some background information. At this point you should indicate the specifics of what you intend to study. It may be that you will look at a particular aspect of your topic rather than the whole thing.

It might be useful to ask yourself these questions:

- Have I explained in simple terms what the case study is about?
- What technological aspect am I focusing on?
- Have I stated this clearly?
- How will I find out about my topic?

Analysis and Description

This will probably be a large section of your report. Begin by analysing your system using systems diagrams. Your class notes on Systems and Control might help you with this. You should also describe in words and/or calculations how your system works. It is useful to also include graphs/charts or useful information.

It might be useful to ask yourself these questions:

- Are my systems diagrams clear?
- Is there an overall simple, clear diagram with inputs, outputs, feedback etc?
- Are all the components clearly identified and analysed in a paragraph after the diagram?
- Has the system been fully analysed and explained?
- Has an evaluation of the technology involved been achieved?

Social, Economic and Environmental Effects

When we consider any technological product or process we must consider the wider implications of the technology used and its impact on society and the world as a whole. You are expected to consider the overall effect of your product/process and report on your findings. Where possible back up what you say by facts/figures that you have uncovered during your research. This section of your report should be largest in terms of words.

It might be useful to ask yourself these questions:

Social Effects

- Have jobs been created or lost, directly or indirectly through use of this technology?
- Have lifestyles been changed through this technology?
- Have cultures been changed through this technology?
- Have any of these effects been positive or negative? Explain

Economic Effects

Has this technology increased profits/income for people or companies?

Has it effected economies?

Does it provide cheaper/more expensive products/technology?

Is it expensive to but/own and use/run this technology?

Have any of these effects been positive or negative? Explain

Environmental Effects

Has this technology had an environmental impact for people, cultures, companies?

Is the product recyclable/made from recyclable components?

Has it effected the natural/urban environment, directly or indirectly?

Does the product manufacture and use/provide environmentally cleaner/dirtier products?

Have any of these effects been positive or negative? Explain.

Conclusion

Your conclusion provides the opportunity to sum up your findings and to make a final statement regarding what you have discovered. It must be in your own words and be based on your research and analysis.

Bibliography

You must indicate where every piece of text, diagram and picture source originated from. This should include the names of books, CD-ROMs and web site addresses. You should follow the layout shown below:

Books

Author surname and initials, (Year), *Title*, Publisher, Place of Publication, Page numbers (optional).

Journals/Periodicals

Author surname and initials, (Year), Title of article, *Name of Journal*, Volume number and part number if appropriate, Page numbers.

Websites

These should be listed alphabetically.

Case Study Report Exemplar

Candidate Name

Introduction

The ability to interface with the computer is essential to the operation of computers, which has been carried out since the birth of computers.

This ability has been developed to an extent, that a device called a mouse is used. This mechanism allows you to interface with a computer much easier, than in the earlier years when a keyboard was used. This improvement in technology has led to a common place in society, which is now readily used in all companies and personal computers.

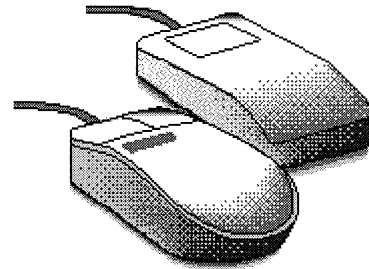


FIG. 1
A COMPUTER MOUSE

The movement of the mouse is mimicked on the computer screen, through a small arrow. Which allows you to interface with the computer much easier than the keyboard.

The mouse is a device that looks like similar in shape to a real mouse, as the name suggests. But there are also many other types of mice for a computer. Some of these are a mechanical mouse, an optical mouse or a tracking ball. All of these are widely used in computer applications.

In this case study report I will focus in on the most commonly used mouse, the opto-mechanical mouse. I will also look at the effect the mouse has had on the society, environment and economy later on in the case study. Plus later on I plan to write a small account on a mouse that uses a laser rather than a rubber ball, to move the cursor on the computer.

