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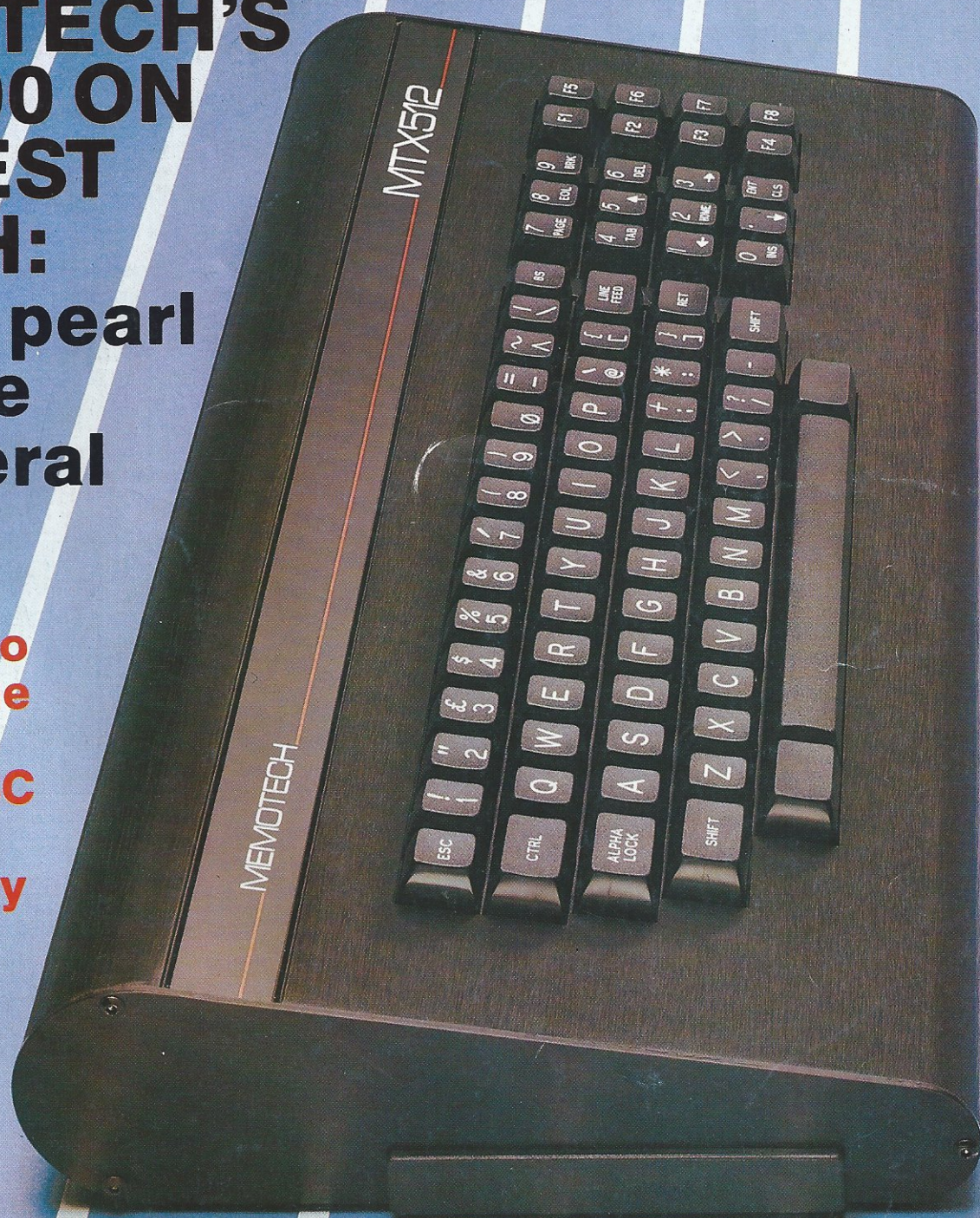
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MEMOTECH'S MTX500 ON THE TEST BENCH: A black pearl from the peripheral people

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The MTX-500 is full of surprises and, let it be said from the start, the surprises have mostly been pleasant ones. The first surprise came when the MTX-500 was first connected to the TV set and switched on. The 'Starting Out' section of the provisional Operator's Manual (253 pages, A4 size) had not mentioned whether or not the machine had a built-in loudspeaker or whether it sent its sound signals to the TV. The obvious test, assuming that it would understand ASCII, was to type 'Control-G'. This is the so-called BEL code which originally caused a bell to ring on a teletype machine, but which nowadays makes most computers emit a beep. Surprise number 1 — a clear, bell-like 'ding' from the loudspeaker of the TV set! Obviously the sound generator of this machine is above average in its capabilities.

