Teacher Resource Bank

GCE Electronics

Sample Coursework

- Sample Three

AQA

Centre-assessed work
Candidate record form
2009

GCE Electronics (2430)
Unit 3 Practical system development (ELEC3)

Centre number

Centre name

Candidate's full name

Candidate number

Notice to candidate The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.

To be completed by the candidate

1. Have you received any help or information from anyone other than your subject teacher(s) in the production of this work?
   Yes ☐ No ☐
2. If you have answered yes, give details below and on a separate sheet if necessary.
3. Any books, leaflets or other materials (eg DVDs, software packages, Internet information) used to help you complete this work and not clearly acknowledged in the work itself must be listed below. Presenting materials copied from books or other sources without acknowledgement will be regarded as deliberate deception.

Candidate declaration I have read and understood the above and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.

As part of AQA's commitment to assist students, AQA may make your coursework available on a strictly anonymous basis to teachers, examining staff and students in paper form or electronically, through the Internet or other means, for the purpose of indicating a typical mark or for other educational purposes. In the unlikely event that your coursework is made available for the purposes stated above, you may object to this at any time and we will remove the work on reasonable notice. If you have any concerns, please contact AQA.

Date

Teacher declaration I confirm that the candidate's work was conducted under the conditions laid out by the specification. I have authenticated the candidate's work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Date

This form should be attached to the candidate's work and retained at the centre or sent to the moderator as required

ELEC3/CRF

Turn over ▶

Candidate's full name

Candidate number

To be completed by the teacher / assessor and candidate

On each occasion when you and your supervisor discuss your coursework, details of the consultation should be recorded. The record should begin as soon as you start on the coursework, i.e. when the form of the experimental project is being chosen and should be completed when the written report is submitted to your supervisor for assessment.

Date discussion took place	Nature of Discussion (e.g. advice, guidance and help given by the supervising teacher)

I certify that the above is a record of the candidate's work.

Date

Turn over ▶

Candidate's full name

Candidate number

To be completed by the teacher

Marks must be awarded in accordance with the instructions and criteria in the specification. The work **must** be annotated to identify the relevant evidence.

Project title:

Please complete the boxes with the appropriate mark for each criterion.

A Problem analysis and solution design

	mark	comment
a		
b		
c		
d		
e		
f		
g		

B System development

	mark	comment
a		
b		
c		
d		
e		
f		
g		
h		
i		

C Making measurements

	mark	comment
a		
b		
c		
d		
e		
f		

D Report

	mark	comment
a		
b		
c		

Total mark (max 50)	

Details of additional assistance given (if any) Record here details of any assistance given to this candidate which is beyond that given to the class as a whole and beyond that described in the specification. Continue on a separate sheet if necessary.

Concluding comments

To see how AQA complies with the Data Protection Act 1988 please see our Privacy Statement at aqa.org.uk

Candidate's record of the supervision of coursework.

NAME:-... .....

REFERENCE NUMBER:-..... .....

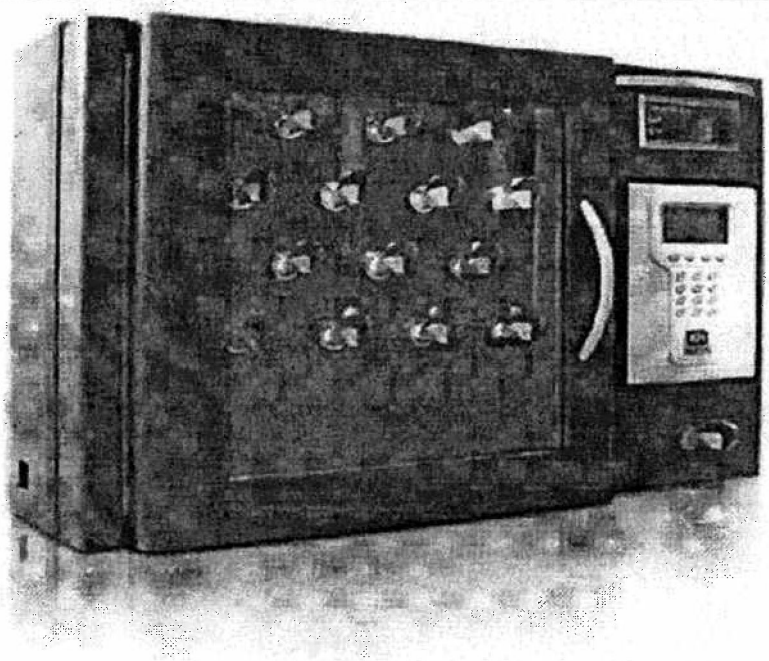
On each occasion when you and your supervisor discuss your coursework, details of the consultation should be recorded. The record should begin as soon as you start on the coursework, i.e. when the form of the experimental project is being chosen and should be completed when the written report is submitted to your supervisor for assessment.

