TRS-80 SYSTEM 80 VIDEO GENIE PMC-80

Issue 15, February, 1981

TANDY MODEL III —

OUR IMPRESSIONS

MICRO-80

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***** ABOUT MICRO-80 *****

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The purpose of MICRO-80 is to publish software and other information to help you get the most from your TRS-80, System 80 or Video Genie and their peripherals. MICRO-80 is in no way connected with either the Tandy or Dick Smith organisations.

** WE WILL PAY YOU TO PUBLISH YOUR PROGRAMS **
Most of the information we publish is provided by our readers, to whom we pay royalties. An application form containing full details of how you can use your TRS-80 or System 80 to earn some extra income is included in every issue.

** CONTENT **
Each month we publish at least one applications program in Level I BASIC, one in Level II BASIC and one in DISK BASIC (or disk compatible Level II). We also publish Utility programs in Level II BASIC and Machine Language. At least every second issue has an article on hardware modifications or a constructional article for a useful peripheral. In addition, we run articles on programming techniques both in Assembly Language and BASIC and we print letters to the Editor and new product reviews.

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***** EDITORIAL *****

As you will already have noticed, this issue heralds a further step forward in development of MICRO-80. We have changed the cover design and have included photographs in the body of the magazine. We have also reintroduced the month and issue number onto the front cover, due to popular demand. The review of the TRS-80 Model III, which is the subject of our first excursion into photography is a fitting subject for innovation. We are very impressed with this computer and believe that our review of it is the first by an Australian magazine. We hope to bring you more such reviews in future issues.

Yet another innovation this month will be of interest to our U.K. readers. Your copy of this issue has been printed in the U.K. What with postal delays and strikes at both ends, the flow of magazines to the U.K. has been sporadic, to say the least. This has resulted in a number of readers waiting several weeks to receive their issues. Now, U.K. readers should receive their copies no more than one to two weeks behind their Australian counterparts. We hope soon to be able to follow this up with more editorial material from the U.K., thus making us a truly international publication.

Finally, the rather lengthy review of the Model III has caused us to hold-over some other material, including the next instalment of G.T. Basic - we hope you approve.

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***** REVIEW OF TANDY TRS-80 MODEL III *****

Our long-awaited TRS-80 Model III arrived shortly before going to press for this edition. We could not resist the temptation to bring you a review as soon as possible. Our impressions of its software capabilities are therefore based on limited experience and rely heavily on the excellent manual provided with the unit. We will report later on users' impressions.

Our machine is a Level II 16K unit, list price in the U.S.A. US$999 to which would normally be added a State tax of about 6%, making the all-up price to the American consumer US$1059 (approximately Aus.$921 or UK. £450). This model is US$210 dearer than the equivalent Model I.

Externally, the Model III is attractive. It is finished in the same silver-grey and black colour scheme as the Models I and II, and has the same keyboard and numeric keypad as the current Model I. The major difference, of course, is its unified construction with the monitor, power supply, expansion interface and first two disk drives all contained in the one cabinet. Since our unit did not come with disk drives, the holes in the front panel where they would normally reside were filled with moulded plastic panels shaped to look like disk drives. These panels are actually made in one piece with the picture tube escutcheon but are designed so they may be snipped out individually when the disk drives are mounted. There is no internal support provided for the disk drives but there are two threaded metal bosses which presumably hold some form of bracket supplied with the drives.

The Model III arrived well packaged and cushioned against damage. The first impression on lifting it up is how light it feels. Examination of the shipping documents shows that the whole unit, together with its packing, weighs only 15 kilograms. Once we had finished unpacking it, our hand naturally reached towards the manual. We said earlier that the manual was an excellent document, and it is. It is about 14 mm. thick and contains a wealth of information about using the machine, technical information and, of course, a guide to using Model III BASIC. Throughout this review we will be making comparisons with the Model I since that is where it all started. The Model III manual has none of the flippancy of the Level I handbook. It is much more after the style of the Level II BASIC reference manual but is more comprehensive and does not assume that the user is at all familiar with Level I BASIC. Although the Model III is available in Level I form (which presumably has its own BASIC manual) Tandy obviously considers that many customers will be buying their first machine equipped with Level II BASIC which, incidentally, is referred to in the Manual as "Model III BASIC". Accordingly, there is much more explanation of how to program in BASIC than there was in the Level II BASIC manual.

What of the rest of the manual? Well, whereas with the Model I Tandy insulated the user from the operating system as much as possible, the opposite is true with the Model III. The manual lists 28 important ROM addresses and 18 important RAM addresses in system RAM. Each of the 28 ROM addresses receives about half a page of explanation and there is an ample sprinkling of assembly language programs demonstrating the use of these ROM calls. Indeed, it is impossible for the operator to use some of the Model III's features without POKEing values into System RAM or using USR calls to ROM. Setting the parameters on the RS232 interface is one example and returning the real-time clock display on and off is another. There is an ominous warning for machine language programmers in the manual "Some of these ROM addresses or calling procedures may change in later releases of the Model III ROM. We suggest you design your programs to minimise the difficulty of adjusting to these possible changes. (Use EQUates for all ROM calls, modularise all uses of ROM routines etc. etc.)"

The memory map is similar to the Model I but with two significant differences. Starting from 3000H (14336Z) there is a 2K ROM for System use and the System RAM takes 1070 bytes as against the 812 or 814 of Level II BASIC. A 16K machine therefore has 15,324 bytes of user memory available. Few clues are given as to the use of the 2K ROM which resides in an area which was unused in the Model I. Three of the "important ROM calls" are in that area, date, time and set cassette board rate. We have heard that a routine which is used in converting single to double density disks is resident there, but that is unconfirmed.

Having examined the manual, it is time to switch on. Three differences strike you immediately. Instead of MEMORY SIZE? (or MEM SIZE ?), the word "CASS ?" is displayed and the cursor is not a line but a small graphics block similar to that in SCRIPSIT. Even more, the cursor is blinking on and off. Back to the manual. Yes, there it is. You have the choice of high speed (1500 baud) or low speed (500 baud) for the cassette interface. You may select either by typing H or L and pressing ENTER. If you simply press ENTER, the default condition is the high speed mode. Should you be using the machine and want to change from one speed to another, the manual gives you an address in System RAM into which you POKE a 0 for low speed or 1 for high speed. Now for the cursor. You can change it from blinking to solid by POKEing a 0 or 1 into another address in System RAM. Yet a third address contains the ASCII code of the cursor character. Yes, believe it or not, by POKEing a value between 0 and 255 into this address, you can use any ASCII character or graphic block as a cursor!

Having got past the CAS ? the familiar MEMORY SIZE ? is displayed. But, wait a minute, something is different. Yes, both CAS ? and MEMORY SIZE ? contain lower case characters with full descenders and, do our eyes deceive us or are the characters really clearer and sharper than on the Model I? Back to the manual. "All text characters are created on an 8 x 8 matrix for excellent definition." Well, no argument with that. Incidentally the monitor is first class. It has excellent contrast which does not vary with the contents of the display and is completely jitter free - still grey, not green. Lower case in the Model III is accessible from BASIC. The machine powers up in the "CAPS LOCK" condition. It can be converted to normal typewriter style operation by typing SHIFT 0 when non-shifted characters will be displayed as lower case, and shifted characters as upper case. Now, don't get too excited and start counting all those extra variables. Only the video section recognises lower case. As far as the BASIC interpreter is concerned, a = A and indeed, if you enter lower case variables in program lines, they will LIST as upper case. The manual also mentions 96 special characters and, without more ado, we wrote a simple program to display them, see Fig. 1. Aha, look at that, symbols for the four suits of cards, pointing finger, pi, omega and lots more. Further reading reveals control character 22 dec. which swaps special characters for alternate characters. Hence Fig. 2. Note the Japanese character set - guess who wants to sell computers in Japan?! Incidentally, hardware buffs will be interested to know that, in the Model III, graphics blocks too are contained in the character generator ROM and no special hardware is used to generate them as in the Model I. What is more, the character generator ROM is a 24 pin device and is mounted in a socket so you could easily manufacture your own set of characters if you so wished. Graphics characters are the same as Model I, i.e. blocks on a 2 x 3 matrix which will disappoint all those who yearn for high resolution graphics.

Still on the video section, another nice feature of the Model III is scroll protection. Fig. 3 explains all.

Have you ever wanted to print the contents of the screen during the execution of a program? On the Model III all you need do is press SHIFT Down Arrow * together and lo and behold the entire contents of the screen are sent to your printer. This only applies to ASCII characters, however. Any graphics or special characters will be printed as periods. Furthermore, you can use this feature in your own program by utilising the ROM $ PRSCRN routine via a USR call.

Model III BASIC recognises only one USR call which is unfortunate now that owners are being encouraged to make ROM calls from their BASIC programs. Nevertheless, it should not be too difficult to find a way around this. The entry address for the USR routine must be POKEd into System RAM at 16526 and 16527. As long as you POKE the correct entry address just before the USR function in your basic program, you can make as many different USR calls as you wish.

Another feature only available on Model I's with the expansion interface fitted is the real-time clock. It is possible to set time and date and have the computer keep track of both from then on (assuming you do not switch off, when everything is reset to 0). From BASIC, PRINT TIME DOLLAR displays the time and date whilst you can turn on a continuously updated clock display at the top of the screen by using ROM call $ CLKON.

A feature unique to the Model III is known as device routing. This allows you to change the input or output device used by a program without altering the program itself. The now inevitable POKE's into System RAM are used together with a USR call to ROM subroutine $ROUTE. The text explains how you can ROUTE all display information to your printer rather than the display, for example. It is also possible to carry out multiple device routings at the same time. There was an attempt to achieve this in TRSDOS 2.1 using the DEVICE command but it was not fully implemented and was dropped from later versions of TRSDOS. Now it is back in force and should be very useful indeed.

We had heard that there are incompatibilities between Model III and Model I software. Well, the manual arrived with an insert explaining the situation as far as Radio Shack (Tandy) software is concerned. There is a list of eight programs, the earlier versions of which require modifications before they can be run on a Model III. The appropriate modifications are explained in the insert. There is a further list of seven programs which cannot be easily converted and must be exchanged for Model III versions if the Model III version had not been contained in the package. Apparently, Tandy stores will arrange the exchange at no cost to customers. This list of programs includes Mailgram, Scripsit - both tape and disk, Profile, Microfiles, Versafile, Visicalc and K-8 Math.

There is then a further list of seven programs which will not run on the Model III and are not available as exchange items. These include RS-232 Communications pack, Renumber, Microchess, RS-Term, Micromovie, TBug and Editor/Assembler.

One other difference is a cosmetic one. The Model III now has the standard ASCII character set and no longer displays the arrow symbols. The Table below explains the difference.

CODE	MOD I	MOD III
91	↑	[
92	↓	\
93	←	]
94	→	^

There is, of course, no indication of the compatibility with non-Tandy programs. The rule would appear to be that BASIC programs will require only minor adjustments, machine language programs which do not use ROM calls may well work, but machine language programs which use ROM calls are unlikely to work at all. As we learn more about the software aspects of the Model III, we will keep you informed.

So much for the software, at least for the moment. Now we will turn our attention to the hardware. Fig. 4 lifts the lid on the Model III! As can be seen, the top cover lifts right off (goodbye warranty!), taking with it the monitor tube and the electronics and revealing a keyboard mounted on a moulded base plate and there, way way back, a vertical metal plate on the front of which is mounted a switching mode power supply and behind which is mounted the logic card (see Fig.5). The raised button to the right of the numeric keypad proclaims that this machine has 16K of RAM. The recessed button behind it is the reset button. Fig.6 is a rear view of the computer showing the logic card. The long black IC placed horizontally about one-third the way up the right hand side of the board is the Z80. Above it are three rows of sockets for up to 48K of memory. The top row is occupied by the 16K supplied with the machine. We could not resist the temptation and our machine quickly became a 48K model. The RAM's used are 4116's as in the Model I and there is no need to make any changes other than plugging in the extra RAM in order to go from 16K to 32K or 48K. The other large IC towards the top left hand corner of the PC board is the character generator mentioned earlier. To the left of the board, at the bottom is a 34 pin card edge, accessible through the base plate. This is the Centronics parallel printer port. Further over, just below the white rectangle (which is actually a piece of flexible PC board used as a cable) is the I/O bus for future expansion. That is the good news. The bad news for those with Model I peripherals is that it is a 50 way card edge and the manual contains absolutely no information as to the signals which are present on it. It is clear that it is different from the Model I if only because of the 10 extra pins. Wonder why? Unfortunately, Tandy has still eschewed the use of gold plating on its card edges and both the Centronics port and the I/O bus have tin plated fingers. No doubt, this will continue to be a source of poor connections as on the Model I.

The logic card is mounted on the vertical metal plate which has a step in it, thus providing space to mount two smaller PC boards sandwiched between it and the logic card. One of these cards is the RS232 interface. Its socket comes out beneath the machine. The other is the disk controller card which, reportedly, are very scarce at present. Along the top of the logic card are two white connectors (the one in the centre is half obscured in the photograph by a metal bracket). No doubt one of these connectors is used to interface with the disk controller card, and the other with the RS232 interface. The Model III will accommodate two double density 40 track disk drives in its own cabinet, two further disk drives may be added externally. The disk controller card has an expansion edge in it which is accessible through a hole in the base plate of the cabinet, just behind the Centronics port (see Fig. 7).

If we had to find one word to sum up our impression of the Model III it would be "integrated". The Model I was developed module by module, over a period of time and reflects that from the tangle of wires, separate power supplies etc. to the lower case mods, XRX 3, loading mods, new ROM chips etc. etc. The Model III has all the earmarks of an integrated system which has been fully developed before being released which is not to say that further developments will not take place but just about everything you could reasonably want is already there. Perhaps the key to many people deciding whether or not to purchase a Model III will be the price and that is yet to be announced in Australia and the U.K. We are convinced that the Model III is an excellent computer and is a much more serious contender for use in a business environment than is the Model I. Tandy is to be congratulated on developing such a refined machine at (hopefully) a realistic price, and once again, it fills a need in the market which few, if any, other manufacturers are meeting. We believe that the Model III TRS-80 is likely to be even more successful than the Model I.

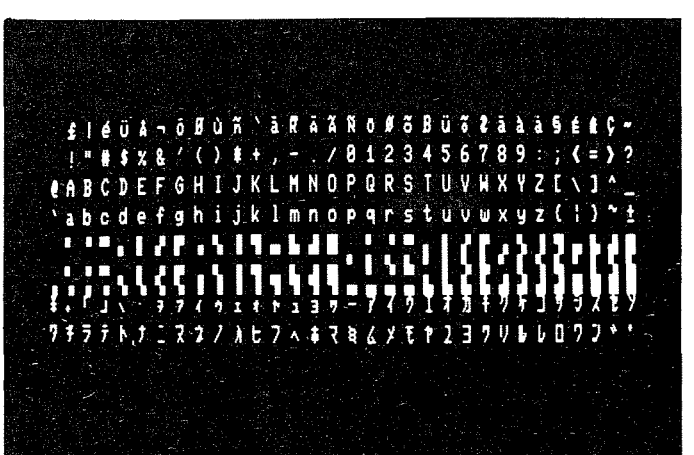

FIG. 1 – FULL CHARACTER DISPLAY

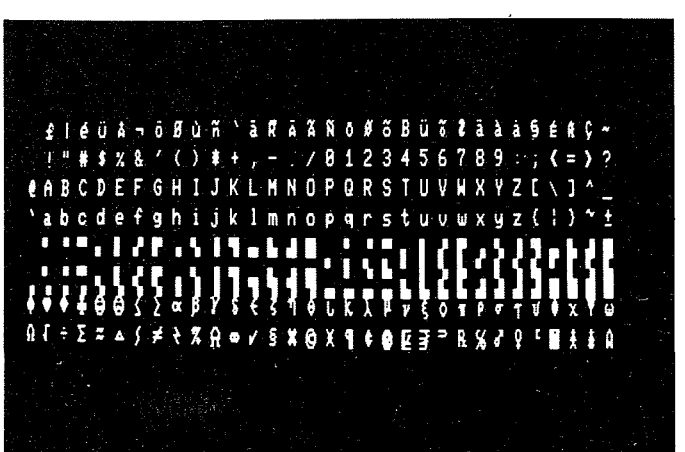

FIG. 2 – FULL ALTERNATE CHARACTER DISPLAY

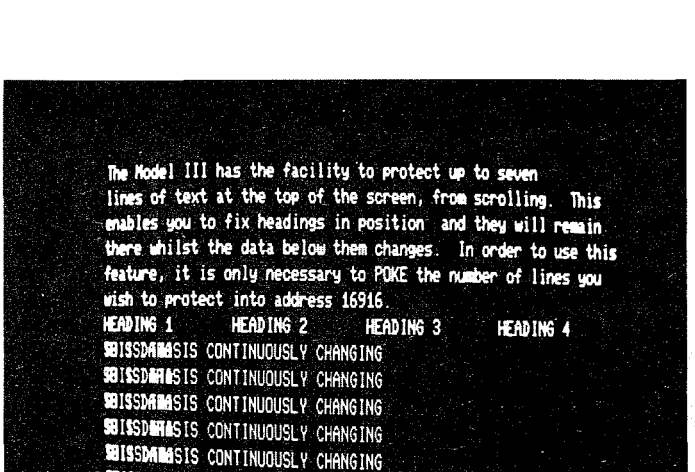

FIG. 3 – DEMONSTRATION OF SCROLL PROTECTION

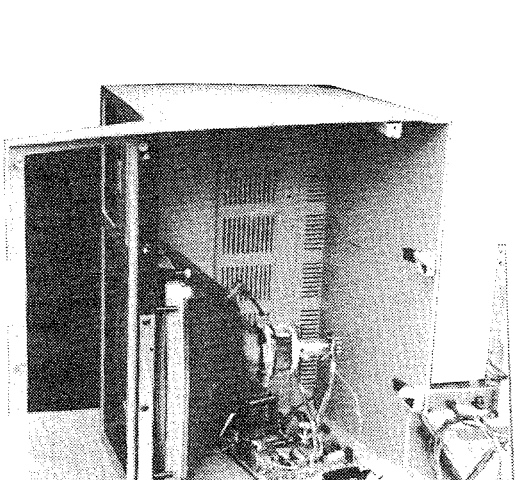

FIG. 4 – VIEW OF INSIDE OF TOP COVER

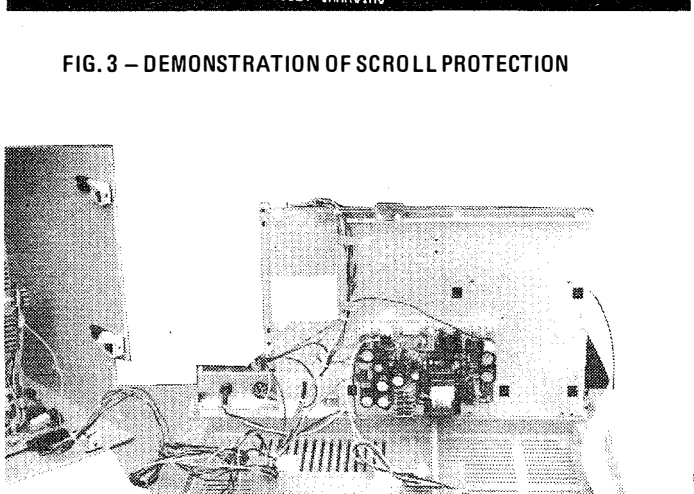

FIG. 5 – VIEW OF KEYBOARD AND POWER SUPPLY

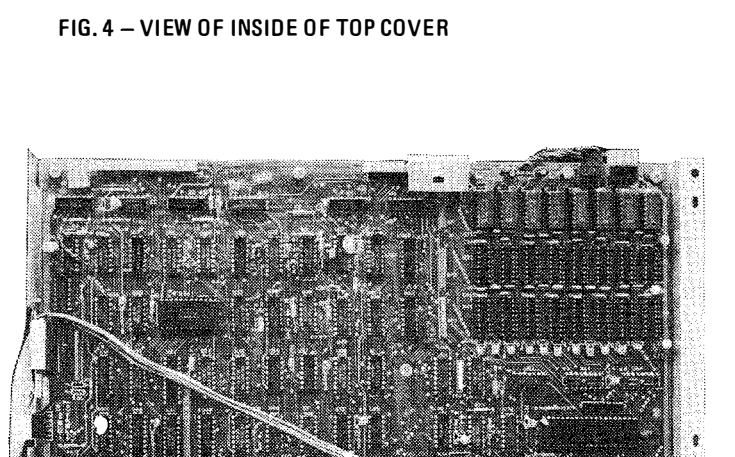

FIG. 6 – REAR VIEW SHOWING LOGIC CARD

E.S.F. FORUM BY CHARLIE BARTLETT
THIS MONTH..... CARE - CLEANING AND CRASHES

As the title implies, we are going to deal with the Care and Cleaning which if never done leads to the crashes (or to be more precise, imagine 75ft of ESF taper dangling from the wafer that contained your favourite programmes). It's so simple to clean the ESF and I'm sure you want to avoid the above.