MODEL LOOKS

But this introduction is running a little too far ahead of events. Let us go back to the stage when the MTX-500 was unpacked from its carton. What we saw was no surprise, for the advertisements had already shown us what the machine should look like. Perhaps it might count as a surprise to find that it actually does look as smooth and sleek as it appears in the photographs. It has the 'long, low look', with a satin finish in anodised black aluminium. Its appearance will give it pride of place, either in

the living room or on the executive's desk. The keyboard measures 48.5 cms across, which is considerably greater than most popular micros.

The reason for this is that the keys are set out in three areas, with a comfortable margin around each. There is the keyboard area proper, with 59 keys. These include the usual alphanumeric keys and symbols, all with auto-repeat. The control keys are Escape, Control, Alpha(betic), Lock, Shift (two keys), Back Space, Line Feed and Return (which is rather too small). These keys are placed in their conventional positions, so there was no trouble adapting to their layout. There are also two unmarked

keys on either side of the space bar — these are the Reset keys. As a safety factor, both of these keys must be pressed together to reset the machine.

To the right of the main area is a key-pad of 12 keys. These have several functions, depending on the current mode of operation. Eleven of them are set out for entering numeric data, duplicating the action of the numeric keys in the top row of the main keyboard. They are arranged in a conventional 'calculator' format, and include a decimal point key. The keys are also marked for other functions, including four direction keys useful for games players, but also used for directing the cursor around the screen.

Several other of these keys are used for editing, including a Delete key and an Insert key. There is a Page key which toggles the machine into one of two text-entry modes. In Scroll Mode, entering new text on the bottom line of the screen causes the screen to scroll upward. In the Page mode the cursor jumps from the bottom right of the screen to top left; new text appears at the top of the screen, replacing that which is already there. Other keys in this area are EOL, which deletes all characters from the cursor as far as the end of the line, CLS which clears the screen, Home which takes the cursor to the top left of the screen without clearing it, and BRK, which breaks a running program.

There is a block of eight function keys (F1-F8) to the extreme right of the keyboard. These are not programmable keys in the sense of those found on the BBC Micro, for example. Like the function keys of the Commodore 64, they can be used as special control keys in programs. They return ASCII codes when pressed, giving 16 possible codes in all (shifted and unshifted).

IT'S SPRING AGAIN

All the keys are lightly sprung, yet return rapidly to their position. We were reminded of the keyboard of the TRS-80 Model I. I have never found a keyboard on which I, a non-typist, could type as fast and with so few errors as that one.

Perhaps the greatest surprise on removing the MTX-500 from

MTX MAGIC

Owen Bishop

Once upon a time there was a company called Memotech who made ZX81 peripherals. Then one day they decided to make their own computer, with sprites at the bottom of the garden and NODDY, too. Will they live happily ever after?

its packing was not the appearance but its weight. Robustly constructed, it sits firmly on table or desk. The metal case, with its black surface, is a guarantee that the circuitry is unlikely to become overheated, even after long periods of use. The fact that the power pack is a separate unit (there would be no room for a sufficiently powerful transformer in a case only 6 cm deep at its deepest) is a further safeguard against overheating. The leads of the power pack total just over 3 metres in length, allowing you to operate the computer at a reasonable distance from the mains socket. The power pack is sturdily made; it has an on-off switch which incorporates a pilot light.

INPUT/OUTPUT

The cartridge port is situated at the left-hand end of the case. The aperture reveals a 30-way connector giving access to the Z80 address bus, the data bus, the data bus and all the usual Z80 control lines, as well as power supply lines and various other connections. This connector may be used for plug-in cartridges, or for connecting a variety of other peripheral devices.

