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MSX and SPECTRAVIDEO COMPUTER FORUM

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Magazine

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Behind The Screens Of The MSX	$24
Starting With The MSX	$24
Starting Machine Code On MSX	$24
Complete Programmers Guide	$37

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MSX2 MSX2 MSX2 MSX2 MSX2 MSX 2 MSX2 MSX2 MSX2 MSX2 MSX2

MSX 2 is coming - real soon. If you would like to be kept informed on availability etc, drop me a line.

PETER J FOX (COMPUTERS) 9 ELLEN ST FREMANTLE WA 6157 Ph: 430 4577

TERMS: Payment with order. Subject to stock availability. Postage/Freight free over $100.

MSX and SPECTRAVIDEO

COMPUTER FORUM

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EDITORIAL

Welcome to the first issue of COMPUTER FORUM.

The main aim of this magazine is to foster an exchange of information about the computers that we use. Yes, I have both a Spectravideo 328 and a Spectravideo MSX computer.

We hope each month to bring you a spread of information covering both SV318/328 and MSX computers. For those people who may be thinking that this will mean only half of the magazine will be of use to them because they own either an MSX or SV318/328, I think you will find that the information about one type has applications either directly or in modified form to the other. So have a look at the other articles, you can never know enough about computers. Your comments are welcome, together with queries and articles — and we also pay for input. So get those thinking caps on. You could earn some cash from your computer.

To those subscribers who got in early, we apologise for the delay in producing this first issue and thank you for your support.

Happy computing . . .

Background to ...

COMPUTER FORUM

The driving force behind COMPUTER FORUM is none other than Yours Truly. For the benefit of those who are confusing me with all those other Yours Truly's around the place I will do a formal introduction.

This Yours Truly is Brod Brown. Up until approximately two years ago, I was practising my art as a computer programmer/operator for a large oil company. When I say large, I mean I was about 3000 down on the promotional ladder in the Australian branch. My hobbies included three years using home computers with a view to increasing their memory capacity to hold people's biorhythms and the contents of Encylopaedia Brittanica at the same time. Around the end of 1983 it occured to me that my future did not lie in programming and operating someone else's computer (although having a wife and two kids did have a bearing on it). So with ten years service under my belt I walked out of the sterile atmosphere of the computer room, took myself out of the number 3000 slot on the payroll, handed in my security pass and went home for the last time. The intention being to write the biggest and best program that would fit on a home computer and would do everything from doing your banking, paying the bills, picking your lotto numbers, keeping your business accounts and shooting your accountant who had been lining his pockets with your money.

IN SEARCH OF A COMPUTER

Now where to start. At that time I owned a super-modified Dick Smith System 80, and home-built Super 80, a Tandy TRS80 and an incredibly bulky vintage Burroughs computer which was programmed in binary for use with punch tapes. I obviously had to find a computer which was a mixture of one of those machines that are played in hamburger joints, the monster that I had left in that sterile computer room, and was priced within the reach of people who don't spend all of their time watching how their shares are doing on the stock exchange.

Just as I was about to start building this machine myself, I virtually stumbled across the Spectravideo SV328, boasting 32K of Microsoft Basic (which should be declared as the only language available for home computers), full colour, sound and CP/M capability. I started looking around for the best deal in second mortgages and my wife started checking our marriage licence for the expiry date, when I discovered that this computer did not cost an arm and a leg. By comparison, my Black and White, 16K, no sound System 80 cost $750 in 1981.

A NEW COMPUTER

So, out came the trusty cheque book and home I went with my latest acquisition. Unpacking the computer took two seconds and within what seemed like a couple of minutes I saw that now familiar logo on the screen in glorious technicolor. Now let's put this thing through its paces.

This thing, I might add, was a twin disk system with 80 column card, RS232 card, extra 64K RAM card and printer interface. After several late nights, I discovered that I was not able to perform some of the things that my Home Computer Life Support and General Be-all and End-all Program required because the author of the manual that was supplied with the computer had deserted me in quite a few areas. I now only used the manual to remind myself of the numbers required to generate each of the 16 colours.

Only one thing to do . . . Start pulling the thing apart physically as well as dissecting the Memory Map. I needed to find out how this thing stored the kind of information needed to keep track of what it is doing each time it is given a command.

ANOTHER PROBLEM

Stumbling block number one! Checking the available software revealed a distinct lack of utility programs, in particular an Editor/Assembler and Disassembler. Back to the dealer. "Sorry mate, can't help you! Go see the local user group."

I couldn't believe this. Here I was again, cheque book in hand and the guy didn't have anything to sell me. So I contacted the user group which happened to be operated by Peter Fox of Peter J. Fox Computers, another Spectravideo dealer. He said they had what I needed so I went round to see him.

I was pleasantly surprised to find that this guy was from the same background as myself with experience of Tandy computers. We both agreed that we had been spoilt over the years with the availability of information about Tandy equipment.

CHANGE OF DIRECTION

At this point, I was so impressed with the Spectravideo computer for its own sake, that I took on a dealership for them, as well as manufacturing some alternative peripheral equipment in the form of printer interfaces and cables. Once again, due to customer queries, I became caught up in the quest for more information about this computer.

My program was taking a back seat. Rather than preparing code for my masterpiece, I seemed to be spending an increasing amount of time at the keyboard, filling ashtrays and wading through every piece of

information which might have relevance to this very powerful but secretive computer. "How can I do this?" someone would ask, and off I would go looking for these elusive answers.

The situation was getting out of hand. I was spending more time answering letters and queries than filling orders. Each week someone would ask the same question as someone else before and another half hour would disappear. Only one thing to do. Produce a magazine . . .

(I might get back to finishing that program one day. I wonder if there will still be a use for it in 2010.)

HACKERS CORNER

Each month this column will contain useful information for those users who have gone beyond BASIC. We welcome items for inclusion from hackers with either type of computer.

To start off this page we include some memory location comparisons between the Spectravideo and MSX computers. DO NOT attempt to poke into these locations if you still have a program in memory that is important.

MEMORY POINTERS FOR MSX / SPECTRAVIDEO

Label	MSX Addr	SV Addr	Bytes	Explanation
USRTAB	F39A	F52B	20	USR Routine Addresses (10)
LINLEN	F3B0	F543	1	WIDTH stored here
CLIKSW	F3DB	FA02	1	Keyclick Flag 0=OFF
CSRY	F3DC	FA03	1	Cursor Y location
CSRX	F3DD	FA04	1	Cursor X location
CNSDFG	F3DE	FA06	1	Bottom of screen protect
SCNCNT	F3F6	FE78	1	Input delay
FORCLR	F3E9	FA0A	1	Foreground colour
BAKCLR	F3EA	FA0B	1	Background colour
BDRCLR	F3EB	FA0C	1	Border colour
CURLIN	F41C	F548	2	Current line number
TTYPOS	F661	F791	1	Cursor pos in screen line
MEMSIZ	F672	F7A2	2	Memory size
STKTOP	F674	F546	2	Top of stack
TXTTAB	F676	F54A	2	Program statement table
TEMPPT	F678	F7A4	2	Next available addr in LSPT
TEMPST	F67A	F7A6	30	Literal String Pool
ENDFOR	F6A1	F7CD	2	End line with current FOR
DATLIN	F6A3	F7CF	2	Last DATA line read
AUTFLG	F6AA	F7D6	1	AUTO flag 0=OFF,1=ON
AUTLIN	F6AB	F7D7	2	AUTO line number
AUTINC	F6AD	F7D9	2	AUTO increment
SAVTXT	F6AF	F7DB	2	Addr of string during input

Location &HFA06 (&HF3DE in MSX) holds the value of how many screen lines will be protected at the bottom of the screen. As you know, in basic the bottom line displays the function key status and you cannot move the cursor into that line.