1) TURN OFF THE ESF

2) TIP UP THE ESF AND LOOK IN THE WAFER SLOT (you will see the read/write head clearly with the drive capstan to the left)

3) CLEAN THE HEAD AND CAPSTAN WITH A COTTON BUD DIPPED IN ALCOHOL (even a dry one will help a bit if you have no alcohol)

4) you've finished!

The effect of allowing the head to become dirty is that you will get PARITY errors. When the capstan gets good and sticky it will suddenly grab hold of your precious wafer and wrap it around itself. The first indication you will have of this happening is when your ESF starts to make noises like a spastic spider having convulsions in a potato chip bag, CRUNCH,CRUNCH !!! The first thing to do if you hear strange noises is to press the BREAK key ***** QUICKLY *****

THE ESF may also take to eating your wafer if you fail to insert the wafer into the slot correctly. Before going any further please examine figure A

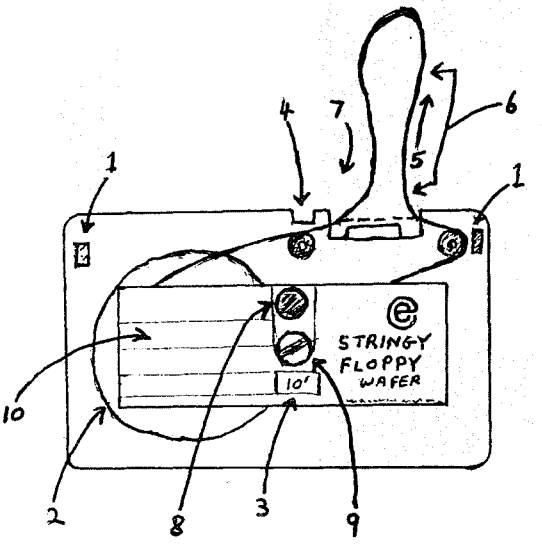

FIGURE A

Key to Figure A:-

1. Recess slots that the ESF uses to hold the wafer in place.
2. Main tape storage wheel
3. Amount of tape (in feet) on this wafer.
4. Capstan drive slot.
5. Refer to text on recovery of damaged wafers.
6. Refer to text on recovery of damaged wafers.
7. Refer to text on recovery of damaged wafers.
8. Write protection reflector.
9. End/start of tape sensor apature.
10. Area for placing program name/s.

*** RECOVERY OF DAMAGED WAFERS (sometimes) ***

If you where silly enough to ignore the above and are presently sitting there will a lap full of loose tape then follow these instructions and you MAY be able to save the wafer (at least long enough to get some of your programs off and onto a new wafer, AFTER YOU HAVE CLEANED THE HEAD THOUGH). If the amount of wafer tape pulled out is no more than one or two inches you can do the obvious and carefully push it back inside in the direction of arrow 7 (clean hands please). However, it is more than likley that you are sitting there with something like 2 ft or more of tape hanging on the floor. So the first thing to do is to hold the wafer upside down (the tape openings pointing towards the floor), get hold of the tape at position 6 and pull it out in the direction of arrow 5.

YES I DID SAY PULL IT OUT, and keep on pulling it out. After a few minutes of this you will notice that the loop of tape hanging out is getting smaller as it rewinds onto the main spool (2) at the correct tension. When the loop comes down to a small enough size push the last of it inside (direction 7).

All of this must be done carefully so that you do not get twists in the tape. Presuming that you have now cleaned your ESF and that you get all the tape back in the wafer, initialize the ESF and then type in @LOAD. Don't type in @LOAD1 or any other number, that way you can get the first program from your battered wafer that the ESF comes across. If it loads OK, @SAVE it onto another wafer. Keep doing this until you have salvaged what you can and then throw the old wafer in the bin, (no it's not worth the risk, what we just did was to try to save the programs, not the wafer).

So save yourself the trouble of doing all that and keep your ESF clean and make sure you insert the wafers correctly.

As they come to hand I will publish addresses for m/l programs not listed in the ESF manual but which you may have on cassette and wish to get onto wafer, this month....

TRCOPY START:-17152D LENGTH:-1520D ENTRY POINT:-17152

If you know of any similar addresses for popular programs, please send them in for publication.

Mr C.E.KENDALL writes...
If I have any more programs for submission, would you accept them on ESF wafers? This would save time at both ends and greatly increase the probability of your getting an error-free copy.

Answer:- as they say on the T.V. you betcha banoose Bruce, the more the merrier.

Mr Kendall also submitted this:-

USING ESF AND DISKS ON THE TRS-80
It appears that the ESF is compatible with Tandy disk drives. A number of programs and their associated data have been worked up on my TRS-80 and ESF, then transferred to another machine with Dual disk drives. No problems were found, so it appears that there are no clashes in memory usage. To effect the transfer, the ESF was simply plugged between the CPU and expansion interface. For data transfer, a temporary modification to the program is of course needed, with ESF @INPUT etc. statements but disk PRINT# etc. instructions. Not many users would want both disk and ESF permanently coupled but it is useful to know that data and programs can be swapped between machines.

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***** MICROBUGS *****

KBFIX - ISSUE 12 PAGE 12
Many of our readers were perplexed by this program, which included a READ statement but no corresponding DATA. The author, Terry Bradbury, whose name we had mislaid at the time, has contacted us and supplied the missing line. He also points out that the NEW statement (line 80) should not be used if this program is incorporated within another program as it will delete everything. You could, of course, use:

80 DELETE 10-80

If your computer suffers from extremely bad keybounce, you may need to increase the delay time even further. You can do this by increasing the 80 in the DATA line.

The revised version of KBFIX is LISTed on Page 8

***** '80 USERS' GROUPS *****

The following is a list of '80 Users' Groups. If you have a group that is not included here, please let us know about it so that we can publish details. Owners of System '80s, Video Genie's and PMC-80 are welcome at all the groups.

BRISBANE: Contact: Mr. Lance Lawes,
Tel: Home (07)396 2998
Bus. (07)268 1191 Ext.15
MEETINGS: 1st Sunday of the month at 2 p.m. at 21 Rodney St. Lindum,4178.

MELBOURNE: EASTERN SUBURBS - 1
Contact: Mr. John Fletcher, 89 0677 between 9-4

EASTERN SUBURBS - 2
MEETINGS: 3rd Wednesday of the month at Kingswood College, 355 Station St. Box Hill.

NORTHERN AND WESTERN SUBURBS COMPUTER USERS GROUP
MEETINGS: Every 2nd Thurs. at 7 pm. at 142 Pascoe Vale Rd., Moonee Ponds
Contacts: David Coupe (03) 370 9590
Clive Budd (03) 370 2917

FRANKSTON: (Vic) PENINSULAR GROUP
MEETINGS: 2nd Tues. of the month (except Jan.)
Contact: M.G. Thompson (03) 772 2674

GEELONG: GEELONG COMPUTER CLUB
MEETINGS: 2nd Tues. of the month at TYBAR Engineering, Hampton St. Newtown.
Contact: The Geelong Computer Club,
P.O. BOX 6, Geelong, 3220

DARWIN: Contact: Tony Domigan, P.O. Box 39086,
Winnellie, N.T.5789.

ADELAIDE: Contact: Rod Stevenson, 36 Sturt Street, Adelaide,5000. 'Phone 51 5241 between 9-4.

CANBERRA: MEETINGS: 3rd Thurs. of each month at 7.30 pm in:-
Urambi Village Community Centre, Crozier Circuit, Kambah.
Contact: Bill Cushing, 10 Urambi Village, Kambah, ACT 2902. ('Phone 31 6399)

TOWNSVILLE: TOWNSVILLE AMATEUR RADIO CLUB
MEETINGS: 2nd Tues. of the month at 7.30 pm at:-
The State Emergency Service Headquarters,
Green St., West End.
Contact: F.G. Sturges, P.O. BOX 5100 MSO, Townsville

** UNITED KINGDOM **

NEWCASTLE: NPCS (Newcastle Personal Computer Society)
Contact: John S. Bone 0632 770036

MERSEYSIDE: LEVEL 1 USERS GROUP
Contact: Sec. Mr. N. Rushton, 123 Roughwood Drive, Northwood, Kirkby, Merseyside

NATIONAL: NATIONAL TRS-80 USERS GROUP IN UK
Contact: Brian Payne, 40a High Street, Stoney Stratford, Milton Keynes.

EDUCATION: NATIONAL TRS-80 EDUCATION USERS GROUP
Contact: Dave Futcher, Beaconsfield First & Middle School
Beaconsfield Road, Southall, Middlesex, UB1 1DR.

** NEW ZEALAND **

AUCKLAND MEETINGS: 1st Tues. of each month at:-
NZ Solenoid Co. Ltd.,
28 Kalmia Street, Ellerslie, Auckland.

```
10 REM KEYBOARD DEBOUNCE ROUTINE
20 REM NO NEED TO ENTER MEMORY SIZE
30 REM PROGRAM ERASES ON COMPLETION
40 FOR I=32746 TO 32766:READ J:POKE I,J:NEXT
50 POKE 16526,234:POKE 16527,127:POKE 16561,241:
   POKE 16562,127:POKE 16598,241:POKE 16599,127
60 X=USR(N)
70 DATA 229,33,243,127,34,22,64,225,201,205,227,3,103,1,80,0,205,96,0,124,201
80 NEW
```

***** MARKET PLACE *****

Market place is available to any reader who has hardware to dispose of. An entry costs nothing - you pay MICRO-80 $5.00 or 5% commission, whichever is the greater - up to a maximum of $30, after the goods are sold. The commission is calculated on your advertised price.

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***** SOFTWARE SECTION *****

***** PINBALL LI/4K by C. Bartlett *****

There's no need to tell anyone how to play pinball so I'll just tell you how to use this particular machine. There are only two control keys (back arrow and space bar), the back arrow is for the right hand flipper and the space bar is for the left hand flipper. To start the game press one of the control keys and the first ball will be fired automatically.

As the ball moves around your pinball machine you'll notice some strange things happening. First of all, parts of the machine will disappear at random intervals and, secondly, for no apparent reason you'll find the ball changes direction (down, down left or down right). This will give you a different game each time you play. Once you have played all six balls just press CLEAR to start another game.

Lines 20 - 80	Draw the boundary
265 - 290	Put the side bumpers on the screen, leading up to the flippers.
315 - 350	Draw the flippers.
500	Game play starts.
515	Only used when new ball is required. If a new ball is required the program will continue to jump to line 515 until one of the control keys is pressed.
SUB 1000	Called each time a new ball is fired.
SUB 1200 AND SUB 2000	Called when one of the flipper control is pressed.

```
1 W=0:M=1:T=0:Q=0:A=32:B=33:C=34:J=78:K=31:L=78:V=0
2  REM:    PINBALL L1/4K  - BY C. BARTLETT
10 C.
15 S.(127,47)
18 P.A.730;"PINBALL
20 F.X=40TO81
40 S.(X,2):S.(X,36)
50 N.X
60 F.Y=2TO35
70 S.(40,Y):S.(41,Y):S.(80,Y):S.(81,Y)
80 N.Y
90 F.Y=6TO35:S.(76,Y):N.Y
100 F.X=0TO2:S.(77+X,3):S.(42+X,3):N.X
110 S.(79,4):S.(42,4)
120 F.X=77TO79
130 S.(X,A)
140 N.X
141 S.(78,35)
```

```
142 S.(72,10):S.(73,10)
150 S.(78,B):S.(78,C)
160 S.(J,K)
170 F.Y=6TO7
180 F.X=46TO71S.5:S.(X,Y):N.X
190 N.Y
200 F.X=46TO49
205 S.(X,12):S.(X,13)
210 N.X
215 F.X=58TO61
220 S.(X,11):S.(X,12)
225 N.X
230 F.X=68TO71
235 S.(X,12):S.(X,13)
240 N.X
245 S.(52,16):S.(53,16):S.(64,16):S.(65,16)
250 F.X=46TO70S.4:S.(X,19):S.(X+1,19):N.X
260 S.(70,19):S.(71,19):S.(58,24):S.(59,24)
265 E=45
270 F.F=21TO26:S.(E,F):E=E+1:N.F
280 E=72
290 F.F=21TO26:S.(E,F):E=E-1:N.F
315 F.Y=27TO28
320 S.(51,Y):S.(66,Y)
325 N.Y
330 F.X=52TO56
340 S.(X,29):S.(X+9,29)
350 N.X
360 F=42
365 F.E=24TO31
370 F.X=41TOF
375 S.(X,E)
380 N.X
390 F=F+1
395 N.E
400 F=75
405 F.E=24TO31
410 F.X=FTO76
415 S.(X,E)
420 N.X
425 F=F-1
430 N.E
450 F.X=42TO56
460 S.(X,32):S.(X+19,32)
470 N.X
500 G=1:H=40:I=4:Q=0
501 R=R.(8)
505 P.A.833;:S.(G,H):S.(I,H)
510 P.A.0;"SCORE";V;AT833;
511 IFP.(127,47)=0G.1
512 IFQ=1G.530
515 IF(P.(G,H))*(P.(I,H))G.515
520 GOS.1000:G.999
530 IFP.(G,H)=0GOS.2000:G.505
540 IFP.(I,H)=0GOS.1200:G.505
552 IFP.(L,K-1)R=5
554 IFP.(L,K+1)R=4
556 IFP.(L-1,K)R=8
558 IFP.(L+1,K)R=2
625 R.(L,K)
630 IF(R=1)+(R=3)+(R=8)L=L+1
640 IF(R=1)+(R=2)+(R=5)K=K+1
650 IF(R=2)+(R=4)+(R=7)L=L-1
660 IF(R=3)+(R=4)+(R=6)K=K-1
670 S.(L,K)
680 IF(L>56)*(L<61)*(K=32)+(K=31)G.700
685 T=T+1:IFT<10G.874
690 G.800
700 R.(L,K)
705 L=78:K=31:Q=0
710 S.(L,K)
720 G.999
800 IF(P.(46,19)=0)+(P.(47,19)=0)P.A.407;"*";:V=V+1
805 IF(P.(50,19)=0)+(P.(51,19)=0)P.A.409;"*";:V=V+1
810 IF(P.(54,19)=0)+(P.(55,19)=0)P.A.411;"*";:V=V+1
815 IF(P.(58,19)=0)+(P.(59,19)=0)P.A.413;"*";:V=V+1
```

```
820 IF(P.(62,19)=0)+(P.(63,19)=0)P.A.415;"*";:V=V+1
825 IF(P.(66,19)=0)+(P.(67,19)=0)P.A.417;"*";:V=V+1
830 IF(P.(70,19)=0)+(P.(71,19)=0)P.A.419;"*";:V=V+1
860 IF(P.(58,24)=0)+(P.(59,24)=0)P.A.541;"#";:V=V+25
865 IF(P.(52,16)=0)+(P.(53,16)=0)P.A.346;"$";:V=V+50
870 IF(P.(64,16)=0)+(P.(65,16)=0)P.A.352;"$";:V=V+50
874 IF(K<6)+(K>7)G.910
875 IF(L>41)*(L<46)P.A.149;"5";:V=V+5
880 IF(L>46)*(L<51)P.A.152;"5";:V=V+5
885 IF(L>51)*(L<56)P.A.154;"9";:V=V+9
890 IF(L>56)*(L<61)P.A.157;"$";:V=V+100
895 IF(L>61)*(L<66)P.A.159;"9";:V=V+9
900 IF(L>66)*(L<71)P.A.162;"5";:V=V+5
905 IF(L>71)*(L<76)P.A.164;"5";:V=V+5
910 IFT=10G.999
920 G.510
998 IF(R<3)+(R>6)+(R=5)G.920
999 R=R.(8):T=0:G.998
1000 F.A=ATO35
1001 F.X=77TO79:R.(X,A-1):N.X
1002 IFM=7G.8000
1005 F.X=77TO79:S.(X,A):N.X
1009 P.A.64;"BALL";M;
1010 R.(78,A-2):S.(78,A-1)
1015 N.A
1025 K=34
1030 A=A-1
1050 F.A=ATO33S.-1
1060 S.(L,K)
1070 R.(77,A):R.(79,A):F.X=77TO79:S.(X,A-1):N.X
1075 K=K-1
1095 N.A
1100 K=K-1
1105 S.(G,H)
1110 Q=1
1120 F.K=KTO4S.-1
1125 R.(L,K+1):S.(L,K)
1127 F.Z=1TO30:N.Z
1130 N.K
1140 K=4
1150 M=M+1
1160 N=-1:O=R.(2)*2-3
1170 RET.
1200 F.X=52TO56
1205 R.(X,29)
1210 S.(X,28)
1215 N.X
1220 F.X=52TO56
1225 R.(X,28)
1230 S.(X,29)
1235 N.X
1250 IF(K<>28)+(L<52)+(L>56)RET.
1270 F.X=1TO5
1275 R.(L,K)
1280 K=K-1
1285 S.(L,K)
1290 N.X
1299 RET.
2000 F.X=61TO65
2005 R.(X,29)
2010 S.(X,28)
2015 N.X
2020 F.X=61TO65
2025 R.(X,28)
2030 S.(X,29)
2035 N.X
2050 IF(K<>28)+(L<61)+(L>65)RET.
2070 F.X=1TO5
2075 R.(L,K)
2080 K=K-1
2090 S.(L,K)
2095 N.X
2099 RET.
8000 P.A.320;"GAME OVER";
8010 IFP.(127,47)=0G.1
8020 G.8010
```

***** KEY NOTE LI/4K by P. Ereaut ******

This is an educational program in the form of a game, where the computer selects keys and notes at random and places them on a stave. You have to tell the computer what they are. You will be told whether the selections were correct or not and the correct answers are displayed. If your selection is wrong it will flash for a short time. After each selection a new key is displayed but the old note will remain on the stave. The next note will be displayed alongside the old one. This will continue until 9 notes are displayed. After 9 notes are selected your score will be displayed.