Full details of the connector are given in the Operator's manual, which also includes essential circuit diagrams and technical details of the main I/O chips. A clip-on cover is provided for the cartridge port, so that it can be neatly closed if it is not required.

All the other connections are on the rear of the case. Another surprise came when we started to plug in the power and TV leads. With most micros one has to twist the case at peculiar angles to see where each lead



is to be plugged in. The rear of the MTX's case is rounded and the legends for each I/O aperture are marked above the cut-outs. Thus they can be clearly seen when looking vertically down on the machine from the front. This makes it easy to plug in the connections correctly, without having to perform contortions. The connections comprise:

- Two RS-232 ports (communications board required)
- Monitor output
- Hi-fi output
- Power input (from power pack)
- TV output (UHF)
- Parallel I/O port (internal socket)
- Parallel printer I/O (Centronics)
- Cassette I/O
- Two joystick inputs.

There is no output for an RGB monitor: however, we have found that the 16 colours (see Table 1) that the MTX produces all show up crisply and clearly on our TV set. Whereas on some computers with 16 colours there are several combinations of screen and background colour which blur into indecipherability, there are very few colour combinations on the MTX that suffer from this defect. Incidentally, the colours are all available all of the time and, since the MTX has a separate 16K video memory, you do not suffer the penalty of losing user memory by using all colours freely.

The cassette port has only Mic and Ear connections, no provision being made for controlling the motor of the recorder.

THE MANUAL

The machine supplied for review was a pre-launch model and its manual was a provisional one. In spite of this it contained a mass of information and remarkably few errors. The errors were mainly typing ones, not errors of fact, and these, we are informed, have been corrected in the final version (this is now ready). There was no index, but a comprehensive contents page tells you where the main summary tables may be found.

The manual begins, in a computerish way, with Part 0, the introduction. This contains a description of the machine and its keyboard. It also includes an overview of the MTX system, with special reference to its languages. The computer holds four languages in its 24 kilobytes of ROM. The main language is MTX BASIC. This has much in common with other BASICs, there being a strong resemblance to Sinclair BASIC, so ZX81 and Spectrum owners will rapidly feel at home. However, as we will describe later, it has many features of its own. The manual includes a clear and concise introductory course in BASIC, with examples and exercises.

NODDY is a language specially designed for handling text. It has few commands, is easy to learn and use, and may be called from BASIC programs. If you want your programs to display screenfuls of text, or to allow the user to key in screenfuls of text, having NODDY around is a great help.

A page (screenful) is formatted simply by typing it directly on the screen. The direction keys allow you to move the cursor around and place text exactly where you want it with the minimum of fuss. The page is recalled instantly with exactly the same format, simply by typing its name, or in various other ways by using the NODDY commands. It is much simpler to handle text with NODDY than to get involved with masses of PRINT or INPUT statements in a BASIC program. Or, if you require a text-handling program such as an address book, it can be programmed entirely in NODDY.

The third language in the ROM is the MTX Graphics package. This contains a comprehensive set of graphics commands, with a strong flavour of Logo. More about this later.

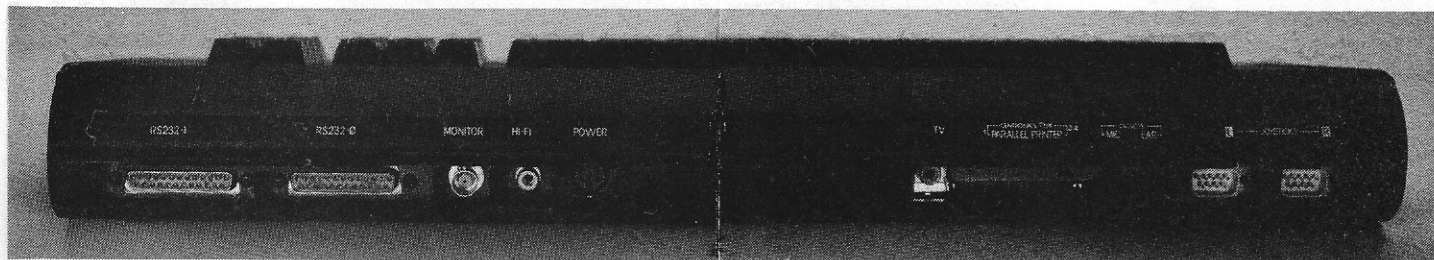
ASSEMBLER

Finally there is the Z80 assembler. This allows whole programs to be written in machine code. It is particularly useful to the average programmer in that sections of programs

TABLE 1

MTX colours.