Try pokeing this location with zero and move the cursor down. You can also lock more than just the bottom line. Pokeing 255 means lock 1 bottom line, 254 means lock the 2 bottom lines etc.

POKEING WIDTH

Try this —

```
10 A$="abcdefghijklmnopqrstuvwxyzABCDEFGHIJKL"
20 INPUT "WIDTH";W
30 POKE &HF543,W : REM MSX use POKE &HF3B0,W
40 PRINT A$
50 GOTO 20
```

HINTS & TIPS

USING 80 COLUMN CARD

We have had a few queries regarding the use of the SV806 80 Column Card with Spectravideo 318/328 computers. The following may be of assistance.

The 80 Column Card can only be used with a disk-based system as the command WIDTH80 activates it.

When using the card, power up in the normal manner and type width80 followed by ENTER. The message Ok will appear on the screen together with a flashing cursor.

This step can be overcome by modifying the ipl program on the disk to include the Width80 command in it. This will give 80 columns on booting up.

PAINT PROBLEMS

When using the PAINT command, some people have experienced the problem of the "paint" colour spilling out of the defined area they want to colour and painting in the whole screen.

There are two causes of this. The most common fault is a mismatch between the paint colour and the border colour of the defined area. For example —

```
LINE (10,10)—(20,20),12,B:PAINT(15,15),10
```

This piece of code draws a box with an outline colour of Dark Green and then proceeds to paint in the area with Dark Yellow. The paint colour does not match the border colour and so it continues beyond the defined area and paints in the screen.

The other way that this problem can occur is using the DRAW command to define an area, but the finishing point does not meet the start point. For example —

```
DRAW "BM30, 30D20R20U20L15"
```

This leaves a gap at the top left-hand corner of the box and the paint will escape here and once again fill in the screen.

X'press MEMORY

At first it would appear that the SVI X'press does not have sufficient free memory available to use programs as large as Ghostbusters and the like.

This is due to the fact that the disk operating system is resident in memory in the form of a ROM chip which consumes a portion of memory.

Peter Fox of Peter J. Fox Computers advised that holding down the SHIFT key during power-up would deactivate the disk ROM and give you full memory. Peter says that this is covered in the manual and sure enough it is there, Appendix A, page 3, but is written in such a way as to be taken as meaning that the software is not compatible.

MSX versus SPECTRAVIDEO

The BASIC commands used by Spectravideo SV318/328 computers are very similar to those used by MSX computers. However there are some differences. These are mainly in the graphics modes.

MSX computers have one more screen mode than SVs. There is one extra text mode and unfortunately this is Screen 1 which means that the graphics screens have been moved to Screen 2 and Screen 3.

Therefore to convert an SV program to run on an MSX computer, the graphics screen modes have to be increased by 1.

SV318/328 Screens —
Screen 0 Text Mode
Screen 1 Hires Graphics
Screen 2 Lores Graphics

MSX Screens —
Screen 0 Text Mode 40 character width
Screen 1 Text Mode 32 character width
Screen 2 Hires Graphics
Screen 3 Lores Graphics

The Screen command in MSX can also set the Key Click (there is no CLICK command in MSX), the cassette baud rate, and select whether the printer can handle MSX graphics characters.

Another graphics command which is not used in MSX Basic is the PUT command together with its GET command. These are used in the SV318/328 computer to GET an area of the graphics display and PUT it somewhere else on the screen.

The LOCATE and PRINT commands cannot be used in MSX graphics modes. The MSX uses a different method to print text to a graphics screen. A file must be opened early in the program and then the cursor positioned using the DRAW or PRESET commands. The text is then printed to the file number which was opened and this in turn displays it on the screen.

Another interesting point which we recently discovered is that CLS has the effect of removing sprites from the screen of an SV318 or SV328, however, on an MSX machine, the screen is cleared except for the sprites. These must be removed by looping through a PUTSPRITE command.

Anybody have a neater solution?

PRODUCT NEWS ...

NEW MSX COMPUTER

A new MSX computer will hit Australia's shores soon. The new Laser MSX will be available in MSX version I and version II.

Manufactured in Hong Kong by the same company that produced the very popular VZ200 and VZ300 computers, the agents for the Laser in Australia are Speedcal of Penshurst.

The MSXI is a standard version I MSX computer with 64K RAM, 16K Video RAM, 32K ROM and three channel sound generator. Also standard are joystick ports, centronics printer interface, and video output.

There are also two expansion slots and one expansion bus. It is rumoured that one of the expansion slots can be used to plug in an MSX2 adaptor due to be released shortly.

The Laser MSX2 is a whole new ball game. Featuring 64K user RAM with the option of 128K, 64K video ram with the option of 128K and 48K ROM. This version allows use of 80 column text, standard 256 x 192 graphics in 16 colour or 512 x 212 in 4 or 16 colour as well as 256 x 212 in 256 colours. That's right — 256 colours. Don't ask me to name them.

Peripherals available soon include disk drives, modem, cartridge software, graphics touch tablet, video superimpose cartridge (for grabbing and digitising pictures from the TV), mouse and fast cassette recorder.

Pricing at present is $495 for the MSXI version, $625 for the 64K RAM/64K VRAM MSX2 model and $695 for the MSX2 128K RAM/128K VRAM version.

A telex received by COMPUTER FORUM from the manufacturers indicates that the Laser, which was to be released in March, will now be available around the middle of 1986.

MSX ADAPTOR

We have been made aware of an adaptor from Spectravideo that converts an SV328 into an MSX computer. Known as the SVI606 MSX Adaptor, this plugs into the back of the keyboard and has an MSX cartridge slot in the top. The only problem with the adaptor is that it reduces the available RAM to 16K and we have been unable to find out which MSX software titles will run on the converted computer.

MOUSE OR JOYSTICK?

Spectravideo, well known for their range of QuickShot joysticks, have released a mouse — or to use their name for it, a Joycard. The SV1107 QuickShot VII Joycard to give its full title is like a track ball with two trigger buttons built into the "nose".

STRINGY FLOPPY

What is a stringy floppy? It is a fast cassette storage system employing a continuous loop cassette operating at high speed.

Data is written to or read from the cassette in the usual manner — sequentially, but there the similarity ends. Originally known as the poor man's disk system, the stringy floppy's secret lies in having its own operating system. With a normal cassette, if you wanted to read the piece of information that you had just passed over on the tape, you would have to rewind — but that assumes that you know that you have passed over it. With the stringy floppy, the cassette simply keeps on advancing until the information comes around again.

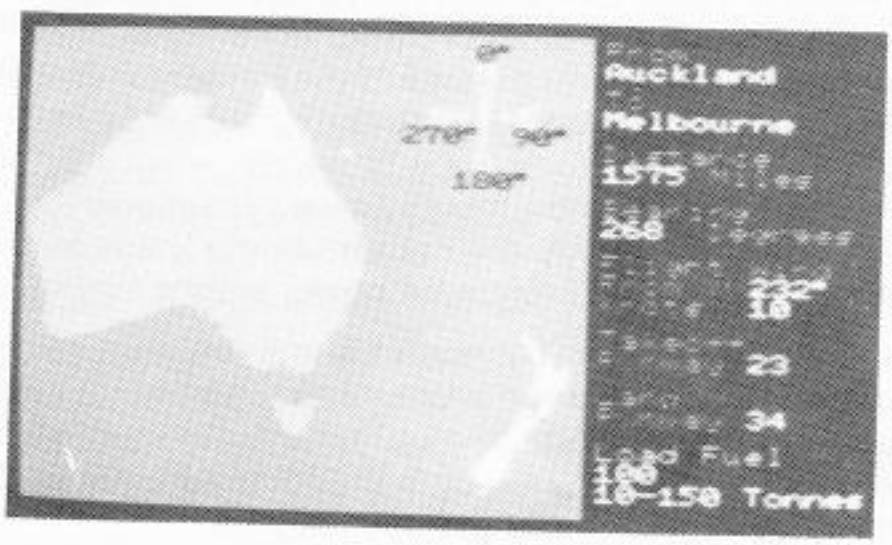
This may sound slow, but remember it is a high-speed cassette system. Storage is fairly large at 99K for each cassette. The only Stringy Floppy that we are aware of is the SV777 Stringy Floppy from Spectravideo which retails at $249 including operating system.