To run this program on a Level II machine add:

```
24   CLEAR 200
and change:
275  PRINT@768,STRING$(128,32)
330  PRINT@768,STRING$(128,32)
580  PRINT@768,STRING$(192,32)
```

Lines of interest:

35	Random key selection
70	Random note selection
115-145	Read and print the flats if there are flats in the key selected.
150-180	Read and print the sharps if there are sharps in the key selected.
195-200	Prints a note at the correct position on the stave (note selected by computer).

```
2  REM                  KEYNOTE L1/4K     -  BY PHIL EREAUT
3 REM
4 REM
8 C.
10 P.A.26,"** KEY NOTE **
11 P.:P.T.(27);"A MUSIC GAME
12 P.
15 P."THE DISPLAY WILL SHOW - RANDOM MUSIC KEY SIGNATURES, AND NOTES
17 P.T.(10);"THE NOTE SHOWN IS RELATED TO THE KEY SIGNATURE
20 P.:P.T.(10);"FROM THE TABLES SHOWN - ENTER YOUR SELECTIONS
22 P."THE SELECTIONS WILL BE DISPLAYED - IF INCORRECT THEY WILL BLINK
23 P.:P.T.(13);"AFTER 9 TRIES YOUR SCORE WILL BE SHOWN
25 P.A.850,:I."PRESS ENTER TO CONTINUE";A$
30 C.
33 L=60:S=0:C=0:E=0
35 K=R.(14)
37 Q=0
40 F.B=64TO576S.128
50 F.X=0TOL:P.A.B+X,"-";:N.X
60 N.B
70 T=R.(12)-1
75 N=T*64+19
80 REST.:F.X=1TOT+41:READB$:N.X
105 IFK=14G.185
110 IFK>6G.150
115 REST.
120 F.X=1TOK
125 READA
130 P.A.A,"&";
135 IF(I.(A/64)=T)+(I.(A/64)=T-7)Q=10
140 N.X
145 G.185
150 REST.
155 F.X=1TO6:READA:N.X
160 F.X=1TOK-6
165 READA
170 P.A.A,"#";
175 IF(I.(A/64)=T)+(I.(A/64)=T-7)Q=20
180 N.X
185 X=34:F.Y=4TO27:S.(X,Y):N.Y
190 R=646:GOS.650
195 P.A.N+S,"O";
196 IFT=10 P.A.N+S+63,"---";
```

```
200 IFT=11 P.A.N+S-1,"-O-";
210 P.A.768,"F   B&  E&  A&  D&  G&  G   D   A   E   B   F#  C#  C
220 P.A.832,"1   2   3   4   5   6   7   8   9   10  11  12  13 14
225 P.A.900,:I."ENTER <KEY NUMBER>";H
230 IFH>14 P.A.917,"  ";:G.225
235 GOS.240:G.270
240 REST.
245 F.X=1TO13:READA$:N.X
250 F.X=1TOH:READA$:N.X
265 P.A.716;"(";A$;")";
268 RET.
270 P.A.981,"(";A$;")";
275 P.A.768:P.A.832
280 P.A.768,
285 P."C& C  C# D& D  D# E& E  E# F  F# G& G  G# A& A  A# B& B  B#
290 P.A.832,
295 P."21 11 31 20 10 30 19 9  29 8  28 17 7  27 16 6  26 15 5  25";
300 P.A.930,:I."ENTER <NOTE NUMBER>";W
305 J=W:D=0
310 IF(W>14)*(W<22)J=W-10:D=10
315 IF(W>24)*(W<32)J=W-20:D=20
320 IF(J<5)+(J>11)P.A.948,"   ";:G.300
330 P.A.768:P.A.832
335 GOS.340:G.362
340 REST.
345 F.X=1TOJ+41:READA$:N.X
350 P.A.850+S;"(";A$;")";
355 IFD=10P.A.852+S,"&)";
360 IFD=20P.A.852+S,"#)";
361 RET.
362 P.A.1012,"(";A$;")";
363 IFD=10P.A.1014,"&)";
364 IFD=20P.A.1014,"#)";
370 IFT<5T=T+7
375 V=T+Q
390 IFH=KG.400
395 P.A.964,"KEY NOT CORRECT";:G.405
400 P.A.964,"KEY CORRECT";:E=E+1
405 IFV=WG.415
410 P.A.994,"NOTE NOT CORRECT";:G.420
415 P.A.994,"NOTE CORRECT";:C=C+1
420 REST.:F.X=1TO52:READA$:N.X
422 Y=704:F.X=1TO12:READA$
425 P.A.Y,A$;:Y=Y-64
426 N.X
427 R=898:GOS.650
428 IFK=14G.430
429 R=905:GOS.680
430 REST.:F.X=1TOK+13:READA$:N.X
435 P.A.645;"KEY...";A$
438 P.A.773,"NOTE";
440 F.X=1TOS+8
445 P.A.777+X,".";:N.X
480 P.A.787+S,B$;
485 IFQ=10P.A.787+S;B$;"&";
490 IFQ=20P.A.787+S;B$;"#";
495 D.323,133,391,201,459,269,67,261,7,201,395,141,335
500 D.F,B&,E&,A&,D&,G&,G,D,A,E,B,F#,C#,C
505 D.B&,E&,A&,D&,G&,C&,F#,C#,G#,D#,A#,E#,B#
510 D.G,F,E,D,C,B,A,G,F,E,D,C
512 D.C,D,E,F,G,A,B,C,D,E,F,G
513 GOS.840
515 F.X=1TO2000:N.X
520 IFS=40G.800
525 REST.
530 F.X=1TO13:READA:P.A.A," ";:N.X
550 Y=704:F.X=1TO12:P.A.Y," ";:Y=Y-64:N.X
575 P.A.640,"                    ";
580 P.A.768:P.A.832:P.A.896
582 P.A.715,"      ";
585 P.A.960,"                                                    ";
590 L=15:S=S+5:G.35
650 IFK=14P.A.R,"NO #'S OR &'S":G.665
655 IFK>6P.A.R,K-6;"#'S:";:G.665
660 P.A.R,K;"&'S:";
665 RET.
```

```
680 REST.
682 P=0:M=27:U=0
685 IFK>6M=33:U=6
690 F.X=1TOM:READA$:N.X
695 F.X=1TOK-U:READA$:P.A.R+P,A$;
700 P=P+3:N.X
705 P.:RET.
800 C.
805 P.:P."NUMBER OF SELECTIONS",9
810 P.:P."NUMBER OF KEYS CORRECT",E
815 P.:P."NUMBER OF NOTES CORRECT",C
820 G.25
840 IF(H=K)*(V=W)G.890
845 F.I=1TO20
850 IFH=KG.865
855 P.A.715,"    ";
860 GOS.240
865 IFV=WG.885
870 P.A.850+S,"    ";
875 GOS.340
885 N.I
890 RET.
```

***** LEVEL II T-BUG UP-DATE ml. (C) J. GRIGG *****

A problem with the Tandy T-BUG program is that only 16 memory locations can be viewed at any one time (ie. 16 lines on the screen). The modification described here allows a possible 256 memory locations to be viewed at any one time. Memory is displayed across the screen, 16 locations for every line on the screen. To do this a number of changes have to be made:

1) First, load T-BUG and using the "M" command, enter the following machine language subroutine starting at location 4981H.

```
LM=32
CD32 45CD 8945 3240 48CD 8945 323F 48CD 7B45
DD2A 3F48 CD7B 4506 10CD 0F45 CD7B 45DD 2310
F63A 4038 FE01 2015 DD22 3F48 CD3C 45DD 2140
48CD 0F45 DD2B CD0F 4518 CE3A 0838 FE01 CAA5
4318 DA00
```

2) To clear whole lines and scroll whole lines Jump to 43A0 and enter the following, using the "M" command:-

MEM LOCATION	ENTER
4554	00
4555	00
4566	00
4567	00
4573	40
455B	40

The display may do some strange things when entering these changes but, if entered correctly, they will work.

3) Change commands and insert new command:

1). Type M 43F0
2). Enter 43 into 43F0
3). Type X
4). Type C 43FD
5). Enter 4D into 43FD
6). Press ENTER once
7). Enter 81 into 43FF
8). Enter 49 into 4400
9)) Type X

The "G" command has now been deleted and replaced with the "M" command and a new command "C" has been added. The "C" command is the same as the old "M" command. The "M" command now prints a whole line of 16 Memory locations. Typing X will exit the routine. Pressing ENTER will display more memory.

***** MICROHEX L2/4K (C) C. BARTLETT *****

I wrote this program mostly to teach myself "HOW" a number is converted from hex to decimal and back again. Also you often see articles about USR routines which require you to POKE the jump address into two locations. One number and two locations to POKE it into !!!! None of the books Ipossess thought to explain just how you get the two numbers to be POKEd from one number. Well if you have the same problem that I did, this program will save you a lot of headaches. It is written in BASIC, so if you don't care how it's done, just use it, but if you do then study the calculations in the BASIC listing. In about 2k of program it does the following :

- Converts Hex to Decimal
- Convert Decimal to Hex
- Converts the user supplied Jump address into the two values to be POKEd
- Provides the two POKE values needed for program chaining when program length is input

The program has inbuilt instructions for simple operation.

```
0 GOTO35
1 CLS:INPUT"ENTER DECIMAL NUMBER TO BE CONVERTED";A:C=A:IF(A<0)*(A>65535)THEN1EL
SEA=A/4096:B=INT(A):D=B*4096:E=C-D:F=E:G=E/256:H=INT(G):I=H*256:J=F-I:K=J:L=J/16
:M=INT(L):N=M*16:O=K-N
2 B=B+48:IFB>57THENB=B+7ELSEIFB<48THENB=48
3 H=H+48:IFH>57THENH=H+7ELSEIFH<48THENH=48
4 M=M+48:IFM>57THENM=M+7ELSEIFM<48THENH=48
5 O=O+48:IFO>57THENO=O+7ELSEIFO<48THENO=48
6 PRINT"HEX = ";:PRINTCHR$(B)+CHR$(H)+CHR$(M)+CHR$(O)
7 GOSUB33
8 IFV$="Y"THEN1ELSERETURN
9 CLS:PRINT"ENTER HEX NUMBER TO BE CONVERTED ? ";
10 A$=INKEY$:IFA$=""THEN10ELSEA=ASC(A$):PRINTCHR$(A);:Z=Z+1:GOSUB11:IFZ=4THEN13E
LSE10
11 IFZ=1THENB=AELSEIFZ=2THENC=AELSEIFZ=3THEND=A
12 RETURN
13 IFA>57THENA=A-7ELSEIFA<0THENA=0
14 A=A-48:IFA<0THENA=0
15 IFB>57THENB=B-7ELSEIFB<0THENB=0
16 B=B-48:IFB<0THENB=0
17 IFC>57THENC=C-7
18 C=C-48:IFC<0THENC=0
19 IFD>57THEND=D-7
20 D=D-48:IFD<0THEND=0
21 B=B*4096:C=C*256:D=D*16:F=B+C+D+A
22 PRINT@320,
23 PRINT"DEC = ";F
24 Z=0
25 GOSUB33:IFV$="Y"THEN9ELSERETURN
26 CLS:INPUT"ENTER DECIMAL TO BE CONVERTED
INTO < LSB > AND < MSB > ";A:B=A:C=A/256:D=INT(C):E=D:F=E*256:G=B-F:IFG<0THENG=0
27 IFD<0THEND=0
28 PRINT" LSB = ";G:PRINT" MSB = ";D:GOSUB33:IFV$="Y"THEN26ELSERETURN
29 CLS:INPUT"WHAT WAS PRINT MEM WITH YOUR LARGEST PROGRAM IN MEMORY";A
30 B=32696-A:C=B/256:D=INT(C):E=D*256:F=B-E
31 PRINT"POKE 16633,";F:PRINT"POKE 16634,";D
32 GOSUB33:IFV$="Y"THEN29ELSERETURN
33 PRINT"MORE (Y/N) "
34 V$=INKEY$:IFV$=""THEN34ELSERETURN
35 CLS
36 PRINT"                    MICROHEX                    (C) C.BARTLETT
                                                        5 .JULY.1980
HEX TO DEC = 1           : REQUIRES LEADING ZEROS ON NUMBERS
                         : WITH LESS THAN 4 DIGITS."
37 PRINT
38 PRINT"DEC TO HEX = 2          : NO SPECIAL FORMAT
DEC TO DEC = 3           :CONVERTS DECIMAL NUMBER DOWN INTO
                         :MSB AND LSB, USED IN POKE ROUTINES
VARPOINT   = 4           :ESF USERS, LOAD IN MEM AND"
39 PRINT"                          :THE PROGRAM SUPPLIES POKE VALUES
                         :FOR THE VARIABLE POINTER"
40 PRINT"SELECT :"
41 X$="":X$=INKEY$:X=VAL(X$):IFX$=""THEN41
42 ONXGOSUB9,1,26,29
43 GOTO35
```

***** SEA WOLF L2/4K (C) CARL CRANSTONE *****

You are in command of the submarine Sea Wolf which is located at the bottom of the screen. Ships will appear from the top left hand side of the screen. Control the sub with the following keys :- "<" to move left, ">" to move right and both together "<>" to fire, it is not necessary to press the shift key. When both keys are pressed you will see the torpedo shoot towards the ship, gradually getting smaller as it goes away from you. You will then be told whether a hit or a miss has been recorded and just to put the cream on the cake this program has sound as well with sonar, torpedo and explosions (Note: SYSTEM 80 users will need to modify the program in a similar manner to that described in last month's MICRO BUGS - Ed.). Memory size does not have to be set, just CLOAD and RUN. When you first RUN, WS is equal to 5. For each ship you sink, 1 is added to the score. When the score is greater than WS, then the next time around you will have to better your former score. If you can't get enough hits, you will run out of torpedoes (of which there are 15). However if your score is 10 and you run out of torpedoes, you will get more torpedoes and continue the game.

```
0 GOTO10:

5 DATA221,33,36,67,221,78,0,121,183,200,221,70,1,62,1,211,255,16,254,221,70,1,62
,2,211,255,16,254,13,194,253,66,221,35,221,35,1,255,255,33,48,0,9,218,29,67,195,
247,66
10 POKE16526,243:POKE16527,66:FOR0=17139TO17187:READS:POKE0,S:NEXT0
15 POKE17188,100:POKE17189,100:POKE17190,0:R=USR(0):CLEAR500:WS=5:GOSUB90
20 'AUTHOR:CARL CRANSTONE:(C):SEA WOLF:27/1/81:S.A.LII.4K
25 CLS:SC=0:PRINT@21,"SEA WOLF":FORT=1TO1000:NEXTT
30 CLS:GOSUB110:S=16288:GOSUB120
35 GOSUB125:POKE17188,68:POKE17189,84:POKE17190,134:POKE17191,84:POKE17192,0
40 IFPEEK(15330)=16THEN55ELSEIFPEEK(15330)=64GOTO60
45 IFPEEK(15330)=80THENY=S:XZ=XZ+1:IFXZ=15THEN170ELSE65
50 F=F+1:IFF=15THENR=USR(0):S=S+1:F=0ELSEGOTO35
55 GOSUB115:S=S-1:IFS<=16257THENS=S+1:GOSUB120ELSEGOSUB120:GOTO50
60 GOSUB115:S=S+1:IFS>=16319THENS=S-1:GOSUB120ELSEGOSUB120:GOTO50
61 GOTO50
65 '
70 IFY=S-64ORY=S-128ORY=S-192ORY=S-256GOSUB95
75 IFY=S-320ORY=S-384ORY=S-448ORY=S-512GOSUB100
80 IFY=S-576ORY=S-640ORY=S-704ORY=S-768GOSUB105
85 POKE17188,45:POKE17189,34:POKE17190,0:R=USR(0):IFY<=15424THENGOSUB130ELSEY=Y-
64:GOSUB125:GOTO65
90 DEFSTRA,B:A=CHR$(140)+CHR$(188)+CHR$(190)+CHR$(191)+CHR$(188)+CHR$(189)+CHR$(
188)+CHR$(140):B=STRING$(64,32)+A+STRING$(64,32)+A+STRING$(64,32):RETURN
95 POKEY,191:FORP=1TO20:NEXTP:POKEY,32:GOTO85
100 POKEY,188:FORP=1TO20:NEXTP:POKEY,32:GOTO85
105 POKEY,140:FORP=1TO20:NEXTP:POKEY,32:GOTO85
110 FORT=15488TO15551STEP2:POKET,137:POKET+1,134:NEXT:X=0:RETURN
115 POKES-1,32:POKES,32:POKES+1,32:RETURN
120 POKES-1,181:POKES,191:POKES+1,186:RETURN
125 X=X+1:PRINT@64,MID$(B,X,64):IFX=145THENGOTO110ELSERETURN
130 POKEY+64,32:GOTO135
135 FOR0=15424TO15487:IFPEEK(0)<>32THEN140ELSENEXT0:GOTO145
140 IFPEEK(0)=140ANDPEEK(0+1)=188ANDPEEK(0+2)=190ANDPEEK(0+3)=191ANDPEEK(0+4)=18
8ANDPEEK(0+5)=189ANDPEEK(0+6)=188ANDPEEK(0+7)=140THEN150ELSEGOTO145
145 PRINT@540,"GOT HIM!!!":FORN=1TO500:NEXTN:PRINT@540,"          ":GOSUB155:SC=
SC+1:IFSC>WSTHENGOTO160ELSE50
150 PRINT@540,"MISSED!!":GOSUB125:FORN=1TO500:NEXTN:GOSUB125:PRINT@540,"
":GOTO50
155 FORT=17188TO17195STEP2:POKET,84:POKET+1,RND(255):NEXTT:POKE17196,0:R=USR(0):
:FORT=Y-2TOY+2:POKET,RND(63)+191:NEXTT:FORT=(Y+64)-8TO(Y+64)+8:POKET,RND(63)+191
:X=0:NEXTT:FORP=1TO100:NEXTP:FORT=Y-2TOY+2:POKET,32:NEXTT:RETURN
160 CLS:PRINT"YOUR SCORE = ";SC:PRINT"BEST SCORE = ";WS:WS=SC:PRINT"TO WIN - DES
TROY >";WS
165 XZ=0:PRINT"ANOTHER GAME?";:INPUTT$:IFLEFT$(T$,1)="Y"THEN25ELSEPRINT"DID YOU
GET SEA SICK OR SOMETHING!":END
170 IFSC>=10THEN175ELSECLS:XZ=0:PRINT"NO TORPEDOES LEFT!":PRINT"RETURN TO BASE!"
:PRINT"PLAY AGAIN?";:INPUTT$:IFLEFT$(T$,1)="Y"THENRUNELSEPRINT"YOU JUST CAN'T TA
KE THE PACE!!!":END
175 CLS:XZ=0:PRINT"SUPPLY SHIP DOCKED. REFUELLING":PRINT"PLAY AGAIN?";:INPUTT$:I
FLEFT$(T$,1)="Y"THEN30ELSEEND
```

DON'T BE HELD BACK BY AN ANTIQUATED DISK OPERATING SYSTEM

MOVE UP TO

NEWDOS 80 **$149 incl. p&p**

NEWDOS 80 is a completely new DOS for the TRS-80 SYSTEM 80. It is well-documented, bug free and increases the power of your system many times over. It is upward compatible with TRSDOS AND NEWDOS (ie TRSDOS and NEWDOS+ programs will run on NEWDOS 80 but the reverse is not necessarily so).