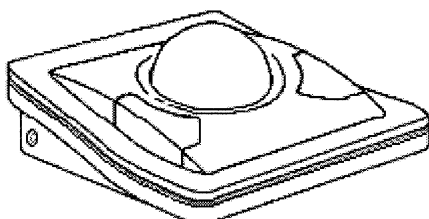


FIG. 2
A TRACKBALL

The main purpose of a mouse is the rotational motion has to be changed into electrical pulses. Plus the mouse size also matters to be ergonomic. Therefore the computer mouse must be designed to use small components for the size of the device. Also the mechanism has to be highly efficient.

Analysis & Description

To analyse the computer mouse fully, the system diagram of the mouse must be examined. This is shown below in *Fig 1*.

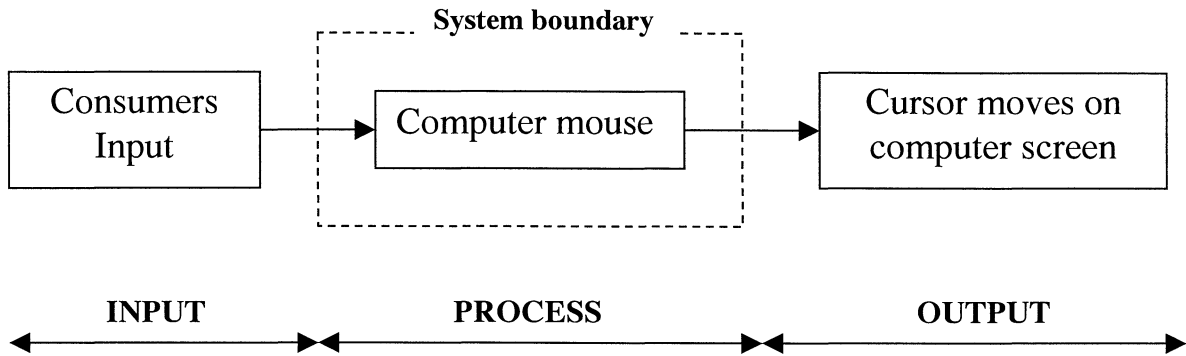


FIG 1 – COMPUTER MOUSE

This basic system diagram above can be broken into the block diagram as shown below.

