

USER

HANDBOOK

MICROVITEC

touchtech501



## USING A 501 TOUCHTECH MONITOR WITH A BBC MASTER

### *NOTE*

When using a 501 TOUCHTECH Monitor with a BBC Master it is necessary to set the correct Data and Baud rates. This is achieved by adopting the following procedure:

- 1 Switch on the Monitor and BBC Master.
- 2 Type in the following:

\*CO. DATA 5 *return*

\*CO. BAUD 7 *return*

### *NOTE*

This procedure need only be performed *once*, as the information is retained in memory even after the BBC Master has been switched off.

# MICROVITEC



## OPERATING INSTRUCTIONS FOR TOUCHTECH 501

### ACKNOWLEDGEMENTS

The TOUCHTECH 501 Touch Screen and introductory programs have been developed as a co-operative project involving Microvitec PLC, the Microelectronics Education Programme and the Department of Trade & Industry and Trowbridge College, Wiltshire.

*Microvitec PLC would like to thank the following for their assistance in the TOUCHTECH 501 PROJECT:*

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# INTRODUCTION

Welcome to the new and important concept involving the interaction of man with machine The TOUCHTECH 501.

Your TOUCHTECH 501 provides you with a powerful alternative to the standard keyboard for communicating with the computer.

The TOUCHTECH 501 is based on the latest infra-red scanning technology which enables it to detect a finger or object placed within the plane of the monitor screen and communicate the co-ordinates of this position to the computer with great accuracy. It is this facility that permits a unique and direct interaction between the computer user and the computer program, without the need for the user to turn away from the screen in order to select one key or another during the course of the program.

Many applications are possible using the TOUCHTECH 501. These will range from use with young children, where Touch Screen operation will be particularly useful in providing a completely natural way to interact with educational programs on a microcomputer, through to business-style application programs like database or spreadsheets, or for other applications that benefit from a menu driven approach.

The programs supplied with your TOUCHTECH 501 are general examples chosen to illustrate some of the possibilities. The programs demonstrate several styles of use. However the 8 modes of operation within TOUCHTECH 501 permit many other possibilities.

For those users with 'BASIC' programming skills, adapting existing programs for use with the TOUCHTECH 501 is relatively straightforward. This involves the addition of two small 'BASIC' routines to the existing program. Full details of these routines are provided within the handbook. A Utilities program 'BOXMAKE' is provided to facilitate this.

We wish you success with your TOUCHTECH 501 and we are sure you will find that it offers a new and exciting dimension to the computer and for software development.

**GETTING STARTED:-**

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# GETTING STARTED

## ASSEMBLY INSTRUCTIONS

All cables have been omitted for clarity.

After unpacking your TOUCHTECH 501, you must attach the feet (1) to the base of your Touch Screen.

Firstly the feet (1), as shown.

Then using screws (2) secure the feet (1) to the base of the Touch Screen.

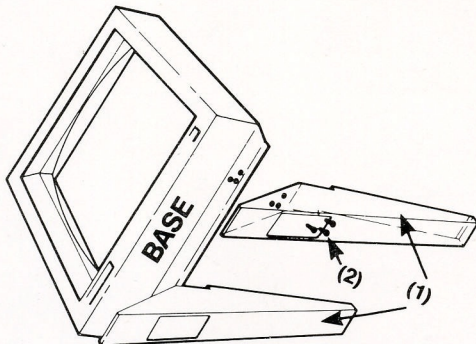


FIG. 1

Having assembled your TOUCHTECH you must now fit it to your 'M' series monitor.

Position equipment as shown, then raise the monitor so that feet (3) are located inside feet (1).

Slide the monitor forward, then slightly raise the rear of the monitor so that feet (2) are located inside feet (1).

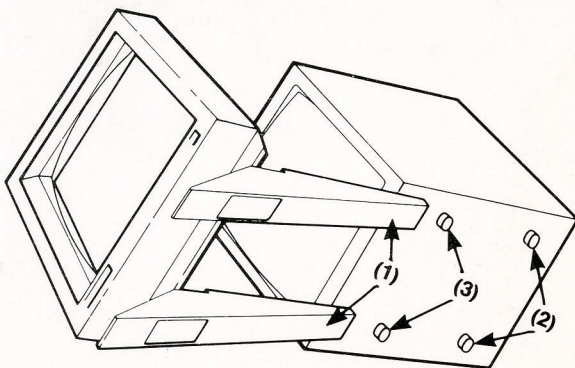


FIG. 2

Your monitor is now pre-set at the correct viewing angle, you must now make the electrical connections in order to get your TOUCHTECH fully operational.

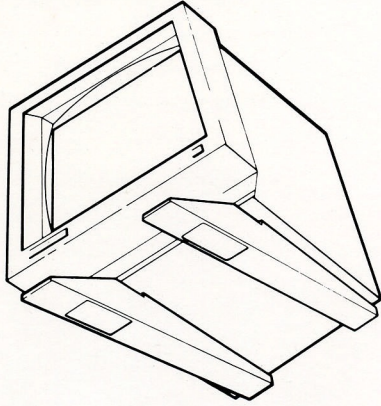
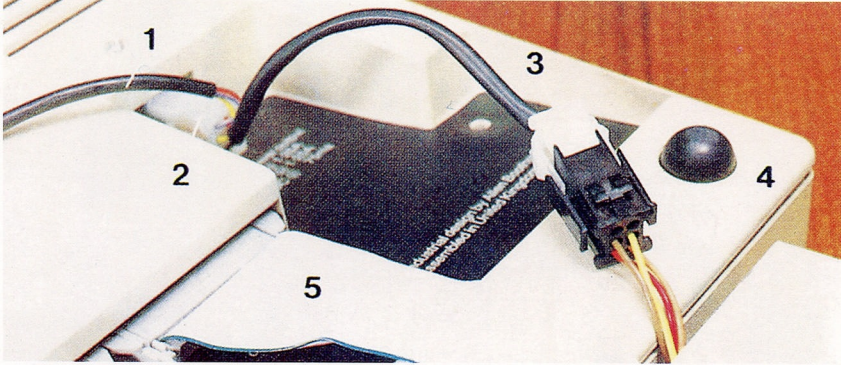


FIG. 3

# ELECTRICAL CONNECTIONS

We will now look at the electrical connections required in order to get your TOUCHTECH 501 fully operational.