These are just a few of the many new features offered by NEWDOS 80.

* New BASIC commands that support variable record lengths up to 4095 bytes long.
* Mix or match disk drives. Supports any track count from 18 to 96. Use 35, 40, 77 or 80 track 5¼ inch mini disk drives, 8 inch disk drives OR ANY COMBINATION.
* An optional security boot-up for BASIC or machine code application programs. User never sees "DOS-READY" or "READY" and is unable to "BREAK", clear screen or issue any direct BASIC statements, including "LIST".
* New editing commands that allow program lines to be deleted from one location and moved to another or to allow the duplication of a program line with the deletion of the original.
* Enhanced and improved RENUMBER that allows relocation of subroutines.
* Create powerful chain command files which will control the operation of your system.
* Device handling for routing to display and printer simultaneously.
* MINIDOS – striking the D, F and G keys simultaneously calls up a MINIDOS which allows you to perform many of the DOS commands without disturbing the resident program.
* Includes Superzap 3.0 which enables you to display/print/modify any byte in memory or on disk.
* Also includes the following utilities:
  - Disk Editor/Assembler
  - Disassembler (Z80 machine code)
  - LM offset – allows transfers of any system tape to Disk file – automatically relocated.
  - LEVEL I – Lets you convert your computer back to Level 1.
  - LVIDKSL – Saves and loads Level 1 programs to disk.
  - DIRCHECK – Tests disk directories for errors and lists them.
  - ASPOOL – An automatic spooler which routes a disk file to the printer whilst the computer continues to operate on other programs.
  - LCDVR – a lower case drives which display lower case on the screen if you have fitted a simple lower case modification.

DISK DRIVE USERS ELIMINATE CRC ERRORS AND TRACK LOCKED OUT MESSAGES FIT A PERCOM DATA SEPARATOR

$37.00 plus $1.20 p&p.

When Tandy designed the TRS-80 expansion interface, they did not include a data separator in the disk-controller circuitry, despite the I.C. manufacturer's recommendations to do so. The result is that many disk drive owners suffer a lot of Disk I/O errors. The answer is a data separator. This unit fits inside your expansion interface. It is supplied with full instructions and is a must for the serious disk user.

MPI DISK DRIVES HIGHER PERFORMANCE – LOWER PRICE

MPI is the second largest manufacturer of disk drives in the world. MPI drives use the same form of head control as 8" drives and consequently, they have the fastest track-to-track access time available – 5msec! All MPI drives are capable of single or double-density operation. Double-density operation requires the installation of a PERCOM doubler board in the expansion interface.

As well as single head drives, MPI also makes dual-head drives. A dual-head drive is almost as versatile as two single-head drives but is much cheaper.

Our MPI drives are supplied bare or in a metal cabinet – set up to operate with your TRS-80 or SYSTEM 80. All drives are sold with a 90 day warranty and service is available through MICRO-80 PRODUCTS.

MPI B51 40 Track Single Head Drive. . . . . only $339
MPI B52 40 Track Double Head Drive. . . . . only $449

Prices are for bare drives and include p&p. Add $10.00 per drive for a cabinet and $60.00 for a power supply to suit two drives. 40 track drives are entirely compatible with 35 track drives. A 40 track DOS such as NEWDOS 80 is necessary to utilise the extra 5 tracks.

OVER 800 KILOBYTES ON ONE DISKETTE! WITH MPI 80 TRACK DRIVES

MPI 80 track drives are now available. The B91 80 track single-head drive stores 204 Kilobytes of formatted data on one side of a 5¼ inch diskette in single-density mode. In double-density mode it stores 408 Kilobytes and loads/saves data twice as quickly.

The B92 80 track dual-head drive stores 204 Kilobytes of formatted data on EACH side of a 5¼ inch diskette in single-density mode. That's 408 Kilobytes per diskette. In double-density mode, the B92 stores a mammoth 408 Kilobytes per side or 816 Kilobytes of formatted data per diskette. With two B92's and a PERCOM double, you could have over 1.6 Megabytes of on line storage for your TRS-80 for less than $1500!!

MPI B91 80 Track Single Head Drive. . . . . only $499
MPI B92 80 Track Dual Head Drive . . . . . only $599

Prices are for bare drives and include p&p. Add $10.00 per drive for a cabinet and $60.00 for a power supply to suit two drives. Note: 80 track drives will not read diskettes written on a 35 or 40 track drive. If drives with different track counts are to be operated on the same system, NEWDOS 80 must be used.

CARE FOR YOUR DISK DRIVES? THEN USE 3M's DISK DRIVE HEAD CLEANING DISKETTES

$30.20 incl. p&p.

Disk drives are expensive and so are diskettes. As with any magnetic recording device, a disk drive works better and lasts longer if the head is cleaned regularly. In the past, the problem has been, how do you clean the head without pulling the mechanism apart and running the risk of damaging delicate parts. 3M's have come to our rescue with SCOTCH BRAND, non-abrasive, head cleaning diskettes which thoroughly clean the head in seconds. The cleaning action is less abrasive than an ordinary diskette and no residue is left behind. Each kit contains:

- 2 head cleaning diskettes
- 1 bottle of cleaning fluid
- 1 bottle dispenser cap

PLEASE USE ORDER FORM ON PAGE 36

MICROPOLIS 77 TRACK DISK DRIVES

These fabulous MICROPOLIS disk drives have more than double the storage capacity of the standard 35 track drives.

DD-7S only $775 incl. p&p

77 track MICROPOLIS drive complete with cable for four drives, power supply, chassis and includes NEWDOS 80.

DD-7 only $649 incl. p&p

Same as above but no cable or NEWDOS 80.

DC-4 only $45 incl. p&p

4 drive connector cable — suitable for any disk drives.

FLOPPY DOCTOR AND MEMORY DIAGNOSTIC (by MICRO CLINIC) $29.95 plus 50c. p&p

Two machine language programs on a diskette together with manual which thoroughly test your disk drives and memory. There are 19 possible error messages in the disk drive test and their likely causes are explained in the manual. Each pass of the memory tests checks every address in RAM 520 times, including the space normally occupied by the diagnostic program itself. When an error occurs the address, expected data, and actual data are printed out together with a detailed error analysis showing the failing bit or bits, the corresponding IC's and their location. This is the most thorough test routine available for TRS-80 disk users.

PROGRAMS BY MICROSOFT

EDITOR ASSEMBLER PLUS (L2/16K) $37.50 + $1.20 p&p

A much improved editor-assembler and debug/monitor for L2/16K TRS-80 or SYSTEM 80. Assembles directly into memory, supports macros and conditional assembly, includes new commands-substitute, move, copy and extend.

LEVEL III BASIC $59.95 plus $1.20 p&p

Loads on top of Level II BASIC and gives advanced graphics, automatic renumbering, single stroke instructions (shift-key entries) keyboard debounce, suitable for L2/16K and up (Not Disk BASIC)

ADVENTURE ON DISK $35.95 plus $1.20 p&p

This is the original ADVENTURE game adapted for the TRS-80. The game fills an entire diskette. Endless variety and challenge as you seek to rise to the level of Grand Master. Until you gain skill, there are whole areas of the cave that you cannot enter. (Requires 32K One Disk)

BASIC COMPILER $208 plus $2.00 p&p

New improved version, the Basic Compiler converts Disk BASIC programs to machine code, automatically. A compiled program runs, on average, 3-10 times faster than the original BASIC program and is much more difficult to pirate.

GREEN SCREEN SIMULATOR $19.95 incl. p&p

The GREEN SCREEN SIMULATOR is made from a deep green perspex, cut to fit your monitor. It improves contrast and is much more restful to the eyes than the normal grey and white image.

All editorial staff of MICRO-80 are now using GREEN SCREEN SIMULATORS on their own monitors.

Please make sure to specify whether you have an old (squarish) or new (rounded) style monitor when ordering. Not available for Dick Smith monitors.

UPGRADE TO 16K FOR ONLY $30.00!!

MICRO-80's 16K MEMORY EXPANSION KIT HAS BEEN REDUCED IN PRICE EVEN MORE

Larger volume means we buy better and we pass the savings on to you. These are our proven, prime, branded 200 ns (yes, 200 nanosecond) chips. You will pay much more elsewhere for slow, 350 ns. chips. Ours are guaranteed for 12 months. A pair of DIP shunts is also required to upgrade the CPU memory in the TRS-80 — these cost an additional $4.00. All kits come complete with full, step-by-step instructions which include labelled photographs. No soldering is required. You do not have to be an experienced electronic technician to instal them.

USE TANDY PERIPHERALS ON YOUR SYSTEM-80 VIA SYSPAND-80 — $119 incl. p&p

The SYSTEM-80 hardware is not compatible with the TRS-80 in two important areas. The printer port is addressed differently and the expansion bus is entirely different. This means that SYSTEM-80 owners are denied the wealth of economical, high performance peripherals which have been developed for the TRS-80. Until now, that is. MICRO-80 has developed the SYSPAND-80 adaptor to overcome this problem. A completely self-contained unit in a small cabinet which matches the colour scheme of your computer, it connects to the 50-way expansion part on the rear of your SYSTEM 80 and generates the FULL Tandy 40 way bus as well as providing a Centronics parallel printer port. SYSPAND-80 enables you to run an Exatron Stringy Floppy from your SYSTEM 80, or an LNW Research expansion interface or a MICROTEK memory expansion module or any other desirable peripherals designed to interface to the TRS-80 expansion port. Make your SYSTEM 80 hardware compatible with the TRS-80 via SYSPAND-80.

UPGRADE TO A 48K SYSTEM FOR ONLY $245!! VIA THE MICROTEK MEMORY EXPANSION/PRINTER MODULE

Need more memory but don't want to pay over $600 for an expansion interface? Then the MICROTEK MT-32 memory expansion/printer module is for you. Ready to plug in and go, this module provides you with sockets for an extra 32K of ram in 16K blocks plus a printer port. It is housed in an attractive, grey and black metal cabinet of similar size to the Tandy expansion interface so that you can sit your monitor atop it. The MICROTEK unit runs from the same external power pack as the Tandy CPU. The Centronics parallel printer port enables you to run most printers including the Olivetti ET-121 with MICRO-80 interface. Full instructions for connecting to your system and adding memory chips are included.

SYSTEM 80 owners can use the MICROTEK module via the SYSPAND-80 adaptor. A separate external power supply providing 7.5–0–7.5 volt ac at 0.5 amp plus 20v unfiltered dc at 250 ma is required. (not available at present from MICRO-80 PRODUCTS)

MICROTEK MT32-A	**0K**	**$149**
MICROTEK MT32-B	**16K**	**$179**
MICROTEK MT32-C	**32K**	**$209**

HIGH QUALITY DISKETTES ALL PRICES INCLUDE P&P

40 TRACK NASHUA SINGLE SIDE/SINGLE DENSITY ... $45.00 box of 10

HIGH QUA

40 TRAC(VERBATIM DOUBLE SID

SOFTWARE BY AUSTRALIAN AUTHORS

All our software is suitable for either the SYSTEM 80 or the TRS-80

NEW SOFTWARE FROM MICRO-80 PRODUCTS

BUSINESS PROGRAMS

MICROMANAGEMENT STOCK RECORDING SYSTEM (L2/16K)

Cassette version. . . . . $29.95 + $1.00 p&p
Stringy Floppy version. . . . . $33.95 + $1.00 p&p

This system has been in use for 9 months in a number of small retail businesses in Adelaide. It is therefore thoroughly debugged and has been tailor made to suit the requirements of a small business. MICROMANAGEMENT SRC enables you to monitor the current stock level and reorder levels of 500 different stock items per tape or wafer. It includes the following features:—

- Add new items to inventory
- Delete discontinued items from inventory
- List complete file
- Search for any stock number
- Save data to cassette or wafer
- Load data from cassette or wafer
- Adjusts stock levels from sales results and receipt of goods
- List all items requiring reordering

We can thoroughly recommend this program for the small business with a L2/16K computer.

SCOTCH BRAND COMPUTING CASSETTES

Super-quality personal computing cassettes.
C-10 pack of 10 ... ... $26.00 incl. p&p
C-30 pack of 10 ... ... $28.00 incl. p&p

UTILITIES

S-KEY by Edwin Paay $15.95 plus 50c. p&p

S-KEY is a complete keyboard driver routine for the TRS-80 and becomes part of the Level II basic interpreter. With S-KEY loaded the user will have many new features not available with the standard machine.

S-KEY features:

* S-KEY provides an auto-repeat for all the keys on the keyboard. If any key is held down longer than about half a second, the key will repeat until it is released.
* Graphic symbols can be typed direct from the keyboard, this includes all 64 graphic symbols available from the TRS-80/SYSTEM 80.
* S-KEY allows text, BASIC commands and/or graphics to be defined to shifted keys. This makes programming much easier as whole commands and statements can be recalled by typing shift and a letter key.
* Because S-KEY allows graphics to be typed directly from the keyboard, animation and fast graphics are easily implemented by typing the appropriate graphics symbols directly into PRINT statements.
* S-KEY allows the user to LIST a program with PRINT statements containing graphics, properly. S-KEY does this by intercepting the LIST routine when necessary.
* S-KEY allows the user to list an updated list of the shift key entries to the video display or line printer.
* S-KEY can be disabled and enabled when required. This allows other routines which take control of the keyboard to run with S-KEY as well.

Each cassette has TRS-80, DISK and SYSTEM 80 versions and comes with comprehensive documentation.

BMON by Edwin Paay $19.95 plus 50c. p&p
THE ULTIMATE HIGH MEMORY BASIC MONITOR L2/16-48K

Our own personnel refuse to write BASIC without first loading this amazing machine language utility program into high memory! BMON Renumbers; Displays BASIC programs on the screen while they are still loading; tells you the memory locations of the program just loaded; lets you stop a load part-way through; merges two programs, with automatic renumbering of the second so as to prevent any clashes of line numbers; recovers your program even though you did type NEW: makes one program invisible while you work on a second (saves hours of cassette time!); lists all the variables used in the program; makes SYSTEM tapes; lets you Edit memory directly . . . the list goes on and on. Cassette comes with 16K, 32K and 48K versions, ready to load. Can anyone afford NOT to have BMON?

EDUCATIONAL

RPN CALCULATOR (L2/16K & 32K)
$24.95 $ 50c. p&p

Give your computer the power of a $650 reverse polish notation calculator with 45 functions and selectable accuracy of 8 or 16 digits. The main stack and registers are continuously displayed whilst the menu is always instantly accessible without disturbing any calculations or register values. The cassette comes with both the 16K and 32K versions, the latter giving you the additional power of a programmable calculator. Comes with a very comprehensive 15 page manual, which includes instructions to load and modify the 32K programmable version to run in 16K. Whether for business or pleasure, this package will prove invaluable, and turn you '80 into a very powerful instrument.

GAMES

MICROPOLY (L2/16K) $7.50 $ 50c p&p

Now you can play Monopoly on your micro. The old favourite board game has moved into the electronic era. This computer version displays the board on the screen, obeys all the rules and, best of all, the banker does not make mistakes with your change!

CONCENTRATION (L2/16K) $7.50 + 50c p&p

Another application of supergraphics. There are 28 "cards" displayed on the screen, face down. Players take it in turn to turn them over with the object of finding matching pairs. There are 40 different patterns which are chosen at random, so the game is full of endless variety. This is of particular value in helping young children to learn the art of concentrating and, at the same time, to introduce them to the computer.

METEOR AND TORPEDO ALLEY (L2/16K)
$9.95 + 50c p&p

Those who frequent games arcades will recognize these two electronic games. In METEOR you must destroy the enemy space ships before they see you. In its most difficult mode, the odds are a thumping 238 to 1 against you being successful. In torpedo alley you must sink the enemy ships without hitting your own supply ship. Both games include sound effects and are remarkably accurate reproductions of the arcade games.

AUSTRALIAN SOFTWARE (Cont.)

TOUCHTYPE (L2/4K) $19.95 + 50c. p&p
An interactive, 22 lesson typing course which uses the computer's keyboard and screen to teach you to type rapidly and accurately and, a massive cassette data dump to control your progress. The computer checks for accuracy, and sets timed exercises to check your progress. If you have to look at each key before you press it, or only use two fingers, then this program, plus a little perserverance, will do some amazing things to your typing speed.

GAMES

U BOAT $7.50 plus 50c p&p
Real time simulation at its best! Comes with working sonar-screen and periscope, a full rack of torpedoes, plenty of targets, working fuel and battery meters, helpful Mothership for high-seas reprovisioning and even has emergency radio for that terrible moment when the depth charges put your crew at risk. Requires Level II/16K.

SPACE INVADERS $7.50 plus 50c p&p
Much improved version of this arcade favourite with redesigned laser and cannon blasts, high-speed cannon, 50 roving drone targets, 10 motherships and heaps of fun for all. Level II with 4K and 16K versions on this cassette.

GOLF (L2/16K) $7.50 + 50c p&p
Pit your skills at mini-golf against the computer. Choose the level of difficulty, the number of holes and whether you want to play straight mini golf or crazy golf. Complete with hazards, water traps, bunkers and trees. Great fun for kids of all ages.