- | | |
|----|--------------|
| 0 | transparent |
| 1 | black |
| 2 | medium green |
| 3 | light green |
| 4 | dark blue |
| 5 | light blue |
| 6 | dark red |
| 7 | cyan |
| 8 | medium red |
| 9 | light red |
| 10 | dark yellow |
| 11 | light yellow |
| 12 | dark green |
| 14 | grey |
| 15 | white |



or even very short routines may be written in assembler and automatically inserted into a BASIC program. This means that you can speed up the time-consuming parts of a games program, for example, making the computer work that much faster where it really has to. The rest of the program can be written in nice, easy BASIC.

The manual does not set out to explain machine code or assembler mnemonics, but assumes you already know about these things. The detailed instructions given for the assembler itself are clearly set out.

SAMPLE PROGRAMS

Before diving into MTX BASIC, we decided to try out the sample programs which came

with the machine. There were five cassettes altogether, Memotech having thoughtfully provided a blank C-15 cassette and a head-cleaner tape along with the demonstration tape and the two games. The demonstration tape loaded very quickly, first time, as did the games tapes. During loading, the signal from the cassette recorder is heard from the TV loudspeaker. This is a sure indication that something is happening, but the sound is rather irritating. Since the sound is coming from the TV and not from a speaker built in to the computer, it is no trouble to turn off the sound while loading.

The demonstration tape shows off many features of the MTX-500, including its Logo

graphics, its sprites and its impressive sound generator. There are also several screenfuls of text, demonstrating NODDY at work.

The two games cassettes included were both by Continental Software, who are producing an increasing range of MTX software. The Toado tape displayed the 16-colour high-resolution graphics of the MTX to good advantage. It is a fast machine code game based on the popular 'amphibian with desires to negotiate road and river' motif, and is well up to standard. The MTX draughts has 10 levels of play — I tried it at level 4, which brought rapid and unerring responses from the computer. In spite of all my cunning plays, it beat me soundly.

MTX BASIC

This has a useful range of statements (Table 2). INK and PAPER are used to set the foreground and background colours and will be familiar to Spectrum users. LET is obligatory in assignment statements, another Spectrum-like feature. As might be expected, the command NODDY calls NODDY. PLOD is the word used to 'RUN' a program written using NODDY (hang on, this is getting a bit silly! Ed). CSR is used to position the cursor anywhere on the screen. It has the same action as TAB(X,Y) in other BASICs, though CSR seems a more sensible name.

MTX BASIC lacks procedures and user-defined functions.

PANEL is one of the words associated with the use of the assembler. Its function is to switch on the front panel — in this mode the screen displays the contents of the Z80's registers and a portion of RAM or ROM. In this mode there are 16 single-key commands which allow the user to roam through memory, examining it or altering it (if it's RAM!), or having it disassembled to mnemonics or displayed in its ASCII equivalent. These and other functions make this a valuable aid to the

machine-code programmer.

CRVS and VS are words for creating and enabling virtual screens. These are text or graphics windows — up to eight of them may be created, in any size or shape, using CRVS. The monitor itself uses some of these: a 'List' screen of 19 lines, starting from the top of the screen; an 'Editor' screen consisting of four lines, which behave as one (you type your BASIC lines into this); and a 'Message' screen, the bottom screen line.

When you type in a line of BASIC program it appears in the 'Editor' line, near the bottom of the screen. When you press Return, it is transferred up into the 'List' screen, which scrolls upward as successive lines are added. Each program line is checked for syntax before it is accepted into the 'List' screen and, if there is an error, this is reported in the 'Message' screen.

MTX BASIC has a large number of words associated with its sound and graphics facilities — we will deal with these later.

The BASIC allows long variable names, up to 150 characters long. This limit is set by the amount of space available in the 'Edit' screen. Words of this length are distinguished from each other by the MTX — all the letters are significant. You can type in variables and BASIC keywords in lower case, but these are converted to upper case when the line is accepted into the 'List' screen. Thus no lower case letters appear in variable names. Lower case letters between quotes are, of course, not affected.