1. There are two leads to be connected, the first is the power lead (1). This plug fits into the disc drive power port (2) on the underside of your micro, and provides  $\pm 5$  volts d.c.
- 2 The plug (3) connects to your disc drive power plug (4).
3. The only other connection is to your socket marked 'Disc Drive' (5).

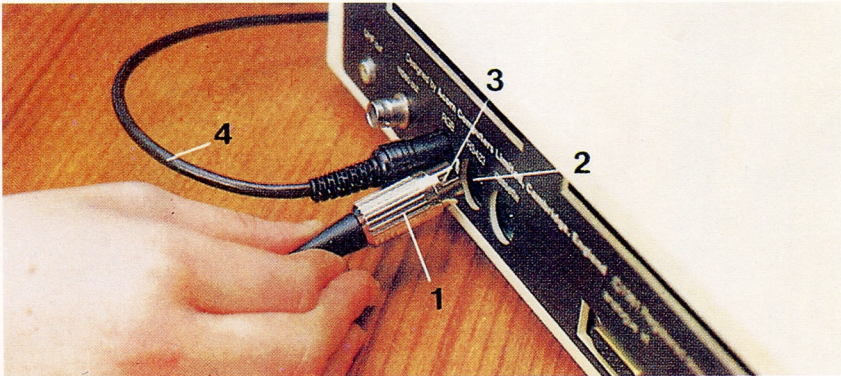


1. The second lead connects to a 5 pin din plug (1) which is fitted to the RS423 port (2) at the rear of your micro.

*Note:* The plug must be fitted with the gap (3) in the plug uppermost.

- 2 The lead (4) to your monitor connects in the normal way. RGB (micro to TTL (monitor).

Now all that's left to do is to switch 'ON' your monitor and micro and enjoy your TOUCHTECH 501.





## RE-SET SWITCH

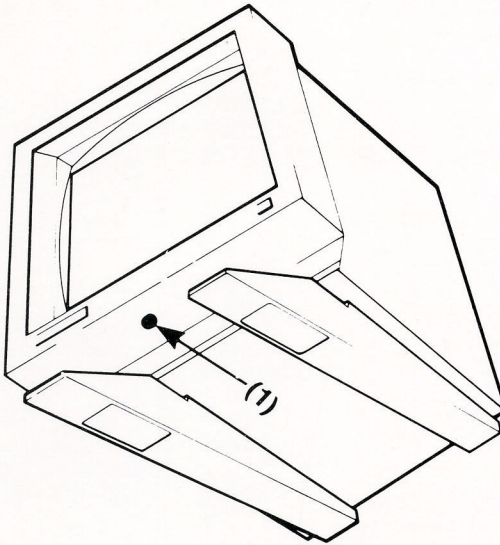
We will now look at the re-set switch (1) its position and its function.

### POSITION

1. The re-set switch (1) is located underneath the front panel of the TOUCHTECH in the centre.

### FUNCTION

1. The function of the re-set switch is to re-set the on-board processor! Should the system 'crash out' the re-set switch should be pressed to initialise the processor.



## CHECK LIST

If your new TOUCHTECH 501 does not operate the following steps will establish whether the TOUCHTECH is faulty. It is important that you carry out these checks before returning the equipment for warranty repair.

1. Ensure that the supply voltage is 'ON' (the LED on the front of the TOUCHTECH should be illuminated).
2. Ensure all electrical connections are correctly fitted (refer to 'ELECTRICAL CONNECTIONS' section of this handbook).

Some of the possible fault causes are:-

- A. Check input lead is correctly fitted, ensure plug is not upside down in the RS423 socket.
  - B. Ensure that the diskette is correctly loaded (see instructions on diskette).
3. Press the re-set switch.
  4. If possible try the TOUCHTECH with another micro, disk drive or monitor ('M' series only) to establish location of fault.

## DEMONSTRATION PROGRAMS

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# MENU SCREEN

To choose a program touch the relevant blue box. The box chosen will turn black and the program will be loaded from disk on removal of your finger.

## TOUCH

### OUTLINE

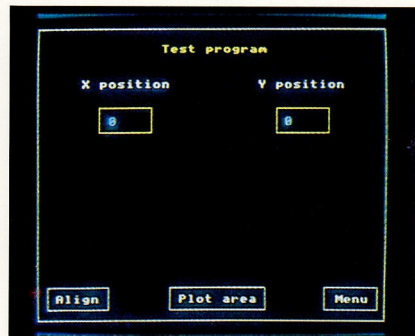
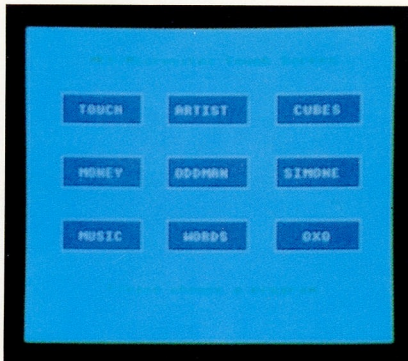
This program demonstrates the essential operation of the Touch Screen its ability to identify the position of the finger, represented by a cross on the screen. The program may also be used to adjust alignment.