Date when discussion took place	Content of discussions; advice, guidance and help given by the supervising teacher.
21 January	coursework outlined by teacher
26 January	Project aim agreed with supervisor.
13 march	sub-systems completed
19 march	Project demonstrated to supervisor.
29 april	written report completed
6 may	Final project report submitted to supervisor.

I certify that the above is a record of the candidate's work.

Supervisor's signature:. .....Date:. 12/5/08...

electronics coursework booklet



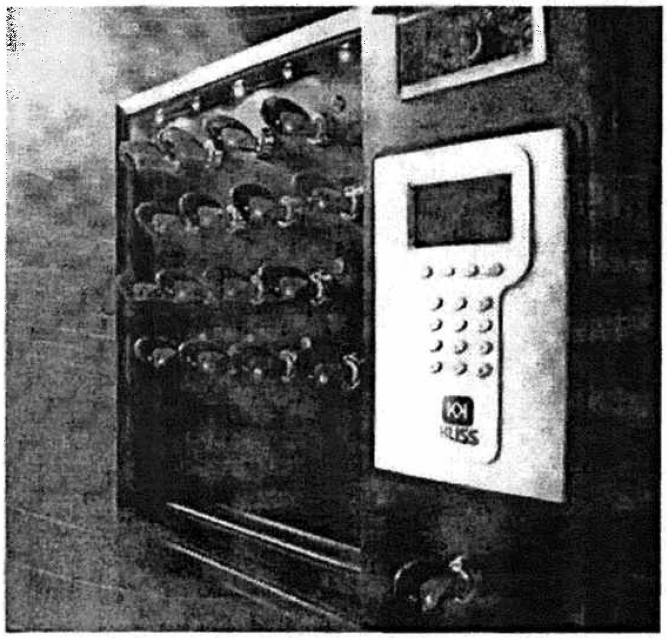
Aim

My coursework is based on the problem of a door lock. The circuit is designed to act as an electronic door lock, holding the lock on the door closed until the correct switch configuration is entered and it is turned on. The problem I am using as an example is my room. I am sick of people coming into my room without permission, so this system is designed to keep the door locked so that people cant get in. I have included a logic key so that it can only be opened by certain people.

Aa2
Description of problem to be solved

Research

I have carried out research on to sites. The first site I looked at was the site en.wikipedia.org and www.keytracker.com/electroniclock.html. The first site "wikipedia" gave information on the technical side of electronic door locks, this gave me the idea to combine a "555 timer circuit" that I have made in past lessons with a solenoid. The second site "keytracker" site gave me the idea to use NAND gates as a way to form a "logic key" tat could be used to limit access to the room that the lock is on.



Ab1
Inadequate details and evidence.

Ac0
No evidence of practical investigations.

Ad1
Description but lacking detail.

Specification

Ae1
Only two parameters and these are weak.
Supply voltage,
Time Period.

The main thing the lock must do is hold the door shut, I have chosen a 24V solenoid because of the strength of the magnet inside it. It must also have a simple yet effective electronic lock system, I will use a NAND gate chip in order to create it along with a block of switches. The circuit must be able to run from a 12V power supply and be able to hold the door open for at least 10 seconds.

Possible Solutions

One possible solution is my initial idea, to use a solenoid attached to a 555 timer circuit so that by sending a pulse I can switch the solenoid off so that the door can be opened and someone can get inside. Another possible solution would be to link the solenoid to a bistable relay, the normally closed gate connected to the solenoid, the normally open to 0V and the contact to +V. The relay coil contacts could be connected to a logic system so that the correct combination is needed to turn the solenoid off and get into the room. I have decided to use the 555 timer circuit as is contains the required amount of and the main circuit is something I have had previous experience with, making it easier to build. I have decided to use a 24V solenoid because it will work efficiently at 12V. I am going to use a 7402 8input nand chip because it gives me enough gates to create a good logic system and counts as one of my active components.

Ag0
Inadequate details.

Af0
Alternative is not electronic.
Inadequate details of alternative.