BENCHMARKS

Before leaving the subject of the BASIC we must look at the results of the Benchmark tests (see Table 3). The listings used were the standard benchmarks published in a previous issue of **Computing Today** and in the Winter'83 edition of **Micro Choice**. The latter issue



quotes tests made in CT on the Spectrum, Dragon 32, Commodore 64, NewBrain, Osborne 1, Sirius 1 and the BBC Micro. In all the tests the BBC machine stood out from the rest. Our tests showed the MTX to be average at BM1, and well above average (ie faster) at BM2 to BM7. In BM4, BM5 and BM6, it was beaten only by the BBC Micro. We were therefore surprised when it did badly on the final test (BM8). It took three to four times as long as the other machines. This benchmark is the one which tests the arithmetic functions: exponentiation, log and sine. Dropping each of these from the program in turn, we found it was reasonably quick at exponentiation, but very slow at logarithms. Actually, we had to use LN in this listing instead of the LOG specified in the benchmark, since LOG is not available on the MTX. The conclusion is that the MTX is not a machine for those who want to perform elaborate and repetitive calculations involving logarithmic and trigonometric functions.

ALL'S UNFAIR . . .

Benchmarks are notoriously unfair in that they can test only those commonplace features possessed by most BASICs, and cannot reveal the merits of any special features of a given machine. Most users will want trig functions not for mathematical calculations as such, but for plotting circles, calculating the orbits of spacecraft and so on. These calculations are already provided for by BASIC words such as CIRCLE and ARC, ANGLE and PHI. The CIRCLE statement produced a circle more quickly than did a circle-drawing BASIC procedure running on the BBC Micro, and using SIN and COS. So for the majority of users, slow calculation of the logarithmic and trigonometric functions is immaterial.

SOUND

There are four sound channels, three of which produce tones while the fourth produces pink noise. These have a range of about 10 octaves. The sound channels can operate simultaneously. Sound commands can be stored in a sound buffer, so the computer can get

on with other tasks while sound effects are being produced.

The SOUND command can have either three or seven parameters. With three parameters, a sound is continuous until it is stopped. The parameter which controls pitch can take any value in the range 0 to 1023. With such a large range, it is easy to produce a completely smooth change in pitch from one extreme to the other. There is no tendency for an ascending or descending note to sound like a scale being played. With seven parameters after the keyword, a wide range of more complex sounds can be generated — the frequency and volume can be altered at chosen rates during the sound. This can be a complicated matter, as might be expected, but the operator's manual deals with sound generation in great detail. Its example of the sound of spacecraft blasting off and then ascending into space is both realistic and impressive.

GRAPHICS

There are two aspects to

graphics on the MTX. First, there are the commands associated with drawing lines and shapes on the screen. The commands CIRCLE, ARC, DRAW, LINE, PLOT have obvious functions. PHI and ANGLE control the orientation of drawing, so allowing complex shapes to be drawn with relatively few commands, and allowing these shapes to be rotated easily.

The second group of commands are associated with the sprites. The MTX has an excellent sprite capability — there may be up to 32 of them, in different colours, all moving independently on the screen. Each sprite has a priority with respect to the other sprites, so that one can be made to move in front of another. The sprites are generated by GENPAT (which is also used to produce user-defined characters). The sprites can have an eight-by-eight or 16-by-16 pixel design.

A sprite can be displayed on normal scale or magnified to double size: it can also be given its own motion, allowing it to cruise around the screen

automatically, or it can be moved to specified positions. Its motion can be reversed, using a single command, as would happen when it bounces off a 'solid' object. There is the unusual effect that a sprite may be made to draw a line (in any colour), leaving a trail as it moves across the screen.

SPRITELY COMMANDS

The set of commands provided allow the user to control the sprites with the minimum of programming effort. As might be expected, some of the commands have numerous parameters: however, there is a command, ADJSR, which allows the programmer to alter just one parameter of a given sprite without having to re-state all the others. This not only makes programming easier, but allows the program to run more quickly.