### USING THE PROGRAM

#### 1. *Finger position*

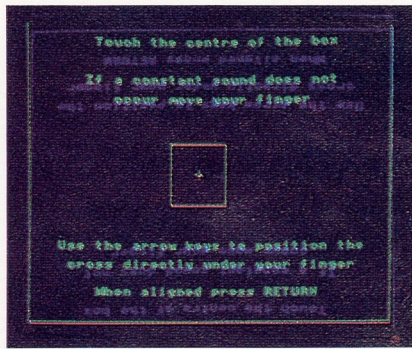
Place a finger onto the screen. A cross should appear on the screen underneath or near to the tip of the finger.

Move the finger slowly around the screen and the cross should follow it. The x and y values that appear on the screen represent the finger position which are on a scale of 0-120 on x axis and 0-90 on the y axis.

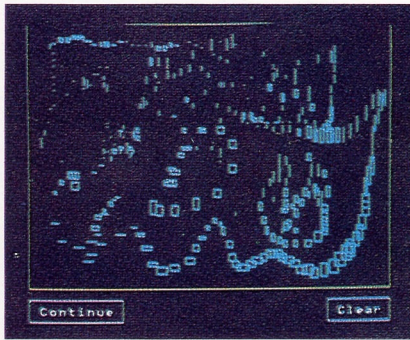


#### 2. *Alignment*

Ideally, the finger should be as near to the perpendicular as possible so as to avoid effects of parallax. This can occur because the detection plane of the Touch Screen lies slightly in front of the glass of the screen. In most circumstances this effect will not be noticeable.



If it is necessary to adjust the alignment of the Touch Screen then this option may be selected by touching the box marked 'Align' You will be asked to place a perpendicular finger onto a point where a constant sound is heard. At this point the cross may be realigned by using the arrow keys. Press the 'return' key to finish.



### 3. Object size

To see a demonstration of the ability of the Touch Screen to detect the size, as well as the position of objects, touch the box marked 'Plot Area'

Move a finger around the screen and a series of rectangles corresponding to the area of the object will be drawn on the screen.

Place a larger object, or the edge of the hand against the screen and larger rectangles will be displayed.

This represents the use of Touch Screen 'size mode 2' (see 'Software Notes' for further details).

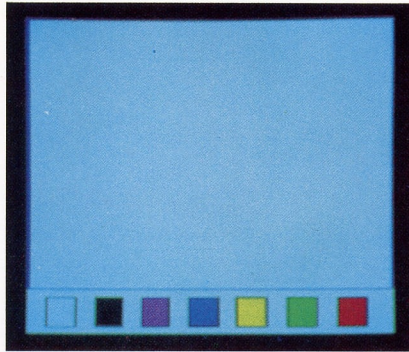
The display may be cleared by touching the 'clear' box. Touching the 'continue' box will end this section of the program.

Touch 'Menu' to return to Main Menu.

# ARTIST

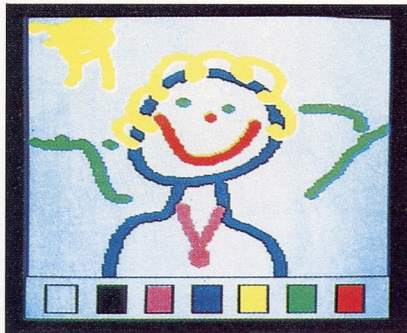
## ARTIST:-

The artist program enables you to make simple finger paintings with a choice of 5 colours and black and white.



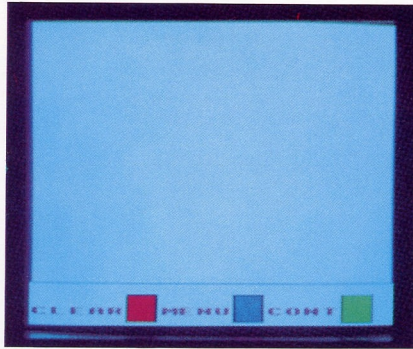
## USING THE PROGRAM

Touch the screen and move finger around, a black trail will follow. If you require another colour for your painting touch one of the coloured boxes, a sound indicates the change of colour, then continue with painting.



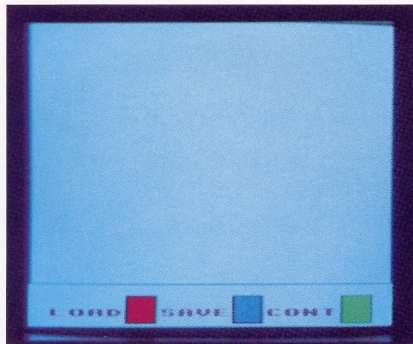
If you touch the white box a 'O' will appear in it. This box enables you to erase part or all of your painting. If you wish to continue with the painting touch one of the coloured boxes and carry on. If the white box with the 'O' in is touched again it will change the screen and the following 3 options will be available:

- (1) 'CLEAR' To clear the screen.
- (2) 'MENU' Return to the main menu.
- (3) 'CONT' To continue and present other options.



If you choose 'CONT' the other options are:-

- (1) 'LOAD' Will allow picture to be recalled from disc.
- (2) 'SAVE' To save completed picture on separate disc.
- (3) 'CONT' Will return to palette.



### **SAVING AND LOADING THE PICTURE FILES**

A separate formatted disc must be used to store completed pictures. On a 40 track disc up to 5 pictures can be stored. By using the option 'LOAD' these can be retrieved.

Choose the white box, touch 'O' for the first sub menu, touch 'SAVE' or 'LOAD' key. Enter name of picture file required and press return on keyboard) choose 'CONT' key to continue.

