

## **Contents**

- Introduction
- A Brief History of Computers
- Setting up your computer
- Loading your computer
- Problem solving
- How to use the system
- Help
- Codes
- Simple Exercises
- A.C.L. Course Test Record

## **Introduction**

A mystique surrounds the world of computers – ROM, RAM, Bits, Bytes etc. – making it seem difficult for the newcomer to crack the code. However, a small amount of carefully planned instruction can open up new horizons for anyone interested enough to give their attention.

I do not expect to turn you into an expert overnight. My aim is to give you a basic understanding of your computer. No previous computing knowledge is assumed, and any necessary technical terms are explained in plain language.

If you have any questions, or experience any difficulties during the course contact:

A.C.L. Division  
Express Marketing Ltd  
73 Watery Lane  
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Birmingham B9 4HN  
Tel: 021-771 4711

Our objective is to help you succeed in all aspects of the course.

Thanks and appreciation are due to Leslie, Gordon and Michael. Their help was invaluable in putting this course together.

I wish you every success.

K. Carrington B.S.Sc.

### **A brief history of computers**

A British inventor called Charles Babbage, first conceived of the computer in 1833. His 'Analytical Engine' was to be an all purpose computing machine, that could be applied to many problems. Only parts of this prototype computer were ever built. As a practical proposition, it was far ahead of its time and would take another century to achieve.

However, further progression was brought about, by the problems of analysing the massive amounts of information generated by the census count in America. The census of 1880 had taken 7 years to count. A tabulation machine designed by Herman Hollerith dealt with the 1890 census and produced results in 6 weeks. On the basis of his success, Hollerith founded a company that in 1924 became the International Business Machine Corporation – I.B.M. – now the largest computer manufacturer in the world.

By the late 1930's I.B.M. was pressing ahead with a full scale computer. Work was completed in 1944 at Harvard University. The machine was the Harvard Mark 1 – the world's first full scale digital computer.

From 1941 onwards, a series of computers developed by scientists under the direction of the British Government led to the production of the world's first electronic digital computer – The Colossus. It used the electronic tube or valve system to transmit data coded into electrical pulses, rather than the old style relay system. But the Colossus performed only one task – code cracking during the war.

Meanwhile, another electronic computer began to take shape in the U.S.A. and was completed in 1946 – The 'Electronic Numerical Integrator And Computer' or ENIAC. Although it had little memory, its major contribution was that it could be given new programs to do different kinds of calculations. This was more in line with Babbage's conception and made it the first general purpose electronic digital computer. It was in service for 10 years.

The next vital steps in the evolution of the computer were:

1. The development of memory so that programs could be stored in the computer in the form of coded instructions.
2. The invention of the transistor in 1948. This led to a breakthrough in computer design. Size and expense were reduced, while power and simplicity were increased.

The memory improved in capacity and reliability with the development of magnetic tape (and later disk) systems.

The early computers were developed for scientific and defence purposes, but now the commercial field was ripe for development. The first commercial computer was built for Sperry Rand in 1951. The UNIVAC 1 has 100 times the capacity of the ENIAC. It was ten times as fast and almost a tenth of its size.