More next month ...

Software NEWS & REVIEWS

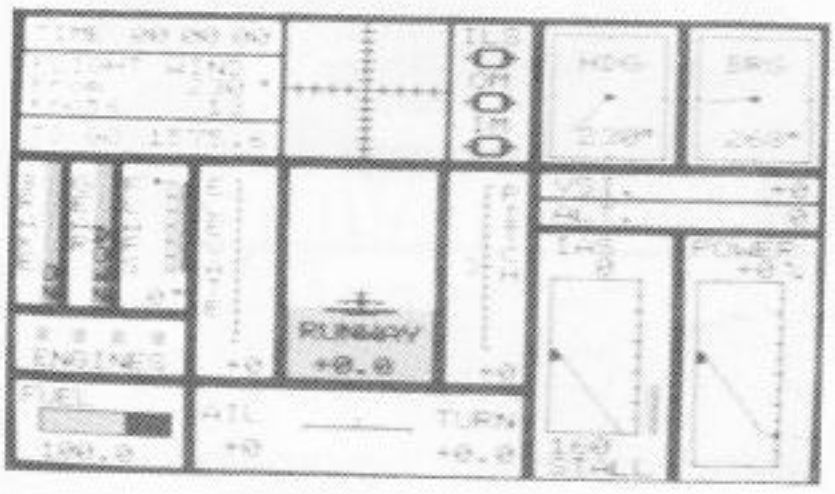
FLIGHT SIMULATOR FOR SPECTRAVIDEO

A Flight Simulator has been released for the Spectravideo SV328. This is a real "Simulator" and not a game. There are no "out-the-window" graphics, however the instrumentation is fully detailed on the screen.



In fact there are two screens in this simulation. The first screen shows a map of Australia and New Zealand with thirteen airports shown. At this point you can select an airport for departure and a destination, or practice landing at Auckland airport by pressing the P key.

Once the airports have been selected, you are asked how much fuel to load. This can be tricky and requires judgement of distance, wind speed and fuel consumption. Once the flight plan has been filed, pressing the ENTER key gets you into the cockpit.



You are now confronted with the cockpit screen displaying all the instruments as follows —

- Clock showing elapsed time
- Wind Indicator
- Brakes and Landing Gear Indicator
- Four Engine Status Indicators
- Elevator and Aileron Indicators
- Pitch and Turn Rate are also displayed
- ILS (Instrument Landing System)
- Compass and Bearing
- Runaway Indicator/Artificial Horizon
- Vertical Speed Indicator
- Altitude Indicator
- Indicated Air Speed
- Engine Throttle Setting

I will not take you through a flight on the Simulator as that is for you to enjoy. Let me say though, that there is a lot to do to keep the aircraft flying properly.

The Flight Simulator comes with a very comprehensive manual of 19 pages. The first few pages mainly deal with the background to flying and the various forces affecting an aircraft in flight.

The SV Flight Simulator, occupying about 24K of RAM is only available on cassette at present and will only fit an SV328 or SV318 with 16K RAM cartridge. We have been advised by the publishers that an MSX version will be available soon together with a disk version for both types of computer. Prices range from $49 to $59 depending on where you shop, but judging by reports from people who have flown the simulator, it is good value for money.

FDS INCREASES ITS RANGE

Forrest Data Services have just released five more of their popular game packs in the FDS Software range. There have also been some changes to the existing range.

The thinking game of TWISTER has now been combined with a new title REVERSE to form PAK23. The game of REVERSE gives the numbers 0-9 in jumbled order and it is your job to rearrange them in ascending order by reversing groups of numbers.

Other packs are —

- PAK 22 containing MISSILE ATTACK, MASTERMIND, LEAKY ROOF

- PAK 20 containing ARTILLERY FIRE, NUMBER PUZZLE, TOWERS OF HANOI and PONG (table tennis)
- PAK 24 containing two titles from the author of TWISTER. This pack comprises FOX & GEESE and THINK.
- PAK21 containing GOLDRUSH and PYRAMID

Due soon is an educational pack which will contain OZ-MAP, OZQUIZ and MATH1.

MSX DATA BASE CARTRIDGE

Recently received in this office, MT-Base for MSX computers is a database with a difference.

We hope to have a review of this product in the next issue.

Some of the products mentioned may not be available Australia-wide yet. If you are interested, contact your nearest dealer. Investigations are continuing to track down stockists — if your dealer can't get it, ask him to contact this magazine.

Please mention COMPUTER FORUM when replying to advertisers.

MAILBOX

This page is for your comments and queries. If you have a specific problem or have solved one, we would like to hear about it.

If you require an answer before we publish it, please enclose a stamped self-addressed envelope. This month, we have included some common problems that have been answered in the past.

MSX FROM SPECTRAVIDEO

I own a Spectravideo SV328 and would like to buy an MSX computer. What I would like to know is, can the software that I own for the 328 be used with an MSX computer?

We are sorry to say that your software will not operate on an MSX computer. You do not say whether you have disk drives or not, but that does not matter.

The problem is that MSX computers will not read SV328 disks or tapes. The only way we know of transferring software from one type of computer to the other is by RS232 or taking a listing and typing the program in again.

Either way, the program would need to be edited to alter some of the commands to MSX requirements.

X'press DISK DRIVES

I have a Spectravideo MSX X'press and was wondering if I could connect a 5¼ inch disk drive to the second drive port.

You certainly can connect a 5¼ inch disk drive to the external drive port on your X'press. In fact we have done just that with the X'press in the office. One of the advantages of doing so is that there is not a great deal of software available on 3½ inch disks at present and also CP/M software is mainly only available for home

computers on 5¼ inch format.

To make the connection you will require a specially made cable connecting the 25 pin outlet to the 34 pin connector on the disk drive. You will also need to separate the lines carrying 12 and 5 volts and take them to the power connector on the drive together with two ground leads.

We hope to bring you an article on how to do this in the near future.

CP/M PROBLEM

I have a few CP/M software packages and was wondering if it was possible to have a menu program on the disk which would allow me to select which program to run?

Ron Gray
Morley

Ron, we have not found any utility software that will perform the function you require. I assume that you want the CP/M disk to boot up to the menu which will basically be the Directory of that disk and then you select a number which will load and run your selection.

Possibly one of our readers has written such a menu program to run under CP/M. If so would you please let us know so that we can help Ron with this problem.

VOICE OF DOOM

I thought you might be interested in the following article which appeared in the Random Access column of the Sydney Morning Herald 17/2/86.

"It is not that I wish to rub salt into an open wound but I find the news about the Japanese MSX operating system machines in the United Kingdom almost irresistible.

Toshiba (UK) Ltd is claiming a successful sales period in the run-up to Christmas. The company estimates 50,000 units were sold. The computer it is talking about is the HX 10, an MSX-based home micro. This machine was launched in Britain at a price of $560, but was discounted to $160 when sales failed to materialise.

The mathematics go something like this. Dealers in the UK would probably need a margin of around $60 to cover the cost of stocking and selling this micro. This would leve Toshiba with $100 for research and development costs, manufacture and shipping it from Japan to Britain.