Sub-system Development

The formulae for working out the time of the system is RxC which is the resistor and capacitor used that are connected to the threshold and discharge on the 555 timer chip. The values I have used are 1 megohm and 10 microfarads. The calculation for this is 1000000x0.00001=10. the

Bb0
Incorrect formula and no component calculated.

Ba0
No evidence of subsystem construction.

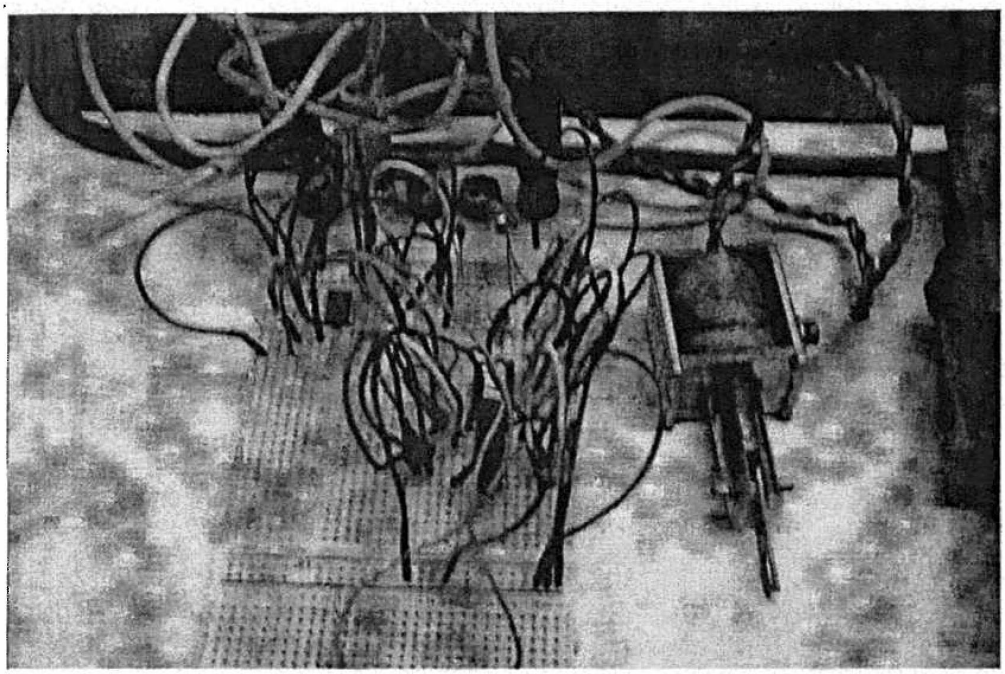
circuit opens the lock on the door for about 10 seconds. The solonoid I have used would be connected to the inside of a slide lock, like the ones found in public bathrooms. When the solonoid is on it holds the handle shut and stops someone from opening the door. when the switch is flipped and the "logic switches" are set right the solonoid will switch off allowing someone to open the door and an LED will come on in order to allert the opener that the door can be opened. For the "logic switches" I have used 2 switches with the same supply, the main switch used for trigering the circuit, and connected the to a nand gate. So if 1 or neither of the gates is on then the door will open. I have split my work into 3 subsystems, the "timer subsystem" containing the 555 timer circuit, the "logic subsystem" which contains the nand gates and switches. The final subsystem is the "output subsystem" which contains the LED, soloniod and transistor. The transistor I added in so that the solonoid could run directly from the power supply instead of drawing power from the reast of the system. The base is connected between the LED and the resistor before it in the circuit, the collector is connected to the negative of the solonoid and has a diode with the minus connected to the +voltage in order to stop backcurrent that could blow the transistor.

Bc0
No evidence of subsystem measurements.

System

Bd2
Adequate description with just minor spelling issues.

The system is based around a 555 monostable timer circuit. When the switch is flicked, aand the switches are open/closed correctly a pulse is sent to the 555 chip, because of the resistor and capasitor I have used mean that the chip will take about 10 seconds charging until it discharges. Whilst the system is charging the LED is turned on, alerting the user that the door can be opened, and the solenoid, at default turned on and holding the door shut, will turn off allowing the plunger to be pulled out, opening the door.