DOMINOES(L2/16K) $7.50 + 50c p&p
Pit your skill at dominoes against the computer, which provides a tireless opponent. Another application of supergraphics from the stable of Charlie Bartlett. Dominoes are shown approximately life size in full detail (except for colour!). The monitor screen is a window which you can move from one end of the string of dominoes to the other. Best of all, you don't lose any pieces between games!

KID'S STUFF (formerly MMM-1) $7.50 plus 50c. p&p
Three games on one cassette from that master of TRS-80 graphics, Charlie Bartlett. Includes INDY 500, an exciting road race that gets faster and faster the longer you play, SUBHUNT in which your warship blows up unfortunate little submarines all over the place, and KNIEVEL (as in motorcycle, ramp and buses).

OTHER PROGRAMS

INFINITE BASIC BY RACET (32K/1 DISK) $49.95 + 50c. p&p
Full matrix functions – 30 BASIC commands; 50 more STRING functions as BASIC commands.

GSF/L2/48K $24.95 + 50c. p&p
18 machine language routines including RACET sorts.

BUSINESS ADDRESS AND INFORMATION SYSTEM (48K/DISK) $24.95 + 50c. p&p
Allows you to store addresses and information about businesses, edit them and print them out.

HISPED (L216, 32 or 48K) $29.95
This machine language program allows you to SAVE and LOAD programs and data to tape at speeds up to 2000 band (4 times normal) using a standard cassette recorder. A switch must be installed to remove the XRX III loading board, if fitted.

PROGRAMS FROM CREATIVE COMPUTING

ADVENTURE PROGRAMS

ADVENTURELAND (L2/16K) $14.95 + 50c. p&p
Try to find and take treasures as you explore a fantasy world. The computer acts as your puppet and carries out your two word commands.
Sometimes you will need special objects to do certain things, often a little magic is necessary. Absorbing and challenging.

THE COUNT ADVENTURE (L2/16K) $14.95 + 50c. p&p
In this adventure, you awaken in a bed in a castle in Transylvania. You don't know why you are there but you'd better solve the puzzle before it's too late. Just as enthralling as ADVENTURELAND but blood thirstier!

ADVENTURELAND AND PIRATE ADVENTURE ON DISK (32K ONE DISK) $24.95 + 50c. p&p
This is the Adventureland program on disk plus Pirate Adventure, complete with buried treasure, keel hauling, planks for walking and skulls and crossbones.
You can save the game to disk at any point and return to it later when your nerves are steady.

GAMES

AIR TRAFFIC CONTROLLER (L2/16K) $9.95 + 50c. p&p
One of the hottest selling games in the USA, you are the Air Traffic Controller and the monitor is your radar screen. Bring down the aircraft safely and avoid mid-air collisions.

Z CHESS (L2/16K) $19.95 + 50c. p&p
(DISK/32K) $24.95 + 50c. p&p
Seven levels of ability, contains all standard moves including castling and En Passant captures. It can play either black or white and its versatile board set-up mode allows specific positions to be played as desired.

SPACE GAMES (L2/16K) $13.50 + 50c. p&p
3 Space Games including ULTRA-TREK, ROMULAN, and STARWARS. Fast, real-time graphics.

STRATEGY GAMES (L2/16K) $9.50 + 50c. p&p
5 Strategy games including TUNNEL VISION (find your way out of a 3-D maze), EVASION – avoid the deadly snake). JIGSAW (put the puzzle together), THE MASTERS (Golf on the '80 for up to 4 players), MOTOR RACING (Compete against the computer at Indy or the Grand Prix).

GRAPHING PACKAGE (L2/16K) $9.95 + 50c. p&p
A set of 6 utility programs which allow you to draw BAR GRAPHS, GRAPH CARTESIAN COORDINATES, carry out POLAR GRAPHING, PARAMETRIC GRAPHING, LINEAR REGRESSION and PARABOLIC REGRESSION.

BOOKS

LEVEL II ROM REFERENCE MANUAL $24.95 + $1.20 p&p
Over 70 pages packed full of useful information and sample programs. Applies to both TRS-80 and SYSTEM 80.

TRS-80 DISK AND OTHER MYSTERIES $24.95 $ $1.20 p&p
The hottest selling TRS-80 book in the U.S.A. Disk file structures revealed, DOS's compared and explained, how to recover lost files, how to rebuild crashed directories – this is a must for the serious Disk user and is a perfect companion to any of the NEWDOS's.

***** ASTRONOMY 1.0 L2/16K (C) FRANK KOSZTELNIK *****

This program was designed for use as an Astronomical guide for observations of the Sun, Planets, Moon and Stars - giving times of rising and setting, distances from earth, sizes of objects and positions amongst other things.
The first thing to do is edit line 10 to suit your location.

eg. K1 = YOUR LATITUDE (in decimal degrees)
K2 = YOUR LONGITUDE (in decimal degrees)
TZ = YOUR TIME DIFFERENCE BETWEEN THE GREENWICH MERIDIAN AND YOUR LOCATION. (TZ is an abbreviation for time zone).

For example for SYDNEY line 10 reads....

```
10 K1 = -33.86667 : K2 = 151.2 : TZ = 10
```

Bearing in mind southern latitudes are negative, longitudes east of Greenwich are positive, (note : TZ = 10 means Sydney is 10 hours ahead of Greenwich mean time).

Then edit line 100 to suit your location... eg. "CO-ORDINATES BASED AT SYDNEY"

NOTE: No allowance has been made for daylight saving. Don't be afraid to be accurate with your latitudes and longitudes as this affects the accuracy of the program, viz: for KATOOMBA N.S.W. line 10 reads...

```
10 K1 = -33.7222222 : K2 = 150.3180555 : TZ = 10
100 "CO-ORDINATES BASED AT KATOOMBA."
```

LIMITATIONS
All calculations (except precession) are limited to the years 1975 - 2000 inclusive.

ENTRY OF INFORMATION
All time inputs are to be in 24 hour format. eg. 8.00 pm is 20.00 hours. The computer expects time inputs in the form of HOURS, MINUTES, SECONDS. However if you wish, you may enter hours in decimal form; eg, 20.75 hours is entered as 20.75,0,0

ACCURACY
Accuracy depends mainly on the values entered for latitude and longitude. For time conversions, co-ordinate conversions, precession etc you may expect an accuracy of plus or minus 5 minutes. This is due to different atmospheric conditions caused by pollution, moisture content etc, and the topography of the horizon; eg mountains etc. For solar calculations, positions are given to the centre of the sun, thus sunrise and sunset are actually for the centre of the sun not for the rising and setting edges. For Lunar calculations the errors are greater, about plus or minus 30 minutes. This is for the same reasons as above plus the fact that the moon is a closer neighbour in space and its motion is far more complicated. However, for general purposes this is close enough.

On RUNning the program you are confronted by a list of choices, from which you proceed to the calculations. We'll look at each one and explain what they mean. (I don't intend to give a lesson on basic astronomy due to the length these instructions would take, so it would be advisable to use this program in conjunction with a book on the subject.... HOWEVER you don't need any astronomical knowledge to use the SOLAR, PLANETARY and LUNAR parts of the program. You only need to know the date).
NOTE : ITEMS ENCLOSED IN (AND) ARE COMPUTER DISPLAYS. EXAMPLES SHOWN ARE BASED AT KATOOMBA.

1.TIME CONVERSIONS.
(1.LOCAL TIME TO GREENWICH MEAN TIME.)
This simply adds or subtracts your time zone differences.
eg.
(ENTER HOURS, MINUTES, SECONDS ?) 12,52,0
(12 HRS 52 MIN 0 SEC LOCAL TIME EQUALS)
(2 HRS 52 MIN 0 SEC G.M.T.)

(2. GREENWICH MEAN TIME TO GREENWICH SIDERIAL TIME.)
(suggest you look up "SIDERIAL TIME" definition in a book).

(ENTER HOURS, MINUTES, SECONDS ?) 12,52,0
(ENTER DAY, MONTH, YEAR ?) 20,10,1980
(12 HRS 52 MINS 0 SEC GMT EQUALS)
(14 HRS 48 MINS 32 SEC)
(This is the siderial time at Greenwich on that day and time).

(3. GREENWICH SIDERIAL TIME TO GREENWICH MEAN TIME)
(The reverse of 2. above)

(ENTER HOURS, MINUTES, SECONDS ?) 14,48,32
(ENTER DAY, MONTH, YEAR ?) 20,10,1980

(14 HRS 48 MIN 32 SEC GST EQUALS)
(12 HRS 57 MIN 59 SEC)

(4. LOCAL SIDERIAL TIME)
(This is the siderial time at YOUR location. It corresponds to "STAR TIME" directly overhead at that time).
(ENTER HOURS, MINUTES, SECONDS ?) 12,52,0
(ENTER DAY, MONTH, YEAR ?) 20,10,1980

(12 HRS 52 MIN 0 SEC LOCAL TIME EQUALS)
(14 HRS 44 MIN 13 SEC LOCAL SIDERIAL TIME.)

2. CO-ORDINATE CONVERSIONS
Right ascension to hour angle conversion. Gives the angle between a selected object and observers local meridian (refer to diagram 1).
(ENTER RIGHT ASCENSION ?) 3,0,0
(ENTER LOCAL TIME ?) 12,0,0
(ENTER DAY, MONTH, YEAR ?) 20,10,1980
(HOUR ANGLE IS 10 HRS 52 MINS 4 SECS)

EQUATORIAL TO HORIZON CONVERSIONS.
Converts co-ordinates as listed in star atlases to horizon co-ordinates, viz. X degrees above horizon, Y degrees around from true north (clockwise). If using straight from an atlas use the routine RIGHT ASCENSION TO HOUR ANGLE CONVERSION"
(ENTER HOUR ANGLE (IN DECIMAL) ?) 3.75
(ENTER DECLINATION ?) -43,0,0

(ALTITUDE IS 45 DEG 46 MINS 20 SECS)
(AZIMUTH IS 240 DEG 40 MINS 11 SECS)

(Note: Some values are requested in decimal because they are usually entered from "in the field" measurements).

3. HORIZON TO EQUATORIAL CONVERSION.
(Reverse of previous)

(ENTER SIDERIAL TIME ?) 12,30,0
(ENTER ALTITUDE (IN DECIMAL) ?) 30.75
(ENTER AZIMUTH (IN DECIMAL) ?) 248.5

(HOUR ANGLE 4 HRS 50 MINS 27 SECS)
(DECLINATION -33 DEG 4 MINS 56 SECS)
(RIGHT ASC. 7 HRS 39 MINS 32 SECS)

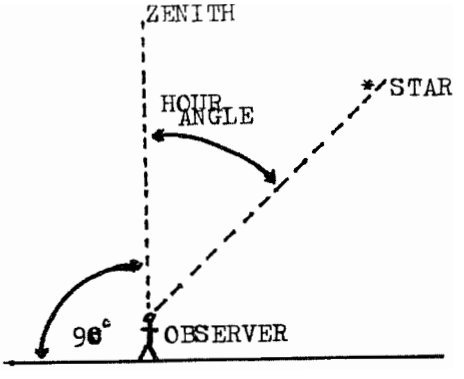

DIAGRAM 1.

ECLIPTIC TO EQUATORIAL CONVERSIONS.
(Converts co-ordinates in reference to the sun to an earth reference).

(ENTER ECLIPTIC LONGITUDE ?) 173,30,0
(ENTER ECLIPTIC LATITUDE ?) 32,0,0

(RIGHT ASC. 6 HRS 33 MINS 7 SECS)
(DECLINATION. 31 DEG 37 MINS 39 SECS)

EQUATORIAL TO ECLIPTIC CONVERSION.
(Reverse of previous)

(ENTER R.A. ?) 12,30,0
(ENTER DEC ?) 32,0,0

(ECLIPTIC LONGITUDE 262 DEG 36 MIN 3 SEC)
(ECLIPTIC LATITUDE 32 DEG 1 MIN 14 SEC)

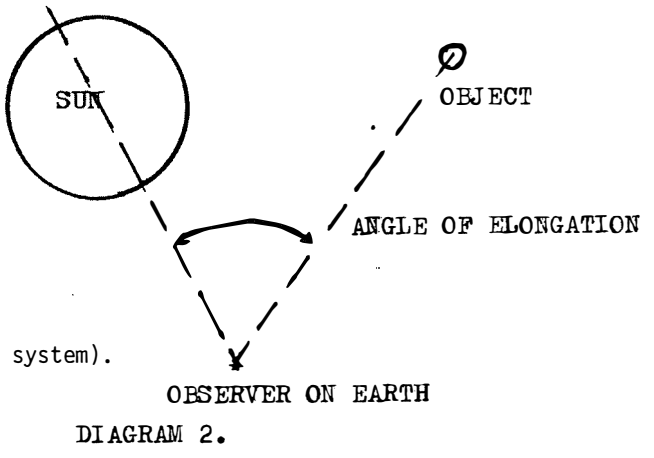

DIAGRAM 2.

EQUATORIAL TO GALACTIC CONVERSION.
(Converts earth based co-ordinates to a galactic system).
(ENTER R.A. ?) 12,30,0
(ENTER DEC. ?) 32,0,0

(GALACTIC L. 163 DEG 44 MIN 11 SEC)
(GALACTIC B. 83 DEG 49 MIN 20 SEC)

GALACTIC TO EQUATORIAL CONVERSION.
(Reverse of previous).
(ENTER "L" GALACTIC COORDINATE ?) 163,44,11
(ENTER "B" GALACTIC COORDINATE ?) 83,49,20

(R.A. 12 HRS 29 MIN 59 SEC)
(DEC. 32 DEG 0 MIN 1 SEC)

3. RISING AND SETTING OF FIXED OBJECTS.
Gives times of rising and setting of selected objects. Choose right ascension and declination from star atlas.

Example:- ALPHA CENTAURI

(ENTER RIGHT ASCENSION ?) 14,36.2,0
(ENTER DECLINATION ?) -60,38,0
(ENTER DAY, MONTH, YEAR ?) 20,10,1980
(FC ERROR IN 15110) (an error here means that this object never goes below the horizon, or never above it, thus no rising or setting). Try another, eg. NEBULA IN ORION

(ENTER RIGHT ASCENSION ?) 5,32.8,0
(ENTER DECLINATION ?) -5,25,0
(ENTER DAY, MONTH, YEAR ?) 20,10,1980

(BEARING OF RISING 96.517)
(BEARING OF SETTING 263.483)
(TIME OF RISING 18 HRS 42 MINS 6 SEC)
(TIME OF SETTING 7 HRS 13 MINS 1 SEC)

(NOTE: True North bearing = 0 degrees).

4. PRECESSION
The position of "fixed objects" does in fact change. (A complete 360 degrees every 25,600 years). So all star atlases are made for a particular year called "EPOCH". You may want to find a star in an atlas, Epoch 1950 for example and convert the positions to 1980. All atlases should have their year of Epoch noted. For better accuracy you may enter decimal years eg. JUNE 1980 may be 1980.5

(ENTER RIGHT ASCENSION ?) 12,52,38
(ENTER DECLINATION ?) -10,49,20
(ENTER EPOCH YEAR. (1900,1950,1975,2000,ONLY) AND YEAR REQUIRED ?) 1950,1980.5

(NEW RIGHT ASCENSION = 12 HRS 54 MIN 13 SEC)
(NEW DECLINATION = -10 DEG 59 MIN 15 SEC)

5. SOLAR CALCULATIONS.
(Speaks for itself, quite accurate except for rising and setting which is 5 minutes out).

(ENTER DAY, MONTH, YEAR ?) 20,10,1980
(R.A. 13 HRS 39 MIN 8 SEC)

```
(DEC     -10 DEG  17 MIN  54 SEC)
(SUN'S DISTANCE  1.51823E+08 KMS)      (at midnight)
(SUN'S ANGULAR SIZE   0 DEG  31 MIN  31 SEC)
(BEARING OF RISING   102.412)
(BEARING OF SETTING  257.588)
(SUNRISE      5 HRS  15 MIN)
(SUNSET      18 HRS   9 MIN)
```

6. SOLAR ELONGATIONS.
Gives angle of "object" from the sun, useful for telling how close an object is to the sun. As viewed from earth). eg. try for Jupiter. (see diagram 2).

```
(ENTER OBJECTS R.A. ?)     11,56,17
(ENTER OBJECTS DEC. ?)      1,34,41
(ENTER DAY, MONTH, YEAR ?) 20,10,1980

(ELONGATIONS IS  28.2041 DEGREES)
```

7. PLANETARY CALCULATIONS.

```
(ENTER PLANETS NAME ?)     JUPITER
(ENTER DAY, MONTH, YEAR ?)  20,10,1980

(R.A.                     11 HRS  56 MIN  17 SEC)
(DEC.                      1 DEG  34 MIN  41 SEC)
(BEARING OF RISING       88.1027)
(BEARING OF SETTING     271.897)
(PLANET RISE              4 HRS   5 MIN)
(PLANET SET              15 HRS  55 MIN)
(DISTANCE FROM EARTH    940257413 KMS)     (at midnight)
(ANGULAR SIZE           31.2798 SEC)
(PHASE OF JUPITER         .998074)        (1.0 when full)
```