Just before last Christmas, Toshiba ran a $5 million advertising campaign in Britain for the HX-10 and, by all accounts, an excellent advertisement it was. If you take the $5 million expended and divide it by the number of machines sold you come, according to my magic calculator, to a figure not unadjacent to $100. Which is what Toshiba got from every sale, meaning that, in effect, Toshiba gave away 50,000 micro computers. It may be the final nail in the MSX coffin.

In Australia, the advertising campaign for Toshiba and the MSX system suggested that other operating systems would die while MSX would live for ever. This was done with an advertisement which sported pretty graphics showing gravestones. This advertisement convinced me not at all. Even though my daughter wrote the copy."

Hoping they are proved wrong in time to come.

Ernie Philip
Tenterfield

Our sentiments too, Ernie. It seems that the world is composed of doers and knockers. I am sure that those 50,000 customers would all be pleased with their purchase. At that price, who wouldn't be?

Considering that it is rumoured to cost $1 million for a licence to produce MSX computers in addition to research and development costs, that advertising bill would be a small price to pay to protect your investment. I wonder if COMPUTER FORUM could get a slice of that action?

In view of his last comment, I think there is one journalist who should be concerned about his daughter's future as a copy writer.

* * *

Keep those letters coming in ... see you next month.

READERS ADS

Use these pages to sell your surplus equipment, etc. Photocopy this form and insert up to 20 words. Put it in an envelope with $5 and send to COMPUTER FORUM by the 10th of each month.

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MSX and SPECTRAVIDEO

BASIC TUTORIAL LIFTOUT

COMPUTER FORUM
Magazine

INTRODUCTION TO PROGRAMMING

A micro computer contains a fixed library of instructions which allow it to perform the functions required by the PROGRAM. This library of instructions is called the INTERPRETER because it interprets the program into machine language which the computer can use.

In MSX and Spectravideo computers the interpreter or language used is BASIC - (Beginners All-purpose Symbolic Instruction Code). This version of BASIC is written by Microsoft and is contained in the ROM part of memory. ROM (Read Only Memory) is used so that the interpreter or language is permanently resident in the computer and becomes active when you switch on. The ROM cannot be altered by the user.

This tutorial is based on class notes used to teach home computer users the basics of programming. The course was for beginners and classes were for two hours per night over six nights. Although the classes were conducted for owners of various types of home computers, the content has been edited and expanded to cover the specific requirements of MSX and Spectravideo computers.

The command words used by your computer are introduced in order of usefulness to the beginner. For example, it would not make sense to leave the PRINT command until the end, as you would be unable to test many of the examples without PRINTing the results. To make the most of this tutorial, we urge you to read through each section first and then please work through and type in the examples so that you can learn by doing.

THE BASIC'S OF BASIC

At this point it is necessary to explain the difference between IMMEDIATE mode and PROGRAM mode. It is not necessary for you to manually change from one mode to the other, the computer will know which mode you require by the way you enter the commands.

An example of IMMEDIATE mode - Type the following line

```
PRINT "ABC"
```

and press the ENTER key. The computer should display

```
ABC
```

The same example in PROGRAM mode - Type the following line

```
100 PRINT "ABC"
```

and press the ENTER key.

It appears that nothing has happened.

In the first example there was no LINE NUMBER at the start of the line, and pressing the ENTER key was taken by the computer as meaning - do this IMMEDIATEly.

By entering a LINE NUMBER at the start of the line, the ENTER key told the computer - this is the end of line number 100 so store it in memory for use as a PROGRAM.

The PRINT command

This command tells the computer to display whatever follows the PRINT command.

Type in the following line and press the ENTER key.

```
PRINT "ABC123"
```

The computer should display -

```
ABC123
```

In this example the PRINT command has told the computer to print everything within the quotation marks. Let us put this into our first program.

Type in the following lines pressing the ENTER key at the end of each line.

```
100 PRINT "ABC123"
110 PRINT "DEF456"
120 PRINT "XYZ789"
```

Type RUN and press the ENTER key.

The computer should display -

```
ABC123
DEF456
XYZ789
```

Before leaving the PRINT command, there is a shorthand method of entering the PRINT command in immediate or program mode -

Type this -

```
?"ABC"
```

and press the ENTER key.

The computer should display -

```
ABC
```

Now type NEW and press the enter key. Then type the following

```
100 ?"ABC"
```

and press the ENTER key. If you now type

```
LIST
```

and press the ENTER key the computer will display

```
100 PRINT"ABC"
```

The computer has converted the ? to the command PRINT before storing it in the program.

Now type NEW and press the ENTER key to clear this program from memory.

The RUN command

By typing RUN, we told the computer to execute the program currently in memory starting at the FIRST LINE NUMBER.

We could have typed RUN 110 in which case the computer would have started executing the program starting at line number 110 and displayed -

```
DEF456
XYZ789
```

The LIST command

Type LIST and press the ENTER key. The program will then be displayed. This command tells the computer to LIST the whole program currently stored in memory.

We can list individual lines or sections of the program -

```
LIST 100      displays line number 100
LIST 100-110  displays lines 100 and 110
LIST 100-     displays line 100 to the end of the program
LIST -110     displays the program up to and including line 100
```

The NEW command

THIS COMMAND SHOULD BE USED WITH CAUTION. The command NEW tells the computer that you want to enter a NEW program. When this command is entered, the computer removes from its control registers the information it requires to RUN or LIST a program. The computer does not actually remove the program from memory, but as MSX and Spectravideo coomputers do not have the ability to undo the effects of a NEW command, it is best to assume that A NEW COMMAND WILL DELETE THE PROGRAM.

At this point, we will not be using this program again, so it is quite safe to remove it.

Type NEW and press the ENTER key.

Type LIST and press the ENTER key.

Nothing is listed. It is always a good policy to use the NEW and LIST commands together to ensure that a program is not in memory before entering another program.

VARIABLES

Variables are a quantity or phrase that can be changed or varied. A variable can be numeric (indicated throughout this workbook by VAR) or a STRING of information (indicated by VAR$). The $ after a letter indicates a string variable.

A NUMERIC VARIABLE contains numbers only -

eg. A - where A can be a decimal OR whole number
ie. 1.23 or 123 or -1.23 or -123

A% - where A% can only be an integer (whole number)
ie. 123 or -123

A STRING VARIABLE contains letters, words or numbers within quotation marks.

e.g. A$ - where A$ can be a letter ie. A$="A"
A$ - where A$ can be a word or phrase ie. A$="FRIDAY"
A$="GO HOME"
A$ - where A$ can be alphanumeric ie. A$="ABC123"

Some examples of using the PRINT command with variables -

```
100 A=2
110 A=3
120 PRINT A
```

Displays 3

```
100 A=2
110 A=A+3
120 PRINT A
```

Displays 5

The value of the VARIABLE A has changed in line 110.

```
100 A$="ABC"
110 A$="DEF"
120 PRINT A$
```

Displays DEF

```
100 A$="ABC"
110 A$=A$+"DEF"
120 PRINT A$
```

Displays ABCDEF

The value of the VARIABLE A$ has changed in line 110.
When PRINTing variables, the PRINT command will display the LAST KNOWN VALUE of that variable.

SIMPLE STRING MANIPULATION

Before leaving the PRINT command, let us now look at the different ways that the value of string variables can be displayed.

The + sign

Using the plus sign between string variables means ADD THE STRINGS TOGETHER TO FORM ONE STRING.

Type in the following, pressing the ENTER key after each line

```
100 A$="EL"
110 B$="EPH"
120 C$="ANT"
130 PRINT A$+B$+C$
```

Type RUN and press the ENTER key. The computer will display

```
ELEPHANT
```

The ; sign

Using the semi-colon sign between string variables means DISPLAY THE STRINGS ONE AFTER THE OTHER ON THE SAME LINE.