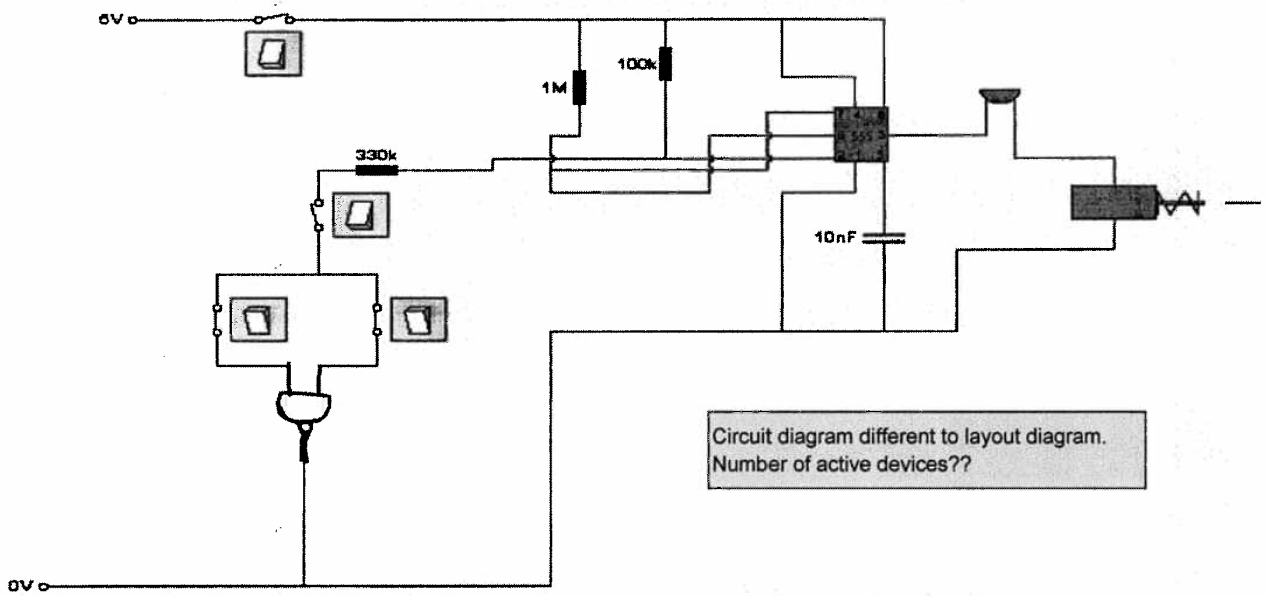
Bg0
Wires unnecessarily long. Difficult to avoid with pre-terminated wires.

Db1
Photograph OK. Circuit diagram not complete.

When the circuit discharges the LED goes out and the solenoid turns back on, pulling the plunger back in and locking the door again.
The overall time of the circuit is the same as the calculations done above, so the average time for getting through the door is 11.8 seconds. Because I decided to use an LED and a solenoid it means that it is a lot less irritating if the code is needed to be put in again so that the door can be closed properly, this was a problem presented with using a buzzer instead of an LED.

Component layout

My circuit diagram is



Circuit diagram different to layout diagram.
Number of active devices??