8. LUNAR CALCULATIONS.
Due to the large motions of the moon, (ED. like elephants ? .. sorry !!), a time of day will also have to be entered for Lunar positions. This one takes a long time so wait for it...

```
(ENTER DAY, MONTH, YEAR ?)   20,10,1980
(ENTER HRS, MIN, SEC ?)      20,0,0         (8 p.m.)

(R.A.                        23 HRS   8 MIN   8 SEC)
(DEC.                        -8 DEG  12 MIN  55 SEC)
(BEARING OF RISING           104.248 DEG)
(BEARING OF SETTING          258.296 DEG)
(MOONRISE                    14 HRS  33 MIN)
(MOONSET                      3 HRS   4 MIN)
(PHASE OF MOON                 .845096)    (1.0 when full)
(DISTANCE FROM EARTH         367993 KMS)   (at above time)
(ANGULAR SIZE                 0 DEG  32 MIN)
(LUNAR PARALLEX               0 DEG  59 MIN)
```

```
5 REM ASTRONOMY 1.0
6 REM AUTHOR FRANK KOSZTELNIK
7 REM 11 CARRINGTON AVE KATOOMBA 2780 N.S.W
10 K1=-33.7222222:K2=150.3180555:TZ=10
11 J1=.0174532:J2=57.295779
12 DEFDBL N
100 CLS:PRINT"ASTRONOMY 1.0":PRINT:PRINT"CO-ORDINATES BASED AT KATOOMBA":PRINT:P
RINT
110 PRINT"1.TIME CONVERSIONS
120 PRINT"2.CO-ORDINATE CONVERSIONS
130 PRINT"3.RISING AND SETTING OF FIXED OBJECTS
140 PRINT"4.PRECESSION
150 PRINT"5.SOLAR CALCULATIONS
155 PRINT"6.SOLAR ELONGATIONS
160 PRINT"7.PLANETARY CALCULATIONS
170 PRINT"8.LUNAR CALCULATIONS
180 INPUT"ENTER NUMBER OF OPTION";GO
190 ONGOGOTO400,600,800,1000,4000,4400,10000,12000
200 GOTO100
400 CLS:PRINT"TIME CONVERSIONS"
410 PRINT"1.LOCAL TIME TO GMT CONVERSION
```

```
420 PRINT"2.GMT TO GST CONVERSION
430 PRINT"3.GST TO GMT CONVERSION
440 PRINT"4. LOCAL SIDERIAL TIME
450 PRINT"5.RETURN
460 INPUT"ENTER OPTION";G2
470 ONG2GOTO2000,2100,2200,2300
480 GOTO100
600 CLS:PRINT"CO-ORDINATE CONVERSIONS"
610 PRINT"1.RIGHT ASCENSION TO HOUR ANGLE CONVERSION
620 PRINT"2.EQUATORIAL TO HORIZON CONVERSION
630 PRINT"3.HORIZON TO EQUATORIAL CONVERSION
640 PRINT"4.ECLIPTIC TO EQUATORIAL CONVERSION
650 PRINT"5.EQUATORIAL TO ECLIPTIC CONVERSION
660 PRINT"6.EQUATORIAL TO GALACTIC CONVERSION
670 PRINT"7.GALACTIC TO EQUATORIAL CONVERSION
680 PRINT"8.RETURN
690 INPUT"ENTER OPTION";G3
700 ONG3GOTO3000,3100,3200,3300,3400,3500,3600,100
710 GOTO100
800 REM
801 CLS
805 INPUT"ENTER RIGHT ASCENSION";H,M,S:GOSUB7000:RA=DH
810 INPUT"ENTER DECLINATION";H,M,S:GOSUB7000:DE=DH
811 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y
815 T=SIN(DE*J1):T1=COS(K1*J1):T=T/T1:X=T
820 GOSUB15100:A1=AC:A2=360-A1
824 IFGM=1GOTO830
825 PRINT"BEARING OF RISING ";A1:PRINT"BEARING OF SETTING ";A2
830 T1=TAN(DE*J1):T2=TAN(K1*J1):T2=0-T2:X=T1*T2
835 GOSUB15100:T=AC:T=T/15
840 R=24+RA-T:IFR>24THENR=R-24
845 ST=RA+T:IFST>24THENST=ST-24
849 D=F1:MO=F2
850 DH=R:GS=1:GOSUB2210:R=DH:GOSUB7100:H1=H:M1=M:S1=S
854 D=F1:MO=F2
855 DH=ST:GOSUB2210:ST=DH:IFGR=1THENRETURN
856 IFGM=1THENRETURN
860 GOSUB7100:PRINT:PRINT"TIME OF RISING ";H1;"HRS ";M1;"MINS ";S1;"SECS":PRINT"
TIME OF SETTING ";H;"HRS ";M;"MINS ";S;"SECS"
865 GOSUB18000:GS=0:RUN
1000 REM
1005 CLS:INPUT"ENTER RIGHT ASCENSION";H,M,S
1010 GOSUB7000:L=DH:RA=DH*15
1015 INPUT"ENTER DECLINATION";H,M,S
1020 GOSUB7000:L1=DH:DE=DH
1025 INPUT"ENTER EPOCH YEAR...(1900,1950,1975,2000 ONLY) AND YEAR REQUIRED";Y1,Y
2
1030 IFY1=1900THENP=3.07234:P1=1.33646:P2=20.0463
1035 IFY1=1950THENP=3.07327:P1=1.33617:P2=20.0426
1040 IFY1=1975THENP=3.07374:P1=1.33603:P2=20.0405
1045 IFY1=2000THENP=3.07420:P1=1.33589:P2=20.0383
1050 N=Y2-Y1:T=SIN(RA*J1):T1=TAN(DE*J1)
1055 T=T*T1:T=T*P1:T=T+P:S=T*N:S=S/3600:S=S+L
1057 IFGS=1THENRP=S:GOTO1070
1060 DH=S:GOSUB7100
1065 PRINT"NEW RIGHT ASCENSION = ";H;"HRS ";M;"MINS ";S;"SECS"
1070 T=COS(RA*J1):T=T*P2:T=T*N:T=T/3600:DH=T+L1
1075 IFGS=1THENDP=DH:RETURN
1077 GOSUB7100
1080 PRINT"NEW DECLINATION = ";H;"DEG ";M;"MINS ";S;"SECS"
1090 GOSUB18000:RUN
2000 CLS:INPUT"ENTER HOURS,MINUTES,SECONDS";H,M,S:H1=H:M1=M:S1=S
2010 GOSUB7000
2020 DH=DH-TZ
2030 IFDH>24THENDH=DH-24
2040 IFDH<0THENDH=DH+24
2050 IFGS=1THENRETURN
2051 IFST=1THENRETURN
2060 GOSUB7100
2070 PRINTH1;"HRS ";M1;"MINS ";S1;"SECS LOCAL TIME EQUALS "
2080 PRINTH;"HRS ";M;"MINS ";S;"SECS. GMT"
2085 GOSUB18000:RUN
2100 CLS:INPUT"ENTER HOURS,MINUTES,SECONDS";H,M,S:H1=H:M1=M:S1=S
2105 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y
2110 GOSUB7200
2115 GOSUB7300
```

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2120 DS=DS*0.065709:T=DS-B:IFGS=1THENGOTO2130
2125 GOSUB7000
2130 DH=DH*1.002743:T=T+DH
2135 IFT>24THENT=T-24
2140 IFT<0THENT=T+24
2145 DH=T:IFGS=1THENRETURN
2146 IFST=1THENRETURN
2150 GOSUB7100
2155 PRINTH1;"HRS ";M1;"MINS ";S1;"SECS GMT EQUALS"
2160 PRINTH;"HRS ";M;"MINS ";S;"SECS."
2164 GOSUB18000:RUN
2200 CLS:INPUT"ENTER HOURS,MINUTES,SECONDS";H,M,S:H1=H:M1=M:S1=S
2205 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y
2210 GOSUB7200:GOSUB7300
2215 T=(DS*0.065709)-B
2220 IFT<0THENT=T+24
2221 IFGS=1GOTO2230
2222 IFGM=1GOTO2230
2225 GOSUB7000
2230 DH=DH-T
2235 IFDH<0THENDH=DH+24
2240 DH=DH*0.997257
2245 IFGS=1THENRETURN
2246 IFGM=1THENRETURN
2250 GOSUB7100
2255 PRINTH1;"HRS ";M1;"MINS ";S1;"SECS GST EQUALS"
2260 PRINTH;"HRS ";M;"MINS ";S;"SECS."
2265 GOSUB18000:RUN
2300 CLS:INPUT"ENTER HOURS,MINUTES,SECONDS";H,M,S:H1=H:M1=M:S1=S
2305 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y
2310 GOSUB7000:GS=1
2315 GOSUB2020
2320 GOSUB7200:DS=DS-1
2325 GOSUB7300
2330 GOSUB2120
2335 T=K2/15
2340 DH=DH+T
2345 IFDH>24THENDH=DH-24
2350 IFDH<0THENDH=DH+24
2355 IFST=1THENRETURN
2360 GOSUB7100
2365 PRINTH1;"HRS ";M1;"MINS ";S1;"SECS LOCAL TIME EQUALS"
2370 PRINTH;"HRS ";M;"MINS ";S;"SECS LOCAL SIDERIAL TIME."
2375 GOSUB18000:GS=0:RUN
3000 REM
3002 CLS:INPUT"ENTER RIGHT ASCENSION";H,M,S:GOSUB7000:RA=DH
3004 INPUT"ENTER LOCAL TIME";H,M,S:GOSUB7000
3006 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y
3008 GS=1:ST=1:GOSUB2315:ST=0
3010 DH=DH-RA:IFDH<0THENDH=DH+24
3012 IFHA=1THENRETURN
3013 GOSUB7100
3014 PRINT"HOUR ANGLE IS ";H;"HRS ";M;"MINS ";S;"SECS"
3016 GOSUB18000:RUN
3100 CLS
3110 INPUT"ENTER HOUR ANGLE (IN DECIMAL)";HA
3120 INPUT"ENTER DECLINATION";H,M,S:GOSUB7000:DE=DH
3130 T=HA*15:T1=SIN(DE*J1):T2=SIN(K1*J1):T8=T1*T2
3140 T3=COS(DE*J1):T4=COS(K1*J1):T5=COS(T*J1):T6=T3*T4*T5:T7=T8+T6
3150 X=T7:GOSUB15000:ALT=AS:T9=COS(ALT*J1):T0=(T1-T2*T7)/(T4*T9)
3160 X=T0:GOSUB15100:AZ=AC:T1=SIN(T*J1)
3170 IFT1<0THENAZ=ABS(AZ)
3180 IFT1>0THENAZ=360-AZ
3190 IFGS=1THENRETURN
3191 DH=ALT:GOSUB7100:PRINT"ALTITUDE IS";H;"DEG ";M;"MINS ";S;"SECS"
3192 DH=AZ:GOSUB7100:PRINT"AZIMUTH IS";H;"DEG ";M;"MINS ";S;"SECS"
3193 GOSUB18000:RUN
3200 CLS
3205 INPUT"ENTER SIDERIAL TIME";H,M,S:GOSUB7000:ST=DH
3210 INPUT"ENTER ALTITUDE (IN DECIMAL)";ALT
3215 INPUT"ENTER AZIMUTH (IN DECIMAL)";AZ
3220 T1=SIN(ALT*J1):T2=SIN(K1*J1):T3=COS(ALT*J1):T4=COS(K1*J1):T5=COS(AZ*J1):T6=
(T1*T2)+(T3*T4*T5)
3225 X=T6:GOSUB15000:T7=AS:T9=COS(T7*J1):T8=(T1-T2*T6)/(T4*T9)
3230 X=T8:GOSUB15100:H=AC:T0=SIN(AZ*J1)
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3235 IFTO<0THENH=ABS(H)
3240 IFTO>0THENH=360-H
3245 H=H/15:HA=H:IFGS=1THENRETURN
3250 DH=H:GOSUB7100:PRINT"HOUR ANGLE";H;"HRS ";M;"MINS ";S;"SECS"
3255 DH=T7:GOSUB7100:PRINT"DECLINATION";H;"HRS ";M;"MINS ";S;"SECS"
3260 TO=ST-HA:IFTO<0THENTO=TO+24
3265 DH=TO:GOSUB7100:PRINT"RIGHT ASC.";H;"HRS ";M;"MINS ";S;"SECS"
3270 GOSUB18000:RUN
3300 CLS
3305 INPUT"ENTER ECLIPTIC LONGITUDE";H,M,S:GOSUB7000:EL=DH
3310 INPUT"ENTER ECLIPTIC LATITUDE";H,M,S:GOSUB7000:ET=DH
3315 EE=23.433333:T1=SIN(ET*J1):T2=COS(EE*J1):T3=COS(ET*J1):T4=SIN(EE*J1):T5=SIN
(EL*J1):TO=(T1*T2)+(T3*T4*T5)
3320 X=TO:GOSUB15000:DE=AS:T6=TAN(EL*J1):T7=TAN(ET*J1):T8=COS(EL*J1):T9=(T7*T4)/
T8:T9=T6*T2-T9
3325 RA=ATN(T9)*J2
3330 Z=EL:GOSUB15500:EQ=Q
3335 Z=RA:GOSUB15500:RQ=Q:IFEQ=RQGOTO3345
3340 RA=RA+90:IFRA>360THENRA=RA-810
3341 GOTO3335
3345 RA=RA/15:IFRA<0THENRA=RA+24
3346 IFGS=1THENRETURN
3350 DH=RA:GOSUB7100:PRINT"RIGHT ASC.";H;"HRS";M;"MINS";S;"SECS"
3355 DH=DE:GOSUB7100:PRINT"DECLINATION";H;"DEG";M;"MINS";S;"SECS"
3360 GOSUB18000:RUN
3400 CLS
3405 INPUT"ENTER R.A.";H,M,S:GOSUB7000:RA=DH
3410 INPUT"ENTER DEC.";H,M,S:GOSUB7000:DE=DH
3415 RA=RA*15:EE=23.433333:T1=SIN(DE*J1):T2=COS(EE*J1):T3=COS(DE*J1):T4=SIN(EE*J
1):T5=SIN(RA*J1):TO=(T1*T2)-(T3*T4*T5)
3420 X=TO:GOSUB15000:ET=AS:T6=TAN(RA*J1):T7=TAN(DE*J1):T8=COS(RA*J1):T9=(T7*T4)/
T8:T9=(T6*T2)+T9
3425 EL=ATN(T9)*J2
3430 Z=RA:GOSUB15500:RQ=Q
3435 Z=EL:GOSUB15500:EQ=Q:IFEQ=RQGOTO3450
3440 EL=EL+90:IFEL>360THENEL=EL-810
3445 GOTO3435
3450 IFGS=1THENRETURN
3455 DH=EL:GOSUB7100:PRINT"ECLIPTIC LONGITUDE";H;"DEG";M;"MIN";S;"SEC"
3460 DH=ET:GOSUB7100:PRINT"ECLIPTIC LATITUDE";H;"DEG";M;"MIN";S;"SEC"
3465 GOSUB18000:RUN
3500 CLS
3505 INPUT"ENTER R.A.";H,M,S:GOSUB7000:RA=DH
3510 INPUT"ENTER DEC.";H,M,S:GOSUB7000:DE=DH
3515 RA=RA*15:T1=COS(DE*J1):T2=COS(27.4*J1):T3=COS((RA-192.25)*J1):T4=SIN(DE*J1)
:T5=SIN(27.4*J1):T7=SIN((RA-192.25)*J1):T6=(T1*T2*T3)+(T4*T5)
3520 X=T6:GOSUB15000:B=AS:Y=T4-(T6*T5):X=T1*T7*T2:TO=Y/X:L=ATN(TO)*J2
3525 IFX>0ANDY>0THENQ=1
3530 IFX<0ANDY>0THENQ=2
3535 IFX<0ANDY<0THENQ=3
3540 IFX>0ANDY<0THENQ=4
3545 TQ=Q
3550 Z=L:GOSUB15500:LQ=Q:IFLQ=TQGOTO3565
3555 L=L+90:IFL>360THENL=L-810
3560 GOTO3550
3565 IFGS=1THENRETURN
3570 L=L+33:DH=L:GOSUB7100:PRINT"GALACTIC L.";H;"DEG";M;"MIN";S;"SEC"
3575 DH=B:GOSUB7100:PRINT"GALACTIC B.";H;"DEG";M;"MIN";S;"SEC"
3580 GOSUB18000:RUN
3600 CLS
3605 INPUT"ENTER 'L' GALACTIC COORDINATE";H,M,S:GOSUB7000:L=DH
3610 INPUT"ENTER 'B' GALACTIC COORDINATE";H,M,S:GOSUB7000:B=DH
3615 T1=COS(B*J1):T2=COS(27.4*J1):T3=SIN((L-33)*J1):T4=SIN(B*J1):T5=SIN(27.4*J1)
:T6=COS((L-33)*J1):TO=(T1*T2*T3)+(T4*T5)
3620 X=TO:GOSUB15000:DE=AS:Y=T1*T6:X=(T4*T2)-(T1*T5*T3):TO=Y/X:RA=ATN(TO)*J2
3625 IFX>0ANDY>0THENQ=1
3630 IFX<0ANDY>0THENQ=2
3635 IFX<0ANDY<0THENQ=3
3640 IFX>0ANDY<0THENQ=4
3645 TQ=Q
3650 Z=RA:GOSUB15500:RQ=Q:IFRQ=TQGOTO3665
3655 RA=RA+90:IFRA>360THENRA=RA-810
3660 GOTO3650
3665 RA=RA+192.25:RA=RA/15
3667 IFGS=1THENRETURN
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```
3670 DH=RA:GOSUB7100:PRINT"R.A.";H;"HRS";M;"MIN";S;"SEC"
3675 DH=DE:GOSUB7100:PRINT"DEC.";H;"DEG";M;"MIN";S;"SEC"
3680 GOSUB18000:RUN
4000 CLS
4005 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y:F1=D:F2=MO:GOSUB7200:PRINT
4006 REM SUN
4010 FORX=1975TOY-1:DS=DS+365:T=X/4:IFT=INT(X/4)THENDS=DS+1
4015 NEXT
4020 N=360/365.25*DS
4025 IFN>360THENN=N-360:GOTO4025
4030 M=N+279.041470-282.510396:IFM<0THENM=M+360
4035 M=M*.0174532:GOSUB16000:T=TAN(E/2)*1.0168621:V=ATN(T):V=V*2:V=V*57.295779:I
FGV=1THENRETURN
4036 V=V+282.510396
4040 IFV>360THENV=V-360
4045 IFV<0THENV=V+360
4055 EL=V:ET=0:GS=1:GOSUB3315:GS=0
4056 IFRA<0THENRA=RA+24
4060 IF GP=1 THEN RETURN
4065 DH=RA:GOSUB7100:PRINT"R.A.";H;"HRS";M;"MIN";S;"SEC"
4070 DH=DE:GOSUB7100:PRINT"DEC.";H;"DEG";M;"MIN";S;"SEC"
4110 T=COS(V*J1)*0.016720+1:T2=0.9997156:F=T/T2
4115 R=149598500/F
4120 PRINT"SUNS DISTANCE";R;"KMS"
4125 DH=F*0.533128:GOSUB7100:PRINT"SUNS ANGULAR SIZE";H;"DEG";M;"MIN";S;"SEC"
4209 D=F1:MO=F2
4210 GR=1:GOSUB815
4215 DH=R:GOSUB7100:PRINT"SUNRISE";H;"HRS";M;"MIN"
4220 DH=ST:GOSUB7100:PRINT"SUNSET";H;"HRS";M;"MIN"
4345 GOSUB18000:RUN
4400 CLS
4405 INPUT"ENTER OBJECTS R.A.";H,M,S:GOSUB7000:PR=DH
4410 INPUT"ENTER OBJECTS DEC.";H,M,S:GOSUB7000:PD=DH
4415 GP=1:GOSUB4000:GP=0
4416 RA=RA*15
4420 PR=PR*15:T1=SIN(PD*J1):T2=SIN(DE*J1):T3=COS((PR-RA)*J1):T4=COS(PD*J1):T5=CO
S(DE*J1):T6=(T1*T2)+T3:T6=T6*T4*T5
4425 X=T6:GOSUB15100:E=AC
4430 PRINT"ELONGATION IS";E;"DEGREES"
4435 GOSUB18000:RUN
7000 REM
7005 IFS=0THENGOTO7020
7010 S=S/60:M=M+S
7020 IFM=0GOTO7040
7030 M=M/60
7040 IFH=0ANDM=0THENDH=0:RETURN
7041 IFH>=0THENDH=H+M
7045 IFH<0THENDH=H-M
7050 RETURN
7100 REM
7110 H=FIX(DH):T1=DH-H:T1=T1*60:M=FIX(T1)
7120 T1=T1-M:S=FIX(T1*60)
7125 IFH>=1ORH<=-1THENM=ABS(M):S=ABS(S)
7130 RETURN
7200 REM
7202 IFMO>12THENRETURN
7203 DS=0
7205 IFMO>2GOTO7250
7210 MO=MO-1:LY=Y/4
7220 IFLY=INT(Y/4)THENMO=MO*62:GOTO7240
7230 MO=MO*63
7240 MO=INT(MO/2):GOTO 7290
7250 MO=MO+1
7260 MO=INT(MO*30.6)
7270 LY=Y/4:IFLY=INT(Y/4)THENMO=MO-62:GOTO7290
7280 MO=MO-63
7290 DS=D+MO:RETURN
7300 REM
7305 IFY<1975ORY>2000THENPRINT"DATA NOT AVAILABLE...1975-2000 ONLY":FORZ=1TO500:
NEXTZ:GOTO400
7310 FORX=1975TO2000
7320 READ B
7330 IFX=YTHENRESTORE:RETURN
7340 NEXTX
7360 DATA 17.397221,17.413525,17.363611,17.379644,17.395558,17.411473,17.361678,
17.377592,17.393506,17.409421,17.359625
```