Sub-Systems Block Diagrams

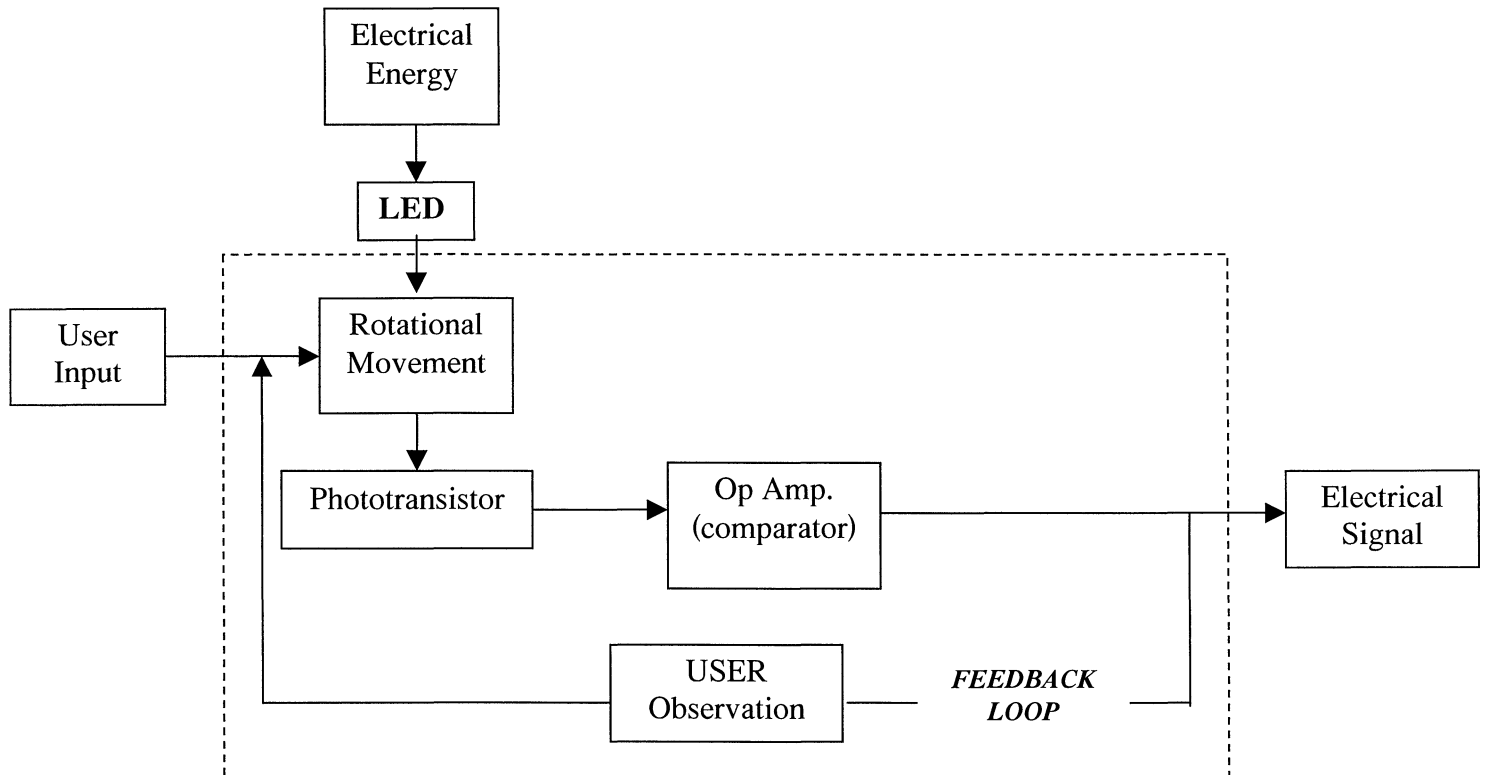


Fig 3 – sub-systems of mouse movement
 (There are two of these - one for vertical and one for horizontal)

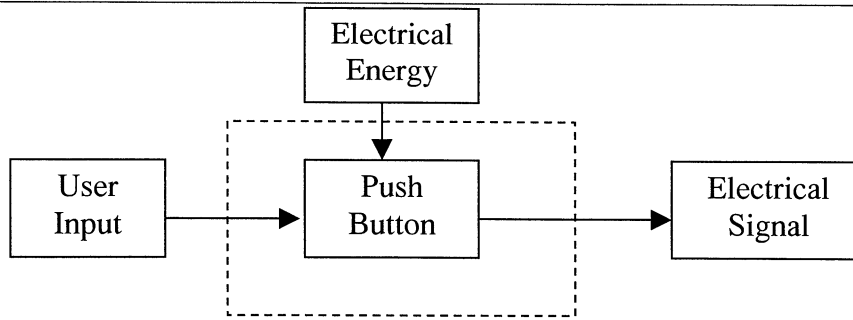


Fig 4 – sub-systems of mouse buttons
(there are three of these)

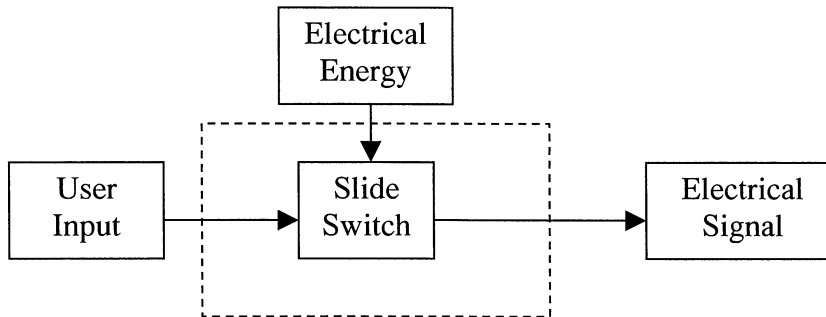


Fig 5 – sub-systems of mouse slide switch

At the end of the report there is a systems diagram, which shows the whole system including the sub-systems.