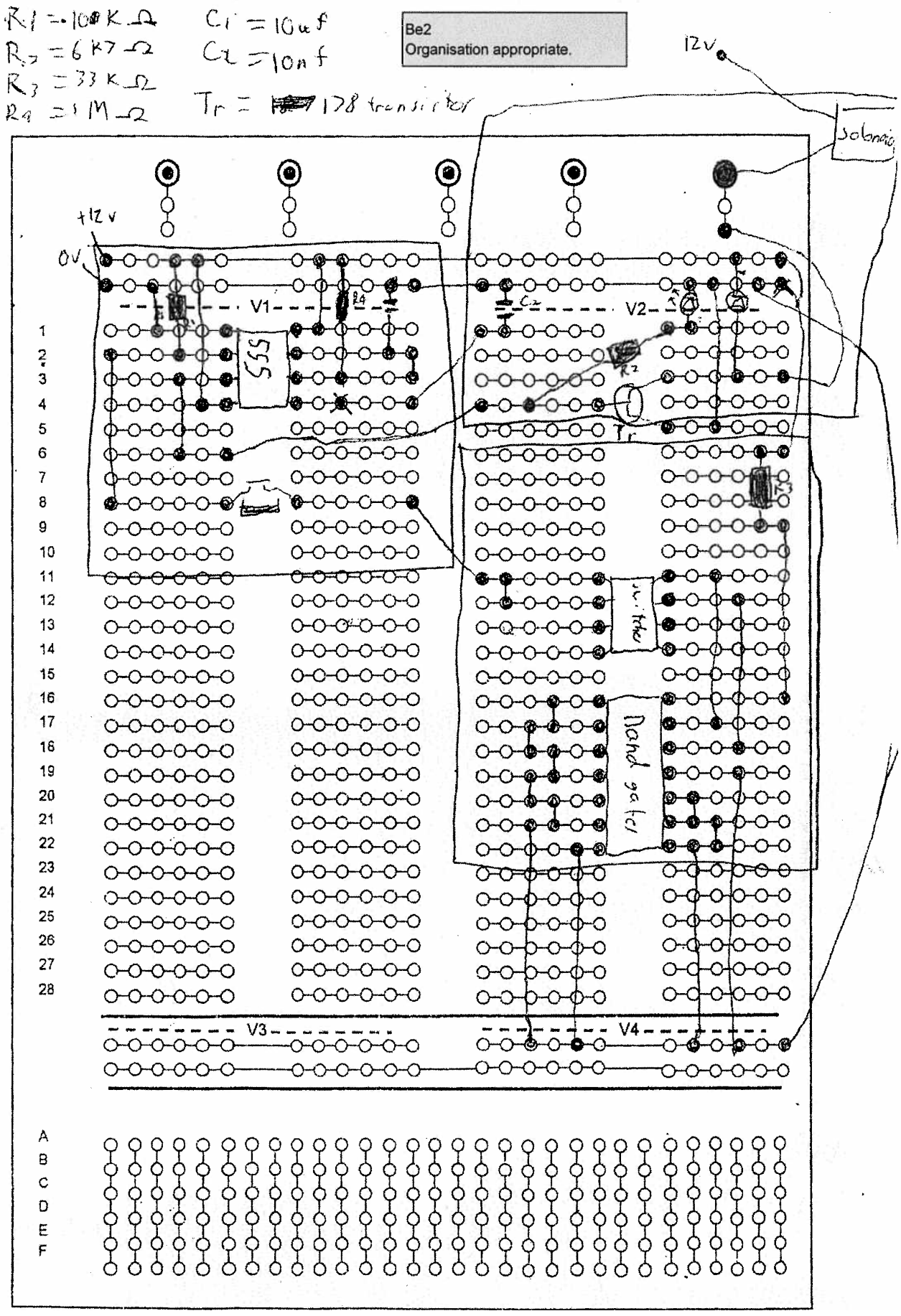
Bh2
System works.

Bi2
System works - minimal guidance

Bf0
No risk assessment by candidate, only the witness statement.

Worked Safely and Competently with minimum supervision

Course tutor



Ca0
Little evidence of planning prior to testing.

Measurements and testing the system

For my system I have devised one simple test that will allow me to test the performance of my system. I plan to turn the circuit on and time how long the LED stays on for using a stopwatch, this wil alow me to tell how long the circuit times for, as the LED turns on when the circuit is timing and turns off again when the circuit finishes. I will time the circuit 6 times and use these times to find the average time.

After finishing the circuit it,the whole system works and the average time for its activation is:

1st :11.75 seconds
2nd :11.65 seconds
3rd :11.93 seconds
4th :11.90 seconds
5th :11.79 seconds
6th :11.78 seconds

Cb1
Only one basic measurement made.

Cc0
No evidence of other measurements.

Average = (11.75+11.65+11.93+11.90+11.79+11.78)/6 =
70.8/6 = 11.8 seconds

Overall my average time was 1.8 seconds above my estimated time, this is probably due to small percentage error on a large resistor, even 1% error is a difference of 10000 ohms. Overall I am happy with the results of my test of the time and consider my circuit finished. The interface between the sub-systems is minimal, being almost solely connecting inputs from one to outputs from another.

Cd1
Only one system parameter measured.

Overview-evaluation, assessment and limitations

There is one limitation to this system with enough strength the door can still be opened even if the system is switched on. On way to overcome this limitation would be to use a stronger magnet, reducing the chance of the lock being broken by force. I am unable to find a better magnet as it would mean rebuilding my system to accommodate the power required to run it. Overall I believe my system works at the standards I had hoped for. If connected to a real door I believe that my system would work adequately well, it could also be converted easily to operate a hidden door lock, having the solenoid hold the door locked and replacing the logic key with a switch hidden somewhere nearby. Throughout the project I received minimal help and worked safely at all times.

Ce1
One limitation mentioned.

Cf0
No evidence.

Da2
Report matches mark description. Minor spelling errors.

Dc0
No summary of references of information and help.