# CUBES

## CUBES:-

The Cube program enables you to produce cuboids in perspective.

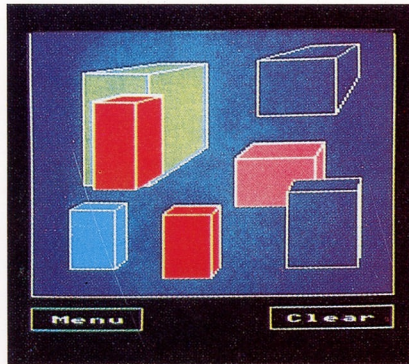
### USING THE PROGRAM

Place a finger on the screen. A cross will appear followed by a sound to indicate your point has registered the first position, repeat this in a second position. The cuboid will appear in perspective on your screen.

The program gives ideas of perspective which may be explored allowing cubic landscapes to be built up.

Touch 'Menu' to return to Main Menu.

'Clear' will clear screen so more cuboids can be formed.





# MONEY

## MONEY:-

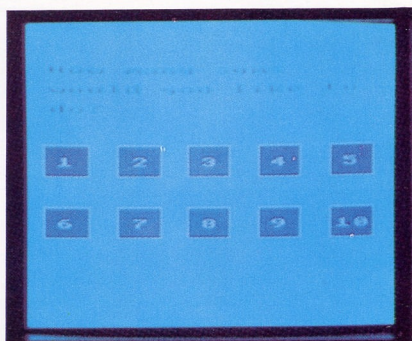
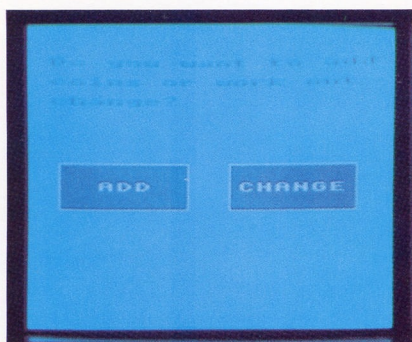
This program is designed to provide practice in handling combinations of money.

## USING THE PROGRAM

There are two options on this program, 'add' and 'change' There is also a choice of the number of questions you wish to answer.

First touch the option, then touch the number of questions you wish to answer. A question will be asked. To answer, touch the coins to make up the correct change, or the correct addition. When you have completed this a sound will be heard and the TOUCHTECH will show you the coins used. Touch the screen for next question. After all questions have been answered touch the screen again and it will show how many were correct.

Touch the screen to return to Main Menu.



# ODD-MAN

## ODD-MAN:-

This program enables the user to test one's perceptive ability by selecting the odd-one-out.

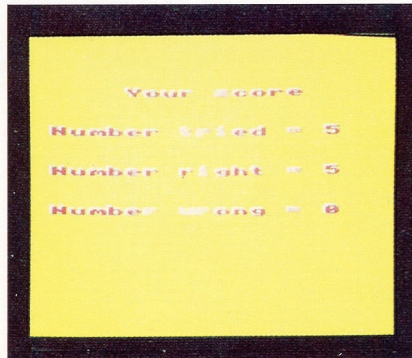
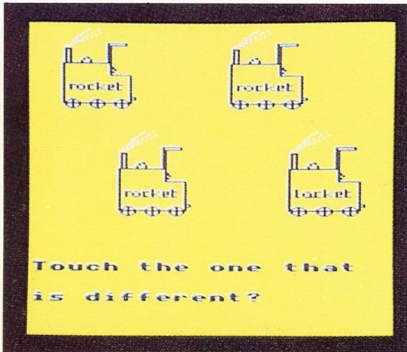
## USING THE PROGRAM

Study the four pictures, touch the picture which is different from the rest. If your choice is wrong the correct choice will be highlighted.

Touch the screen and another set of pictures will appear. This is repeated five times.

A score out of five will appear then, the screen returns to Main Menu automatically.

The program Odd-man is used with kind permission of Ega Beva Software



# SIMONE

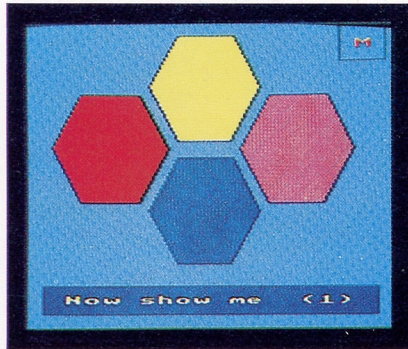
## SIMONE:-

This is a computer version of the popular game where the player must follow a sequence of colours chosen by the computer.

## USING THE PROGRAM

The computer will highlight one of the four colours. Touch the colour it has highlighted. It will then highlight two, then three, etc. Touch the same sequence as the computer. This will continue until you get it wrong. The computer will show the correct sequence before repeating the process using a different combination of colours.

Touch 'M' to return to Main Menu.



# MUSIC

## OUTLINE:-

This program is a three-stage menu-driven music synthesiser. The program presents an on-screen keyboard that can actually be played by lightly touching each key. The three stages allow the instrument to be played directly, a particular sound to be created graphically and a section of musical score created using a pre-stored or newly created sound.

Stage one represents the keyboard and a range of options that allow a number of instruments to be mimicked, and different ranges of octave to be selected.

This stage is also used to select the tempo at which a section of music will be played back in the third stage of the program.