Type in the following, pressing the ENTER key after each line

```
100 A$="EL"
110 B$="EPH"
120 C$="ANT"
130 PRINT A$;B$;C$
```

Type RUN and press the ENTER key. The computer will display

```
ELEPHANT
```

It appears that the + and ; symbols do the same thing when used with string variables. They perform differently when used with numeric variables.

Type in the following, pressing the ENTER key after each line

```
100 A=1
110 B=2
120 C=3
130 PRINT A+B+C
```

Type RUN and press the ENTER key. The computer will display

```
6
```

In this example, line 130 means DISPLAY THE SUM OF THE VALUES OF VARIABLES A,B,C.

This program could have been written another way, with the same result.

```
100 A=1
110 B=2
120 C=3
130 D=A+B+C
140 PRINT D
```

Type RUN and press the ENTER key. The computer will display

```
6
```

Now type NEW and press the ENTER key.

Type in the following, pressing the ENTER key after each line

```
100 A=1
110 B=2
120 C=3
130 PRINT A;B;C
```

Type RUN and press the ENTER key. The computer will display

```
 1 2 3
```

In this example, line 130 means DISPLAY ON THE SAME LINE, THE CURRENT VALUES OF VARIABLES A,B,C. Notice the space before each number. This is reserved for the sign of the number. Only negative signs are displayed, otherwise positive numbers are assumed, but the space is still included.

The comma

Using the comma between string variables means DISPLAY THE NEXT STRING AT THE NEXT INBUILT TAB POSITION ON THE SAME LINE.

For the typists among you, TAB in this instance is fixed by the computer. The use of TABs in laying out printing will be covered in a later section.

Type in the following, pressing the ENTER key after each line

```
100 A$="EL"
110 B$="EPH"
120 C$="ANT"
130 PRINT A$,B$,C$
```

Type RUN and press the ENTER key.

The computer will display

```
EL          EPH
ANT
```

Now type NEW and press the ENTER key.

SIMPLE MATHS USING PRINT

To perform calculations on the computer, the plus (+) key and minus (-) key are provided. The symbols that are missing are the multiply and divide symbols. The computer uses the asterisk (*) for multiply and the slash (/) for divide. Therefore -

```
2+2 means ADD 2 and 2
2-2 means SUBTRACT 2 form 2
2*2 means MULTIPLY 2 times 2
2/2 means DIVIDE 2 by 2
```

We can write a sum as

```
6+7-1*4/2
```

Reading from left to right, the answer to this would be 24. That is 6 plus 7=13, 13 minus 1=12, 12 times 4=48, 48 divided by 2=24.

So let us try this on the computer. To do this, add the command PRINT to the start of the calculation in order for the result to be displayed. Type the following, and press the ENTER key.

```
PRINT 6+7-1*4/2
```

The computer will display

```
11
```

What happened ....?

The computer has an order of precedence for maths operations. They are -

1	^	exponentiation (raise to the power)
2	()	parenthesis (brackets)
3	*,/	multiply, divide
4	+,-	add, subtract

Exponentiation is handled first, then anything in parenthesis is resolved to a single value and the brackets removed, followed by multiplication and division and finally addition and subtraction.

Therefore to obtain our answer of 24 in the previous example, we can force the computer to handle the sum from left to right by adding brackets.

This can be done as follows -

```
(6+7-1)*4/2
```

The computer will resolve the brackets first and then perform the multiplication and division.

```
(6+7-1)*4/2
(12)*4/2
12*4/2
48/2
24
```

The STOP command

The STOP command can be used anywhere in a program. As the name suggests, it will stop the program. This is useful as it allows the program to be halted at any point and the values of the variables can be examined. The program will resume at the next statement if CONT is typed followed by ENTER.

The CONT command will only work in text screen mode, because any STOP or break in a program forces the screen display back to text mode.

The INPUT command

We may want to give a value to a variable while the program is running rather than have to write it into the program each time. This is the function of the INPUT command.

The INPUT command allows anything to be entered except a comma. The information must be of the same type as the program expects - that is, if the information required by the program is numeric, INPUTting letters or symbols will result in an error message.

Type in the following, pressing the ENTER key after each line

```
100 A=12
110 INPUT B
120 PRINT A+B
```

Type RUN and press the ENTER key. The computer will display

```
?
```

meaning that it is waiting for your INPUT.

Type the number 3 and press ENTER. The computer will now display

```
 15
```

Notice two things about this program. The INPUT statement requires you to press ENTER after giving the information. This is because the computer does not know how much information you will enter. Pressing the ENTER key tells the computer that your input is everything that you have typed up to pressing ENTER.

The other point about this program is that it is not very friendly, because when it requests input, only a ? is printed. The user does not know what the program is expecting.

So change line 110 to read

```
110 INPUT "ENTER A NUMBER";B
```

Now LIST the program (type LIST and press the ENTER key) and it should look like this

```
100 A=12
110 INPUT "ENTER A NUMBER";B
120 PRINT A+B
```

Type RUN and press the ENTER key.

The computer will display

```
ENTER A NUMBER ?
```

meaning that it is waiting for your INPUT OF A NUMBER. Remember that the semi-colon tells the computer to stay on the same line and display the next item.

Enter the number 3 and press ENTER.

The computer will now display

```
 15
```

We have added a PROMPT STRING to line 110 which displays the type of information required.

The GOTO command

When the RUN command is entered, the computer will execute (start performing) the program starting at the first line number and progressing through the program in numeric sequence by line number.

An exception to this method happens when the GOTO command is encountered. GOTO is inserted in the program at a point where we want the computer to jump to another section of the program instead of continuing with the next line.

Type in the following, pressing the ENTER key after each line

```
100 PRINT "A"
110 PRINT "B"
120 GOTO 140
130 PRINT "C"
140 PRINT "D"
```

When you have finished, type RUN and press ENTER

The computer will display

```
A
B
D
```

Notice that the C in line 130 was not printed. This is because the GOTO command at line 120 forced the processing to continue at line 140, bypassing line 130.

Type NEW and press the ENTER key.

The GOTO command can also jump backwards.

Type in the following, pressing the ENTER key after each line

```
100 PRINT "A"
110 GOTO 100
```

When you have finished, type RUN and press ENTER

The computer will continue to display the letter A until you stop it by pressing CTRL/STOP (that is hold down the CTRL key and press the STOP key). This is called an endless loop.

The real value of the GOTO command will be seen in the IF/THEN command explanation covered in a subsequent section.

* * * * *

On the next page are some questions based on what you have learned so far. Where the question concerns the outcome of a program, try to write down what you think the result will be before you type in the program to find out.

Do not send in your answers, if there is any doubt check back through the previous pages. Should you find any errors or have any suggestions to improve this tutorial, please WRITE to us. We do not tape our telephone conversations and therefore, your call could be wasted.

QUESTIONS

1. What is the INTERPRETER?

2. Which of these is a program line?

   (a) PRINT "GOOD MORNING"

   (b) 100 PRINT "GOOD MORNING"

3. Which of these commands will activate the program in memory?

   (a) LIST
   (b) PRINT
   (c) RUN

4. Why should the NEW command be used with care?

5. With the following program

```
100 A$="ABC"
110 B$="DEF"
120 PRINT A$+B$
```

   Which of these would be the output

   (a) ABC DEF
   (b) ABCDEF

6. What will be displayed when the following program is run?

```
100 A=20
110 B=5
120 C=2
130 D=9
140 PRINT A*B/C+D
```

7. What will be displayed when the following program is run?

```
100 PRINT "LINE 100"
110 GOTO 130
120 PRINT "LINE 120"
130 PRINT "LINE 130"
```

8. What is wrong with the following program?

```
100 PRINT "LINE 100"
110 REM GOTO 140
120 PRINT "LINE 120"
130 PRINT "LINE 130"
```

BOOKS . BOOKS . BOOKS . BOOKS

THE COMPLETE MSX PROGRAMMERS GUIDE

This book is big. With 61 chapters, the reader is taken through basic programming and on to machine code calls all in the one book.