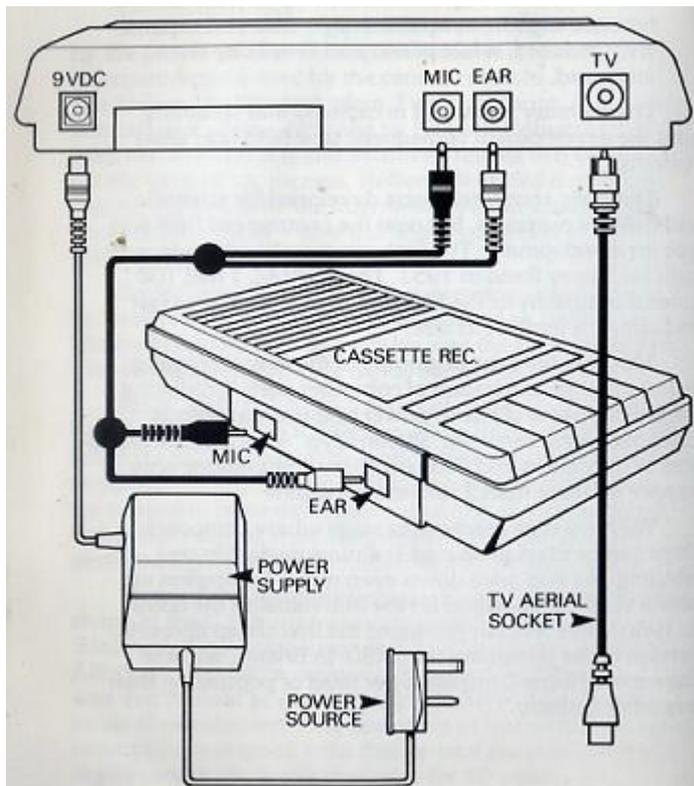
This was only the beginning of the ever increasing process of miniaturization of computer parts, producing the fall in price and rise in power of these marvellous machines. Next came the 'Silicon Chip', which packs many tens of transistors and their ancilliary components onto a space no more than 2 millimetres square.

We have now reached the stage where computer chips can be mass produced at almost negligible cost, bringing size and price down even more. Computers are now a viable proposition for the individual in the home. In 1980, Clive Sinclair produced the first cheap domestic version of the computer, the ZX80. In Britain, we now have more home computers per head of population than any other country.

## **Setting up your computer**

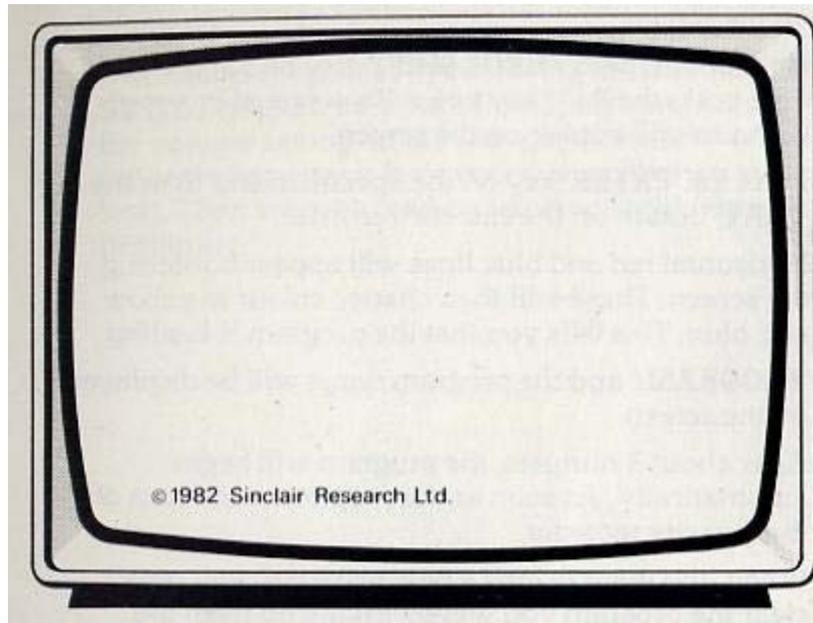
This diagram illustrates how to connect the Spectrum to a television and cassette recorder:

N.B. Computer/Cassette lead – Grey jacks plugs into EAR socket on Spectrum and cassette unit, and black jack plugs into Mic Sockets.



The T.V. should be tuned into Channel 36 (the video channel).

When it is first plugged in and properly tuned, the screen will display this message:



You are now ready to load the first program.

### **Loading your computer**

1. Place the tape in the cassette recorder and make sure it is fully rewound.
2. Set the volume control on the cassette recorder to approximately  $\frac{3}{4}$  volume.
3. Press the **J** (Load) key and the word 'LOAD' will appear on the screen.
4. Hold down the '**SYMBOL SHIFT**' key and at the same time press the **P** (") key twice. Two sets of inverted commas will appear on the screen.
5. Press the '**ENTER**' key on the Spectrum and then the '**PLAY**' button on the cassette recorder.
6. Horizontal red and blue lines will appear bordering the screen. These will change colour to yellow and blue. This tells you that the program is loading.
7. '**PROGRAM:**' and the program name will be displayed on the screen.
8. After about 3 minutes, the program will begin automatically. As soon as the program starts turn off the cassette recorder.
9. When you want to load a **new program**, you must clear the program you were working on from the computer's memory:
  - a. Hold down the '**CAPS SHIFT**' key, and at the same time press the '**SPACE**' key.
  - b. Then press the **A** (new) key.
  - c. Then press the '**ENTER**' key.