The above are only a few of the things that can be done with the sprites produced by the MTX's Texas TMS9918 video display processor (same family as the chips in the TI99/4A and

TABLE 2

Command Words.

MTX BASIC

BAUD
CLOCK
INK
PAPER
EDIT
GOTO
IF
LET
LPRINT
NEXT
NODDY
PLOD
PAUSE
RAND
RUN
STOP
VERIFY
CIRCLE

ELSE
STEP
CSR
DIM
GOSUB
LLIST
NEW
ON
PANEL
RETURN
SAVE
DRAW
FKEY
THEN
CONT
CLEAR
DATA
FOR

INPUT
LIST
LOAD
PRINT
OUT
POKE
READ
SOUND
PLOT
CODE
OFF
TO
REM
CLS
ASSEMBLE
AUTO
VS
CRVS

ATTR
COLOUR
ADJSR
MVSPR
SPRITE
CTLSPR
NODE
GENPAT
RANGLE
WINDOW
RESTORE
SELECT
EDITOR
DSI
AANGLE
SNDBUF
ARC
LINE

MTX Operands

+
-
*

/
↑
=

>
<
>=

<=
< >

MTX Functions

AND
ABS
EXP
SGN
TAN
VAL

ASC
RND
NOT
COS
INT
PEEK

PI
OR
ATN
LN
SIN
INP

SQR
USR
LEN
MOD

MTX Strings

CHR\$
LEFT\$
MID\$

RIGHT\$
INKEY\$
STR\$

TIMES\$
GREAD\$
SPK\$

TABLE 3

BM	Time (secs)
1	1.4
2	4.7
3	11.0
4	10.8
5	12.6
6	22.4
7	39.3
8	42.7

Benchmarks.

Electronics Today International's Cortex computer project). Full technical details of this chip are given in the operator's manual.

CHARACTER SET

As well as the normal character set, the MTX-500 provides fonts for other languages: American, English, French, German, Swedish and Spanish. The fonts include all the special letters and accents used in these languages, with, of course, a corresponding loss of certain of the mathematical and punctuation symbols. The foreign language fonts, together with the text-handling facilities of NODDY, could make this a good computer for language-teaching programs.

SUMMING UP

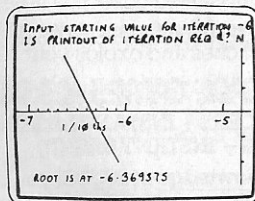
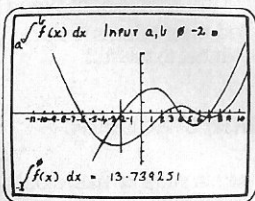
The MTX-500 is a machine with a flavour of its own. It has great scope which, during the time we have had it, and in the limited space of this review, we have not been fully able to explore. Programming it is straightforward once you have learned the special MTX BASIC keywords. The assembler makes machine code programming easy for those who are familiar with the Z80 MPU. NODDY is a useful text-handling language, making the computer suitable for business applications. The excellent graphics and sound facilities make it a first-rate computer for the games enthusiast. Its large memory, expanded to 64K and beyond, and the fact that none of this is robbed to provide for the graphics, makes it likely that some extensive and elaborate games will be developed by this machine.

Overall, we liked its appearance, construction, facilities and action very much and consider it good value for money in comparison with other machines in this price range.

FACTSHEET

CPU	Z80A
Clock	4 MHz
ROM	24K
RAM	32K, expandable
Video RAM	16K
Languages	MTX-BASIC (including MTX graphics) NODDY Z80 Assembler
Keyboard	79 keys, including keypad and eight function keys
Display	24 lines of 40 characters on TV or monitor Up to 16 colours Up to 32 sprites Eight user-definable virtual screens
I/O	Cassette port (up to 2400 baud) Parallel I/O port Joystick ports (2) Hi-fi Monitor TV Cartridge Printer (Centronics)
Options	Communications board (two RS232 interfaces) ROMs for FORTH, PASCAL Colour 80-column board Memory boards (32K, 64K, 128K, 256K, 512K) Disc systems Silicon disc (256K)
Cost	MTX-500 £275 (including 15% VAT)
Supplier	Memotech Ltd, Station Lane, Witney, Oxon OX8 6BX. Telephone: Witney (0993) 2977.

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