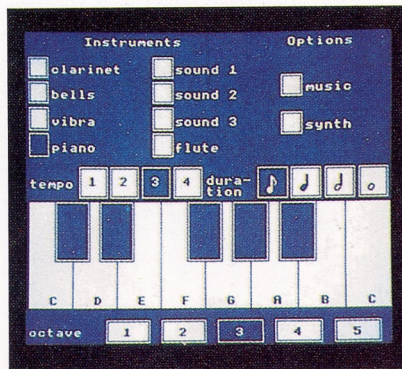
Stage two will permit the creation of a new sound that can be stored under the boxes 'sound 1' 'sound 2' and 'sound 3'. This is accomplished by directly manipulating graphically each of eight parameters that describe a given sound.

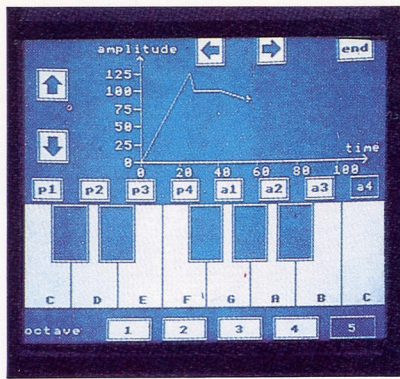
The third stage is a musical editor that allows a single voice to be created on a musical score as the keys are touched. This can be edited and played back. All the main options in this program need to be touched twice to be selected.

## USING THE PROGRAM *Stage 1 Keyboard*

First choose a given instrument by touching the appropriate box. Note that the initial three special sounds are undefined at the beginning of the program.

Choose a particular duration of note, quaver or semi-breve, and a given octave and the keyboard is ready to play.





The tempo ranges from 1 (fast) to 4 (slow) and this defines the speed at which a tune will be played back during the Editor stage of the program.

### Stage 2 *Synthesiser*

First choose the sound number (1-3) under which the synthesised sound will be stored. Then choose the 'synth' option.

The boxes p1 to p4 each refer to a particular section of a pitch curve.

At the beginning the sound is of constant pitch, but by choosing a particular pitch parameter for example raising the curve at this point a 'pitch hill' will be heard when a key is touched, this is achieved by touching the relevant arrow. It is recommended that gradual changes are made so as to permit the exploration of how the new sound 'profile' is being built up.

The parameters a1 to a4 refer to the amplitude envelope that governs the intensity and duration of different sections of the sound. By choosing a4 for example and forming a perpendicular drop to the end of the curve, a 'cut-off' sound will be heard. By raising and extending the curve at this point a sound of long duration can be produced. This is again achieved by touching the relevant arrow.

Note that the curve at each point can also be moved, within limits, in the horizontal plane. The graph will automatically re-scale itself as the sound profile increases or decreases.

To end this section and store the newly created sound choose the option 'end'

### Stage 3 Music Editor

This section is chosen by the option 'music' from the first stage of the program.

To assemble a section of music, each note type, quaver to semi-breve is chosen followed by touching the appropriate note on the keyboard. The notes will appear on the score as they are played.

Using the displayed options the emerging tune may be played back and notes may be overplayed, inserted or deleted.

A particular position in a section of score may be arrived at by touching the arrow boxes.

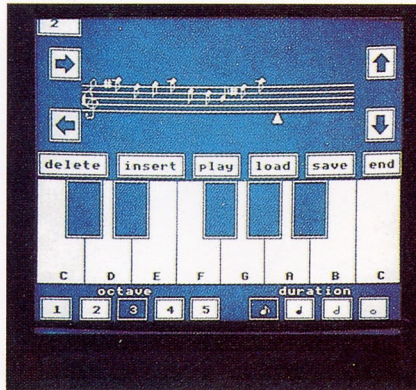
This section of music may be stored on your data disc and later brought back for playing. The sounding of a long note during saving or loading indicates that there is a disc operation error.

The composed tune will remain in memory until the program is ended.

Touch 'end' to return to the first stage.

Touch 'menu' box to end the program and return to the Main Menu.

*Note:* Only one tune can be saved on one disc.



# WORDS

## WORDS:-

This program enables the user to re-arrange an anagram to correspond with the given clue.

## USING THE PROGRAM

Read the clue. After looking at the anagram decide which letters are to be re-arranged. The screen has to be touched twice. The first identifies the letter to be moved. The second is the position to which it is to be moved in order to form a word to correspond to the clue.

Touch 'M' to return to Main Menu.



# OXO

## OUTLINE:-

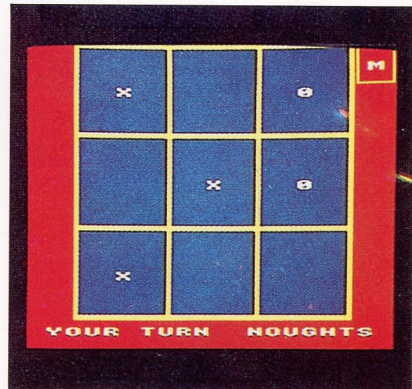
Noughts and crosses is a very old game brought to life in this example by TOUCHTECH 501. The interaction of the Touch Screen leads to a natural and responsive game.

## USING THE PROGRAM

You may choose a two-player game or alternatively choose to challenge the computer. However, you are warned that the computer has been programmed with an unshakeable and somewhat frustrating strategy!

To place a nought or a cross into a square simply touch the required position. Prompts will be given at each point in the program.

Touch 'M' to return to Main Menu.





## **SOFTWARE NOTES**

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# SOFTWARE NOTES

## INTRODUCTION

As an intelligent device your TOUCHTECH 501 Touch Screen operates a two way serial communication with the host microcomputer. Writing software that will operate with the Touch Screen will therefore include the following stages:

- a. Enabling the serial port.
- b. Selecting a Touch Screen operational mode.
- c. Requesting information.
- d. Receiving information.
- e. Interpreting the information to provide positional and other information for use in the BASIC program.