Changing movement in to electrical signals is difficult, since the ball isn't moving in a linear or rotational movement. For this reason a phototransistor* has to be used with potential divider. This can be achieved by changing the users movement into rotational movement. Which can be used to make the LED pulse.

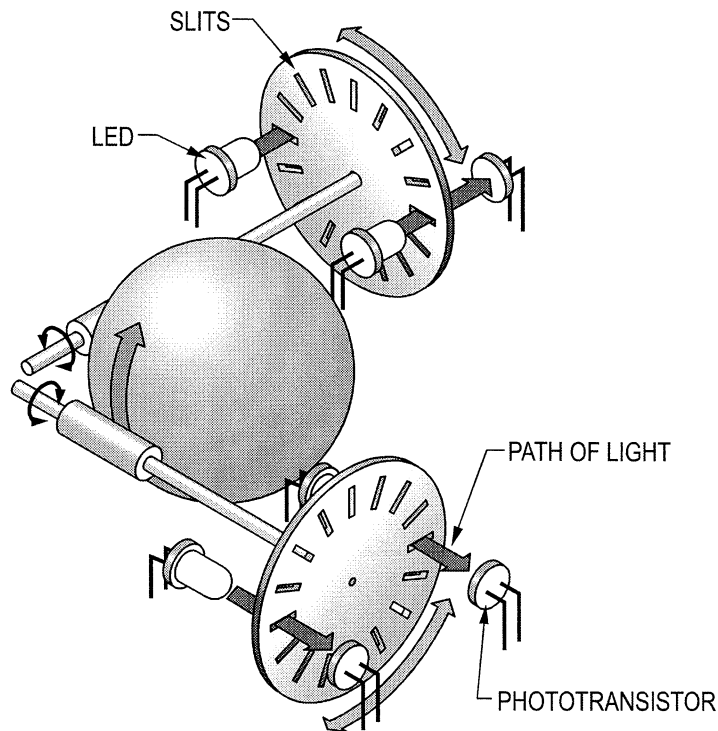
With the LED pulsing** this can change the voltage through the phototransistor. So the electrical signal can be changed to a +ve or -ve voltage, a Comparator Op. Amp. is used.

This Op. Amp. is very useful since it has a reference voltage, which could be seen as a starting point on the monitor.

* A phototransistor is an electrical switch that isn't turned on/off by electricity, but instead light is used to turn the switch on/off.

** Pulsing is for example a light that is turned on/off so many times in a period.

The diagram below shows how the users movement is changed into rotational movement.



Input

The input of the mouse is the movement provided by the user.

Process

The process is changing the movement into an electrical signal. Using a phototransistor can do this. An electrical signal is sent in to an Op. Amp. which determines if the signal is positive or negative, this does this by referring the signal to the reference signal. But when the amplifier is in a comparator mode the main voltage that goes into the comparator sets the signal amplification.

Output

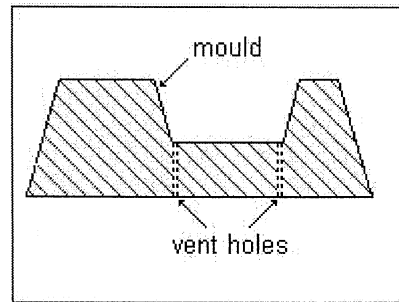
This signal is sent to the computer through a wire, and is interpreted into the cursor movement.

Social, Economic & Environmental Effects

There are three main effects that the mouse has on the Social, Economics and Environment. The first effect that I will write about is the production of the computer mouse case.

- Environmental effect

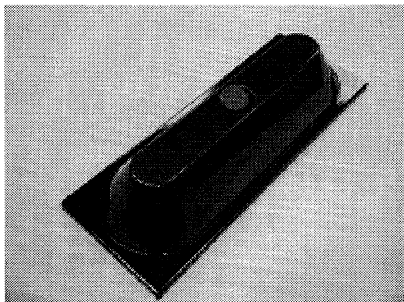
The computer mouse is made of plastic, which when produced has to go through a process of *Vacuum Forming*. Which can be used to shape the mouse. This process uses thermoplastics, which use heat to form the plastic shape.