For the beginner, the book starts off where you start off — unpacking the computer and plugging in leads.

The book covers a great deal of ground and would be invaluable for all MSX users from novice to advanced.

Contained within the first section is a guide for beginners to BASIC and covers most of the commands available to the user. There are also several worked examples with explanatory notes. These were found to be helpful in most cases, however some areas were glossed over which might be forgiven in a book that attempts to treat the whole subject in one volume.

The more experienced programmer is catered for in another section titled Advanced Programming Guide. This section assumes a working knowledge of BASIC and looks at areas that are specific to MSX computers together with sound and graphics handling techniques.

The third section contains detailed explanations of both BASIC and machine language programming.

The final section shows you how your MSX computer works by giving a complete guide to the operating system.

Written by Tom Sato, The Complete MSX Programmers Guide is a worthy addition to your library if you have the shelf space for it.

Publisher: Melbourne House
568 Pages

SPECTRAVIDEO SPRITES BOOK

Sprites are probably one of the greatest features of the Spectravideo 318 and 328 computers and yet the manual only devotes a few pages to them.

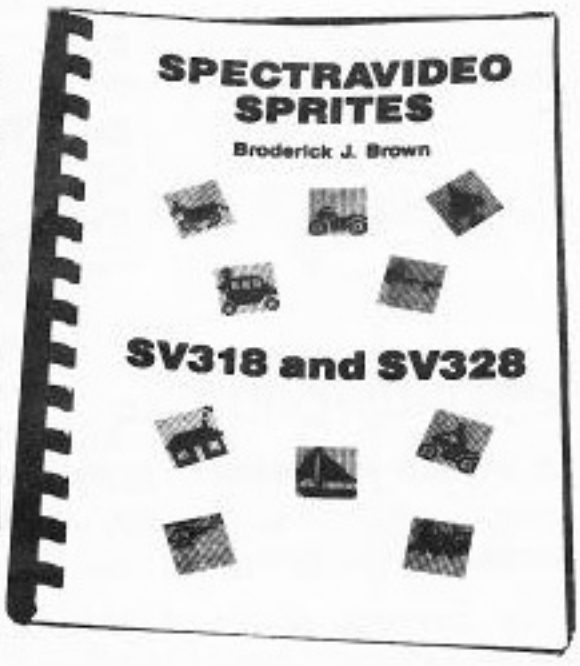
SPECTRAVIDEO SPRITES is a complete tutorial on sprites with chapters covering creating, positioning and moving sprites. An appendix contains 'ready-made' sprites for use in your own programs.

A memory map of the Video RAM area is also included for those who prefer to directly control the Sprites without resorting to the inbuilt commands.

The aim of the book is to show how to create and manipulate sprites. To help you learn as you go, there are many example programs with explanations of how they work. A full chapter is devoted to creating a game program which is also fully explained.

When you have finished this book, you will not only have learned to use sprites in your own programs, but will also have an excellent motor racing game — free.

Publisher: Forrest Data Services
86 pages



COMPUTER KIDS

Hi kids! This is your very own place in COMPUTER FORUM Magazine, so look out for it each issue. It's Easter time now, and I know we all love to get lots of chocolate eggs and bunny rabbits, and sometimes fluffy toys too, but don't forget that Easter is a time to be more kind and considerate to other people. So don't just think of yourself. Anyway, this month, I have included a program for you to type into your computer which, when you run it, will put an Easter bunny on the screen and he delivers eggs. Have lots of fun typing that in and doing the word puzzle.

If you have any computer problems or interesting things that have happened between you and a computer, write to me, and I'll put it in this column to share with fellow readers (if it's a suitable letter). The address to write to is: COMPUTERKIDS, C/o COMPUTER FORUM, P.O. Box 71, Palmyra, W.A. 6157.

I'll be here, with you, next issue! Happy Easter. Bye for now, Wendy.

P.S. For the more interested kids out there, don't forget to have a look at the rest of the magazine too! Especially the BASIC tutorial section.

EASTER BUNNY

```
10 REM FOR SV 318/328 CHANGE LINE 30
TO READ SCREEN 1,2
20 CLS:LOCATE 11,10:PRINT"THE EASTER
BUNNY!"
30 XR=224:EC=8
40 FOR A=1 TO 500:NEXT A
50 SCREEN 2,2
60 FOR I=1 TO 32:READ B:S$=S$+CHR$(B)
:NEXT
70 DATA 15,63,56,124,127,15,15,15
80 DATA 31,27,1,0,0,1,1,0
90 DATA 0,128,192,0,0,128,192,224
100 DATA 240,248,254,254,56,240,224,0
110 SPRITE$(1)=S$
120 FOR J=1TO8:READ C:T$=T$+CHR$(C):N
EXT
130 DATA 24,60,60,126,126,126,126,60
140 SPRITE$(2)=T$
150 PUT SPRITE1,(XR,96),11,1
160 PUT SPRITE2,(XR-7,100),EC,2
170 XR=XR-24:FOR T=1 TO 500:NEXT
180 IF XR=8 THEN PUTSPRITE3,(8,96),EC
,2:EC=2:XR=224:GOTO150
190 IF EC=2 THEN IF XR=32 THEN PUTSPR
ITE4,(32,96),EC,2:EC=13:XR=224:GOTO15
0
200 IF EC=13 THEN IF XR=56 THEN PUTSP
RITE2,(56,96),EC,2:GOTO 220
210 GOTO 150
220 GOTO 220
```

COMPUWORDS No. 1

The words in bold letters in the sentences below are hidden in the word sleuth. See how quickly you can find them. The sentences explain the words, so don't forget to read them.

The computer language, **BASIC,** is the most widely used in home computers and means Beginners All-Purpose Symbolic Instruction Code.

A **CHIP** is a small electronic component which is used inside the **COMPUTER** to "make it work".

When a computer produces shapes and colours on the screen, they are called **GRAPHICS.**

The **KEYBOARD** is the set of keys on the outside of the computer which are used to put information, or **DATA,** inside the computer's **MEMORY** banks.

A **MICRO** computer means a small personal computer which would only take up a desk, as opposed to a main-frame computer which would take up a whole room.

The **PRINT** command is used in a computer to place words on the screen.

RUN is typed into the computer to use programs after they have been either typed in or loaded from cassette or disk.

```
H U A V N T E I A L H B
N A P P E X Y G D A T A
T T N I T S U R M E C S
W C U O M H E A P E U I
X P R I N T I P N G F C
N R W O U M W H P E N D
P Z Y P S X C I M I O Q
I M M P A U B C E T E R
H O C I C O R S M N L E
C O R H C E T H O A K P
E P Y G E R I A R J S M
T F E D R A O B Y E K R
```

PROGRAM LISTINGS

Each issue of COMPUTER FORUM will contain program listings for you to type in. When entering these programs it is a good idea to save off to cassette or disk every 10 or 20 lines and then continue. Then if the power goes off or another major disaster occurs, you will not have to type in the whole lot again.

Another check is to verify each save using the CSAVE? command. To use this command, CSAVE your program, then rewind the tape and type CLOAD? and press enter. This command will then compare the program on the tape with the one in memory, to verify that it was saved correctly.

Take care that you do not mistake the letter I for 1 or an O for a zero. Where graphics characters are used in the program, they will be shown as @1@. This symbol will then be repeated at the end of the listing with instructions concerning the graphics character used.