```
7370 DATA 17.375540,17.391454,17.407368,17.357573,17.373487,17.389402,17.405316,
17.355521,17.371435,17.387349,17.403264,17.353468,17.369383,17.385297,17.401211
10000 CLS
10005 INPUT"ENTER PLANETS NAME";P$
10010 IFP$="MERCURY"THENPE=.24085:LE=320.66305:LP=77.06645:EC=.205629:SA=.387099
:IC=7.00427:LN=48.03493:AZ=6.74:PL=0:GOTO10060
10015 IFP$="VENUS"THENPE=.61521:LE=310.97453:LP=131.21928:EC=.006785:SA=.723332:
IC=3.39438:LN=76.45475:AZ=16.92:PL=0:GOTO10060
10020 IFP$="EARTH"PRINT"OTHER THAN EARTH":GOTO10005
10025 IFP$="MARS"THENPE=1.88089:LE=249.62919:LP=335.59881:EC=.093382:SA=1.523691
:IC=1.84983:LN=49.36466:AZ=9.36:PL=1:GOTO10060
10030 IFP$="JUPITER"THENPE=11.86224:LE=355.21414:LP=13.91992:EC=.048460:SA=5.202
804:IC=1.30450:LN=100.19608:AZ=196.74:PL=1:GOTO10060
10035 IFP$="SATURN"THENPE=29.45771:LE=104.17278:LP=92.55833:EC=.055630:SA=9.5388
44:IC=2.48933:LN=113.43842:AZ=165.6:PL=1:GOTO10060
10040 IFP$="URANUS"THENPE=84.01247:LE=205.78286:LP=170.25472:EC=.04725:SA=19.181
854:IC=.77316:LN=73.87283:AZ=65.8:PL=1:GOTO10060
10045 IFP$="NEPTUNE"THENPE=164.79558:LE=249.91462:LP=44.40592:EC=.008586:SA=30.0
57960:IC=1.77236:LN=131.50506:AZ=62.2:PL=1:GOTO10060
10050 IFP$="PLUTO"THENPE=246.378:LE=202.3345:LP=224.258:EC=.246115:SA=39.29976:I
C=17.14451:LN=109.9965:AZ=8.2:PL=1:GOTO10060
10055 PRINT"NO SUCH PLANET":GOTO10005
10060 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y:F1=D:F2=MO:PRINT
10065 GOSUB7200
10070 FORX=1975TOY-1
10071 DS=DS+365
10072 T=X/4:IFT=INT(X/4)THENDS=DS+1
10075 NEXT
10080 N=DS/PE*.985626
10085 IFN>360THENN=N-360:GOTO10085
10090 T1=114.591557*EC:T2=SIN((N+LE-LP)*J1):ZC=T1*T2+N+LE
10100 IFZC>360THENZC=ZC-360:GOTO10100
10110 ZD=ZC-LP
10120 T1=(1-EC*EC)*SA:T2=(COS(ZD*J1)*EC)+1:ZE=T1/T2
10121 ZE=T1/T2
10130 ZF=DS/1.00004*.985626
10140 IFZF>360THENZF=ZF-360:GOTO10140
10150 T1=1.915977:T2=SIN((ZF-2.9761229)*J1):ZH=T1*T2+ZF+99.53431
10160 IFZH>360THENZH=ZH-360:GOTO10160
10170 IFZH<0THENZH=ZH+360:GOTO10170
10180 ZI=ZH-102.51044
10190 T1=(COS(ZI*J1)*.01672)+1:ZJ=1.000279558/T1
10195 T1=SIN(IC*J1):T2=SIN((ZC-LN)*J1):X=T1*T2:GOSUB15000:ZK=AS
10200 T1=COS(IC*J1):T2=TAN((ZC-LN)*J1):T3=T1*T2:T4=ATN(T3)*J2:T5=ZC-LN:T6=T5+30:
T7=T5-30
10204 IFT4>T5+720THENT4=T4-1440
10205 IFT4<T7ORT4>T6THENT4=T4+180:GOTO10204
10210 ZL=T4+LN
10215 J3=ZH-ZL:J4=ZL-ZH
10216 ZM=COS(ZK*J1)*ZE
10220 IFPL=1GOTO10255
10225 T1=180+ZH:T2=SIN(J3*J1)*ZM:T3=COS(J3*J1)*ZM:T3=ZJ-T3:T4=ATN(T2/T3)*J2:T1=T
1+T4
10230 IFT1<0THENT1=T1+360:GOTO10230
10235 IFT1>360THENT1=T1-360:GOTO10235
10240 ZO=T1
10245 T1=ZM*TAN(ZK*J1):T2=SIN((ZO-ZL)*J1):T3=T1*T2:T4=SIN(J4*J1)*ZJ:ZP=ATN(T3/T4
)*J2
10250 IFPL=0GOTO10265
10255 T1=ZJ*SIN(J4*J1):T2=ZJ*COS(J4*J1):T2=ZM-T2:ZO=ATN(T1/T2)*J2:ZO=ZO+ZL
10256 IFZO<0THENZO=ZO+360:GOTO10256
10257 IFZO>360THENZO=ZO-360:GOTO10257
10260 T1=ZM*TAN(ZK*J1):T2=SIN((ZO-ZL)*J1):T2=T1*T2:T3=ZJ*SIN(J4*J1):T4=T2/T3:ZP=
ATN(T4)*J2
10265 EL=ZO:ET=ZP:GS=1:GOSUB3315:GS=0
10270 DH=RA:GOSUB7100:PRINT"R.A.";H;"HRS ";M;"MIN ";S;"SEC"
10275 DH=DE:GOSUB7100:PRINT"DEC.";H;"DEG ";M;"MIN ";S;"SEC"
10276 D=F1:MO=F2:GR=1:GOSUB815:GR=0
10277 DH=R:GOSUB7100:PRINT"PLANET-RISE ";H;"HRS ";M;"MIN"
10278 DH=ST:GOSUB7100:PRINT"PLANET-SET ";H;"HRS ";M;"MIN"
10280 T1=COS((ZC-ZH)*J1):T2=2*ZJ*ZM*T1:T3=ZJ*ZJ+(ZM*ZM):T4=T3-T2:T4=SQR(T4):T5=A
Z/T4
10285 PRINT"DISTANCE FROM EARTH ";INT(T4*149492000);"KMS"
10290 PRINT"ANGULAR SIZE";T5;"SEC"
10295 T1=ZO-ZC:T2=COS(T1*J1)+1:T2=T2/2
```

```
10300 PRINT"PHASE OF ";P$;T2
10305 GOSUB18000:RUN
12000 CLS:REM LUNAR CALCS
12010 INPUT"ENTER DAY,MONTH,YEAR";D,MO,Y:F1=D:F2=MO
12020 INPUT"ENTER HRS,MIN,SEC";H,M,S:GOSUB7000:MT=DH/24
12030 ML=124.8756:MP=145.9601:MN=248.6441:MI=5.1453:ME=.0549:MO=.5181:MA=384401:
MC=.9507
12040 GOSUB7200
12050 FORX=1975TOY-1:DS=DS+365:T=X/4:IFT=INT(X/4)THENDS=DS+1
12055 NEXT
12060 ZA=DS+MT
12070 GP=1:GOSUB4006:GP=0:ZD=ZA*13.176339+ML
12075 M=E*J2
12080 IFZD>360THENZD=ZD-360:GOTO12080
12090 ZE=ZA/8.85*.9856262:ZE=ZD-ZE-MP
12100 IFZE<0THENZE=ZE+360:GOTO12100
12105 ZF=ZA/18.61*.9856262:ZF=MN-ZF
12106 IFZF<0THENZF=ZF+360:GOTO12106
12110 ZG=(ZD-V)*2-ZE:ZH=SIN(ZG*J1)*1.274:ZI=SIN(M*J1)*.186
12120 ZJ=SIN(M*J1)*.37:ZK=ZE+ZH-ZI-ZJ:ZL=SIN(ZK*J1)*6.289:ZM=ZD+ZH-ZI+ZL:ZN=(ZM-
V)*2:ZN=SIN(ZN*J1)*.658:ZO=ZN+ZM:ZP=SIN(M*J1)*.16:ZP=ZF-ZP:T3=ZO-ZP
12130 T1=TAN(T3*J1):T2=T1*.99597:ZQ=ATN(T2)*J2:T4=T3-20:T5=T3+20
12140 IFZQ<T4ORZQ>T5THENZQ=ZQ+180:IFZQ>T3+420THENZQ=ZQ-840:GOTO12140
12144 ZQ=ZQ+ZP
12145 IFZQ>360THENZQ=ZQ-360:GOTO12145
12146 IFZQ<0THENZQ=ZQ+360:GOTO12146
12150 ZR=SIN(T3*J1)*.0896818:X=ZR:GOSUB15000:ZR=AS
12160 EL=ZQ:ET=ZR:GS=1:GOSUB3315:GS=0:IFGO=1THENRETURN
12170 DH=RA:GOSUB7100:PRINT"R.A.";H;"HRS ";M;"MIN ";S;"SEC"
12180 DH=DE:GOSUB7100:PRINT"DEC.";H;"DEG ";M;"MIN ";S;"SEC"
12190 D=F1:MO=F2:MT=0:GO=1
12200 GOSUB12030:R1=RA:D1=DE
12210 D=F1:MO=F2:MT=.5:GOSUB12030:R2=RA:D2=DE
12220 RA=R1:DE=D1:GM=1:GOSUB815:M1=R:M2=ST:MR=A1:ZZ=M1
12230 RA=R2:DE=D2:GOSUB815:M3=R:M4=ST:MS=A2:M1=ZZ
12240 TR=(12*M1)/(12+M1-M3):TS=(12*M2)/(12+M2-M4)
12250 PRINT"BEARING OF RISING";MR;"DEG"
12260 PRINT"BEARING OF SETTING";MS;"DEG"
12270 DH=TR:GOSUB7100:PRINT"MOONRISE";H;"HRS ";M;"MIN"
12280 DH=TS:GOSUB7100:PRINT"MOONSET";H;"HRS ";M;"MIN"
12290 T=180-V+ZO
12300 IFT<0THENT=T+360:GOTO12300
12310 IFT>360THENT=T-360:GOTO12310
12320 T=COS(T*J1):F=(1+T)/2
12330 PRINT"PHASE OF MOON";F
12340 T=COS((ZK+ZL)*J1)*ME:T=1+T:P=.9969859/T:D=P*MA
12350 PRINT"DISTANCE FROM EARTH";D;"KMS"
12360 T=MO/P:DH=T:GOSUB7100:PRINT"ANGULAR SIZE";H;"DEG ";M;"MIN"
12370 T=MC/P:DH=T:GOSUB7100:PRINT"LUNAR PARALLAX";H;"DEG ";M;"MIN"
12380 GOSUB18000:RUN
15000 REM ARC SIN
15010 AS=ATN(X/SQR(-X*X+1))
15020 AS=AS*J2
15030 RETURN
15100 REM ARC COS
15110 AC=-ATN(X/SQR(-X*X+1))+1.5708
15120 AC=AC*J2
15130 RETURN
15500 REM Z
15510 IF(Z>0ANDZ<=90)OR(Z>-360ANDZ<=-270)THENQ=1
15520 IF(Z>90ANDZ<=180)OR(Z>-270ANDZ<=-180)THENQ=2
15530 IF(Z>180ANDZ<=270)OR(Z>-180ANDZ<=-90)THENQ=3
15540 IF(Z>270ANDZ<=360)OR(Z>-90ANDZ<=0)THENQ=4
15550 RETURN
16000 REM KEPLERS EQUATION
16010 E=M:T=0.000017
16020 T1=SIN(E):T2=0.016720*T1
16030 D=E-T2-M
16040 IFABS(D)<=TTHENRETURN
16041 SET(127,47)
16050 T3=COS(E):T3=T3*0.016720:T3=1-T3
16060 TE=D/T3
16061 RESET(127,47)
16070 E=E-TE:GOTO16020
18000 PRINT:PRINT:INPUT"ENTER WHEN READY";Z:RETURN
```

***** MURDER L2/16K (C) G. MOAD *****

In this Cluedo type game you are the Detective investigating a murder. This game however has a few extras like more than one floor and the fact that if you are not careful when (and if) you catch the murderer, he might kill you as well. The following is a brief explanation of the program logic:-

100-410 Floor plan graphics
500-970 Instructions
1000-1030 Initialization - GOSUB 3300 to determine Murderer
2000-2050 Command input -move,question,accuse, or (GOSUB 5000) 2100-2280 Move-only to rooms connected by doorway or stairs
2290-2350 Print current position and people present
2500-2580 Question-GOSUB 610 for help
2590-2610 Where were you at the time of the murder ?
2620-2650 Was anyone with you ?
2660-2740 Did you notice anything suspicious ?
2800-2860 Accuse - only two tries - must have witness
2870-2880 Score - for competition
2890-2900 End - note NEW command
3000-3030 Initilization
3200-3208 Determine people in the room, store in R$
3300-3330 Murderer,murder room (on ground floor ex. hall)
3340 Murder weapon at the scene of the crime
3350-3360 Witnesses ?
3400-3440 Print people present
3500-3580 Check if person input exists
3600-3620 Check if person in room
3700-3855 Move person (chosen at random) to an adjacent room
3860 Murderer takes weapon, but not in your presence
3862-3890 Kill the witnesses if alone with murderer
3900 Print location on floor plan
4000-4020 Inkey$ character input-also timing loop
4200-4210 Instring routine- checks if acceptable character
5000 Gives murderer, murder room

If you are typing this program in from the magazine be sure to CSAVE it before you RUN it as the ending routine uses the command NEW to clear memory when you have finished playing.

```
10 'MURDER/BAS VERSION 5.0 12/80
    (C) GRAEME MOAD
    6/278 DOMAIN ROAD
    SOUTH YARRA, VICTORIA  3141
20 CLEAR1000:DEFINTA-Z:DEFSTRS:DIMS2(12),L(12),S9(31)
30 RANDOM
40 CLS:PRINT@264,CHR$(23);"THE MANOR HOUSE MURDER"
50 PRINT@640,"DO YOU WANT INSTRUCTIONS <Y/N>?"
60 GOSUB4100
70 PRINT@768,"INITIALIZING"
100 'FLOOR PLANS
110 S9(0)=CHR$(191)+STRING$(20,131)+CHR$(171)+STRING$(19,131)+CHR$(171)+STRING$(
21,131)+CHR$(191)
120 S9(1)=CHR$(191)+CHR$(212)+CHR$(170)+"      <K>ITCHEN      "+CHR$(170)+CHR$(213
)+CHR$(191)
130 S9(2)=CHR$(191)+CHR$(232)+CHR$(170)+CHR$(213)+CHR$(191)
140 S9(3)=CHR$(191)+"    <D>INING ROOM     "+CHR$(170)+CHR$(198)+STRING$(13,176)+C
HR$(186)+"      <B>ALL ROOM      "+CHR$(191)
150 S9(4)=CHR$(191)+CHR$(212)+CHR$(170)+CHR$(176)+"     "+CHR$(176)+CHR$(149)+"//
/STAIRS///"+CHR$(170)+CHR$(213)+CHR$(191)
160 S9(5)=CHR$(191)+CHR$(254)+CHR$(191)
170 S9(6)=CHR$(191)+"     "+STRING$(16,140)+CHR$(174)+CHR$(233)+CHR$(191)
180 S9(7)=CHR$(191)+CHR$(220)+"<H>ALL       "+CHR$(170)+STRING$(21,140)+CHR$(191)
190 S9(8)=CHR$(191)+CHR$(212)+CHR$(170)+CHR$(233)+CHR$(191)
200 S9(9)=CHR$(191)+"       <LO>UNGE       "+CHR$(170)+STRING$(5,176)+CHR$(202)+ST
RING$(4,176)+CHR$(186)+"       <LI>BRARY       "+CHR$(191)
210 S9(10)=CHR$(191)+CHR$(217)+CHR$(170)+CHR$(202)+CHR$(149)+CHR$(217)+CHR$(191)
220 S9(11)=CHR$(143)+STRING$(25,140)+CHR$(142)+STRING$(3,140)+"===="+STRING$(3,1
40)+CHR$(141)+STRING$(25,140)+CHR$(143)
230 S9(16)=CHR$(191)+STRING$(40,131)+CHR$(171)+STRING$(21,131)+CHR$(191)
240 S9(17)=CHR$(191)+CHR$(206)+"BEDROOM <1>"+CHR$(207)+CHR$(170)+CHR$(213)+CHR$(
191)
```