This can cause an environmental effect through the plastic heating up and letting gases off, which can harm humans. Also the drilling and retrieval of oils from the seabed has tremendous environmental impact. Not only that it could cause environmental damage through burning coal, which produces the electricity to make the pressing machine work. Other environmental effects can also be caused through resources like oil, coal and nuclear power plants.

But saying that the company could also get electricity from a wind farm, water turbines or solar panels. Which would cause this environmental effect to be dismissed.

-Social Effects



The mouse is a simple device that can be used by nearly anyone. Even a small child of the age 4 upward can use a mouse. Also the mouse is now being used in business/home environments. But not only that it can make jobs on the computer much easier than using a keyboard.

The mouse has also created jobs, because people have to be employed to make the mouse casing and the printed circuit board. Which has been beneficial to communities world wide, therefore it has changed life's.

The mouse isn't all good, since it can cause repetitive strain to the hand. This is because people have all different sizes of hands, where as the mouse is design for wide variety of hand sizes. But some people might not come under the average size of hand, which causes the repetitive strain. Another thing that can cause repetitive strain is the daily uses of the mouse for long periods of time. The people that use the mouse daily could be secretaries, CAD operators, etc. This just shows that everything has bad points (even the mouse).

All the social effects above show that the mouse is a worth while device to have. But it also shows that the mouse has a bad point.

- *Economic Effects*

Much of the profit from the mouse has gone in to the companies. But in turn people will have a bigger income. Which I would say would affect the economy.

To buy a mouse it will cost approx. 4 to 5 pounds. Which isn't very much, but sell them with a commercial computer will build up the income, coming from the mouse.

Conclusion

The report that I have writing is about the complete system of a mouse. Apart from the software that controls the mouse in the computer, which I wasn't able to work on, within the context of the report.

The mouse is now used as an input to a computer, which help people to interact with the computer with more ease.

Now the mouse is the most commonly used computer input, after the keyboard. But to find out how the mouse works I had to dismantle a mouse.

Before looking inside the mouse I looked at the mouse from the outside, which can make people think that the mouse is a simple device. Where as the mouse is a very complex device. But at first it can be very daunting, because of the circuit board. Which brings me onto the problems of analysing complex printed circuit board.

Much of the problems of making the mouse work was to find out how to change movement into electrical signal. However the movement of the mouse isn't just in a linear direction, but it can be in any direction. To over come this problem, the movement of the mouse must be changed in to another form of motion. For example the motion of the mouse can be changed in to rotational action via a mechanism.

After this problem, of changing movement into electricity, much of the mouse was simple to work out. But the main problem that I don't need to go into was the software that decoded the electrical signals, which controlled the cursor movement.

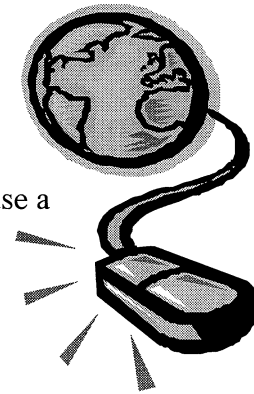


This software could have been basic stamp (as I found out later on).

The control of the mouse is simple how the computer interpreters the signal of the mouse, and changes it in to the movement of the cursor on the computer screen. This would have been very difficult to get information on, even thought the mouse is a simple device. I would have however liked to explore this area with more depth.

After looking inside the mouse I looked at the environmental, social and economics of the mouse. And found that the main area for the environmental effect was in making the case for the mouse. But what wasn't a surprise was that most computer user now uses a mouse to interact with the computer. Another very good point about a mouse is that they don't cost a great deal of money.

Even now companies like Microsoft are developing the mouse, so that it is more comfortable - ergonomic, and so the mouse doesn't have to use a cable to interact with the computer. But another company has developed a mouse that not only doesn't use a cable to interact with the computer, but also uses a laser instead of the ball in the mouse.



After looking at my report I found that there are very few bad points about the mouse. For example the mouse isn't expensive, it's small, it's simple to use and most of all now they're comfortable. This is reflected in my own opinion, but on the other hand the bad points are mostly on producing it. Even though there are bad points about the mouse I believe that many people to come will use them

Bibliography

Microsoft Encarta 98 - Microsoft.