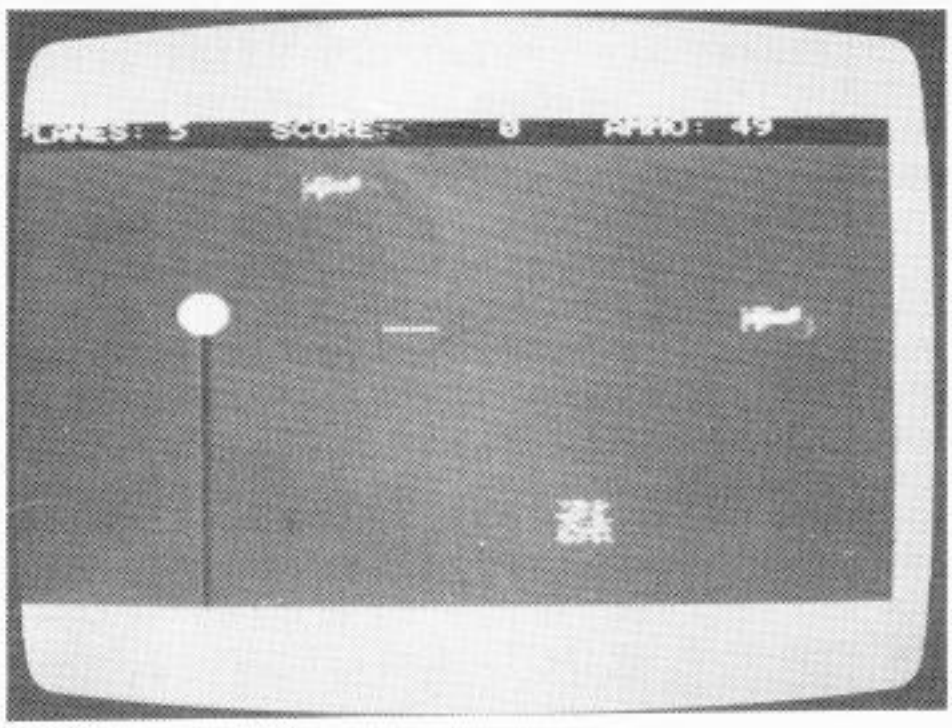
All of the listings have been tested on MSX and SV318/328 computers and do work. Should you have any problems, we suggest that you thoroughly check your work as errors can creep in very easily. Should you not wish to type in these listings, send a blank tape together with $2 to COMPUTER FORUM and we will post a copy to you. Do not forget to tell us which computer you have.

DATE GENERATOR

```
10 REM--THIS PROGRAM DETERMINES THE-
20 REM--DAY OF THE WEEK FOR A GIVEN-
30 REM--BIRTHDAY AFTER 1582---------
40 REM--SETTING UP REPEAT FACILITY--
50 REM--READ IN TABLE OF KEYS AND---
60 REM-EXTRAS-----------------------
70 DIM T(12),E(4)
80 FOR I=1 TO 12
90 READ T(I)
100 NEXT I
110 FOR I=1 TO 4
120 READ E(I)
130 NEXT I
140 CLS:PRINT"TYPE IN YOUR NAME"
150 INPUT N$
160 REM-GET YEAR OF BIRTHDAY WANTED-
170 CLS:PRINT:PRINTN$;", PLEASE ENTER
 THE DATE":PRINT"YOU WOULD LIKE IN TH
E FORM:":PRINT"DAY, MONTH, YEAR"
180 PRINT:PRINT"( NO DATES BEFORE 158
2 CAN BE LOOKED AT BECAUSE THE CURREN
T CALENDAR DID":PRINT"NOT EXIST BEFOR
E THEN )"
190 INPUT D,M,Y
200 IF Y<100 THEN Y=Y+1900
210 REM-OBTAIN LAST TWO DIGITS OF---
220 REM--GIVEN YEAR-----------------
230 LET F2=INT(Y/100)
240 LET L2=Y-F2*100
250 REM-INTEGER AFTER DIVISION BY 4-
260 LET A=INT(L2/4)
270 REM-REMAINDER AFTER DIVISION----
280 REM-BY 4 OF F2------------------
290 LET R=F2-INT(F2/4)*4
300 REM-DECIDE IF IT IS A LEAP YEAR-
310 REM-L=0 IF NOT, L=1 IF SO-------
320 LET L=0
```

```
330 IF L2<>0 THEN 360
340 IF R=0 THEN LET L=1
350 GOTO 370
360 IF (L2-4*A)=0 THEN LET L=1
370 REM-DETERMINE KEY NUMBER--------
380 LET K=T(M)
390 IF L=0 THEN 420
400 IF M=1 THEN LET K=0
410 IF M=2 THEN LET K=3
420 REM-DETERMINE EXTRA-------------
430 LET X=E(R+1)
440 REM-FINDING DAY OF WEEK---------
450 LET C=L2+A+K+D+X
460 LET C=C-INT(C/7)*7
470 REM-OUTPUT RESULTS--------------
480 PRINT:PRINT"THE DAY OF THE WEEK F
OR":PRINTD;"/";M;"/";Y;" IS:";
490 IF C=1 THEN PRINT "SUNDAY"
500 IF C=2 THEN PRINT "MONDAY"
510 IF C=3 THEN PRINT "TUESDAY"
520 IF C=4 THEN PRINT "WEDNESDAY"
530 IF C=5 THEN PRINT "THURSDAY"
540 IF C=6 THEN PRINT "FRIDAY"
550 IF C=0 THEN PRINT "SATURDAY"
560 REM-SEE IF ANOTHER DATE WANTED--
570 PRINT:PRINT"DO YOU WANT ANOTHER D
ATE TO BE ":PRINT"LOOKED AT (Y/N)"
580 INPUT A$
590 IF A$="Y" THEN 160
600 REM- DATA FOLLOWS---------------
610 REM-ARRAY T OF KEYS-------------
620 DATA 1,4,4,0,2,5,0,3,6,1,4,6
630 REM-ARRAY E OF EXTRAS-----------
640 DATA 6,4,2,0
650 END
```

WORLD WAR I



You are a World War I flying ace. Your squadron has been ordered to shoot down the balloons that the enemy is using to spot for their artillery.
Pushing the joystick forward will make your plane climb and pulling back will make it dive. Watch out for the RED Baron above and the artillery flak below. Good hunting!