You should be left with a clear screen with the Sinclair copyright message displayed at the bottom. You can then repeat the loading procedure above.

## **Problem solving**

If you make a **typing error** you can correct it by:-

Holding down the '**CAPS SHIFT**' key and at the same time press the **0** (or **DELETE**) key.

If you experience loading problems:-

1. Check that you have followed the loading procedure correctly.
2. Disconnect the power by removing the lead from the **9V DC** socket on the back of the Spectrum. Adjust the **volume** setting on the cassette recorder. (Volume setting is important. It must not be too high or too low). Then start the loading sequence again from the beginning.

## **How to use the system**

1. An inverted triangle (▼) flashing on the screen is the symbol which tells you to refer to the **Help** section of the manual if you require further instructions.
2. When you have read and understood a screen of text you 'turn the page' to read the next screen by pressing the '**SPACE**' key.
3. At the end of each short **Section** of information you will have the opportunity to:
  - a) Go back to the start of that section and work through it again by pressing the '**X**' key.  
or
  - b) Continue and complete the **Exercises** which test your understanding of each section.
4. **You cannot continue** until you successfully complete each Exercise.
5. e.g. **Exercise 1**

The screen will look like this:

### **Exercise 1**

A computer works through 4 basic stages in the course of any operation. These are:

- 1.
- 2.
- 3.
- 4.

Now the computer is waiting for you to '**input**', ie type in, information.

If you think the first stage is 'processing', use the keyboard to type in your answer. You will see it appear in the border area on the bottom left of the screen. When you are happy with your answer press the **ENTER** key, and the computer will tell you if it is correct. (All answers will be typed in lower case. There is no need to use capital letters.)

### **Important points:**

- a) The computer is programmed to accept only the **correct spellings**. If you enter the right answer, but the spelling is wrong the message "WRONG, TRY AGAIN", will appear on the screen.
- b) If you add an **unnecessary space** before, during or after the word by inadvertently pressing the '**SPACE**' key it will produce a **WRONG** answer.

- c) If you notice a mistake, as you are typing you can **DELETE** it in the following way:

Hold down the ‘**CAPS SHIFT**’ key (bottom left of keyboard) and at the same time press the **0** or **DELETE** key (top right of keyboard). This will delete backwards from the last letter that you typed.

- d) You must press the **ENTER** key **to input** the information.
- e) If you are unable to find the correct answer you cannot continue. Therefore, type in ‘**help**’ and press the **ENTER** key. This will take you back to the information section where you can search for the correct answer.

6. e.g. **Exercise 2**

To complete this exercise, you will be required to enter more than one word. One of the answers is – **memory chip**. Be sure to **insert a space** between the two words by pressing the ‘**SPACE**’ key, or your answer will be **WRONG**. (You cannot turn to the next screen of text by pressing the ‘**SPACE**’ key during an exercise.)

7. Multiple choice exercises.  
e.g. **Exercises 10 and 11**

The screen will look like this:

**Exercise 10**

1. Which system does a computer use to represent numbers in its internal circuit?
- The Decimal System
  - The Binehaven
  - The Binary System

If you think that ‘a. The Decimal System’ is the correct answer:

- Type in the letter ‘a’.
- Then press the **ENTER** key.
- The computer will then tell you if this is the correct answer.
- If it is not correct try again.

NB.

Every time you get an answer wrong 2 points will be deducted from your score. See the section on **CODES** (page 12) for details of the points needed to qualify for a certificate.

8. When you successfully complete each exercise, a **CODE** will appear on the screen. This should be entered into your manual, on the page provided, for **return to A.C.L.**
9. All answers will be entered in lower case. There is no need to use capital letters.