The program 'BOXMAKE' described in a later section will merge the procedures that perform the communication with the Touch Screen into your own program and also a procedure to identify when particular areas of the screen are touched. You do not need to understand the following operational notes in order to use 'BOXMAKE'

## TOUCHTECH 501 COMMUNICATIONS SOFTWARE

Communications firmware resident within the TOUCHTECH 501 is designed to support eight different modes of Touch Screen operation itemised as follows:

Mode	Description	Send Format	Receive Format
0	data dump mode	M0.	all detector states
1	point mode	M1	x y.
2	size mode	M2	x y length width.
3	multiple mode	M3	x1 x2 x3 x4 y1 y2 y3 y4
128	continuous dump	M128.	as for mode 0
129	continuous point	M129	as for mode 1
130	continuous size	M130.	as for mode 2
131	continuous multiple	M131	as for mode 3

To select a particular mode the string described in the column 'send format' is sent to the Touch Screen via the RS423 port. Having selected one of the modes 0-3, single items of positional information may be requested from the Touch Screen by sending a question mark as an ASCII character. The information returned will be in the format described in the column 'receive format'

All communication to and from the Touch Screen is through the use of standard ASCII characters. The procedure TSCOMS will convert these strings of characters into a numeric scale.

The modes 0-3 are 'request' modes where the Touch Screen returns a single string of information to the host computer upon receiving the particular 'mode code' and will continue to do so until a new code is given.

The modes numbered 128-131 are equivalent to modes 0-3 only they bring about continuous mode operation of the Touch Screen. In continuous mode positional and size information will be sent as a constant stream of characters. This information will be stored in the serial buffer of the computer until ready for examination. Consequently, it will be necessary, following periods of delay in the program, to flush this buffer so as to guarantee that the positional information is up-to-date.

The Touch Screen program disc contains two procedures called 'tsinit' and 'tscoms' which are saved as spooled files.

These procedures may be added to a program for which Touch Screen operation is required by using the \*EXEC command.

'tsinit' is an initialisation procedure that will set the Touch Screen to one of the eight modes of operation. It may be called during program operation by the expression.

PROCTsinit (1)

where the number in brackets corresponds to the required mode of operation.

'tscoms' is a routine that will request information from the screen (if operating in modes 0-3) and will convert the received strings of information into an array containing the positional, or other information appropriate to the selected mode. An object position will be recorded in the range of 0-120 on the x axis and 0-90 on the y axis, i.e. Touch Screen co-ordinates. However these values will normally be converted into graphic co-ordinates in order to represent plot positions during program operation.

The routines 'tsinit' and 'tscoms' are saved on the Touch Screen disc as spool files that can be added to the user program using the \*EXEC command. These routines will be added automatically to a given program during the operation of the programing aid 'BOXMAKE' supplied on the Touch Screen disc.

## **MAKING YOUR OWN TOUCH SCREEN PROGRAMS**

### **'BOXMAKE' Program notes**

This program may be used to define a number of boxes on the screen that would represent touch sensitive areas for input during the course of a program. The program may be used as a facility for writing new Touch Screen programs or for modifying existing programs for Touch Screen input where the programs are suitable for this technique.

## **OUTLINE OF OPERATION**

To use 'BOXMAKE' the program to be adapted will need to be frozen at the screen picture that is to be adapted for Touch Screen operation. At this point the program 'BOXMAKE' would be run. The arrow and shift keys will be used during the program to define the required areas as numbered boxes. The program will then generate a procedure which it will save to disc as a spooled file. This will then be merged with the original program, together with two additional Touch Screen driver routines. The original program can be linked to these new procedures so that the box numbers that represent the sensitive areas produce the appropriate response in the context of the program.

It should be noted that it will not be possible to use this method with certain programs as they may be written so as to be resistant to modification, or there may prove to be insufficient available memory to permit the addition of the new routines. In the latter case operation may sometimes be regained by 'downloading' the program in memory prior to running it. However it will not be possible to access the disc drive once downloading has occurred.

Normal copyright requirements should be acknowledged in adapting programs using this technique.

## **HOW TO USE THE PROGRAM 'BOXMAKE'**

- 1 Load the program which is to be adapted for Touch Screen operation.
- 2 List the program and find the point in the listing immediately after the section that creates the screen picture.
- 3 Add an intermediate line number followed by 'CHAIN BOXMAKE'
- 4 Run the program making sure that Touch Screen disc is in the disc drive. At the appropriate point in the program the screen should be overlaid with the instructions on how to create the boxed areas.
- 5 Move each box in turn with the arrow keys so that the top left hand corner of the box is placed in the required position on the screen. Holding down the SHIFT key, the arrow keys can then be used to increase or decrease the size of the box. Press the RETURN key to place the box at this position.
6. When all the required boxes are in place, make a sketch to remind you of which box number corresponds to the particular areas of the screen.
- 7 Press the TAB key and you will be asked to put in a new disc on which the routine 'boxproc' will be saved.
8. Press the RETURN key and the procedure data will be saved as a spooled file called 'boxproc'

- 9 Load the original program but do not RUN it.
10. Press f0 to renumber the program.  
Insert the disc on which 'boxproc' is saved.  
Press f1 to add the new procedure, now called 'PROCboxes'  
Insert the Touch Screen disc.  
Press f2 to add the Touch Screen initialising procedure.  
Press f3 to add the Touch Screen communication procedure.
- 11 You should now list the program and add the following
  - a. A line near the beginning  
e.g. 190 PROCtsinit (1)

This will set up point mode operation of the Touch Screen (Mode 1).