This listing is in Spectravideo SV318/328 format. For MSX owners, see the note at the end of the listing.

```
10 CLEAR500:SCREEN1,2:DEFINTA-Z:LL=6:BX
=50:N=RND(-TIME):GOTO760
20 ONSPRITEGOSUB180:SPRITEON:ONINTERVAL
=10GOSUB640
30 GOSUB390
40 GOSUB690:INTERVALON
50 GOTO250
60 REM CONTROL PLANE
70 SOUND5,15:SOUND7,56:SOUND10,10:ST=ST
ICK(0)+STICK(1):ONST+1GOSUB120,130,130,
120,140,140,150,160,170:PUTSPRITE1,(X,Y
),14,0:IFY<16THENY=16ELSEIFY>176THENY=1
76
80 IFS=2THENPUTSPRITE9,(NX,NY),9,0:NX=N
X-4:IFNX<0THENNX=255:NY=20+INT(RND(1)*1
6)
90 IFF=0THEN100ELSEPUTSPRITE4,(FX,FY),1
5,4:FX=FX-15:IFFX<0THENF=0:PUTSPRITE4,(
20,207)
100 IFF=8THEN110ELSEIFAM>0ANDS=2AND(STR
IG(0)+STRIG(1)<>0)THENGOSUB360
110 RETURN
120 X=X-1:RETURN
130 X=X-1:Y=Y-1:RETURN
140 X=X-1:Y=Y+1:RETURN
150 X=X-2:Y=Y+2:RETURN
160 X=X-2:RETURN
170 X=X-2:Y=Y-1:RETURN
180 GOSUB680:PUTSPRITE4,(20,207):SPRITE
OFF:INTERVALOFF
190 IFFY>NY+16THEN210ELSEIFF=8ANDFX<NX+
17ANDFY<NY+2THENXP=NX:YP=NY:GOSUB600:PU
TSPRITE9,(0,207):NX=255:SC=SC+1:GOSUB63
0:F=0:GOTO240
```

```
200 IFNX-50<X+16ANDY<NY+8THENXP=X:YP=Y:
GOSUB600:PUTSPRITE1,(0,207):S=1:GOTO240
210 IFFY>BY-16ANDFY<BY+16ANDFX>0ANDFX<6
6THENEX=1:XP=BX:YP=BY-6:GOSUB380:SC=SC+
3:GOSUB630
220 IFY<BY+16ANDY>BY-11ANDX>34ANDX<66TH
ENXP=X:YP=Y:GOSUB380:S=1:GOSUB630
230 IFX>66ANDY>150THENS=1
240 SPRITEON:INTERVALON:RETURN
250 GOSUB70:IFX<-16THENX=256
260 IFS=1ANDLL>0THENINTERVALOFF:GOTO40
270 IFLL=0THENRUN
280 IFEX=0THENGOSUB300
290 GOTO250
300 REM BALLOON
310 IFBA=0ANDX>100THENBY=100-INT(RND(1)
*64):BA=1
320 GOSUB70:PUTSPRITE2,(50,BY),14,1:LIN
E(58,BY-16)-(58,BY+8),4:LINE(58,BY+8)-(
58,191),1
330 IFPD=0THENBL=INT(RND(1)*10)+1:BY=BY
+BL:PD=1:IFBY>191THENBY=191
340 BY=BY+BL:IFBY>151THENBA=0:PD=0
350 RETURN
360 AM=AM-1:LINE(204,0)-(256,10),1,BF:L
OCATE204,0:PRINTAM:IFAM=0THENINTERVALOF
F:GOTO40
370 F=8:FX=X-32:FY=Y:RETURN
380 PUTSPRITE2,(0,207):GOSUB600:FORPD=B
YTO199STEP16:LINE(58,11)-(58,PD),4:GOSU
B70:NEXT:BL=0:PD=1:BY=207:EX=0:RETURN
390 REM PLANE
400 FORI=1TO32:READA:S$=S$+CHR$(A):NEXT
:SPRITE$(0)=S$
410 DATA159,10,186,127,255,127,138,12,1
36,0,0,0,0,0,0,0
420 DATA3,7,255,255,255,252,0,0,0,0,0,0
,0,0,0,0
430 REM BALLOON
440 S$="":FORI=1TO32:READA:S$=S$+CHR$(A
):NEXT:SPRITE$(1)=S$
450 DATA7,15,31,63,63,127,127,127,127,1
27,127,63,63,31,15,7
460 DATA224,240,248,252,252,254,254,254
,254,254,254,252,252,248,240,224

470 REM EXPLOSION1
480 S$="":FORI=1TO32:READA:S$=S$+CHR$(A
):NEXT:SPRITE$(2)=S$
490 DATA7,13,25,92,81,151,160,160,170,9
,201,12,27,33,25,5
500 DATA204,200,208,202,232,234,224,214
,224,204,194,182,192,118,100,164
```

```
510 REM EXPLOSION2
520 S$="":FORI=1TO32:READA:S$=S$+CHR$(A
):NEXT:SPRITE$(3)=S$
530 DATA87,23,35,12,11,251,90,60,17,92,
21,102,97,123,205,50
540 DATA24,210,28,152,32,184,24,21,124,
20,94,182,112,18,190,17
550 REM TRACER
560 S$="":FORI=1TO32:READA:S$=S$+CHR$(A
):NEXT:SPRITE$(4)=S$
570 RETURN
580 DATA0,0,0,0,0,0,0,170,0,0,0,0,0,0,0
,0
590 DATA0,0,0,0,0,0,0,170,0,0,0,0,0,0,0
,0
600 FORE=1TO10:PUTSPRITE3,(XP,YP),15,2:
PUTSPRITE3,(XP,YP),10,2
610 GOSUB70:PUTSPRITE3,(XP,YP),15,3:PUT
SPRITE3,(XP,YP),10,3:NEXT:PUTSPRITE3,(0
,207):RETURN
620 REM UPDATE SCORE
630 LINE(120,0)-(150,10),1,BF:LOCATE120
,0:COLOR15:PRINTUSING"######";SC:RETURN
640 XP=INT(RND(1)*170)+70:YP=INT(RND(1)
*30)+150:GOSUB70:PUTSPRITE3,(XP,YP),15,
2:PUTSPRITE3,(XP,YP),10,3
650 IFEF<10THEN660ELSEPUTSPRITE8,(NX-50
,NY),15,4:EF=0:GOTO670
660 PUTSPRITE8,(0,207):EF=EF+1
670 PUTSPRITE3,(20,207):RETURN
680 SOUND6,31:SOUND7,7:SOUND10,16:SOUND
12,45:SOUND13,3:RETURN
690 CLS:AM=50:S=1:LINE(0,185)-(256,191)
,12,BF:LINE(0,100)-(256,184),15,BF
700 LL=LL-1:IFLL=0THENRUNELSEX=240:Y=17
6:LINE(0,0)-(256,10),1,BF:LOCATE0,0:PRI
NT"PLANES:      SCORE:          AMMO: 5
0":LOCATE42,0:PRINTLL:GOSUB630
710 DRAW"BM0,100C1R6F3R3F6R3E3R8F8R3D50
F8R5F3R5F10D16":PAINT(0,191),1
720 GOSUB70:IFX>200THENY=176
730 IFX<-16THENX=256:S=2:LINE(0,100)-(2
56,191),4,BF:RETURN
740 IFPOINT(X,Y+7)=1THENGOSUB680:GOTO70
0
750 GOTO720
760 W$="R20D5L3D40E20F20U40L3U5R20D5L3D
60L19H15G15L19U60L3U5":I$="R20D5L3D55R3
D5L20U5R3U55L3U5"
770 DRAW"BM40,60C8"+W$+"BR80"+W$+"BR80"
+I$:PAINT(41,61),8:PAINT(121,61),8:PAIN
T(201,61),8
780 FORW=191TO140STEP-5:LINE(96,W+4)-(1
80,W+12),4,BF:LOCATE96,W:PRINT"WORLD WA
R ONE":NEXT
790 FORT=1TO1000:NEXT:GOTO20
```

NOTE: FOR MSX CHANGE LINES 10,360,630,690,700 AND 780 AS FOLLOWS

```
10 CLEAR500:SCREEN2,2:DEFINTA-Z:LL=6:BX=50:N=RND(-TIME):OPEN"GRP:"AS#1:GOTO760
360 AM=AM-1:LINE(224,0)-(256,10),1,BF:LOCATE224,0:PRINT#1,AM:IFAM=0THENINTERVALOFF:GOTO40
630 LINE(120,0)-(180,10),1,BF:LOCATE120,0:COLOR15:PRINT#1,USING"#####";SC:RETURN
690 CLS:FORR=0TO10:PUTSPRITER,(0,207):NEXT:AM=50:S=1:LINE(0,185)-(256,191),12,BF:LINE(0,100)-(256,184),15,BF
700 LL=LL-1:IFLL=0THENRUNELSEX=240:Y=176:LINE(0,0)-(256,10),1,BF:PRESET(0,0):PRINT#1,"PLANES:   SCORE:        AMMO: 50 ":PRESET(48,0):PRINT#1,LL:GOSUB630
780 FORW=191TO140STEP-5:LINE(86,W+4)-(200,W+12),4,BF:PRESET(86,W):PRINT#1,"WORLD WAR ONE":NEXT
```

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