## Help

▼1

- Type in the number **2**.
- You will see the number 2 appear in the bottom left hand corner of the screen.
- Press the **ENTER** key. The ‘cursor’ (ie. the flashing ‘L’) will then move to the right.

4. Type in the number **3**.
5. You will see the number 3 appear behind the cursor.
6. Press the **ENTER** key.
7. **2 + 3 = 7** will appear beneath the text in the bottom left of the screen.
8. You **must** enter 5 sets of numbers before you can continue.

### ▼2

If you want to play the **Space Invaders** game use the following keys:

**5** – To move **LEFT**

**8** – To move **RIGHT**

**0** – To **FIRE**

### ▼3

You will have a list of alternative directions in which you can proceed.

eg. You can go:-

east

west

If you choose 'east' then:

1. Type in **east**
2. Press the **ENTER** key
3. You will then be faced with a new list of alternatives.
4. Repeat this procedure until you reach the end of the game.
5. If you get the message '**INVALID INPUT**', you have chosen a direction which is not included in the alternatives available to you. Therefore you must choose another direction.

## Codes

When you successfully complete each exercise a **CODE** will be displayed on the screen. Enter these codes in the boxes provided on the **COURSE TEST RECORD**.

You must score a **minimum** of 60 points in Exercise 10, and 97 points in Exercise 11, in order to pass the course. (The codes which are displayed after these exercises reflect your points score, which will appear on the screen for you to check.)

To qualify for a **Certificate** from A.C.L., recognising your achievement, you must:

- a) Meet the required standards.
- b) Complete the Course Test Record on page 15 and post it to A.C.L. for marking.

## Simple exercises

The following are simple exercises for you to try out on your computer. Remember to copy them exactly, as a full stop or comma out of place can spoil the program. (If you experience any difficulty in obtaining any of the key functions refer to the Index at the back of your Spectrum manual.)

```
10 FOR n=1 TO 20
20 INK RND*6
30 CIRCLE 5*n + 50,70,n*3
40 NEXT n
```

```
10 FOR n=0 to 25
20 INK RND*4
30 PLOT 0,0
40 DRAW n*10,100
50 NEXT n
```

```
10 FOR n=0 to 255 STEP 5
20 PLOT n,0
30 DRAW INK RND*6;0,175
40 NEXT n
50 FOR n=0 TO 175 STEP 5
60 PLOT 0,n
70 DRAW INK RND*6;255,0
80 NEXT n
```

```
10 FOR n=-55 TO 55
20 BEEP .05,n
30 NEXT n
```

```
10 INK 6: PAPER 0: BORDER 0: CLS
20 FOR i=-PI TO PI STEP 0.1
30 PLOT 128.0
40 DRAW 0,175,i
50 NEXT i
```

```
5 OVER 1
10 FOR i=0 TO 254 STEP 3
20 PLOT 0,0
30 DRAW i,175
40 NEXT i
50 FOR i=175 TO 0 STEP -3
60 PLOT 0,0
70 DRAW 255,i
80 NEXT i
```

```
10 FOR a=0 TO 255
20 PLOT a,0
30 DRAW OVER 1;255-2*a,175
40 NEXT a
50 FOR a=0 TO 175
60 PLOT 0,a
70 DRAW OVER 1;255,175-2*a
80 NEXT a
```

```
10 FOR n=1 TO 704
20 PRINT PAPER RND*6;" ";
30 NEXT n
```

```
10 PRINT AT RND*20,RND*30; PAPER RND*6;" "
20 GOTO 10
```

## A.C.L. Course Test Record

Complete and return to A.C.L. Division, Express Marketing Ltd, 73 Watery Lane, Bordesley, Birmingham B9 4HN.

Passes will be awarded a certificate in recognition of their achievement.

Exercise Example	Code			For office use only
	A	B	5	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Your A.C.L. Certificate is free. If you would like to receive it in an attractive frame (wall hanging or free standing), please enclose £4.99. (Cheques payable to Express Marketing Ltd).

Please find enclosed cheque/P.O. to the value of £

With Frame       Without Frame       Tick Box

Name.....

Address.....

.....

..... Computer model.....

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