Focus on Plastics - CD ROM Focus Educational Software

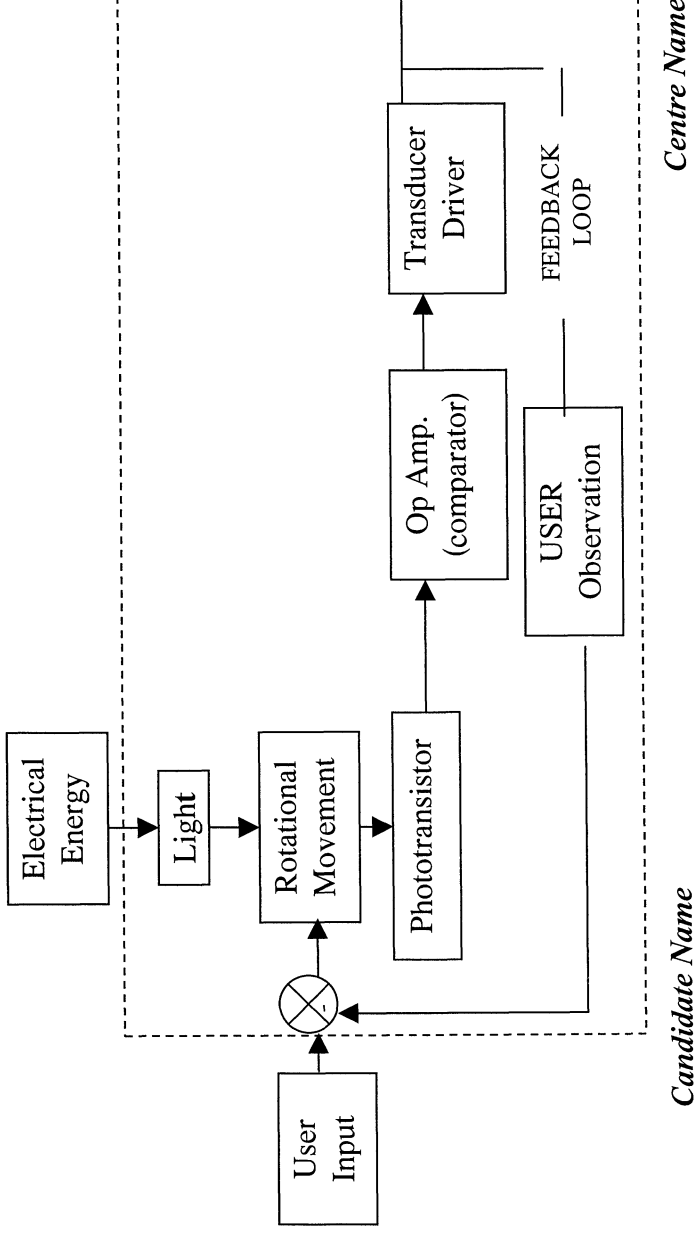
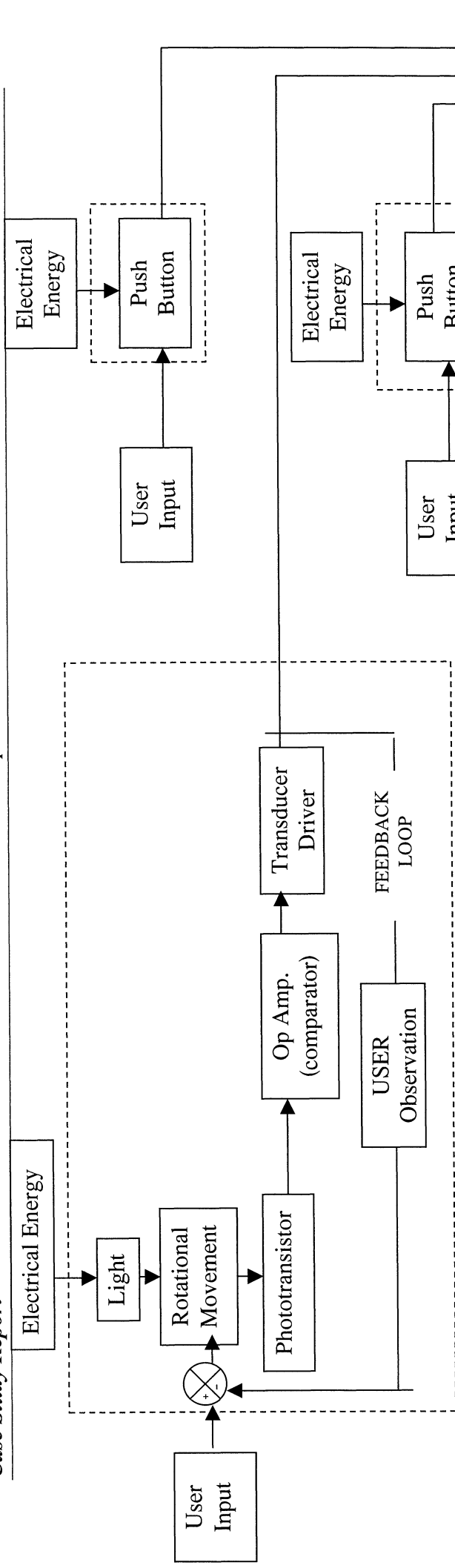
Typical Op Amp Circuits -