```
250 S9(18)=CHR$(191)+CHR$(232)+CHR$(170)+"      BEDROOM <3>      "+CHR$(191)
260 S9(20)=CHR$(191)+CHR$(211)+STRING$(3,176)+"    "+STRING$(14,176)+CHR$(186)+C
HR$(213)+CHR$(191)
270 S9(21)=CHR$(191)+CHR$(211)+CHR$(149)+CHR$(200)+"///STAIRS///"+CHR$(170)+CHR$
(213)+CHR$(191)
280 S9(22)=CHR$(191)+STRING$(19,131)+CHR$(133)+CHR$(199)+"<H>ALL"+CHR$(199)+CHR$
(138)+CHR$(213)+CHR$(191)
290 S9(23)=CHR$(191)+CHR$(211)+CHR$(144)+CHR$(212)+CHR$(160)+CHR$(213)+CHR$(191)
300 S9(24)=CHR$(191)+CHR$(211)+CHR$(157)+STRING$(3,140)+"    "+STRING$(3,140)+CH
R$(156)+STRING$(3,140)+"    "+STRING$(2,140)+CHR$(142)+STRING$(21,140)+CHR$(191)
310 S9(26)=CHR$(191)+"    BEDROOM <2>    "+CHR$(149)+" <B>ATH-  "+CHR$(149)+CHR$
(223)+CHR$(191)
320 S9(27)=CHR$(191)+CHR$(211)+CHR$(149)+"   ROOM   "+CHR$(149)++CHR$(200)+"<C>O
NSERVATORY"+CHR$(201)+CHR$(191)
330 S9(28)=CHR$(191)+CHR$(222)+CHR$(149)+CHR$(223)+CHR$(191)
340 S9(29)=CHR$(143)+STRING$(19,140)+CHR$(141)+STRING$(10,140)+CHR$(141)+STRING$
(31,140)+CHR$(143)
350 SQ=CHR$(34):C$(0)="B/D/H/LO/LI/K/S":C$(1)="1/2/3/B/C/H/S"
360 GOTO500
400 FORI=0TO15:PRINTS9(I);:NEXT:RETURN
410 FORI=16TO31:PRINTS9(I);:NEXT:RETURN
500 IFA=2THEN1000:'INSTRUCTIONS
510 CLS:PRINT
"   A MURDER HAS BEEN COMMITTED AT THE MANOR HOUSE.  IT IS UP
TO YOU TO SOLVE THE CASE.  THERE ARE SIX SUSPECTS WITH BOTH     OPPORTUNITY AND
MOTIVE TO COMMIT THE CRIME.
"
530 PRINT
"THEY ARE -
 1. JEEVES, THE BUTLER .....  ALWAYS A SUSPECT
 2. MARGARET, HIS WIFE .....  SUSPECTED HIM OF CHEATING
 3. ELLEN, HIS DAUGHTER ....  AFTER THE FAMILY FORTUNE
 4. FREDERICK, HIS SON .....  DITTO"
540 PRINT
" 5. INGRID, THE MAID .......  SUSPECTED HIM OF CHEATING
 6. HERBERT, A GUEST ........  DEFRAUDING THE COMPANY.
   THE SUPECTS ARE GATHERED IN THE HOUSE AWAITING YOUR ARRIVAL. YOUR TASK IS TO
QUESTION THEM AND SO DEDUCE THE MURDERER."
600 A$=INKEY$:IFA$=""THEN600ELSECLS
610 PRINT
"   YOU MUST GO FROM ROOM TO ROOM AND INTERROGATE EACH OF THE
SUSPECTS IN TURN.
   THEY WILL RESPOND TO THE FOLLOWING QUESTIONS -
"
630 PRINT
"    <1> WHERE WERE YOU AT THE TIME OF THE MURDER?
    <2> WAS ANYONE WITH YOU?
    <3> DID YOU NOTICE ANYTHING SUSPICIOUS?
"
650 PRINT
"   ALL, EXCEPT THE MURDERER, WILL ANSWER TRUTHFULLY.
   WHEN YOU THINK YOU KNOW THE IDENTITY OF THE MURDER YOU MUST  CONFRONT THAT PE
RSON AND ACCUSE HIM(HER).  IF YOU ARE CORRECT"
660 PRINT
"YOU HAVE WON THE GAME BUT YOU ARE ONLY ALLOWED TWO GUESSES SO
BE SURE YOU HAVE THE RIGHT PERSON."
800 A$=INKEY$:IFA$=""THEN800ELSECLS
810 IFV9>0RETURN
820 PRINT"   THE FLOOR PLAN OF THE MANOR IS AS SHOWN -":GOSUB400:PRINT@898,"THE
GROUND FLOOR"
830 A$=INKEY$:IFA$=""THEN830ELSECLS
840 GOSUB410:PRINT@898,"THE FIRST FLOOR"
900 A$=INKEY$:IFA$=""THEN900ELSECLS
910 PRINT
"THE FOLLOWING SYMBOLS ARE USED TO DESIGNATE PEOPLE/ITEMS IN THE GRAPHIC DISPLAY
 -
 X - YOU
 J - JEEVES
 M - MARGARET
 E - ELLEN
 F - FREDERICK
 I - INGRID
 H - HERBERT
 G - GUN (THE MURDER WEAPON)"
930 A$=INKEY$:IFA$=""THEN930
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950 CLS:PRINT"
    FINALLY, REMEMBER THE PERSON YOU ARE TRYING TO CATCH IS A
MURDERER.  MURDERERS CAN BE DANGEROUS BOTH TO YOU AND TO ANY
WITNESSES OF THE ORIGIONAL CRIME.  SO BE CAREFUL.
                                              GOOD LUCK!"
970 A$=INKEY$:IFA$=""THEN970
1000 '**** GAME STARTS HERE ****
1010 GOSUB3000:GOSUB3300
1020 R=3:P(1)=3:FORI=2TO6:P(I)=RND(12):NEXT:CLS:GOSUB400
1030 PRINT@768,"I KNOCK AT THE FRONT DOOR.  THE BUTLER LETS ME INTO THE HALL."
2000 GOSUB3900
2010 PRINT@960,"WHAT WILL YOU DO <M/Q/A>? ";CHR$(30);
2020 GOSUB4010:T=T+X:X=0
2030 B$="MQA*":GOSUB4200:ONAGOTO2100,2500,2800,5000
2040 PRINT@960,"<M>OVE TO AN ADJACENT ROOM, <Q>UESTION, OR <A>CCUSE SOMEONE";
2050 FORI=1TO500:NEXTI:GOTO2000
2100 'MOVE
2110 V3=V3+1:V9=V9+1
2120 PRINT@960,"WHERE SHALL I MOVE TO <"C$(F)">? ";
2130 GOSUB4010:T=T+X:X=0:IFF>0THEN2210
2140 B$="DOHIBKSL":GOSUB4200:R1=A
2150 ONR1GOTO2160,2170,2180,2190,2190,2170,2190,2200:R1=R:GOTO2280
2160 IF(R=2ORR=3ORR=6)THEN2280ELSER1=R:GOTO2280
2170 IF(R=1ORR=3)THEN2280ELSER1=R:GOTO2280
2180 GOTO2280
2190 IFR=3THEN2280ELSER1=R:GOTO2280
2200 PRINT@1003,A$;:GOTO2130
2210 B$="''''''H12BC3S":GOSUB4200:R1=A:IFR1-6<1THENR1=R:GOTO2280
2220 ONR1-6GOTO2230,2240,2250,2260,2240,2240,2270
2230 GOTO2280
2240 IFR=7THEN2280ELSER1=R:GOTO2280
2250 IF(R=7ORR=10)THEN2280ELSER1=R:GOTO2280
2260 IF(R=7ORR=9)THEN2280ELSER1=R:GOTO2280
2270 IF(R1=13ANDR=7)THENR1=3:GOTO2280ELSER1=R:GOTO2280
2280 '
2290 IFF<>INT(R1/7)THENF=INT(R1/7):CLS:ONF+1GOSUB400,410ELSEPRINT@L(R),"        "
;
2300 R=R1:GOSUB3900
2310 PRINT@768,CHR$(31)"I AM IN THE "S2(R)". ";
2320 J=1:FORI=1TO6:T(I)=0:IFP(I)=RTHENT(J)=I:J=J+1
2330 NEXTI:IFJ=1THEN2010ELSEGOSUB3400
2340 IFJ=2THENPRINT" IS HERE."ELSEPRINT" ARE HERE."
2350 GOTO2010
2500 'QUESTION
2510 V2=V2+1:V9=V9+1
2520 PRINT@960,CHR$(30)"WHO SHALL I QUESTION <J/M/E/F/I/H>? ";
2530 GOSUB3500:GOSUB3600:IFP=0THEN2000
2540 PRINT@960,"WHAT WILL I ASK "S0(P)" <1/2/3/HELP>?"CHR$(30);
2550 GOSUB4010:T=T+X:X=0
2560 B$="123H":GOSUB4200:Q=A:IFQ=0THEN2000
2570 IFQ=4CLS:GOSUB610:ONINT(R/7)+1GOSUB400,410:PRINT@L(R),R$;:GOTO2000
2580 ONQGOTO2590,2620,2660
2590 PRINT@768,CHR$(31)S0(P)", WHERE YOU AT THE TIME OF THE MURDER?"
2600 PRINTSQ"I WAS IN THE ";:IFP<>MTHENPRINTS2(MR(P))SQ:GOTO2000
2610 PRINTS2(MR(7))SQ:GOTO2000
2620 PRINT@768,CHR$(31)S0(P)", WAS ANYONE WITH YOU?":IFP=MANDMR(7)<>MR(M)THEN265
0
2630 J=1:FORI=1TO6:IFMR(I)=MR(P)ANDP<>ITHENT(J)=I:J=J+1
2640 NEXTI:IFJ>1PRINTSQ"I WAS WITH";:GOSUB3400:PRINTSQ:GOTO2000
2650 PRINTSQ"I WAS ALONE"SQ:GOTO2000
2660 PRINT@768,CHR$(31)S0(P)", DID YOU NOTICE ANYTHING SUSPICIOUS?"
2670 IFM<>PTHENONMR(M)GOTO2680,2690,2710,2700,2700,2690ELSE2730
2680 IFMR(P)=2ORMR(P)=3ORMR(P)=6THEN2710ELSE2720
2690 IFMR(P)=1ORMR(P)=3THEN2710ELSE2720
2700 IFMR(P)=3THEN2710ELSE2720
2710 PRINTSQ"I HEARD THREE SHOTS"SQ:GOTO2000
2720 IFMR(P)=MR(M)PRINTSQ"I SAW "S0(M)" COMMIT THE MURDER"SQ:GOTO2000
2730 IFM=PANDMR(7)=MR(M)ANDW>0THENA=RND(W):PRINTSQ"I SAW "S0(W(A))" COMMIT THE M
URDER"SQ:GOTO2000
2740 PRINTSQ"NO"SQ:GOTO2000
2800 'ACCUSE
2810 V1=V1+1:V9=V9+1
2820 PRINT@960,CHR$(30)"WHODUNIT <J/M/E/F/I/H>?";
2830 P=0:GOSUB3500:GOSUB3600:IFP=0THEN2000
2840 IFP<>MTHENP=P1:PRINT@768,CHR$(31)"WRONG!";:IFV1>1THENPRINT" - THE MURDERER
WAS "S0(M);:GOTO2870ELSE2000
```

```
2850 IFLEN(R$)=1THENPRINT@768,CHR$(31)SO(M)" STRANGLES ME - AARRRGGH!";:GOTO2870
2860 PRINT@768,CHR$(31)"RIGHT! - YOU HAVE SOLVED THE CRIME";
2870 PRINT:PRINT"YOU TOOK";V9;"MOVES."
2880 PRINT"MOVEMENT =";V3,"QUESTION =";V2,"ACCUSATION =";V1,"TIME =";T/10
2890 PRINT@960,"WOULD YOU LIKE A NEW CASE <Y/N>?";CHR$(30);
2900 GOSUB4100:IFA=1THEN10ELSENEW
3000 FORI=1TO12:READS2(I),L(I):NEXTI:FORI=0TO7:READSO(I),S1(I):NEXTI:RETURN
3010 DATADINING ROOM,264,LOUNGE,648,HALL,540,LIBRARY,688,BALL ROOM,306,KITCHEN,1
56,UPSTAIRS HALL,412,BEDROOM 1,142,BEDROOM 2,582,BATHROOM,662,CONSERVATORY,682,B
EDROOM 3,238
3030 DATAME,X,JEEVES,J,MARGARET,M,ELLEN,E,FREDERICK,F,INGRID,I,HERBERT,H,GUN,G
3200 'FIND PEOPLE
3205 R$="":FORI=1TO7:IFP(I)=ATHENR$=R$+S1(I)
3208 NEXTI:RETURN
3300 'MURDERER
3310 M=RND(6):FORI=1TO7:MR(I)=RND(6):NEXTI
3330 IFMR(M)=3:MR(M)=RND(6):GOTO3330
3340 P(7)=MR(M)
3350 FORI=1TO6:IFMR(I)=MR(M)THENIFI<>MTHENW=W+1:W(W)=I
3360 NEXTI:RETURN
3400 'PEOPLE PRINTING
3410 IFJ=2PRINT" ";SO(T(1));:RETURN
3420 IFJ=3PRINT" ";SO(T(1));" AND ";SO(T(2));:RETURN
3430 FORI=1TOJ-2:PRINT" ";SO(T(I));",";:IFI=2ANDQ<>2THENPRINT
3440 NEXTI:PRINT" AND ";SO(T(I));:RETURN
3500 'PERSON SELECTION ROUTINE
3510 GOSUB4010:T=T+X:X=0
3520 X=0:B$="JMEFIH":GOSUB4200:P=A
3580 SO(0)=SQ+A$+SQ:RETURN
3600 'TEST PRESENCE IN ROOM
3610 B$=R$:GOSUB4200:IFA<1THENPRINT@960,SO(P);" IS NOT PRESENT";CHR$(30);:P=0ELS
ERETURN
3620 FORI=1TO100:NEXT:P=0:RETURN
3700 'MOVE
3705 A1=RND(6):A=P(A1):IF(X<100ANDA=R)OR(P(A1)=0)RETURN
3710 IFA=1THENONRND(3)GOTO3805,3810,3825
3715 IFA=2THENONRND(2)GOTO3800,3810
3720 IFA=3THENONRND(6)GOTO3800,3805,3815,3820,3825,3830
3725 IFA=4THEN3810
3730 IFA=5THEN3810
3735 IFA=6THENONRND(2)GOTO3800,3810
3740 IFA=7THENONRND(6)GOTO3810,3835,3840,3845,3850,3855
3745 IFA=8THEN3830
3750 IFA=9THENONRND(2)GOTO3830,3845
3755 IFA=10THENONRND(2)GOTO3830,3840
3760 IFA=11THEN3830
3765 IFA=12THEN3830
3800 P(A1)=1:GOTO3860
3805 P(A1)=2:GOTO3860
3810 P(A1)=3:GOTO3860
3815 P(A1)=4:GOTO3860
3820 P(A1)=5:GOTO3860
3825 P(A1)=6:GOTO3860
3830 P(A1)=7:GOTO3860
3835 P(A1)=8:GOTO3860
3840 P(A1)=9:GOTO3860
3845 P(A1)=10:GOTO3860
3850 P(A1)=11:GOTO3860
3855 P(A1)=12:GOTO3860
3860 IFP(M)=P(7)ANDP(M)<>RTHENP(7)=0
3862 IFW=0THEN3890
3865 A=P(M):GOSUB3200:IFLEN(R$)<>2THEN3890
3870 B$=R$:A$=S1(W(W)):GOSUB4200:IFA=0THEN3890
3875 IFP(7)PRINT@768,"BANG!....  ";
3880 PRINT@768,"AAAARRGH!";
3885 PRINTCHR$(30):PRINTCHR$(30):P(W(W))=0:W(W)=0:W=W-1
3890 RETURN
3900 GOSUB3705:A=R:GOSUB3200:PRINT@L(R),"       ";:PRINT@L(R),"X"+R$;:RETURN
4000 'COMMAND INPUT
4010 A$=INKEY$:IFA$=""THENX=X+1:PRINT@1012,INT(X/10);:IFX/50=INT(X/50)THENGOSUB3
900:GOTO4010ELSE4010
4020 RETURN
4100 A$=INKEY$:B$="YN":GOSUB4200:IFA=0THEN4100ELSERETURN
4200 'INSTR
4210 FORA=1TOLEN(B$):IFA$=MID$(B$,A,1)RETURNELSENEXT:A=0:RETURN
5000 PRINT@990,SO(M)" "S2(MR(M));W;:GOTO2000
```

********* NEXT MONTHS ISSUE **********

Next months issue will contain at least the following programs plus the usual features and articles.

** FINANCE - LI/4K **

With this program, you'll be able to balance your cheque book and you'll also be able to see how you are going financially via a graph.

** REMOVING LINEAR BRACKETS - LI/4K **

This is an educational program to assist students in learning the correct method of removing brackets in algebraic expressions.

** BOWLING L2/4k **

Ten pin bowling comes to the 80 with graphics and sound, watch out for those gutter balls though

** AGEING RELATIVELY - L2/4k **

Just the thing if you are planning a trip to Alpha' Centauri. Calculates how much your friends will age while you are away.

** COPYCAST L2/16k **

The purpose of this program is to provide a fast and accurate method of estimating how much space in a book a number of words will fill.

** BASIC MEMORY DUMPER - L2/4k **

Amongst other things this program converts system tapes to CLOAD tapes for easier loading. Lets you have M/l in BASIC.

***** CASSETTE EDITION INDEX *****

The cassette edition of MICRO-80 contains all the software listed each month, on cassette. All cassette subscribers need do is CLOAD and RUN the programs. Level II programs are recorded on Side 1 of the cassette and Level II programs on Side 2. All programs are recorded twice in succession. (Note: The second dump of ASTRONOMY is on Side 2 due to lack of space on Side 1). The tape counter readings are less likely to be accurate on Side 2 due to variations in length between cassettes.

		I.D.	APPROX. START POSITION CTR-41	CTR-80	SYS 80
SIDE 1					
C WORD	L2/4K	S	7	5	5
MICROHEX	L2/4K	H	30	22	22
			75	51	51
MURDER	L2/16K	M	95	64	64
			160	110	110
ASTRONOMY	L2/16K	A	225	152	152
SIDE 2					
PINBALL	L1/4K	-	44	30	-
			100	68	-
KEYNOTE	L1/4K	-	155	105	-
			205	139	-
ASTRONOMY	L2/16K	A	260	175	175

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MICRO-80

LEVEL II ROM REFERENCE MANUAL

by Edwin Paay

Published by MICRO-80 PRODUCTS

Written by Eddy Paay, the LEVEL II ROM REFERENCE MANUAL is the most complete explanation of the Level II BASIC interpreter ever published.

Part 1 lists all the useful and usable ROM routines, describes their functions explains how to use them in your own machine language programs and notes the effect of each on the various Z 80 registers.

Part 1 also details the contents of system RAM and shows you how to intercept BASIC routines as they pass through system RAM. With this knowledge, you can add your own commands to BASIC, for instance, or position BASIC programs in high memory—the only restriction is your own imagination!

Part 2 gives detailed explanations of the processes used for arithmetical calculations, logical operations, data movements, etc. It also describes the various formats used for BASIC, SYSTEM and EDITOR/ASSEMBLER tapes. Each section is illustrated by sample programs which show you how you can use the ROM routines to speed up your machine language programs and reduce the amount of code you need to write.

The LEVEL II ROM REFERENCE MANUAL is intended to be used by machine language programmers. It assumes a basic understanding of the Z 80 instruction set and some experience of Assembly Language programming. But BASIC programmers too will benefit from reading it. They will gain a much better insight into the functioning of the interpreter which should help them to write faster, more concise BASIC programs.

MICRO-80