- b. After the screen display position in the program add the following, using appropriate line numbers.

```
302 REPEAT
303 PROCtscoms (1)
304 PROCboxes (Xp(1), Yp(1))
305 UNTIL FALSE
```

In the above short program Xp and Yp will be the x and y positions that represent the centre of the finger position. This information will be produced by the procedure PROCtscoms.

12. The program may be tested at this point and the appropriate box number should appear at the top of the screen when that box is touched.
- 13 The program should finally be adjusted so that these box numbers correspond to the required program response. This could be achieved by the structure like the following where PROCyes and PROCno would be part of the original program:

```
301 REPEAT
302   PROCtscoms (1)
303   PROCboxes (Xp(1), Yp(1))
304   IF box=1 THEN PROCyes
305   IF box=2 THEN PROCno
306 UNTIL FALSE
```
- 14 When tested the program should finally be saved on a separate disc.

As a practice run the program 'BOXMAKE' could be tested using one of the picture files saved from the artist program (although the images here will probably be too crude for serious application).

Use the following short loader program to commence operation and then refer to stage 4 in the above notes.

```
10 MODE 2
20 *LOAD filename
30 CHAIN 'BOXMAKE'
```

## Appendix 1

### PROGRAM LISTINGS

#### 'tsinit' the Touch Screen initialisation procedure

```
21000
21010DEFPROCtsinit(mode)
21020REM Operating system address
21030osbyte = &FFF4
21040
21050REM Switch off escape key
21060*FX229 1
21070
21080REM I/O Baud rates
21090*FX7 7
21100*FX8,7
21110
21120
21130
21140REM Convert the mode number
21150REM into a string variable A$ and
21160REM add 'M' to the beginning and
21170REM to the end
21180A$ = 'M' + STR$(mode) +
21190
21200
21210
21220REM Convert each character in A$
21230REM to an ASCII character and
21240REM store in osbyte parameter Y%
21250FOR I% = 1 TO LEN (A$)
21260Y% = ASC(MID$(A$,I% 1))
21270
21280REM Set up Osbyte parameters to
21290REM insert a character into the
21300REM RS423 buffer
21310X% = 2.A% = 138
21320
21330REM Enable RS423, select keyboard
21340*FX2 2
21350
21360REM Flush RS423 output buffer
21370*FX21 2
21380
21390REM Insert character into RS423
21400REM buffer
21410CALL osbyte
```

21420  
21430REM Pause until character is sent  
21440REM to Touch Screen  
21450REPEAT UNTIL ADVAL 3)= 191  
21460  
21470NEXT  
21480  
21490REM Disable RS423  
21500\*FX2,0  
21510  
21520REM Switch on escape key  
21530\*FX229,0  
21540ENDPROC

**'tscoms' the Touch Screen communication procedure**

**5DIM tsdata(18),Xp(4),Yp(4)**

22000

22010DEFPROCTscoms(mode

22020LOCAL C% I% J%

22030

22040REM Switch off escape key

22050\*FX229 1

22060

22070REM If a continuous mode is

22080REM selected send a question mark

22090REM to the Touch Screen

2100IF mode<128 PROCquestion mark

22110

22120REM Select and enable RS423

22130\*FX2 1

22140

22150REM Flush RS423 input buffer

22160\*FX21 1

22170

22180

22190

22200REM Check that there is a

22210REM character in the RS423 buffer

22220REM and store it in array tsdata

22230REM When a full stop is received

22240REM the data packet is complete

22250C% = 0

22260REPEAT

22270C% = C% + 1

22280REPEAT UNTIL ADVAL 2)>0

22290tsdata (C% = GET

22300UNTIL tsdata(C% = 46

22310

22320

22330

22340REM Discard the full stop

22350REM remove the high nibble from

22360REM the data items

22370C% = C% 1

22380FOR I% = 1 TO C%

22390tsdata(I% = tsdata(I% 64

22400NEXT

22410

22420

22430

22440REM Rotate the first and third



```

22450REM data item of each step so
22460REM that they become the high
22470REM nibbles of the X and Y Touch
22480REM Screen co-ordinates
22490REM add the second and fourth
22500REM data items, the low nibbles,
22510REM to form the X and Y Touch
22520REM Screen co-ordinates
22530REM Multiply X by 11 22 44 to get
22540REM a BBC graphic co-ordinated and
22550REM store in array Xp
22560REM Multiply Y by 11 37 to get
22570REM a BBC graphic co-ordinated and
22580REM store in array Yp
22590J% = 0
22600FOR I% = 1 TO C% STEP 4
22610J% = J% + 1
22620Xp(J% = (tsdata(I% * 16 + tsdata(I% + 1))*11 22 44
22630Yp(J% = (tsdata(I% + 2)*16 + tsdata(I% + 3))*11 37
22640NEXT
22650
22660
22670
22680REM Disable RS423
22690*FX2,0
22700
22710REM Switch on escape key
22720*FX229,0
22730ENDPROC
22740
22750
22760
22770DEFPROCquestionmark
22780
22790REM Enable RS423 select keyboard
22800*FX2,2
22810
22820REM Flush RS423 output buffer
22830*FX21 2
22840
22850REM Insert ? into RS423 buffer
22860*FX138,2,63
22870
22880REM Pause until ? is sent
22890REM to Touch Screen
22900REPEAT UNTIL ADVAL 3 = 191
22910ENDPROC
22920

```

### NOTE ON MODES 3 AND 131

The Touch Screen supplies positional information expressed as Touch Screen co-ordinates in the range 0-120 and 0-90 for the x-axis and y-axis respectively.

This is converted by the procedure 'tscoms' into screen graphic co-ordinates by applying scaling factors to the x and y values.