RS Catalogue '99 - CD ROM

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Case Study Report

Computer Mouse



Candidate Name

Centre Name

MODERATOR REPORT FORM



Centre Name	Exemplar Report Moderation	Number	
Centre's SQA Co-ordinator			
Moderation Group Name		Number	
Date of Visit/Central Event		Completion Month	
Moderator Name			

MODERATION RESULT			NAB / AEP (x if used)
Unit Number	Accepted	Not Accepted*	
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	<input type="checkbox"/>	<input type="checkbox"/>	
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*
*If crossed you must complete a **not accepted** report and provide reasons for your decision including specific advice on how the issue can be resolved and what action you expect the centre to take.*

The centre should be commended for the very high quality of Case Study Reports.

Good introduction, good use of system diagrams throughout the report, very high quality of Analysis. Social Economic and Environmental Effects adequately addressed. Very good conclusion. Excellent use of knowledge gained in units and is applied appropriately throughout report, in particular the aspects relating to Applied Electronics .

The teacher has clearly understood the requirements of NAB and has had the candidate make very good use of knowledge gained in the units. Good, well presented report which fulfills all evidence requirements

Reported back to (for visiting moderation)			
Moderator Signature		Date	

Please enter an x if continuation sheet is used <input type="checkbox"/>	FOR OFFICE USE ONLY	
	EXPENSES	
	APS	
CENTRE COPY	OFFICER	

MODERATOR REPORT FORM

SCOTTISH
QUALIFICATIONS
AUTHORITY



Centre Name		Number	
Centre's SQA Co-ordinator			
Moderation Group Name		Number	291
Date of Visit/Central Event		Completion Month	
Moderator Name		N. I. Number	

MODERATION RESULT

NAB / AEP (x if used)

Unit Number	Accepted	Not Accepted*	
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Comments (Use Continuation sheet if appropriate)

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MODERATOR REPORT FORM

SCOTTISH
QUALIFICATIONS
AUTHORITY



Centre Name		Number	
Centre's SQA Co-ordinator			
Moderation Group Name		Number	
Date of Visit/Central Event		Completion Month	
Moderator Name		N. I. Number	

MODERATION RESULT	NAB / AEP (x if used)
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Unit Number	Accepted	Not Accepted*	
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	<input type="checkbox"/>	<input type="checkbox"/>	

Comments (Use Continuation sheet if appropriate)

Reported back to (for visiting moderation)	
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Moderator Signature	Date	
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FOR OFFICE USE ONLY	
Please enter an x if continuation sheet is used <input type="checkbox"/>	EXPENSES
Please enter an x if carried out visit/if attended central event in own time <input type="checkbox"/>	APS
MODERATOR COPY	OFFICER