When using the multiple modes 3 and 131 this procedure should be modified so that the scaling operation takes note of the new positions of the x and y positional information in the received string. To do this alter lines 22180 and 22200 as follows:

```
22180FOR I% = 1 TO 7 STEP 2  
22200Xp(J% = (tsdata(I% * 16 + tsdata(I% + 1)))*11 22 44
```

Then.

delete line 22210 and add the following lines:

```
22221J% = 0  
22222FOR I% = 9 TO 15 STEP 2  
22223J% = J% + 1  
22224Yp(J% = (tsdata(I% * 16 + tsdata(I% + 1)))*11 37  
22225NEXT
```

## FAST COMMUNICATION

During particular applications of the Touch Screen it will be necessary to operate the transfer of information to and from the Touch Screen at a higher speed than is achieved through the use of the BASIC communications procedure.

On the Touch Screen disc there is a program 'ASSCOM' which is a high speed, machine code communications routine between the computer and the Touch Screen.

The program is presented as an assembler listing and when run, the program will assemble the machine code into the function key buffer of the BBC computer, which is at address &B30.

During the program operation this machine code routine may be called using the following lines in your program.

```
code% = &B30
A% = 129:REM continuous point mode
CALL code%
```

Locating the machine code in the function key buffer ensures that the maximum amount of memory will remain available for the applications program. However, this means that the function keys will not be operable whilst this program is running, but in practice it should be the aim of Touch Screen programs to run independently off the computer keyboard, and this is therefore unlikely to be a drawback.

It is still possible, however, to retain the option of programming the break key.

eg. \*KEY 10 OLDIIMRUNIIM

## FAST TOUCH SCREEN OPERATION

To make use of this fast communications routine, first use the program 'BOXMAKE' to modify the program that is to be converted to Touch Screen operation as indicated in the previous section, by following operations 1 to 9 inclusive.

At this point you may merge the first two procedures to your program as indicated in operation 10, but do not press f3

The program should be modified by adding the following lines of program (choosing suitable line numbers).

At the beginning, add.

```
190 IF INKEY 256) = -1 code% = &B30 ELSE code% = &A00
192 PROCtsinit (129): REM continuous point mode
```

After the screen display position.

```
301 REPEAT
302 A% = 129
303 CALL code%
304 Xp = ?&70*11.22 44
305 Yp = ?&71*11.37
306 PROCboxes (Xp, Yp)
307 UNTIL FALSE
```

To test the program it should be first saved.

To assemble the machine code and run the program under test, the following short loader program may be used.

```
10 CHAIN 'ASSCOM'
20 CHAIN '(program name)'
```

The program may be tested, and then modified as suggested in the section describing the use of the program 'BOXMAKE' so as to provide appropriate responses in the context of the program.

# EQUIPMENT WARRANTY

The manufacturer warrants for a period of 12 months from the date of purchase that the equipment shall be free of defects in materials, workmanship and operating failure, from normal intended use. The manufacturer will, at its option, repair or replace defective equipment at its factory free of charge during the warranty period. The purchaser shall be responsible for transportation charges of the equipment to and from the manufacturer's factory/service centre. This warranty is contingent upon proper use of the equipment, and does not apply to damage caused by misuse or negligence.

This warranty is in lieu of any other warranty, expressed or implied and is in lieu of all obligations and liabilities for damages in connection with performance of the equipment for a particular purpose, interruption of business, and loss of use, revenue or profit. Under no circumstances will be manufacturer be liable for special, incidental or consequential damages.

The warranty expressed is subject to the following conditions.

1. That the purchaser pre-pays postal and/or transport charges to the manufacturer's factory and accepts a C.O.D. return postage and/or transport charge when the equipment is submitted for warranty service.
2. The purchaser packages equipment in its original carton or functional equivalent to eliminate postal and/or transport damage when returning equipment for warranty service.
3. That the purchaser briefly describes the symptoms associated with the equipment failure in writing and submits it to the manufacturer, together with the defective equipment.

THIS WARRANTY IS IN ADDITION TO AND DOES NOT IN ANY WAY AFFECT OF REDUCE THE STATUTORY AND LEGAL RIGHTS OF THE CUSTOMER.

NOTE: ALL ITEMS MUST BE COMPLETED FOR WARRANTY TO BE IN EFFECT. IF PURCHASED THROUGH A DEALER THEN THE ADDITIONAL SECTIONS MUST BE COMPLETED BY THE DEALER.

BEFORE RETURNING EQUIPMENT YOU ARE ADVISED TO CHECK THE EQUIPMENT USING THE CHECK LIST IN THE OPERATING INSTRUCTIONS BOOKLET, SUPPLIED WITH THIS EQUIPMENT, AS AN ADMINISTRATIVE CHARGE WILL BE MADE ON EQUIPMENT RETURNED WITHOUT FAULT.

NAME .....

ADDRESS UNIT IS TO BE RETURNED TO .....

TELEPHONE NUMBER .....

MODEL NUMBER .....

SERIAL NUMBER .....

NAME/ADDRESS OF DEALER .....

NATURE OF DAMAGE OR FAULT (please give as much information as possible)

IF EQUIPMENT IS TO BE USED IN A BUSINESS

WHAT TYPE OF BUSINESS? .....

WHAT IS YOUR JOB TITLE? .....

WAS THE EQUIPMENT PURCHASED FOR ANY SPECIAL APPLICATION?

YES NO .....

IF YES, PLEASE STATE BRIEFLY THE APPLICATION .....

HOW DID YOU HEAR ABOUT MICROVITEC? .....

DO YOU HAVE ANY ADDITIONAL COMMENTS ABOUT THE PERFORMANCE OF YOUR EQUIPMENT?

# NOTES

# NOTES

# NOTES



# NOTES